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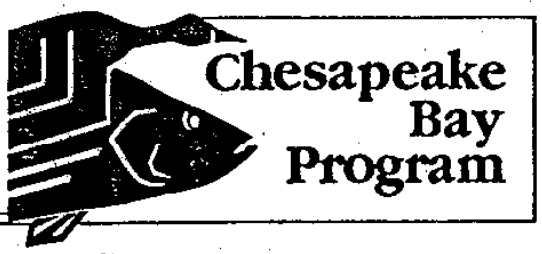
Reducing Pollution from Nonpoint Sources: The Chesapeake Experience

February 26-28, 1990



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Reducing Pollution from Nonpoint Sources: The Chesapeake Experience February 26-28, 1990

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REDUCING POLLUTION FROM NONPOINT SOURCES: THE CHESAPEAKE EXPERIENCE FEBRUARY 26-28, 1990

CONFERENCE PROGRAM

MONDAY, FEBRUARY 26

* = Remarks Not Available

* = Remarks Not Available

TUESDAY, FEBRUARY 27 **PAGE**

8:30 a.m. EMERGING NONPOINT ISSUES: THE GROWTH DILEMMA
Moderator: Robert Gray, 2020 Panel *
Torrey Brown, Sec'y of Nat. Resources, Md. *
Mark Bundy, Md. DNR *
Michael Hirschfield, Md. DNR *
Hon. Tayloe Murphy, Va. General Assembly *

10:00 a.m. BREAK

10:30 a.m. EMERGING ISSUES,
Concurrent Workshops (Choose One)

1. WETLANDS AS MANAGEMENT TOOLS
Moderator: Louise Lawrence, MDA *
Court Stevenson, Ph.D., Univ. of Md. *
Blaine Delaney, Three Rivers S & W Dist. p. 64
JoAnn Watson, MDE p. 66

2. PESTICIDE MANAGEMENT IN THE NINETIES
Moderator: Walt Peechatka, Pa. Dept. of Ag *
Bob Ehart, Ciba-Geigy p. 67
Michael Heller, Chesapeake Bay Foundation *
John Luna, Va. Tech. *

3. PROTECTING GROUNDWATER
Moderator: Bill Woodfin, Va. SWCB *
James O'Connor, Ph.D., Univ. of D.C. p. 68
Fred Cunningham, Va. SWCB *
Mary Jo Brown, Pa. DER p. 70

4. ERODING SHORELINES
Moderator: Jack Frye, Va. DSWC *
Carlton Lee Hill, Va. DSWC p. 72
Chris Zabawa, Md. DNR p. 73
Suzette Kimball, VIMS *

12:00 noon LUNCHEON
Moderator: Hon. Jeffrey Coy, Pa. General Assembly p. 76
Terry Nipp, Ph.D., National Association of State
Universities and Land Grant Colleges

1:30 p.m. EMERGING ISSUES, Concurrent Workshops Cont. (Choose One)

5. RIPARIAN BUFFERS: DO THEY WORK?
Moderator: Bruce James, Ph.D., Univ. of Md. *
Joseph Tassone, Md. Office of Planning p. 77
Theo Dillaha, Ph.D., VPI-SU p. 80
Jeffrey Horan, Md. DNR p. 82

* = Remarks Not Available

* = Remarks Not Available

B. C. LEYNES, JR.
Director

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FOREWORD

Reducing pollution from nonpoint sources has been one of the most difficult challenges in the Chesapeake Bay restoration effort. The states and the federal government have joined in mounting a comprehensive effort to define, quantify and control nonpoint source pollution. The level of effort and the dollar resources that we have devoted to this challenge since 1983 are unprecedented. The nonpoint activities are coordinated by a regional committee which is part of the Bay Programs management structure. I have been pleased to serve as chairman of the nonpoint source committee for the past three years.

The idea for a conference emerged from committee discussions about whether we were making adequate progress. We wanted to provide a forum for showcasing the many exciting and innovative things that are happening around the basin. We also wanted to bring together the nonpoint experts and give them the opportunity to share their views on how well we are doing and what new directions we should be considering as we move into the nineties.

I think the conference we held in Williamsburg last February accomplished these goals. We were delighted with the attendance (475 people came!), with the wide variety of exhibits, and with the energy generated by the many excellent workshops. This document summarizes some of what occurred in Williamsburg, and I hope you will find it a useful reference.

As we progress toward achieving our year 2000 nutrient reduction goal, we are engaged in a comprehensive evaluation of both the target and our programs. We will undoubtedly be proposing some program modifications based on that review. This conference provided an excellent vehicle to get us started on the evaluation process. We know we have a long way to go; we are confident we have made a good beginning.

R. B. Geddes

Roland Geddes
Chairman, Nonpoint Source Committee

OPENING REMARKS

Edwina Coder
President, Alliance for the Chesapeake Bay

Good morning. My name is Edwina Coder, and I am president of the Alliance for the Chesapeake Bay. I am very pleased to welcome you to this conference. The Alliance has worked with the Nonpoint Source Committee of the Chesapeake Bay Program to put this meeting together. It is designed to highlight the progress made here in the Chesapeake Bay region to identify and remedy nonpoint sources of pollution. It is also designed to allow us to focus on what we have characterized as "emerging issues," those aspects of the nonpoint problem which require further attention. The discussions we have at this meeting will provide critical advice and guidance to those who are involved in the process of evaluating the nutrient reduction strategy, and will help set the course for the Bay restoration effort in the nineties.

I am pleased to tell you that over 450 people have registered for this conference. They represent nearly one hundred local governments throughout the drainage basin. We also have with us people from more than a dozen states outside the Bay area, as well as professionals from a wide array of state and federal agencies, the private sector, and interested citizens. To all of you, welcome.

It is now my pleasure to introduce to you Dr. Bernard Caton, recently appointed deputy secretary of natural resources for the Commonwealth of Virginia. Many of you, I am sure, know Dr. Caton as a loyal interested working member of the Chesapeake Bay Program team from Virignia, present at many, many of those meetings which keep the Bay program moving.

KEYNOTE ADDRESS

SETTING THE STAGE: THE NONPOINT PROBLEM AND THE BAY

Joseph Mihursky, Ph.D., Chesapeake Research Consortium

I. HUMAN PROBLEMS AND THE COASTAL ZONE
   A. Causes of Change
      1. Long term growth patterns of human populations on Earth
         1990 = 5.3 Billion people

      2. How are contemporary populations distributed?
         a. World = 50% within 200 Km(125 mile) of seacoast
         b. Effluvia of at least = 2.7 billion people & people impacts on coastal zone.

   B. U.S.A. Patterns
      a. U.S.A. 3-D Demographic pattern
         1990 = 250 million people within 50 miles of seacoast=170 million people.
      b. U.S.A. population growth 1790-1990.

II. THE CHESAPEAKE REGION POPULATION PROJECTION
A. U.S.C.O.E. demographic pattern 1970-2020.

B. Bos-Wash megalapolis to Boston rich folk megalapolis on western shore region.

C. Ingredients necessary for growth
1. Space
2. Energy
3. Freshwater supplies

III. THE RATE OF CHANGE DILEMMA
A. Environmental change faster than ever before.

B. Increase in technological capability faster than ever before.

C. Cultural/sociological/individual rate of change faster than ever before.

IV. ECONOMIC DIMENSIONS AND POLITICAL PERCEPTIONS

A. Legislative tradition to champion growth development

B. What process makes dollars? -- We use science and technology to convert natural resources to saleable products and goods.

C. Open market system creates need to produce products and goods as cheaply as possible through:
1. Improve efficiency
2. Innovation/marketing
3. Do not process wastes = environmental degradation
4. Other

D. The point source problem and realization of external diseconomics -- the first breakthrough.

E. The relatively new realization of non-point problems.
1. Non-point sources and types in U.S. rivers and lakes -- Pie Diagram.
2. Hydrologic changes -- urbanization example from Toronto, Canada as one example of concern.

V. THE EMERGING PERCEPTUAL REVOLUTION OF CAUSES AND CONSEQUENCES OF CHANGE TO BAY SYSTEMS AS AN EVOLVING VALUE SYSTEM
A. Water quality focus

B. Linkage to living resources

C. Broader realization of declines in quality and quantity of living resources may be due to three factors.

D. Nutrient-sediment story as non-point example
1. Browning and greening the Bay - SAV link
2. Energy pathway alteration
a. Traditional metozoan pathway
b. Microzoan pathway

VI. THE LARGER ISSUE -- NATIONAL AND GLOBAL LINKS TO CHESAPEAKE CONDITION

A. North American NOx deposition patterns.

B. Budgets -- how big are the numbers and how are they distributed within and without the watershed -- need for good data.

C. Need to allocate resources, effort, technology, and incentives in the most cost effective and efficient manner.

VII. THE GOVERNANCE ISSUE

A. Social Evolution Theory says we constantly strive to better the human condition.

B. This striving is done by people.

C. Realization that the quality of the human condition is linked to our surrounding environmental condition, i.e. we are part of the living resources.

D. Realization that our ability to change and transform conditions are more powerful than ever before.

E. The further realization that we have not often understood the total effects of our actions.

F. The apparent success of our Chesapeake governance track record to date.

G. The Chesapeake National Experiment and its position as an international model for coastal systems.

VIII. ARE WE AT A HISTORICAL POSITION TO IMPROVE OUR EFFORTS AND ACCELERATE OUR ACTIVITY?

A. Collective societal wisdom of the Chesapeake Cooperative venture of management, science, legislators, media, and the public -- a success story.

B. National Trends

1. Washington Post public opinion poll.
2. Speaker O'Neill's quote re: budget priorities
3. Warfare economy vs. the new economy
4. Reallocation of resources. brain power and priorities to solving the man and nature warfare occurring on our coastal oceans and estuaries.

C. The need to market the correctness of a major coordinated effort to better manage ourselves in the boundary zone where the land masses and coastal zones meet.

D. Chesapeake governance must maintain and improve this leadership position.

E. The role of this conference in aiding this leadership position.

THE CHESAPEAKE STRATEGY: PROGRAM OVERVIEW

George Wolff, Moderator, Chesapeake Bay Commission

Speaker #1:

Roland B. Geddes
Director, Division of Soil & Water Conservation
VA Department of Conservation & Recreation

Thank you George. On behalf of the Nonpoint Source Subcommittee, I wish to add my welcome to each of you and express our thanks to the Alliance for the Chesapeake Bay and Fran Flanigan and her staff for their excellent work in putting on this conference.

You have heard a description of the nonpoint source problem from Dr. Mihursky. My assignment is to give a broad overview of our Chesapeake nonpoint strategies. Our audience consists of newcomers to NPS as well as some of the nation's experts in this field. This of course will be a simplistic look at a very complex problem.

The nonpoint source programs of all the states are based on research done by the Chesapeake Bay study of the early 80's, as outlined by Dr. Mihursky. The identification of sediment, phosphorous and nitrogen as the primary nonpoint source pollutants led each state to develop its strategies to deal with these. Specific strategies include, among others, the 40 percent nutrient reduction, conventional pollutants, toxics and the states' 319 plans. In general these 4 strategies have the following common goals:

A. Reduce erosion from agriculture and forestry. This addresses both sediment and soil particle bound pollutants such as phosphorus.

B. Reduce erosion from construction activities.

C. Reduce phosphorous and nitrogen reaching streams from agriculture by better management of both fertilizer and animal wastes.

D. Reduce phosphorous and nitrogen from runoff from suburban areas.

E. Reduce phosphorous, nitrogen, sediment, metals, oil and other pollutants from the urban runoff. And reduce the pesticide runoff from agriculture and suburban areas.

As we have developed these strategies we have recognized that how we manage our land controls the NPS contributions to the bay and that cropland is the largest single contributor to the nonpoint source problem in the Chesapeake Bay drainage area. Because of this lead agency responsibility for nonpoint was given to the Division of Soil and Water Conservation in Virginia (which is a land management agency) and to our counterparts in Pennsylvania and Maryland. Another major factor in this decision was the existence of the local soil and water conservation district system with its network of cooperating local, state and federal agencies. We all recognize that NPS programs must involve many angencies and groups and requires a high level of coordination and cooperation. Details of how these programs are being implemented in each state will be presented in the sessions over the next two days. But most involve a balanced program of the following elements: Research, Education, Technical Assistance, Financial Incentives and Program Management.

First, applied research - not that basic research that is behind these programs but applied research on how to address the problems that have been identified.

Second is education - probably the most important of the five elements that I am going to discuss, although education is not covered in any detail in this meeting, I think that we all agree education gives us the most long lasting results, and probably gives us

the most bang for our buck. Certainly the educational programs of the Chesapeake Bay, conducted by the government agencies at all levels, and by many private organizations that are involved in Chesapeake Bay education is extremely important and is the foundation of all our nonpoint source abatement programs, especially those that are voluntary.

Another element common to most of these programs is the provision of technical assistance, whether it is technical assistance to a farmer in installation of a best management practice or technical assistance to aid a rural locality in the enforcement of its erosion and sediment control laws.

Financial incentives is the fourth element. This is especially important to the farmers in helping them with the financial impact of BMP installation. Certainly we all agree that there is no way that the public treasury can afford to pay for the entire cleanup of the Chesapeake Bay and our cost share programs are really part of our education and demonstration efforts.

The last of the five basic elements is program management. Program management includes the need to identify those specific areas causing greatest problems and to target resources and efforts to those problems, We are using hydrologic unit planning to address targeted watershed problems. It also includes a system to measure , track and report progress as it is made. In Virginia we have contracted with our friends at Virginia Tech to develop our Geographic Information System called VirGIS to assist with targeting and measuring results. You will hear more about VirGIS in the different sessions this week. We still need to do a better job of measuring and reporting NPS progress.

I have already told you that our agricultural strategies in all three states includes a strong element of preventing erosion from cropland. Certainly very important parts of those strategies are the conservation elements of the 1985 Farm Bill. We are depending on conservation compliance to play a major role in our 40 percent nutrient reduction strategy. Conservation compliance requires that each farmer, having highly erodable land, have a conservation plan for that land approved by the local conservation district by the first of January 1990. We are very happy that the Soil Conservation Service and the local conservation districts have been able to meet their resposibilities, and for the most part these plans are now written and are in place as required by this law. Conservation compliance also requires that these plans be fully implemented by the first of January 1995. This will be a tremendous undertaking. Our farmers are going to need a lot of technical assistance and financial help to enable them to meet the provisions of these plans but full compliance will greatly assist in reaching the 40 percent nutrient reduction goal. The Conservation Reserve Program, which pays farmers an annual payment for taking cropland out of production and putting it into grass or trees for a ten year period, has been important but we are disappointed with the number of acres signed up within the Chesapeake Bay basin.

The 1985 Farm Bill is up for renewal in 1990. Our bay states are supporting a strong water quality provision in the 1990 Farm Bill with no reduction in the requirements of conservation compliance. We would like to see an extension of CRP and to have the eligibility expanded to include cropland that is environmentally sensitive as well as highly erodible or those strips of land immediately bordering our waters.

In a few minutes Paul Swartz will talk about another one of our strategies, designed to address nitrogen and phosphorous reaching the bay from animal waste and fertilizer management will also be discussed in separate breakout sessions this week.

To date, the urban programs of our states hane centered around better enforcment of our erosion and sediment control laws, and the passage and/or enforcement of new or stronger stormwater management regulations, better erosion control and environmental design in our state and local highway construction programs. These efforts, of course, will be described in more detail in breakout sessions.

While forestry has been identified as a relatively minor contributor of pollution to the bay, it is a factor that must be addressed. All three states have taken somewhat different approaches to this, but are working on it. This too will be covered in a breakout session this afternoon.

Better protection for our wetlands, especially non-tidal wetlands, pesticide management - with stronger programs of integrated pest management, protection of groundwater, the impact of eroding shorelines along the bay itself on the nutrients reaching the bay, the effectiveness of riparian buffer programs, the impact of homeowners and lawn care on water quality will all be discussed in concurrent workshops tomorrow.

All three bay states are studying fairly small watershed areas to determine the impact of BMP installation on specific water bodies. Some of these demonstration areas are now beginning their fifth year. Results from research on these areas to date will be presented in the demonstration water project discussion this afternoon, and a larger watershed will be discussed tomorrow afternoon.

From the beginning it was recognized that nonpoint source programs must be a blend of voluntary and regulatory programs. Rosemary Roswell will be discussing this in a few minutes in more detail. I am sure that a discussion of the proper mix of voluntary and regulatory nonpoint source programs will be discussed throughout this entire meeting.

We continue to ask how much nonpoint source pollution reduction do we really need? Second, can we acheive those reductions? Third, how long will it take? Will adequate funding be available to do the job? If it is, who is going to pay it? Do we go the traditional "the polluter pays" or does the public share with the polluter? How much additional regulation is needed? Certainly most of us are on record as saying we think we can achieve the 40 percent reduction in nitrogen and phosphorus by the year 2000. We have, though, been careful to say that progress on this will be difficult, slow, costly, and for some people, it will be painful, but if we stick to it, provide the funds, bite the bullet of additional regulations where absolutely necessary, and control the pollution from the inevitable population growth, we can restore the bay.

Speaker #2:

Rosemary Roswell
Assistant Secretary, Maryland Department of Agriculture

NPS Programs are directed at addressing many aspects of the NPS problem. Our NPS programs have evolved over time and are at different stages of development and implementation. We have been dealing with conventional pollutants for a number of years. And then as a result of the EPA report on the Chesapeake Bay, we began to develop programs to address nutrients. And now, we are looking at programs to address the NPS aspects of toxics.

They all involve a mix of program elements: research, information/education, technical assistance to individuals, groups, local jurisdictions; financial asistance; enforcement/regulation.

Questions we are now dealing with are whether our programs are doing what they are designed to do and "are they enough?" To help answer these questions, as they relate to our nutrient reduction goals, a special NPS Panel has been established. About 15 individuals, who represent a variety of interests and persectives have been asked to serve on this panel.

Members represent farm, forestry and urban interests. The panel includes concerned citizens, conservationists, environmentalists. However you might label panel members, they are, all but one, "independent" of the NPS programs of the Bay jurisdictions. The one exception is myself - I've been asked to represent all of the agencies on the NPS Subcommittee. The Panel membership should be announced within a couple of months.

The Panel charge is: to evaluate the capability of NPS control programs to achieve the 40% reduction goal. The Panel will need to look at the full range of voluntary and regulatory aspects of current NPS programs, and to look at the mix of program elements and assess whether programs are adequate. The Panel is being asked to recommend changes which may be necessary. All this by end of 1990 - so that the Panel's assessment can be incorporated into the 1991 reevaluation of the Baywide Nutrient Reduction Strategy. The task of the panel is considerable. I'm sure all of you here realize the complexity of the NPS control efforts but I know I'm always hearing about a new program or a new approach, and I'm not sure that the range of our programs is fully appreciated. Often I've heard the question "Is the voluntary approach working?" I could answer "Yes, at least 95% of the time". Neither the question nor the answer is really that simple. As a matter of fact, when several representatives of the NPS Subcommittee got together to define what our voluntary programs are, we couldn't identify any program that was purely voluntary.

To illustrate my point, let me give an example in the agricultural area.

Conservation planning is based on voluntary participation - the farmer working with technical staff of local soil conservation districts to identify management practices that will limit NPS pollution. But it is not just a voluntary program.

In some areas, Maryland's Chesapeake Bay Critical Area, or Virginia's Chesapeake Preservation Act requirements apply. These mandate conservation plans on farmland. In other area, conservation planning may be a requirement imposed on a farmer to solve a pollution problem. In Maryland we have an agricultural enforcement program within the Maryland Department of the Environment (MDE) when a situation is identified as a problem, staff of MDE contact both the landowner and the soil conservation district. A conservation plan is developed and a schedule is established for implementing best management practices to address the pollution problem. If a landowner refuses to cooperate, then formal enforcement action is taken. The conservation compliance aspects of the Federal Food Security Act also mandate conservation planning and implementation on highly erodible lands, in order for a farmer to retain USDA program benefits.

Obviously it is important to have an enforcement or regulatory component to our NPS programs. There are occasions when landowners do not agree to correct pollution problems and the only way to resolve the situation is to impose penalties. But how much regulation do we need?

The same question may be asked with regard to other elements of NPS programs. How much information, research, technical assistance do we need? The answer is: a balance. To achieve most effective results we have to have the right combination of program elements.

If we mandate conservation practices, we have to have technical expertise and assistance available to those charged with implementing practices. No simple requirements serve. Practices have to be tailored to the operation, whether it is a construction activity or agricultural activity, and to specific site conditions including the physical characteristics of the land.

Even if we do mandate conservation practices and have technical assistance our efforts cannot be very effective without education. Legal requirements often result in minimal compliance. Education leads to understanding and appreciation of the need for conservation practices. It leads to sustained commitment, and therefore results in long term maintenance of conservation practices, expanding conservation efforts and increasing participation in conservation programs. It also helps to spread the word to others, as individuals who are committed to practicing conservation are the best salesmen of conservation.

The need for balance exists in all programs, not just in agriculture. For example, sediment control and stormwater programs, which are considered regulatory programs, also must include other elements. In Maryland, certain practices are mandated. Training is provided to contractors and to inspectors so that mandated practices are clearly understood and implemented. Technical assistance is provided to local governments to assist them in implementing programs. For example, we are providing assistance related to establishment of stormwater utility structures and promotion of maintenance of these structures. Education efforts include the establishment of an urban demonstration area in Maryland, involving the cooperation of every level of government. This demonstration site will provide opportunity for cost-sharing information about sediment control and stormwater management practices among agencies, construction industries and the general public.

There is also a need for cost-share in urban NPS programs. Maryland has such a program for stormwater retrofit. A major increase in funding for this cost-share program in FY90 is resulting in considerable increase in retrofit projects.

The importance of a financial assistance element in a program is well illustrated by the record of participation in the Conservation Reserve Program in Maryland. We had been promoting forested buffers with technical assistance and some limited cost share. When the CRP program was expanded to include buffers and we added a bonus to the federal CRP payment, and then a bonus for planting trees, CRP participation in Maryland more than doubled. "Program management" is a critical element in NPS control programs. Needs assessment and targeting make the most effective use of limited resources. But this can be the trickiest element, particularly when targeting is combined with regulation.

The Conservation Compliance requirements are targeted to highly erodible land. This makes sense. However, when all available resources are directed to mandated action in order to meet deadlines, other needs are neglected. And these needs may be greater in terms of NPS pollution. For example, areas of livestock concentrations with animal waste problems would not be getting attention when technical assistance is focused on erodible soils. Another example of targeting tied to mandated requirements is Maryland's Critical Area program. Farms having land within 1,000 feet of tidal waters are required to have conservation plans implemented in 1991. Therefore staff efforts are directed to these areas, whether or not NPS pollution conditions exist. There may be areas upstream, outside the Critical Area, that are

contributing pollution and have a greater impact on the Bay. Staff may be spending time making contacts and doing paperwork to meet mandated requirements on land that already has adequate protection measures implemented, while areas with critical problems may be neglected due to staff limitations.

There are trade-offs that have to be considered when developing a regulatory approach. Flexibility to allow local determination of critical needs and priorities should be built into programs.

In looking at research as a program element, and considering program balance, we need to look at the weight given to research vs. other elements, but we also need to look for a balance within research programs. We do need applied research, directed at helping us to make management decisions related to the Chesapeake Bay Clean-up. We need to be researching the trade-offs of different NPS control programs and techniques. For example, we are looking at practices which are good for erosion control and determining what effect these practices are having on groundwater. These are the kinds of issues that need more investigation. We also need to be looking beyond technical adequacy of NPS control practices. We need to consider the reality of getting practices adopted. Do practices make sense within a total operation, whether it's construction or agriculture? Do they make sense economically? Do they reflect values and management abilities of individuals or groups who need to adopt the practices?

While most of what I've discussed has been related to our Nutrient Reduction Strategy, the same issues are being addressed in other areas. Right now we are looking at the nonpoint sources of toxics, primarily pesticides.

Maryland Governor William Donald Schaefer has established a Pesticide Council to review current pesticide programs and Maryland's Toxic Reduction Strategy, and to recommend actions or programs needed to protect human health and the environment from effects of pesticides.

Maryland Department of Agriculture (MDA) will soon release a comprehensive report of pesticide usage during 1988 by farmers and certified private and commercial applicators. The report will list pesticides applied and quantities applied on a county and statewide basis. MDA is continuing to conduct training and examination activities to certify, and recertify, private (farmers) or commercial pesticide applicators and to license pest control businesses. MDA is conducting inspection and monitoring of pesticide use or licensed businesses. MDA is enforcing and expanding the special pesticide notification and information programs required by law or regulation. These notification requirements include providing specific pesticide health and safety information to customers, and posting signs on treated lawns at time of pesticide application.

Maryland is also developing a water monitoring program. Utilizing the pesticide usage survey, MDA and the Maryland Department of Environment have identified most extensively used pesticides and selected pesticides to be included in the surface water monitoring program. Pesticide usage information will also be used to develop groundwater monitoring programs.

Integrated Pest Management (IPM) programs are expanding. IPM programs result in reduced pesticide use and in proper use - pesticides are applied when needed and applied safely. Alternative controls are used and may include cultural, biological, mechanical, genetic or chemical applications.

I have presented some of the topics and issues to be addressed during the NPS Conference. We are looking for ideas and suggestions as to how to answer the questions raised.

Speaker #3:

Paul O. Swartz
Director, Bureau of Soil and Water Conservation
Pennsylvania Department of Environmental Resources

My remarks to you this morning will focus on the challenges which lie ahead for the NPS programs in the Chesapeake Bay region.

What are the challenges?

1. Creating/maintaining public awareness of NPS problems and solutions.
2. Refining nutrient management programs.
3. Finding the right balance between voluntary and regulatory aspects of NPS programs.
4. Protecting groundwater
5. Creating better partnerships to improve the effectiveness of NPS programs.
6. Finding new ways to spell success.

1. Creating/Maintaining Public Awareness Of NPS Problems And Solutions

Creating and maintaining public awareness of the Chesapeake Bay and what we are doing to improve its water quality through NPS management programs remains an important challenge for all of us. But there is an even greater challenge: giving average citizens concrete information about what they can do to save the Bay. We need to do more -- much more -- in the area of public information and education. The subject matter of the workshop on "Homeowners and Lawncare" is vitally important as the population of the Bay region continues to grow.

How well have we, the managers of nonpoint source programs, told our story?

Let me share a quote from an article in the July/August 1989 issue of THE ENVIRONMENTAL FORUM entitled "Poison Runoff" by Paul Thompson.

> "Perhaps because poison runoff is such a complicated and diffuse problem, the public has not yet comprehended its scope and significance. In a recent NEW YORK TIMES poll, Americans ranked ranked industrial water pollution as our third most significant environmental problem, just behind acid rain and global warming. This concern is certainly justified. United States industries continue to dump hundreds of millions of pounds of toxic pollutants each year into our rivers, lakes and coastal waters. But poison runoff from farms and urban areas ranked tenth and

seventeenth, respectively, on the public's list of environmental concerns. Why the incongruity? Clearly, either we need more effective environmental education, or Americans find it difficult to consider their own behavior when thinking about water quality problems."

How do we compare in the Chesapeake Bay region?

My impression is that we have done a good job of creating general public awareness of the Chesapeake Bay Program and the role agriculture plays in improving the Bay's water quality. For instance, in a poll conducted by the HARRISBURG PATRIOT NEWS recently, the Chesapeake Bay Program was ranked among the top ten environmental issues in Pennsylvania.

Given the fact that Pennsylvania does not border the Chesapeake Bay, I think this finding is significant. Folks in places like Bradford County--as far north as you can be in the Chesapeake Bay watershed and still be in Pennsylvania-- are very attuned to the Bay and very eager to be involved in our cleanup efforts.

On the other hand, I question how well those of us responsible for managing NPS implementation programs have done in informing and educating our colleagues in the Chesapeake Bay Program about those programs. To the extent that implementation programs have become synonymous with cost-share programs, we have failed to communicate the importance and necessity of the other components of our programs. Planning (targeting), education, including research and demonstration projects, technical assistance and evaluation, including water quality monitoring, and enforcement are every bit as important as financial assistance for farmers in improving the Bay's water quality and protecting its living resources. As Rosemary explained earlier, all of these functions are necessary to put BMPs on the land.

2. Refining Nutrient Management Programs

We can take, to borrow Art Davis' words, "pardonable pride" in our efforts in the area of nutrient management during the past five years. There is no more cost effective BMP than applying less nutrients and less pesticides to our farmland and residential areas. I hope you are already aware that between 1980 and 1986, commercial fertilizer sales dropped 16% in Virginia, 21% in Maryland and 35% in Pennsylvania, according to information from a survey conducted annually by the TVA.

What we've been doing through our nutrient management and IPM programs in the Chesapeake Bay Program watershed is to chip away at the Berlin wall of conventional agricultural wisdom that more is better.

One of the concurrent sessions this afternoon deals with demonstration projects. Demonstration projects have been very important in the development and refinement of our nutrient management programs in the Chesapeake jurisdiction.

For example:

As you know, free access to streams by livestock results in direct pollution of our waterways. A demonstration project undertaken by the Northumberland Conservation District in Pennsylvania to construct a livestock stream crossing led to the development of a general permit for livestock stream crossings which will soon be available for statewide use. This general permit will make it easier for farmers to use this practice and thereby improve water quality.

Similarly, a demonstration project with the Pennsylvania Game Commission to fence pastureland along streams resulted in revision of specifications for this practice by ASGS to allow for the use of high tensile wire. Farmers were reluctant to use this practice, because the specification previously called for barbed wire or woven wire, which tend to collect debris in high water conditions. As a result of this specification being revised, more farmers are expected to use the practice.

Since there was no commercially available manure spreader designed to spread chicken manure at low enough rates to meet crop nutrient needs, the Lebanon County Conservation District developed one which allows chicken manure to be spread at environmentally safe rates. As a result of the demonstration project, technological innovations were subsequently used in manure spreaders manufactured by the John Deere Company.

The other side of the coin, however, is that nutrient management is at this point as much art as science--that is we have as many questions as we do answers. Five short years ago, we talked about the desirability of land application of manure to allow for volatilization of ammonium in order to prevent leaching of nitrogen into the groundwater. In the original watershed model, we assumed the contribution of atmospheric nitrogen to be 3 lb. per acre annually. As the result of more recent data which shows significantly higher nitrogen loadings from atmospheric sources than previously thought, the watershed model has been reprogrammed for nitrogen loadings in the range of 31-42 lb/acre annually from atmospheric deposition. Consequently, the idea of volatilizing ammonium from manure is no longer being looked at as a practice we want to encourage.

We need to evaluate the types of nutrient management plans we are developing and whether the BMPS we are using are the most cost effective and afford the most protection to the environment. And, as Lynn Shuyler keeps reminding us, we need to keep those practices in place and functioning beyond the timeframe of the contracts signed by farmers.

3. Finding The Balance Between Voluntary/Regulatory Aspects Of NPS Programs

Roland and Rosemary have already discussed the importance of having a good balance between the regulatory and voluntary aspects of nonpoint source management programs. The independent panel--or Roswell Commission as I prefer to call it--should help us to focus attention on this important issue.

I would only add that I think there seems to be some basic misconceptions about how these programs are functioning in the Bay states. Further, some people apparently think our programs are purely voluntary and that there are no regulatory programs.

This is not the case. For instance, in Pennsylvania alone, 101 enforcement actions were taken in 1989 for erosion and sediment pollution control violations, resulting in penalties of $328,600. This represented more than a 100% increase in the number of enforcement actions and a 90% increase in penalties collected in 1988.

It is true that we need to find more effective enforcement tools to deal with the truly bad actors, the individuals who blatantly violate state environmental protection laws and regulations. However, at the same time we should not sell ourselves short on what we have done in the area of enforcement.

Legislation has been introduced in Pennsylvania's General Assembly that would require all poultry and livestock farms in the state to develop and implement nutrient management plans. I'm happy to say that Rep. Jeff Coy, the prime sponsor of that legislation and a

member of the Chesapeake Bay Commission from Pennsylvania, is participating in the conference.

Also in response to a referendum issue on the ballot last fall, the commissioners in Juanita County, a rural area in central Pennsylvania, are proceeding with the development of a countrywide ordinance that will create the same requirements for all poultry and livestock farms in the county until such time as the state law is enacted.

4. Groundwater

Protecting groundwater is listed as one of the emerging issues to be discussed at one of the concurrent workshops at this conference tomorrow afternoon and is an important objective of our nonpoint source management programs. In Pennsylvania -- as I am sure is the case elsewhere -- we have found that protecting groundwater requires programs involving permits for on-lot septic systems and land application of sewage sludge, public water supply and disposal of animal wastes.

An important question we need to answer is: "What nutrient loads are delivered to the Chesapeake Bay via groundwater?" One of the milestones of the Baywide nutrient reduction strategy was to "... develop consistent accounting for loads delivered via groundwater flows." Although we did not meet that milestone in 1989, $80,000 is budgeted for FY 90 to research this question.

An issue pertinent to groundwater protection is the design of manure storage facilities. We are currently designing manure storage facilities to hold manure generated over a period of 180 days, which allows for the manure to be emptied and applied to the land in the Fall and Spring. Concern has been expressed that, because there are no crops to uptake the Fall applied manure, we may inadvertently be encouraging a practice that may exacerbate groundwater pollution problems. Perhaps we should be requiring manure storage structures with greater capacity in order to avoid spreading manure in the Fall of the year.

5. Creating Better Partnerships To Improve The Effectiveness Of NPS Programs

Through the Chesapeake Bay Program we've come a long way in breaking down institutional barriers among various governmental agencies during the past few years. Interagency Personnel Agreements (IPAs) and Interagency Agreements (IAGs) have fostered closer working relationships between and among various state and federal agencies. I think Roland and Rosemary would agree that one the the primary benefits of the NPS Subcommittee that conceived this conference is the fact that we have created a very viable partnership among the states in working toward a common goal.

But we need to work together even more closely in the future and continue to break down institutional barriers. Several resolutions recently adopted by the National Association of Conservation Districts could help to bring state and federal conservation agencies which work with farmers closer together. One resolution supports the adoption of specific criteria to identify those instances where it is appropriate to use alternative conservation systems and minimum criteria for erosion reduction when using alternative conservation systems; another states that the 1990 Farm Bill should, at a minimum, require all farmers to develop a water quality protection plan that will meet all state and federal water quality laws and regulations.

We, the NPS practitioners, also need to develop a closer working relationship with local government.

There are some good examples of how local government can be involved in a meaningful way in NPS programs. In Pennsylvania, an earth disturbance permit is required for activities which involve 25 or more acres of earth disturbance. We have learned that one of the most effective tools to enforce this requirement is for local governments to revoke building permits if projects are begun before earth disturbance permits are issued. The fact that the municipality is itself in violation of state law if it issues building permits prior to the issuance of an earth disturbance permit has considerably improved our working relationship with local governments! The issue of growth management is a very important one for those of us responsible for NPS programs, since uncontrolled growth could very well negate our efforts.

We need to provide local governments with the option of being involved in all aspects of NPS programs -- including enforcement -- and provide incentives for them to do so. We also need to ensure that the Chesapeake Bay NPS Subcommittee and the Chesapeake Bay Local Government Advisory Committee work together more closely in the future.

Another area in which we need to consider creating better partnerships is with our sister states which are part of the Chesapeake Bay watershed but not part of the Chesapeake Bay Program. Although Delaware, New York and West Virignia comprise 16.4% of the total Chesapeake Bay drainage basin, we have not invited them to sit with us around the Chesapeake Bay table.

How significant are nutrients from the far reaches of the watershed? One of the interesting things we have learned from our nutrient monitoring conducted by the SRBC over the past five years is that the nutrient loadings in the Susquehanna River Basin are essentially proportionate to the size of the drainage area. Even though you have heard a lot about nutrients associated with concentrated agriculture in the lower Susquehanna basin, and it is true that the per acre loadings are highest in this area, SRBC has told us that better than 3/4 of the total nutrient loadings in the Susquehanna basin originate in the upper Susquehanna basin -- the watershed area upriver from Harrisburg.

Again, perhaps it is time for us to consider pulling a few more chairs around the Chesapeake Bay table for our sister states.

6. Finding New Ways To Spell Success

How do we measure the success of NPS programs?

Obviously, we must ultimately measure the success of our NPS programs by the water quality of our streams and rivers, our groundwater and our Chesapeake Bay -- and, beyond water quality, we must ultimately measure our success by the restoration of the Bay's living resources. For the time being, we measure our success in terms of how much money we have spent and in terms of the quantity of nutrients and soil saved as the result of our NPS programs.

Unfortunately, we have not yet developed a single reporting system which includes the BMPs from both state and federal NPS programs. Our current systems, which report pounds of nitrogen and phosphorus reductions and tons of soil saved in the Chesapeake Bay watershed, capture only a fraction of the BMPs actually being installed on farmland. Moreover, we need to have a better reporting system for BMPs on non-agricultural land. We need a truly integrated reporting system which accurately measures the accomplishments of our NPS programs. If we can develop a 3-D hydrodynamic model of the Chesapeake Bay, we can certainly develop a comprehensive reporting system!

Again, this will require us to overcome some institutional barriers by merging information from both state and federal conservation agencies in all the Chesapeake Bay jurisdictions. We understand the SCS Chesapeake Bay Board of Directors is committed to working with EPA and the states in developing an integrated reporting system for Chesapeake Bay agricultural NPS programs.

It's easy to measure how much money has been spent in cost-share programs, but how do we measure the results of educational programs in terms of changing attitudes and behavior on the part of those who use the land and those who influence land use decisions? How do we measure accomplishments which are not directly the result of governmental programs or activities at all?

We do need to concern ourselves with how much money is being spent for implementation programs, and the fact is that less and less of the federal funds for the Chesapeake Bay Program have been devoted to implementation programs in recent years, although state appropriations have increased. We should all be concerned about this disturbing trend.

At the same time, we need to find more sensitive measures to more fully capture the accomplishments of our Chesapeake Bay NPS programs. This is a big challenge for us as we approach the 1991 re-evaluation of the 40% nutrient reduction goal.

7. Conclusion

In conclusion, let me repeat the challenges I see for NPS managers in the immediate future:

1. Creating/maintaining public awareness of NPS problems and solutions.
2. Refining nutrient management programs.
3. Finding the right balance between voluntary and regulatory aspects of NPS programs.
4. Protecting groundwater
5. Creating better partnerships to improve the effectiveness of NPS programs.
6. Finding new ways to spell success.

The NPS Subcommittee of the Chesapeake Bay Implementation Committee is very pleased to be part of this first Chesapeake Bay NPS conference and we hope that each one of you will both learn and share at this conference.

Speaker #4:

Wilbur Gary Nelson
Administrator, Housing and Environmental Regulation Administration
Department of Consumer And Regulatory Affairs, Washington, D.C.

Good morning invited guests and conference participants.
My name is Bill Nelson. and I am the Administrator of the Housing and Environmental Regulation Administration for the District of Columbia. It is a pleasure to be here and I

want to thank the Alliance for the Chesapeake Bay for inviting me to speak to you today about the District of Columbia Nonpoint Source Pollution Program and how it contributes to the overall strategy for the Chesapeake Bay and its tributaries.

Since the signing of the 1983 Chesapeake Bay Agreement, the District of Columbia has identified a number of initiatives to assist in the restoration of the Chesapeake Bay. Stormwater management was identified as one of the initiatives that could be used in improving not only the quality of the Potomac and Anacostia rivers in the District, but also the Chesapeake Bay. We believed that efforts to clean up the two rivers, particularly the Anacostia, 80% of which flows through Maryland, required cooperation and coordination between the two jurisdictions. Consequently, in 1984, the District and Maryland signed into law the Anacostia Watershed Restoration Agreement.

This agreement committed the District to develop and implement a Stormwater Management Program compatible with the established programs in Maryland and further highlighted the importance of stormwater management as a tool to combat nonpoint source pollution. The District utilized its initial Chesapeake Bay Implementation Grant to implement its Stormwater Management Program. Being a uniquely urban area with a high degree of imperviousness, our nonpoint source program is focused entirely on the management of urban runoff.

Two agencies, the Department of Consumer and Regulatory Affairs and the Department of Public Works share responsibilities for managing the District's nonpoint source programs. DCRA's role as the lead agency is in the development of regulations, review and approval of erosion control and stormwater management plans, and inspection of construction sites to ensure compliance with approved plans. The Department of Public Works is responsible for implementing demonstration projects.

From 1984 to the present, DCRA has received approximately $2 million dollars from EPA to implement the District's nonpoint source program. These funds are matched by District appropriated funds. The funding is used in seven areas:

(1) The development of stormwater management regulations with the goal of ensuring that developers use best management practices to control stormwater runoff from their projects;

(2) To hire personnel for plan review and enforcement of the regulations;

(3) To provide technical assistance to contractors and developers;

(4) The development of a stormwater management guidebook;

(5) The development of educational materials and public outreach programs;

(6) To maintain a stream gauging station that provides flow data which together with flow concentrations will enable DCRA staff to compute pollutant loads and identify critical areas for remedial action;

(7) And to initiate plans for the design and construction of retrofit projects and streambank stabilization in the Anacostia Basin, where most of the District's nonpoint source control efforts are targeted because of the river's high level of degradation.

Successful implementation of the District's program has involved coordination and cooperation with agencies and organizations such as the National Park Service, the U.S. Army Corps of Engineers, the Soil Conservation Service, Interstate Commission on the Potomac River Basin, the Metropolitan Washington Council of Governments, the Consortium of Universities, as well as a host of District Government agencies.

Implementation of the new 319 Program, will increase demands on the current nonpoint program in terms of manpower requirements, broadening the scope of existing programs and call for more strict enforcement mechanisms.

The District will meet these challenges by amending the Erosion and Sedimentation Control Law to provide better enforcement mechanisms and implement our Civil Infractions Program in this area to provide us with stronger enforcement authority to carry out our regulatory responsibilities more effectively.

As the District continues to tailor its nonpoint source program to meet the demands of a stable and highly urbanized area, we will continue to attain where possible, compatibility with programs in the neighboring jurisdictions of Maryland and Virginia.

In closing I would like to emphasize that we in the District are very proud of our efforts in restoring the Bay and we are pleased to join with our neighbors in working together in this most important program that will have such long term benefits for the future of our region.

PERSPECTIVES ON PROGRESS - A PANEL

Joseph Maroon, Moderator, Chesapeake Bay Foundation

Speaker #1:

Sandra S. Batie, Ph.D.
VA Polytechnic Institute and State University

The end of a decade is a time for reflection, a time for rededication, a time for redirection. When one considers that at the beginning of the 1980s the role of nonpoint sources in determining surface and groundwater quality was rarely recognized and poorly understood, then one can appreciate just how much progress toward improved Bay quality has occurred. Ten years ago, any of us interested in nonpoint pollution would begin with a definition, now we have an entire conference dedicated to the subject. Ten years ago, the environmental community was discovering nonpoint pollution after a decade of attention almost exclusively to point sources. Now the control of nonpoint pollution is a top environmental priority. Ten years ago the universities had very little research or extension addressing nonpoint pollution sources; the numbers of researchers have increased many fold. The Extension Service now views water quality protection as an important part of its mission. Ten years ago the agencies most closely relating to agriculture, a chief contributor to nonpoint pollution, were emphasizing the maintenance of soil productivity and the protection of farmers' incomes. Now water quality is an important concern of these agencies; Soil Conservation Service field guides now include pesticide management and water quality protection plans. The Division of Soil and Water Conservation and the Soil Conservation Districts devote many hours to water quality improvement. Ten years ago many farmers were unaware that either their farm or their practices were contributing to declining water quality. Today, far fewer remain uninformed on their relationship to the Bay. Ten

years ago the public's concern about the Bay's quality rarely incorporated nonpoint sources; now the word nonpoint is even known in our elementary schools, and the public has become far more sophisticated in their knowledge of the complexities associated with obtaining the environmental quality desired. All these changes have meant that today the Bay has better water quality than it would have had without them. In this sense, much progress toward improved Bay water quality has occurred in the 1980s.

As the 1990s unfurl, we can expect to see more progress, but probably not by doing more of what was done in the past. Rather, Bay water quality management will enter a new maturity where techniques are sharpened and made more cost-effective--obtaining the most water quality improvement possible with our program resources. The emergence of some of these new trends can already be seen.

Whereas the 1980s saw program growth, the 1990s will witness increased program effectiveness. For example, rather than voluntary programs presenting a menu of choices to those farmers or suburbanites who elect to participate, I would expect to see more refined diagnosis of which properties and which practices are causing which problems. Cost sharing funds and program assistance would be targeted not necesarily to where the problem is the greatest, but to where the funds and assistance will result in the most improvement in water quality. Program accountability in terms of impact on outputs--improved water quality--will rise; program accountability in terms of inputs--numbers of program employees hired, number of farmers reached, numbers of BMPs adopted-- will decline.

Program strategies will be less of a passive voluntary nature--waiting for an individual to request assistance--and more of an assertive voluntary nature--seeking out the individuals whose changed behavior could have the most impact on water quality. For the reluctant participant, there will probably be mandatory requirements in certain situations. Best Management Practices will be more precisely targeted, for example, to more efficient use of nitrogen and improved use of pesticides based on loadings and toxicity levels. Furthermore, BMPs will better incorporate the interrelationships between ground and surface water quality. There will be less concern with obtaining 100 percent control than with obtaining the most control possible for each dollar spent. It may be more cost effective, that is, there may be more improved water quality obtained per program dollar spent, to reduce nonpoint pollution on many farms by 50 percent, than to reduce nonpoint pollution on a few farms by 95 percent. This cost effective strategy suggests the willingness of program managers to take the risk that occassionally standards will be exceeded. That is, if BMPs are designed to withstand most storm events without nonpoint pollution increases, the price may be too expensive relative to what could have been achieved with lower design standards. Unless program funds are unlimited, a few "gold-plated" solutions on some farms may translate into no solutions elsewhere. The same comment is germane to point protection of course. In the future we probably will see more willingess to accept the pollution impact of the occasionally extreme rainstorm event on, say, sewage treatment plants, than to design our plants to control all such events at the cost of running out of program funds for other areas. Furthermore, we will probably see more consideration of the tradeoffs between managing point and nonpoint pollution sources--as to where each program dollar has the most impact on Bay quality. In some cases we may be better off in terms of improved Bay quality to place more dollars in point source management than to manage numerous diverse farming operations. In other cases, the reverse may be true. Such coordination will require enhanced cooperation among agriculturally- and nonagriculturally-oriented agencies toward a common environmental goal of improved water quality--the genesis of which we have already witnessed in the 1980s.

This prediction of the 1990s depends in part on research findings and expanded knowledge bases. Technical research that relates BMPS to reductions of certain pollutants,

relates these reductions to loadings, and relates loadings to improved water quality presently has many gaps. Tradeoffs between point and nonpoint sources of pollution, as well as ground and surface water quality needs more analysis. Improved targeting to geographical locations requires improved knowledge bases. Much of the remainder of this conference addresses these needs. Similarily, social science research is required to assist in the redirection for greater cost effectiveness of programs. The best policy relevant research will be interdisciplinary and will be conducted by researchers sensitive to the policy process and the needs of the Chesapeake Bay program.

The prospects for progress in terms of improved Bay quality are good even with the knowledge we have available now; but they are even greater with the research that will be forthcoming in the 1990s. This conference is excellently positioned to be a catalyst for this progress.

Speaker #2:

Manly Wilder
U.S. Department of Agriculture, Soil Conservation Service

My perspective on progress in the Chesapeake nonpoint source effort is that we have come a long way; we are moving fast; but we have a long, long way to go. We have come a long way in determining what the problems are and in building awareness. We are rapidly building momentum in planning the conservation systems needed to solve many of the nonpoint source problems. Yet, we have a long way to go in accomplishing all the conservation we would like to see on the land and in developing the additional technology needed for monitoring and controlling nonpoint source pollution.But, given the scope of the undertaking, and the relatively short period of time that the Bay Program has been underway, progress is excellent, and the outlook is good. I base my optimism on the following:

1. Broadscale awareness throughout the watershed that the Bay's problems are real and that we all are part of the solution is growing. The Alliance's excellent program is an important part of this awareness building. It is a broad-reaching program, touching citizens from all walks of life.

2. We are taking a total resource management approach, on the basis of watersheds (or hydrologic units), to solve the nonpoint source problems. People are talking across district, political, and landownership boundaries to coordinate solutions for their entire watershed.

3. More federal, state, and local resources are targeted for the Bay Program.

4. There is tremendous cooperation among government agencies and between government and the private sector.

5. Technical progress is occurring in SCS and other agencies serving the Bay Program. When the Chesapeake Bay initiatives began in 1984, SCS signed an agreement to work closely with the Environmental Protection Agency (EPA). This agreement was reinforced in 1987, when it was expanded to include other agencies. Now, we have eight federal agencies under cooperative agreement, along with state agencies and conservation districts.

Over the last 3 or 4 years, Congress has given SCS special funds earmarked for the Bay Program. In 1988, about $1 million went to SCS to help accelerate the program; in 1989, $1.6 million; and in 1990, about $2.1 million. This money is allocated according to a formula agreed upon by the six states in the Chesapeake Basin (Maryland, Virginia, Pennsylvania, Delaware, West Virginia, and New York, plus the District of Columbia). In terms of staffing, SCS has added 50 additional field office positions for Bay Program work in the six states since the mid-1980's.

Augmenting the SCS contribution are the contributions of cooperating federal, state, and local organizations. For example, districts and state agencies are working closely with SCS to update water quality infommation in our field office technical guides. State cost-share programs have adopted our standards and specifications for conservation practices that benefit the Bay.

To increase our overall effectiveness, the six state conservationists in the Bay watershed have joined together as a board of directors for the SCS effort. The board members have a full-time coordinator who works with EPA's Chesapeake Bay Liaison Office in Annapolis. SCS has also had a resource conservationist working at the EPA Bay office to help work with the Bay Computer Model to identify areas for priority assistance.

In the Chesapeake watershed, the cooperative effort involving SCS is helping states focus their efforts on controlling soil erosion, managing animal waste, and improving agrichemical use.

Progress under the conservation provisions of the 1985 Food Security Act has significantly augmented the Bay effort. In the Chesapeake watershed area in Maryland, Pennsylvania, and Virginia, SCS and the districts have helped farmers complete more than 53,000 conservation compliance plans covering about 1.9 million acres of highly erodible land. When fully implemented, these conservation systems should contribute significantly to the reduction of nutrient loading (via sediment and water runoff) from agricultural nonpoint sources.

The Conservation Reserve Program, another facet of the 1985 Food Security Act, which puts marginal land under a permanent plant cover, should make a significant contribution also, thanks to the piggyback bonuses that certain Bay area states have added to the USDA rental payment.

Given the technology at hand and the scope of our activities, we are measuring progress from our erosion control efforts in terms of --

* The amount of soil that we keep from eroding, and
* The amount of nitrogen and phosphorus we keep out of the bay as a result of the reduction in sediment loading.

For example, we have estimated that conservation efforts in the Chesapeake Basin in 1989 will reduce annual nitrogen loading by 3,573 tons and phosphorus loading by 748 tons. Those efforts included nearly 741,000 acres put under a conservation plan, for an estimated soil loss reduction of 1.4 million tons per year.

The values we use to estimate phosphorus and nitrogen reduction from sediment reduction are the consensus of Federal, state, and local specialists in the Chesapeake area. Science will someday, give us a practical way of measuring progress more precisely. But until then, we are taking action with the best tools at hand.

Waste management is a special concern for high-density poultry and livestock operations. I am very pleased to see that these industries are coming to SCS for help and advice. We realize that in high-population areas like the Chesapeake Bay area disposal of animal waste is a real problem. While this problem is difficult to solve, our chances are good with close cooperation between government and the private sector.

Concern over agrichemical use also is an impetus for cooperation between government and the private sector. Now that interest in "sustainable agriculture" has been rekindled, we need to work together to help agriculture find the widest possible choice of cost-effective and environmentally sound resource management systems with common sense, long-term profitability, and protection of resources as the basic goals.

Over the past few years, cooperation between state and federal agencies and the private sector has been unprecedented. Cooperation has a vital role in USDA's new water quality initiative, which is a top conservation priority. We have in place a fully cooperative effort in education and technical assistance, research and development, and database development and evaluation. For SCS this priority effort means special project funding, still more coordination with other agencies and the private sector, and an SCS 5 year plan to help us expand and improve technical assistance.

Under this new 5-year plan, we are focusing technical and financial assistance on hydrologic unit areas that states have designated as having high-priority concerns regarding nonpoint source pollution. New York's East Sydney Lake watershed is one of these. Over the 5-year period, we expect to start more than 275 of these hydrologic initiatives, so I would encourage the states in the Chesapeake Basin to submit proposals where this kind of activity could help in the development of new and innovative technology.

In cooperation with the Extension Service, we are developing on farm demonstration projects to promote cost-effective technologies and conservation practices in areas that have nonpoint source contamination concerns. One of these projects is in Maryland.

Under our new water quality initiative, SCS also is improving its technical support capabilities, with accelerated training, development and use of computer technology, and expanded availability of information and data bases. In Virginia, for example, we are putting extra resources into adapting our computerized progress-reporting system to help evaluate workload needs and monitor progress in applying best management practices.

Throughout the country we are working with other agencies, and the private sector, to learn more about the chemical, physical, and biological processes of nonpoint source contamination. We are learning all we can about how chemicals change and persist in soil and how breakdown products move into water. Work has also begun on using geographical information system technology to develop computer models to help us better understand these processes.

Speaker #3:

R. Neil Sampson, Executive Director
American Forestry Association

In late 1988, the American Forestry Association announced a new campaign we called Global ReLeaf. The idea was based on public concern about the potential for global warming

caused by the greenhouse effect. We were aware that the scientific community was not in agreement about the changes that might occur, but we were also aware that the public was deeply concerned. Global warming may not turn out to be a climatalogical phenomenon in the 21st Century, but it was, and still is, real in the minds of people.

So, with attention tuned toward the subject, we began a campaign to explain how, in a small way at least, people could make a difference. They could plant a tree, or help improve forest growth through environmental action. That would, for sure, cause more carbon dioxide to be taken up and stored in plant tissue, which couldn't hurt the greenhouse effect, and might -- if enough people planted enough trees -- help.

In addition, there are a lot of other advantages to improving trees and forests. Around one's house or small business building, it is possible to incur substantial energy savings through trees. That means a savings in people's pockets soon and, in many cities, enough action by citizens could result in significant improvements in living guality for all the city's residents -- saving them thousands of dollars an hour on summer afternoons.

Out in the countryside, improving trees and forests can reduce soil erosion and water pollution, increase ground water recharge, improve air quality, increase wildlife habitat, and restore stability to watersheds prone to flooding and drought cycles because of improper land use and management.

People's reaction has been overwhelming -- in the Chesapeake region, across America, and around the world. In truth, the main idea is only somewhat about trees and forests. The main idea is about people, and their relationship to their environment. If they want an environment that works, they need to tend it with loving care and stewardship.

Global ReLeaf calls people to constructive action, to rebuild their own environments. It tells them that it is they who must restore the earth. It tells them that, with right actions, we can not only prevent pollution today, we can right the wrongs of yesterday. Again -- that idea doesn't have a whole lot to do with trees, even though the tree may be a tool at times. It has to do with attitudes, and how people view their role in the environment.

Fourteen states, and over 100 cities, have now established official Global ReLeaf campaigns -- often funded by significant state and local funds. Thousands of community projects have been initiated, and more come on line every day. American business and industry has joined in enthusiastically. Companies ranging from Amway to Gallo to Texaco have designed programs that were "tuned" to their customers and markets. The total number of corporate Global ReLeaf campaigns is now approaching 50, and growing by three a week.

At the national level, President George Bush has picked a natianal tree planting initiative -- called America the Beautiful -- as one of the few new programs in the 1991 budget. With a philosophy entirely similar to that of Global ReLeaf, the President is calling upan American citizens, non-profit organizations, and businesses to enter into partnerships with government at all levels and bring significant resources to bear in this environmental restoratian effort. We cammend the President on this initiative, and have pledged to utilize the growing interest in the Global ReLeaf campaign to further his goals. We welcame the increased participation of the federal government in this environmental restoration opportunity.

What is causing this explosion of interest? We're convinced it is caused by the fact that people are concerned about the environment, and are ready to channel that concern into

positive action. They really want to know what they can do. And if we tell them something realistic -- within their ability -- that makes sense -- they do it.

What does this have to do with progress in the Chesapeake? Much, I hope. The problems of this region, particularly as they relate to pollution of the Bay fram nonpoint sources, are problems of the land and how it is used. Virtually every acre in the Bay is -- or was -- a forest ecosystem. Much of it still is. Using that forest wisely, so that it is a healthy, thriving, non-polluting ecosystem, is essential to the future of the Bay.

But today, millions of people live in that forest. In the process of building cities and suburbs, we have destroyed half the forest in the urbanized counties around Washington, DC, in the past couple of decades alone. Studies by urban foresters indicate that forest canopy cover in many developments is 30 percent or lower. It could be 60 percent, or higher. That change, well within the reach of the residents and communities involved, would help reduce many of the environmental ills now affecting other residents, and the Bay itself.

With the popularity of a program like Global ReLeaf, and the new impetus provided by the President's America the Beautiful initiative, we think much citizen action can be mobilized within this region. It is happening already, in many places. Just as important, that action need not stop with tree planting and community forestry projects. Once people begin to see how they can improve their lives by working to restore the environment around them, there are many more achievements that lie within reach. This kind of action will not came automatically -- it will be up to conservation organizations to make it happen. But we have more opportunity today than we have had for many years.

The public is "tuned in" to the environment today. And, you know, talking to the public on these issues is a little like talking on the CB radio. If folks aren't "turned on" and "tuned in" to the channel you're using, you can shout your head off and make little or no difference. But when they're tuned in, you can communicate, and motivate. That, my friends, is the time you can make progress, both here in the Chesapeake, and all around the world. We must not fail to give this opportunity our best effort while those channels are open.

CHESAPEAKE SUCCESS STORIES
(Concurrent Workshops)

WORKSHOP #1: NUTRIENT MANAGEMENT ON CROPLAND

Bill Browning, Moderator, VA Division of Soil & Water Conservation

Speaker #1:

NITROGEN AND PHOSPHORUS MANAGEMENT ON CROPLAND

Russell B. Brinsfield, Ph.D. and Kenneth W. Staver, Ph.D.
University of Maryland System, Agricultural Experiment Station
Wye Research and Education Center

Nitrogen:

Effective strategies to reduce nitrogen inputs to Chesapeake Bay from Eastern Shore agricultural regions must address subsurface flow paths. Off site strategies designed to intercept nitrogen before it enters Chesapeake Bay will require major investments of land, but will still fail to reduce nitrate contamination of groundwater under cropland. Practices are needed which operate within crop production systems to prevent nitrogen contamination of groundwater and resulting subsurface transport into Chesapeake Bay. Presently, the need for improved nitrogen management is most acute in corn production systems and on land receiving high nitrogen organic wastes. Proper coupling of cereal grains with corn production, either as cover crops or in rotations, can immobilize soluble nitrogen in the soil profile during groundwater recharge, thereby reducing the potential for leaching. In addition, appropriate timing of nitrogen applications relative to crop uptake and groundwater recharge will enhance nitrogen utilization efficiency. Unlike off site interception strategies, increased nitrogen retention will help maintain agricultural productive capacity while providing desired environmental benefits. Although short term financial incentives are limited for improved nitrogen management practices, their value will increase in a stricter regulatory climate or with higher inorganic nitrogen costs.

Phosphorus:

For moderately well drained, nearly level coastal plain soils on the Eastern Shore of Maryland, implementation of no-till methods for corn production may increase phosphorus transport in surface runoff. Particulate phosphorus transport is reduced from these systems by the use of no-till practices but these reductions are offset by elevated dissolved phosphorus concentrations. No-till methods may decrease total phosphorus transport in years with above average or unusually intense precipitation when sediment transport from conventionally tilled systems is elevated.

However, naturally low rates of soil loss on the Eastern Shore generally limit the impact of no-till practices on total phosphorus transport, suggesting that no-till methods should only be considered as a tool for phosphorus control on cropland prone to high erosion rates. Increased dissolved phosphorus transport from no-till systems will reduce the effectiveness of off-site phosphorus control strategies which focus on sediment retention. The current strategy for reducing phosphorus inputs to Chesapeake Bay from Maryland agricultural land is directed primarily at particulate phosphorus, and thus will probably have minimal effect on the Eastern Shore, particularly when no-till methods are being used. Achieving the established goals for reduced phosphorus inputs to Eastern Shore tributaries of Chesapeake Bay will require strategies which reduce the dissolved phosphorus content of surface runoff. Presently, it appears that phosphorus fertilization rates in Eastern Shore corn production systems can be reduced with little risk of yield reductions, and potential savings to farmers. More information is needed on the relationship between phosphorus fertilization rates and dissolved phosphorus concentrations in surface runoff from notill systems.

Speaker #2:

NUTRIENTS AND VIRGINIA CROP PRODUCTION

N. M. Alley, Ph.D., VA Tech

Nitrogen and phosphorous are essential plant nutrients that have been identified as contributing to the pollution of the Chesapeake Bay. Non-point sources have provided significant amounts of these nutrients to the Bay. For individuals interested in preservation of the Bay and not familiar with crop production, a logical question is "why do we use nutrients?"

Plant nutrients are used to insure sustainability. When crop yields are removed from land, essential plant nutrients must be replaced if the land is to continue to furnish food for people and livestock. Plant nutrients in the form of manures and commercial fertilizers replenish soils and enable continued production. Pollution problems arise when excessive amounts of plant nutrients "escape" from the soil-plant system and move into the ground and surface waters. Also, for growers, the loss of nutrients from the soil-plant system is an economic loss that from a business management perspective must be avoided if at all possible.

The single best defense against nutrient losses from the soil-plant system is a vigorously-growing crop. Such a crop has a deep root system that captures nutrients and soil water before leaching can occur. Also, a vigorously-growing crop covers the soil and prevents erosion losses.

Nutrient use efficiency increases with total crop management. Poorly-managed, low yielding crops do not provide good cover, use only small amounts of nutrients, and do not provide sufficient economic returns for growers to implement available conservation technologies. Crop management systems that seek to optimize the use of all inputs with regard to economic returns and soil stewardship are generally best for the grower and for the environment.

Our research group at Virginia Tech has focused on improved management of soft red winter wheat. Soft red winter wheat is an important crop for Virginia and most Mid-Atlantic cash grain farmers. Also, soft red winter wheat is important to most consumers because soft wheat flour is used in crackers, cookies, cakes, and numerous other food products. The protein content of soft red winter wheat varies from approximately 9 to 12% and thus plant available nitrogen is essential in wheat production. Optimization of wheat management practices has enabled average Virginia wheat yields to increase from approximately 35 bushels/acre to greater than 50 bushels/acre during the past ten years. These increased yields have been accomplished without increases in nitrogen fertilization. The increased efficiency of nitrogen use has been good economics for the grower and good for the environment.

A final point with regard to progress on nutrient loadings to the Bay from non-point sources is that all fertilizer applications, especially nitrogen fertilizer, have been reduced significantly. For example, nitrogen fertilizer application peaked in the 1976-1977 crop year with 117,476 tons of N being applied in Virginia. Only 79,064 tons of N were applied in 1988-1989, a 33% reduction. Also, the decrease in nitrogen fertilizer applications between 1984-1985 and 1988-1989 was 19,821 tons, or 20%. Thus, the loading rates that can be ascribed to agricultural use of fertilizers have been reduced significantly. These reductions have occurred because of economic conditions and the implementation of technologies that result in greater nutrient use efficiency.

Grain crop producers in Virginia understand the need for increased efficiency of nutrient use. Technologies that improve nutrient use efficiency are good for the environment and make good business sense. Research which develops improved fertilization programs will contribute significantly to the improvement of water quality and to the sustainability of Virginia agriculture.

Speaker #3:

Les E. Lanyon
Department of Agronomy, The Pennsylvania State University

Managing nutrients from several sources while protecting water quality is a common challenge for the crop and livestock farmers of Pennsylvania. If a nutrient management process is to be developed and implemented at the farm level, appropriate tools to support this activity must be available to the farmer. Research and extension specialists in the Department of Agronomy at The Pennsylvania State University have been developing the idea of a nutrient management process as an approach to nutrient management on Pennsylvania farms and the corresponding tools to implement the process.

Since so much of the nitrogen (N) that is available for use by crops on Pennsylvania farms is in organic forms, such as fresh manure N and/or legume residual N, and since these forms of N are among the most difficult to manage with a high degree of confidence, intensive efforts have been focused on the development of a suitable test for soil N availability. A promising soil N test has been developed and a pilot-test of its use under field conditions was conducted in 1989.

The promising test is a pre-sidedress Soil N test for corn production. The results from the in-season test are used as an index to adjust the sidedress N recommendations. The test was pilot tested in Pennsylvania in 1989 by county agents, conservation district personnel, and crop management association technicians. All of these cooperators were trained in the use of the test during the winter and spring of 1989. Standard centralized laboratory testing of the samples and field quick testing of the soil samples were available to the cooperators.

The soil test procedure was developed based on the results of research in Pennsylvania, Vermont, Connecticut, and Iowa. It is best suited to fields with a recent manure history, following legumes, and/or with potential carryover N. The following steps describe the procedure selected for the 1989 field test in Pennsylvania.

1. Only fields receiving minimum spring fertilizer N were tested.
2. It was recommended that manure be applied based on manure analysis and crop N requirements as estimated from the yield goal and field history.
3. Soil samples were taken when the corn plants were approximately 12" tall, but at least one week before sidedressing.
4. A representative sample of the field was collected by taking 10 to 20 cores to a 12 inch depth between corn rows from randomly selected points in the field.
5. Cores were composited and dried as quickly as possible.
6. The samples were analyzed for nitrate N by laboratory or quicktest methods.
7. The sidedress N recommendations were determined.
   a. <10ppm normal N recommendation.
   b. 10 to 25ppm rate adjusted according to nitrate level.
   c. >25ppm no N recommended.

Almost 1500 soil samples from across Pennsylvania were analyzed in the field evaluation program of 1989. Of these samples, 1400 were analyzed using the quick-test kit. A set of 360 samples were analyzed by both methods. Participants in the program who used the quicktest kits compiled the results of their analyses and completed a questionnaire about the pre-sidedress soil N testing program and the quicktest kit.

One of the major impacts and causes of the physical, biological and aesthetic deterioration of our urban streams is existing and recently developed urban areas and the Nonpoint Sources (NPS) of pollution associated with these areas. The deterioration of the local feeder creeks, streams and rivers severely affects these waterways, but ultimately their cumulative effects impacts the quality of the Chesapeake Bay.

The many Point Sources in our urban areas have been the source of a great deal of attention and money over the last 20 years and a major reduction in pollution from these point discharges has occurred. Further improvement will be costly and the program is beginning to reach its limits. This change will bring greater attention on the next major, but until recently forgotten, source of pollution: Nonpoint Source Pollution. To reach a solution to the problem a new approach will be needed. We will need participation by every level of government, private organizations and every citizen to be able to solve -the Urban Nonpoint Source Pollution problem.

The State of Maryland has had a number of NPS programs for many years. These include an Urban Sediment Control Program (1970) and a Stormwater Management Program (1983). These and many other programs will be discussed.

1. Sediment Control Program - This program requires urban developments to obtain an approved erosion and sediment control plan, implement that plan and maintain that plan during the construction phase of a project. MDE-SSA is now developing higher sediment control standards and looking at increased use of temporary stabilization for erosion control. Adequate levels of trained inspectors and strong enforcement are the major elements of a successful program.

2 . Stormwater Management Program (SWM) - This program requires that each new urban development project address their stormwater impacts. This has generally been broken into quantity and quality control needs. There are many SWM techniques, these include infiltration, flow attenuation, wet ponds, extended detention ponds, dry pond, wetland ponds, grass and wooded buffers, porous pavement, water quality inlets and others yet to be developed.

The Stormwater Management Program is still fairly new statewide and a State Grant program to assist local jurisdictions to implement their programs has been available since 1984. For the SWM program to have the most impact requires good regulations, adequate staff to review plans and inspect construction and an adequate long term maintenance commitment. To be most effective in implementing SWM practices, in many cases, a series of comprehensive watershed planning studies may be needed to provide guidance.

A major component of a good SWM system is an adequetely financed program and an active maintenance program. Could you imagine a road system where we did not have an adequate funding source? Or a road system that was not inspected, inventoried or maintained? How can we expect SWM facilities to function without proper construction and maintenance programs? We must face the facts and make the necessary decisions needed to support our commitment to the development and maintenance of an SWM system that will maiintain and improve the water quality of our local streams, creeks, rivers, and the Bay. Our administration has been working on the development of a "Utility Fee" structure to support the many aspects of a SWM-NPS program.

3. Stormwater Pollution Control Program (Stormwater Management Retrofitting) - This program encourages local jurisdictions to develop projects that will provide stormwater management controls for existing urban areas. The program provides grants up to 75% of a projects cost for each practice. Through FY9O $5.5 Million has been made available to assist local

Of the samples tested, 23X were <10ppm, 55% were between 10 to 25 ppm and the remaining 22% exceeded the 25 ppm level. Farmers using the pre-sidedress soil N test were polled to compare their N fertilization practice in the fields tested in 1989 with their practice without the test. Approximately 50% of the pre-sidedress N recommendations were less than the farmers would have normally applied while 36% of the recommendations were actually higher. Overall, the average N recommendations were 20 lbs/A less than the the farmers would have applied without the test.

The average results of the quicktest nitrate measurements of 19.7 ppm compared closely to the standard laboratory results of 19.6 ppm for the same samples. Recommendations for N based on the analyses agreed within 25 lbs/A on over 80% of the samples that were run by both methods. In general the quicktest was rated favorably by the users (4.4 on a scale of 1 to 5) and they were confident (4.3 on the same scale) in its use.

The major problems with the pre-sidedress soil N test are related to the sampling. The cooperators identified sampling time, sampling depth, and pretest sample handling as the most troublesome aspects of the program (all rated < 3.6). Collecting information about field history and yield goal was also troublesome as indicated by the 4.0 ratings.

The pre-sidedress soil N testing program is designed to assist farmers in confidently utilizing difficult to manage forms of N on their farms and it appears to be successful. The results of the program will be greater confidence in the accuracy of N applications, enhanced management of N fertilzer, and less potential for nitrate pollution from the corn fields in the program.

Improved soil N availability tests for corn production continue to be investigated. Examples of such tests are a measure of the chlorophyll content of young corn plant leaves with a hand-held chlorophyll meter and the absorbance of at 200nm of sodium-bicarbonate soil extract taken at planting or at pre-sidedress time. Chlorophyll content of the young corn leaves has been found to be a function of soil N availability, especially in N limiting conditions. Absorbance by a soil extract at the particular wave-length measures both nitrate N in the extract as well as the potentially minerializable organic N.

ACKNOWLEDGEMENTS

Research and extension programs on the development of the pre-sidedress soil nitrogen at The Pennsylvania State University were under the direction of: Drs. Richard H. Fox, Professor of Soil Science; Douglas B. Beegle, Associate Professor of Agronomy, and Gregory W. Roth, Assistant Professor of Agronomy. Partial support of the programs was provided by the Pennsylvania Department of Agriculture, the Pennsylvania Department of Environmental Resources, and the Tennessee Valley Authority.

WORKSHOP #2: CONTROLLING URBAN NONPOINT SOURCES

James Cox, Moderator, VA Division of Soil and Water Conservation

Speaker #1:

Vincent H. Berg, P.E.
Maryland Department Of The Environment
Sediment And Stormwater Administration

jurisdictions with these projects. To date, over 50 projects have been constructed, designed, or identified to use these funds. In addition, the State can also provide a low interest loan to the local jurisdiction to pay for its portion of the project.

This programram is fairly new and many jurisdictions have been reluctant to enter the program since there is not a legislative requirement to provide retrofitting SWM practices in existing urban areas. With over 700,000 acres of existing development in the state, the need to provide large numbers of these types of projects is very great. The Bay and its tributaries will not significantly improve until we begin to recapture the NPS pollution from these many existing urban areas. Water quality control is the major need in these areas.

Some of the methods being used in SWM retrofitting include development of wet ponds, wetland ponds, infiltration systems, sand-peat filters, refurbishing existing ponds, multi-pond systems, water quality inlets and many other innovative methods. The need to recover the sins of the past is a very important element in controlling urban Nonpoint Source pollution. If we only address the impacts of new development, we will only be continuing at a slower rate down the same road of degrading our tributaries and the Bay. It is every jurisdiction's and owner's responsility to correct these wrongs of the past (redevelopment and existing development), the same as it would be to correct a leaching landfill or a contaminated industrial site.

4. Stream Stabilization and Restoration Methods – This program should be part of a jurisdiction's SWM-NPS program. This might include providing streambank stabilization in urban areas, stream clearance of blockages, removal of structural elements such as large concrete channels and culverts, and using softer methods to provide stable channels. These softer stream restoration methods might include riprapping, log and gabion drop structures, streambank plantings, fish habitat development and restocking, and other methods that would allow the natural cleansing forces of a stream to work. The use of plunge pools, level spreaders, buffers, energy dissipation structures and parallel pipe systems should be used in conjunction with storm drains to mitigate their impact, when they must be used. Stream monitoring is another important program element, so we can assess our accomplishments. A formal system or a citizens' water quality monitoring program should be developed. In Maryland, several private organizations are organizing private citizen monitoring programs in cooperation with government agencies.

Buffers - Good planning and restoration programs should include stream buffers and slope grading controls along perrenial and intermittent streams. Buffers provide a natural method of trapping many urban pollutants from yards and streets. On those streams without wooded buffers, a program to plant trees and other vegetation is an easy first step in NPS control and you can involve your community.

6. Other Program Areas - There are a number of other urban programs that are not generally thought of as part of an NPS program, but they are very important to the NPS solution. These would include correcting septic system failures, maintaining the sewer and water systems, controlling underground tank leakage, landfill leachate control, nonpoint discharges from industrial and commercial sites, forestry management, control of disturbances to wetlands, mine reclamation, shore erosion control, control of runoff from Federal, State, and County roads, solid waste and recycling activities, sewage sludge application, air pollution controls and other elements of an urban society that can impact the surface and ground water resources.

7. Other Needs - There are a number of social and psychological changes that our citizens will need to make to have a successful urban NPS program. We as a society will need to rethink our attitudes towards waste disposal recycling and the way we care for our lawns among other things. Urban fertilizer herbicide and pesticide use must be controlled to minimize the impacts of these chemicals on our surface and ground water resources. Why are there not newspaper columns on organic gardening and lawn care, only columns on chemical intensive gardening? Increased urban housecleaning methods including more frequent street cleaning, treating automobile waste from underground parking facilities and possibly adding drip pans to cars, trucks and buses to prevent auto liquid wastes from getting into the environment and into the streams. The use of more inert materials in the manufacture of exposed buildings and vehicle parts to reduce the levels of copper, nickel, cadmium, lead and other toxic metals. These are only a few of the changes that will be needed.

The importance of Nonpoint Source Pollution as the next major hurdle in cleaning up our tributaries and the Chesapeake Bay has been recognized and it is now time to make a major impact on this pollution source. We can not accept the NPS pollution from previous development. We must aggressively attack the water quality problems of the past, as well as minimizing the impacts of new development. We all contribute to the problem and we can all be part of the solution. It is our responsibility as government officials, designers, developers and citizens to take the lead to correct this problem. What better time to make this commitment than as we approach the 20 year anniversary of Earth Day.

Speaker #2:

RESTORING DEGRADED URBAN STREAMS AND ESTUARIES: THE ANACOSTIA RIVER WATER

Thomas R. Schueler
Anacostia Restoration Team, Metropolitan Washington Council of Governments

The Anacostia watershed is a graphic example of how the urban development process gradually diminishes the quality of the aquatic resources in the Chesapeake Bay. This 170 square mile watershed has been intensively developed and massively changed over the last two centuries. Over one-half million people in suburban Maryland and the District of Columbia now live in the Anacostia watershed. Almost a quarter of the entire watershed area is now covered by impervious surfaces. As a consequence, both the free-flowing and tidal portions of the river suffer from poor water quality, inadequate aquatic habitat, a radically altered hydrologic regime and the destruction wetlands and riparian forest.

Since 1985, local, state and regional agencies have joined together to implement a far-reaching watershed restoration effort in the Anacostia. The primary objectives of the watershed restoration effort are to:

1. Reduce the loads of sediment, nutrients, organic carbon and other pollutants to the tidal river, through the implementation of strategic urban retrofits and the District's Combined Sewer Overflow Abatement Program.

2. Enhance the abundance and diversity of resident fish populations, through instream fish habitat improvements and better riparian management.

3. Restore the spawning range of anadromous fish within the basin to its historical limits, primarily by removal of barriers to fish migration.

4. Improve the hydrologic regime of headwater streams during both wet and dry weather, primarily through implementation of strategic urban retrofits and best management practices.

5. Augment the total acreage of tidal and non-tidal wetlands within the tidal Anacostia, through wetland protection, creation and restoration efforts.

6. Expand the forest cover throughout the watershed, particularly along the riparian margins of the stream network, through an aggressive reforestation effort.

7. Improve recreational access and opportunities in the Anacostia, and increase the awareness and participation of residents in the restoration effort.

Presently, over forty different restoration initiatives are in planning, design, construction and/or monitoring within the watershed. The projects include wetland restoration project, marsh plantings, riparian reforestation, streambank stabilization, instream fish habitat improvements, removal of fish barriers, wetland mitigation and a series stormwater retrofit projects. The retrofit projects typically involve construction of extended detention wet pond marsh systems within older stormwater management facilities to reproduce the natural hydrologic regime and remove urban pollutants. At other sites, an innovative new practice, the peat sand filter is being tested as retrofit tool.

The signatories to the Anacostia Watershed Restoration Agreement (Maryland, District of Columbia, Montgomery County and Prince Georges County) are also making significant efforts in the Anacostia to control the impact from new development, through their stormwater, sediment control, wetland and tree protection efforts.

The paper will review some of the more successful restoration techniques applied in the Anacostia. In addition, the paper will discuss methods and strategies for mitigating the impacts of urbanization on streams and estuaries that may prove useful in other developed and developing communities in the Chesapeake Bay region.

WORKSHOP #3: DEMONSTRATION PROJECTS

Vic Funk, Moderator, PA Department of Environmental Resources

Speaker #1:

CONESTOGA HEADWATERS RURAL CLEAN WATER PROGRAM PROJECT

Mary Jo Brown
Pennsylvania Department of Environmental Resources

The Conestoga River flows through some of the most productive and intensively used agricultural land in Pennsylvania before its junction with the Susquehanna River 25 miles north of the Pennsylvania-Maryland border. As a result, the Conestoga is seriously affected by nonpoint discharges of sediment, nitrogen and phosphorus associated with agriculture.

One program which was initiated to help clean up the upper Conestoga River basin was the Conestoga Headwaters Rural Clean Water Program (RCWP) project. The goal of the federal RCWP is to control agricultural nonpoint source pollution, thereby improving water quality. This experimental program, administered by the U. S. Department of Agriculture (USDA) provides financial and technical assistance to farmers for the installation and maintenance of Best Management Practices (BMPs). RCWP monies were targeted for areas with significant agricultural nonpoint source water pollution problems. Twenty-one projects were funded nationwide, including the Conestoga Headwaters Project.

Five of the RCWP projects, including the Conestoga Headwaters project, were designated "Comprehensive Monitoring and Evaluation Projects." These projects received additional funding to conduct in-depth monitoring to determine the effects of selected BMPs on water quality and the socio-economic impacts of BMPs on farmers.

The Conestoga study monitoring objectives were to:

1. Quantify the transport of sediment, nutrients, and pesticides in the surface water of the Upper Conestoga River basin;

2. Quantify the movement of nitrates into groundwater aquifers;

3. Investigate the transport of pesticides to ground water;

4. Measure the effects of specific BMPs on nitrate and other contaminant movement into ground water; and

5. Evaluate the cost and effectiveness of individual BMPs.

Conestoga RCWP monitoring has been a cooperative effort by several agencies. The U. S. Geological Survey and the Pennsylvania Department of Environmental Resources collected and analyzed water quality samples and are doing the detailed analysis of the data. USDA - Agricultural Stabilization and Conservation Service provided overall project management and collected land use data. USDA - Soil Conservation Service did the technical planning on the farms for all BMPs other than developing nutrient management plans. Penn State Cooperative Extension developed nutrient management plans for the cooperating farmers and calculated crop yields. Penn State University collected and analyzed soil samples. USDA publishes an annual report which summarizes the activities of the entire project. USGS will publish a series of reports detailing various aspects of the monitoring program. USDA - Economic Research Service has published several reports on the economic aspects of the project.

The monitoring strategy developed for the project involved monitoring for one to two years before BMP implementation to gather baseline data. Water quality would then be monitored for two to four years after BMP implementation to determine the effects of specific BMPs on water quality. Nutrient management was chosen as the BMP to be most intensively studied. The water quality monitoring was conducted at two field sites and a small watershed site. Both field sites were located on farms underlain by carbonate rock, while the small watershed site encompasses 5.8 square miles of mostly agricultural land underlain by both carbonate and noncarbonate rock. Carbonate areas were selected for study because various reports have shown that most of the elevated groundwater nitrate levels occur in such areas.

The small watershed site monitoring strategy called for the 5.8 square mile basin being subdivided into two subbasins. In one 1.4 square mile subbasin (nutrient management subbasin), 14 of the 16 farmers agreed to follow nutrient management plans developed by Penn State Cooperative Extension. In a similar 1.4 square mile subbasin (control subbasin)

nutrient management plans were not developed for the farmers. Water quality for the entire small watershed site and the two subbasins has been monitored since April 1984. Nutrient management plans were implemented by the farmers in the spring of 1986. At the sampling locations within the small watershed site, monthly baseflow samples are collected and analyzed for nutrients, sediment and pesticides. Storm samples are collected during several storms each year and analyzed for nutrients and sediment.

Data are being analyzed in several ways, examples of which are shown graphically on the following page. (1) Data collected before BMP implementation during baseflow conditions are compared to data collected after BMP implementation. This is shown in the form of boxplots, which summarize several years of data. (2) Long-term trends are developed using various statistical approaches. The trend lines on the following page were based on the Seasonal Kendall statistical test. (3) Data from the control and nutrient management subbasins for similar time periods are compared. The graphs which have been included with this material show baseflow dissolved nitrate concentration data. These figures indicate that the median dissolved nitrate concentration at the nutrient management subbasin is lower during the post-BMP period. The long-term trend at this station is slightly downward, compared to the long-term trend for the control subbasin which shows a statistically significant increase. The change in slope of the correlation lines on the third graph show, in a different way, the change in nitrate concentration between the pre and post-BMP periods.

Speaker #2:

INDIANTOWN BMP DEMONSTRATION PROJECT
Overview

W. L. Magette 1, R. A. Weismiller 2, B. V. Lessley 3, T. H. Ifft 1, J. D. Wood 4

1 Agricultural Engineering Department
2 Agronomy Department
3 Agricultural & Resource Economics Department
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Background

The Indiantown Best Management Practices (BMP) Demonstration Project is a major component of the State of Maryland's educational program focusing on agricultural nonpoint source (NPS) pollution. It is an outgrowth of the U.S. Environmental Protection Agency's Chesapeake Bay study. The project is conducted by the Maryland Agricultural Experiment Station (MAES) and the Maryland Cooperative Extension Service (MCES) with funding from the Maryland Department of Agriculture (MDA). The project has two key objectives:

1. Determine the costs of selected BMPs implemented on a demonstration field crop farm and evaluate the economic and management effects of these BMPs on farm costs;

2. Obtain physical and chemical data on the quality and quantity of surface and ground water flows on the demonstration farm and evaluate the changes in water quality induced by the introduction of BMPs.

An implied objective of the project is that it serve as an educational tool for transferring information about BMPs to farmers and other audiences.

The demonstration project derives its name from the commercial farm on which it is based. Indiantown is a typical 343 acre Eastern Shore cash grain farm owned by Mr. Howard Wood, his relatives, and ancestors since the 1600's; it has been under a conservation farm plan since 1946.

Project Implementation

Two important principles guide implementation of the project: a) it is a demonstration, not a research, effort; and b) the farm owner has ultimate authority over BMP implementation. An interdisciplinary team of scientists from the academic departments of agricultural engineering, agronomy, and agricultural and resource economics serve as project leaders. An on-site project coordinator is the primary communication point between project leaders and farm owners and is responsible for daily operation of the project, including monitoring station installation, field and water quality sampling, assistance with record keeping, and help in conducting educational tours. At the local level, assistance as necessary is given by the county agricultural Extension agent, soil conservation district (SCD) personnel, and the Soil Conservation Service (SCS).

Six edge-of-field runoff sites and 23 ground water monitoring wells comprise the monitoring network for obtaining water quality samples. Runoff and ground water samples are analyzed for nitrogen (total Kjeldahl, ammonium, nitrate, nitrite), phosphorus (total and orthophosphorus), chloride, total suspended solids, total volatile solids, and sulfate. Ground water samples are collected for analysis monthly. Runoff samples are collected on an event-by-event basis.

The CREAMS model (Chemicals, Runoff and Erosion from Agricultural Management Systems) developed by the USDA Agricultural Research Service is used with water quality data obtained through monitoring to "calibrate" the CREAMS model for Eastern Shore conditions. It also serves as the base to which an economic model is appended for forecasting possible water quality and economic impacts resulting from the adoption of various BMPs.

Project Successes

Economics. A detailed field-by-field record of material inputs, costs, and outputs has been developed for a seven-year period (1982-89). These records have helped establish that the cost of controlling pollutants varies with soil texture. Production costs for no-till corn have averaged $2.55 more than for conventional corn; however, 30 less pounds of nitrogen per acre has been used to produce no-till versus conventional till corn. Using the CREAMS model and data from the Indiantown demonstration, it appears that achieving a 40 percent reduction in nitrogen losses on a farm like Indiantown could reduce farm income by at least $8/ac to $13/acre, depending on whether surface or leaching losses are targeted. These results have important policy implications for designing effective BMP implementation programs.

Water quality. Surface runoff and ground water quality have been measured since 1986, during which time annual precipitation has ranged from 61% below normal (in 1987) to 18% above normal (in 1989). Monthly deviations have been more erratic and have influenced pollutant losses dramatically. Because of the short period of monitoring and the abnormal precipitation patterns, conclusive results about BMP impacts on water quality at Indiantown are not available at present. Over the period 1986-1988 (dry years), total annual losses of pollutants in surface runoff have been low (maximum of 1.75 tons/ac eroded soil; maximum of

11 lbs/ac nitrogen; maximum of I lb/ac phosphorus). A single storm has usually been responsible for producing 50 to 80 percent of the total annual losses of pollutants. In soybean and corn production areas, leaching has been the major pathway for losses of nitrogen. At the ground water table (approximately 15' to 20' below ground level), nitrate concentrations have generally exceeded 10 mg/L. Except in one area of the farm, there has not been a large difference in nitrate concentrations in ground water beneath no-till and conventionally tilled areas. Similarly, nitrate concentrations in ground water beneath an upland riparian forest have been similar to those found beneath agricultural cropland that is upslope of the forest.

Education. The Indiantown project has been successful in attracting a variety of visitors to learn about agricultural BMP implementation. Since mid-1985, approximately 1400 persons have toured the farm. These have been farmers; interested citizens; local, state and Federal government officials; educators; youth; and special interest agricultural and environmental groups. Visitors have come from across the U.S. and as far away as England and Barbados. Requests for information about the Indiantown BMP Demonstration project have come from many states, as well as from Canada and Ireland. The project has helped inform 150 of Maryland's legislators about agriculture and agricultural NPS pollution control. Approximately 25% of the visitors to the farm have been agricultural producers or from the agricultural community; 31% have been youth; 25% have been with national or international groups; and 5% of the audience have been state and Federal agency personnel.

Summary

The Indiantown BMP Demonstration project is successfully achieving its objectives. It also is revealing several things about conducting demonstration projects on a commercial farm. A successful project requires cooperative and enthusiastic farm owners and operators. An onsite project coordinator is essential, particularly when water quality monitoring is involved; an interdisciplinary management team is also necessary to address the varied aspects involved with a farm-scale demonstration. Firm timetables for project implementation can not be fixed owing to constraints related to the commercial nature of an operating farm and to weather. Developing a successful demonstration requires significant funding and takes several years, especially if water quality monitoring is involved.

Acknowledgement: Funding for this project was provided by the Maryland Department of Agriculture, the Maryland Agricultural Experiment Station, and the Maryland Cooperative Extension Service. Appreciation is expressed to the family of Mr. Howard Wood for the use of Indiantown for this demonstration project.

Speaker #3:

ASSESSMENT OF BMP IMPACTS ON WATER QUALITY

Saied Mostaghimi
Associate Professor, Agricultural Engineering Department
Virginia Polytechnic Institute and State University

The Nomini Creek and Owl Run Watershed projects were selected, as part of the Chesapeake Bay Program, to assess the impact of cropland and animal waste management practices, respectively, on the quality of surface and ground waters. Specific elements of the monitoring system on these two watersheds include: wet and dry weather physical, chemical, and biological monitoring of surface and groundwater; physical and chemical analysis of soils; chemical analysis of atmospheric deposition; and landuse. The primary chemical characteristics being monitored include both soluble and sediment-bound nutrients, organics and pesticides in runoff, soil, and groundwater. Several runoff and precipitation monitoring sites were selected, in each watershed, to better define and characterize the spatial impact of parameters such as precipitation and landuse on pollutant losses. The pre-BMP implementation phase of these two projects ended in 1989. The main objective of this phase was to collect adequate baseline information representative of existing conditions in the watersheds. Data collection will continue during and after post-BMP implementation phases to evaluate the long-term impact of management practices on water quality.

In this presentation, the monitoring strategies are discussed and a summary of nutrients and pesticides found in water samples from the Nomini Creek Watershed during the first three years of the study is presented. Results indicate that N03-N concentration in groundwater were greater under no-till than conventionally-tilled areas. A total of 17 pesticides were detected in samples during the first three years of the study. Atrazine was detected in over 20% of the samples collected with its concentration ranging from 0.03 to 25.5 ppb. Statistical analysis of the data indicate no significant differences in pesticide concentrations between well locations, landuse, or sampling date. Samples collected in late spring or early summer showed higher frequency or pesticide detection. The ongoing data collection from the watershed should provide more definitive relationships between nutrients and pesticides concentrations in water samples, landuse, and hydrologic variables.

WORKSHOP #4: WATERSHED ASSESSMENT AND TARGETING

Alan Taylor, Ph.D., Moderator, University of Maryland

Speaker #1:

Michael Lovegreen
Manager, Bradford County, PA Conservation District

In PA., the Cost Share Element of the Chesapeake Bay Program is aimed at the reduction of agricultural nutrient contributions to the tributaries of the Bay by 40%. This is accomplished through a program directly administered by local Conservation Districts. The initial requirement for a Conservation District to participate is an assessment process for targeted watersheds.

During 1989, the Bradford County Conservation District was given a grant to conduct such watershed assessments. The purpose of the grant was to assess the need for assistance in addressing potential non-point sources of pollution from agricultural enterprises in the targeted watersheds, develop an implementation plan to address those needs, and consider some type of targeting or priority system.

Bradford County is part of the dissected Allegheny Plateau with rolling hills, deeply entrenched streams, very steep mountains, and broad Susquehanna River flats. Elevations range from a low of 600 feet to around 2200 feet. The 738,000 acres that make up the County consists of 342,800 acres (46.4%) of cropland and pastureland. Predominant agricultural enterprises (over 1500 farms) are dairy and veal (over 94,000 head) with some beef, sheep, and poultry operations. Support crops for these operations include corn (30,000 acres) and mixed hay/alfalfa (41,000 acres).

The watershed studies in Bradford County covered an area of 519,328 acres, the largest area to be assessed in PA. This area included the Susquehanne River Sub-basins 4-C, which included 285,095 acres consisting of Sugar and Towanda Creeks, and 4-D, which included 234,233 acres consisting of Wysox, Wyalusing, Sugar Run, and Tuscarora Creeks. Approximately 490 livestock operations were identified in sub-basin 4-C and 350 livestock operations in sub-basin 4-D.

In order to accomplish such a major undertaking, the District first organized an oversight committee consisting of individuals from the District, Soil Conservation Service, PA. Farmers Association, Pomona Grange, County Planning Commission, Ag. Stabil. and Conservation Service and Extension Service. The District then organized an assessment team as opposed to hiring out elements of the study to consultant firms. Team members were briefed on all tasks to be accomplished and trained as multi-functional positions to facilitate peak demands during the study (e.g. map delineation, measurement, on-farm interview etc.).

The watershed assessment team assembled detailed sets of maps and compiled data for the purpose of developing a Pollution Potential Index. This index was developed in order to set priorities based on elements directly contributing to potential sources of nutrient runoff associated with livestock and normal farming operations. These elements include information on: sub-watershed delineation (61 separate sub-watersheds were delineated); average slopes; amount of land in row crops; amount of land in hay and pasture; amount of land in urban/residential use; amount of area covered by water; amount of land in forest; soil erodibility; animal density; drainage density; and farm density. Each of these factors were weighted by importance through consensus of the local committee and entered into an empirical formula which compared maximum values in each of the sub-watersheds, thus giving a comparison index.

Personal face to face interviews were conducted by randomly selecting individuals owning and/or operating agricultural lands in each of the sub-basins, in order to assess the needs and anticipated interest in the area of nutrient management on agricultural operations. In sub-basin 4-C, 60 (12%) individuals were in person with an additional 36 by phone. In sub-basin 4-D, 48 (13.7%) individuals were interviewed in person with an additional 95 by phone. Livestock farm locations and animal numbers were gathered through interviews with farmers at public meetings organized, agency personnel (SCS, Extension, ASCS, etc.).

Results of the interviews conducted revealed that only 35% of those interviewed had their soil tested in sub-basin 4-C and only 50% in sub-basin 4-D. In the area of manure testing, only 5% tested in sub-basin 4-C and 0% in sub-basin 4-D. Manure storage was used by only 1% in sub-basin 4-C and 4-D. 75% of those interviewed needed new or updated conservation plans in sub-basin 4-C, with 61% needing such in sub-basin 4-D.

A "cooperation expectancy" factor was created for each farmer interviewed. This factor is based on conservation needs expressed by the farmer, past history of government

program participation and the attitudes of the farmer concerning the Chesapeake Bay Program. These factors were then averaged for each sub-basin to come up with an expected number of program participants.

A cooperation expectancy of 57% in sub-basin 4-C is estimated for the Chesapeake Bay Program, and 66% in sub-basin 4-D.

Taking the extent of the needs documented in the study and adjusting that need by the coooperation expectancy, an estimate was prepared to address the structural and practice needs, as well as the educational/informational needs demonstrated through the interviews of the study area. This is combined Program and landowner contribution.

Local technical capabilities and resources were assessed and a plan of implementation was proposed. A final report was developed which was reviewed by the public through regional meetings and approved by the local Conservation District before submitting to the State.

Speaker #2:

PROGRAMS FOR ASSESSING AND TARGETING WATERSHEDS IN VIRGINIA

Karl L. Huber
Virginia Department of Conservation and Recreation
Division of Soil and Water Conservation

Pursuant to its task of developing and implementing a nonpoint source (NPS) pollution abatement program as part of the larger Virginia Chesapeake Bay Program, the Virginia Department of Conservation and Recreation - Division of Soil and Water Conservation (DCR - DSWC) is actively assessing the agricultural NPS pollution potential of watersheds in the Chesapeake Bay portion of the state. Based on this assessment, watersheds are prioritized in terms of their need for agricultural NPS pollution abatement programs. Need, in this case, is a measure of both their NPS pollution potential and their propensity for showing significant water quality improvements as a result of the installation of selected best management practices (BMPs). Those watersheds showing the greatest need are targeted to receive a greater portion of the Division's Cost-Sharing Program for BMP installation. Efforts are underway to extend the concept of subwatershed targeting throughout the state to include expanded categories of NPS pollution (ie. urban, etc.)

The DSWC currently relies on five elements to facilitate the above task:

* water quality monitoring,
* geographic information system (GIS) calculation and mapping of pollution indexes,
* BMP and nutrient management tracking,
* water quality modeling.
* local information

Water Ouality Monitoring

The DSWC has contracted with the Agricultural Engineering Dept. of Virginia Tech to monitor water quality in two dissimilar agricultural watersheds in the state; Owl Run in Fauquier County is principally dominated by animal waste and Nomini Creek in Westmoreland County is cropland oriented. Monitoring started about 1986 and will continue for ten years. The first phase of the monitoring (pre-BMP) has just concluded. The post-BMP monitoring which follows will allow the researchers to evaluate the effectiveness of the BMP practices implemented in relation to pre-BMP conditions. A separate synopsis of this effort, prepared by S. Mostaghimi, appears elsewhere in this conference summary.

GIS Application

In 1985 the DSWC initiated a contract with the Information Support Systems Lab (ISSL), Dept. of Agricultural Engineering, Virginia Tech, to begin the task of identifying and prioritizing areas of agricultural NPS pollution potential in Virginia, particularly in the Chesapeake Bay watershed. Since that time, the ISSL has been digitally capturing a set of base data layers (i.e. soils, elevation, agricultural land use, water features, and watershed and county boundaries) from which agricultural NPS pollution potential can be calculated. The ISSL also developed a GIS to perform these calculations and report the results as a set of derived data layers (e.g. erosion, water quality, and watershed pollution density indexes). This GIS is known as VirGIS, and the base and derived data layers are referred to as the VirGIS database.

VirGIS output, particularly the measures of need for NPS pollution reduction and the subsequent prioritizing of watersheds based on that need, help Division personnel and their counterparts in the Soil and Water Conservation Districts (SWCD) make decisions regarding where to concentrate their efforts and funds. Currently the data for 44 counties exists in the VirGIS database, with 6 other counties being added this year. This includes more than 2/3 of the Bay watershed in Virginia.

BMP and Nutrient Management Tracking

The DSWC currently tracks agricultural BMPs installed and Nutrient Management Plans implemented under state sponsored programs. The program tracking includes relevant information about the BMP installation or Nutrient Management Plan such as dates, associated costs, geographic reference, and nutrient information. Efforts are underway to include similar data bases from other agencies as well as information on other NPS pollution sources. This tracking information coupled with other tools will allow the DSWC to assess the level and geographic extent of BMP activities within any watershed, make possible the calculation of pollution reduction estimates within watersheds without a massive monitoring effort, and produce refined land use and cropping practice data layers useful for water quality modeling.

Water Ouality Modeling

The Division is engaged in making operational several water quality models, each most appropriately applied to watersheds of a particular range of sizes. These models include:

* VirGIS
* HSPF
* AGNPS

VirGIS contains the algorithms for computing a water quality index (WQI). WQIs are calculated on a per grid basis (usually 1/9 hectare) but are averaged within a watershed to produce a watershed pollution density index (PDIw). Comparing PDIws amongst the watersheds in a SWCD is one important aid to prioritizing watersheds for inclusion into the Division's BMP Cost-Share Program. Other routines in VirGIS allow for the modeling of phosphorous and nitrogen runoff as related to soil loss and animal waste sites. As the VirGIS database expands to encompass the whole state, the Division will use VirGIS for statewide modeling efforts.

The two other models, HSPF and AGNPS, are being readied for the modeling of smaller watersheds. AGNPS is being calibrated using the previously mentioned monitoring data of the test watersheds. It will then be used to evaluate BMP effectiveness within other small watersheds. HSPF will be calibrated in a similar fashion but will probably be applied to larger watersheds than those evaluated by AGNPS and also provide Virginia with an improved NPS interface to the Bay modeling effort being conducted by the Chesapeake Bay Program.

Speaker #3:

William E. Duncanson
Planner/Land Use Administrator
Richmond County, Virginia

Richmond County is located on the Northern Neck of Virginia, a tidewater peninsula lying between the Potomac and Rappahannock Rivers and the Chesapeake Bay. The County is bounded by the Rappahannock River along the length of its southern border and shares a border with each of the other three counties of the Northern Neck: Westmoreland, Northumberland and Lancaster.

The total area of Richmond County is about 203 square miles, of which approximately 11 square miles are water. The County is approximately eight miles wide and 26 miles long. The Rappahannock River and its numerous tributaries form a 197 mile shoreline for Richmond County. These shoreline areas were targeted to receive the major emphasis of recent planning projects.

The physical environment of Richmond County is largely determined by its coastal setting. The Rappahannock River and two of its tributaries provide the natural border for a large portion of Richmond County. The soils, topography and geology of the County have been formed from the sedimentary processes and sea level changes that have taken place during the formation of Chesapeake Bay watershed. The coastal environment of Richmond County is responsible for the bounty of renewable, natural resources which are found there. The fertile soils of the County, formed from marine and fluvial sediments, provide a strong base for agriculture and forestry. The waters of the Rappahannock River and its tributaries provide a healthy environment for finfish and shellfish. Together, the production and harvest of these renewable resources serve as the mainstay of the Richmond County economy.

Development in Richmond County traditionally had been governed by land ownership patterns and resultant availability of land for development. Recent development pressure in the Northern Neck has centered on waterfront property for use as retirement, second home and speculative ventures. To date, the land ownership patterns coupled with the type of

waterfront found along the Richmond County shoreline has had a dampening effect on development. As available desirable properties in the Northern Neck are developed, more pressure will be exerted on landowners of shoreline properties to sell for development purposes. Low prices on agricultural and forestal products, failing seafood productivity, higher land prices and escalating real estate tax rates make it ever more attractive to sell shoreline property for more intensive land use purposes.

The Richmond County Board of Supervisors and Planning Commission have observed development in adjoining and nearby localities and realize that Richmond County can expect a significant increase in development pressure over the next few years. The County is the only tidewater Virginia locality without a Zoning Ordinance. In order to manage the anticipated growth the County must have the proper land use controls in place. The County must have available a reliable assessment of its natural resources in order to arrive at effective and efficient land use decisions.

Richmond County has a computer generated Geographic Information System (GIS) on line referred to as The Richmond County Resource Information System (RIS). The RIS contains the following datalayers:

Baylor grounds
Bird nests
Erosion index
Floodplain
Habitat types
Existing land use
Shoreline erosion
Stream networks
Stream order
Water quality index
Watersheds
Historical sites
Elevation
Property boundaries
Wetlands (tidal/non-tidal)
Transportation routes

Other inventories planned include:

Septic suitability
Shoreline structures
Chesapeake Bay Preservation Areas
Residential suitability
Commercial suitability

All of the inventoried datalayers can be computer manipulated to combine multiple layers of data to provide desired information. The information is in a raster based format and cell size is 1/9 hectare or approximately 1/4 acre. Maps can be created by actual property boundaries (taken from Tax maps), watersheds, Topographic maps (7.5 minute series) or UTMs coordinate "windows" from the Topographic maps.

The RIS can also describe a property without creating a map. Categories and attributes include: acreage, number of housing units, waterfront, lakes, number of historical sites, endangered or rare bird nest sites, land erosion, water quality index, floodplain, wetlands (tidal and non-tidal), septic suitability, shoreline erosion, land use and soils.

The last two categories, land use and soils, contain extensive information layers that will allow County officials an opportunity to examine development potential and suitability for particular parcels of land.

Existing Land Use

Cropland
Coniferous
Cut-over forest
Pasture
Mixed forest
Non-ag/non-forest
Deciduous
Plantation

Soils (category/suitability)

Dwelling no basement	Small commercial	Roadbase
Dwelling w basement	Septic absorption	Sewage lagoons
Sanitary landfills	Pond/reservoir	Dikes/levees
Excavated ponds	Drainage	Irrigation
Grass waterways	K factor	T factor
Wind erodibility	Organic matter	Hydrology
Flood frequency	Flood duration	Flood months
Water table depth	Water table months	Water table kind
Land capability	Prime farm	Soil profile
Water capacity	USDA - texture	Permeability

The RIS allows County staff to conduct desk top analysis of proposed development projects. The system can best be used as a "red flag " device that can alert staff to potential problems that may result from improper land use.

The County also uses field inspections, land photography, aerial photography and remote sensing (satellite) for assessment of its natural resources.

WORKSHOP #5: ANIMAL WASTE MANAGEMENT

Richard Duncan, Moderator, PA Soil Conservation Service

Speaker #1:

ANIMAL MANURE UTILIZATION IN AGRICULTURAL NUTRIENT MANAGEMENT

H.L. Brodie P.E.
Extension Agricultural Engineer
University of Maryland, Department of Agricultural Engineering

Removing manure from an animal production enterprise is a necessary part of of animal management. Waste handling and treatment must be responsibly accomplished to conserve animal health, production income and environmental quality. A variety of waste handling and treatment alternatives are available to farmers, but usually some or all of the waste is applied to the land. Land application of waste requires rigorous management to remain effective at conserving environmental quality and production income.

The steps necessary for managing animal waste are identical in concept to those necessary for utilizing commercial fertilizers. Animal wastes are simply a substitute nutrient source. When using commercial fertilizer, the plant needs are determined and then the formulation of nutrients is fixed by the waste generation process and the agronomic decisions are based on making the nutrient need compatible with the nutrient source.

The phosphorous to nitrogen ratio in manures is generally not the same as that ratio required by plants. Providing adequate manure nitrogen to plants often provides an excess of phosphorous and may result in a long term overload of soil phosphorous delivery to surface water and decreased economic return from waste utilization.

Management to satisfy crop need with the most abundant nutrient in the waste (usually phosphorous) relative to the plant need requires supplementing other nutrients with commercial fertilizer. This strategy allows optimum timing and placement of supplemental commercial nitrogen for crop growth and environmental protection while preventing excessive phosphorous accumulation in the soil.

Although these concepts are quite simple to describe, the task of implementation requires major effort. There is a significant uncertainty with using manure as a fertilizer source. Farmers have become accustomed to the ability of fertilizer companies to provide guaranteed nutrient mixes with proven results. Even with nutrient analysis, the nutrient content of a heterogeneous pile or tankful of manure is still an estimate. Spreading manure on fields is not accomplished with the same accuracy as can be achieved with fertilizers. As a farmer relies more on manure nutrients he requires more outside support to balance the greater uncertainty.

This support is being developed within the University of Maryland System through research, demonstration, and educational activities. These projects include agronomic plot studies of manure and sludge for crop and water quality response; manure spreader design for improved control of poultry litter application; computer assisted decision making; development of equipment and structural maintenance templates for use with farm management plans; economic analysis of alternatives; manure nutrient analysis, manure spreader calibration clinics; one-on-one farm consulting and other conventional Extension methods.

Cooperative Extension promotes ideas through education for social and technical change. In the past, the goal of increased crop and animal protection per unit was consistently achieved because private business provided a sales force and Extension provided farmers with information. The private sales force financially supported research-demonstration and promotional activities. This public-private partnership worked very well as demonstrated by the steady increase in farm productivity.

But now the promotion of new ideas on production and fertility in response to changing economic and environmental conditions does not blend as easily with private business ideas. After all, asking farmers to use manure as a fertilizer replacement provides a direct negative impact on the income of the private business person with whom we have had this long standing positive relationship. Consequently, when promoting manure nutrient management there is no built-in sales force from the private sector, but direct competition for clients. Research, demonstration, and promotional activity funding must occur with minimal private company assistance. Client service must be provided at levels that will increase farmer participation in manure management programs on a continuing basis.

Service involves listening to each farmer to determine his/her needs and then assisting that farmer in developing a solution to those needs. The success of the solution is increased in proportion to the degree of farmer input. Farmers will voluntarily adopt, maintain, improve, and advertise their solutions when they have a personal stake in the development of that solution. A farmer proud of an accomplishment is our best promotional ally. The key is client contact.

Maryland has been developing a program for client contact to accomplish manure and nutrient management goals. Over the last ten months, fourteen nutrient management consultant positions have been established. The consultant's job is door-to-door promotion of the nutrient management program and providing client service.

Nutrient consultants are responsible for carrying the message to the farm, learning about individual farm problems, recommending improved nutrient operating procedures, and cropping programs, taking soil and manure samples, identifying manure storage needs and developing other activities as may be necessary to move the program forward. Consultants provide the farmer with direct access to appropriate Extension and other agency specialists for the solution of technical, economic, and cultural problems that affect management of nutrients. Start-up year activity has developed 198 farm nutrient management plans covering 8,035 acres. The average nutrient input was reduced by 30 lbs. of nitrogen, 21 lbs. of phosphorous, and 23 lbs. of potassium per acre.

Farmers, being naturally cautious, offer only a few fields for management planning with a wait-and-see attitude before embracing the program. Participation will increase as more fields are successfully planned. The goal is for farmers to become comfortable with nutrient management techniques so that they can maintain an operating plan with minimal assistance.

The success of this educational consulting program requires a total commitment from all cooperating agencies and offices from funding to individual office environment. Nutrient consultants must be adequately trained and motivated to fulfill the promised assistance to farmers. A strong budget must be maintained to successfully carry out the program objective.

Speaker #2:

WITHIN PASTURE STREAMBANK FENCING

John Byerly
Pennsylvania Game Commission
Bureau of Land Management

The Pennsylvania Game Commission, through a cooperative agreement with the Pennsylvania Department of Environmental Resources, Bureau of Soil and Water Conservation, has begun projects using high quality, low maintenance electric fencing to keep livestock off of streambanks and out of the waterways.

Through fencing and planting, we are establishing streamside corridors of vegetation favorable to many species of wildlife. These projects are demonstrating the multiple benefits of improved pasture management, wildlife habitat, water quality and aesthetics.

The Pennsylvania Game Commission is locating willing cooperators and obtaining necessary agreements.

The Commission will install fencing according to the following:

a. High quality electric fencing materials will be used.
b. Low impedence, high voltage energizers will be used to electrify the fence.
c. In cow only pastures, a single wire installation with 55' between posts will be used. In cow-calf pastures, a two-wire installation with 50' between posts will be used.

d. Fences will bracket stream meanders. The distance from the stream edge to the fence may vary as follows:
   1. Distance from fence to streambank will depend on local topography with an average minimum of 10 feet recommended.
   2. Fencing will generally parallel the direction of the stream and not include short meanders.
e. Alternate watering facilities are encouraged. In-stream watering accommodations can be made with cost sharing through other agencies.

The Game Commission is recommending planting trees and shrubs that are suitable for streambank stabilization and wildlife food and cover. Species that tend to spread throughout pastures or cropland sites will not be used.

Benefits to be realized from the stream protection include:

- Soil Stabilization
- Cleaner Water
- Reduction of Potential Injuries to Livestock
- Better Wildlife Habitat
- Improved Fish Habitat
- Additional Opportunities for Pasture Management
- Aids in the Cleanup of the Entire Watershed
- Additional Income from Furbearers for Landowner
- Opportunities to Produce Fruit, Nut and Shade Producing Trees Between Fence and Stream

Landowners take pride in their property, their livestock, their crops and their way of doing business. This program offers a method of assisting them to obtain fencing to keep the livestock away from the streambanks and out of the waterways.

The fencing is provided and erected free-of-charge to those landowners who agree to maintain it for a ten-year period.

Most important, this cooperative conservation program will enhance the environment for ALL WHO LIVE DOWNSTREAM.

Speaker #3:

RICHARD FITZGERALD
Division of Soil and Water Conservation

Introduction:
Grass Roots Nutrient Management has always been practiced on the farm in some form or fashion. Fertilizer decisions are constantly being affected by two questions. One - "How much fertilizer do I need?" and two - "Where is it going to come from?" This process is a juggling act, trying to decide what, when, where and why!!

Effective nutrient management planning should provide the information to indicate how the farmer can use crop rotation and fertilizer/manure applications to build a balanced fertility program. Crop management provides the 3 major plant foods (carbon, hydrogen,

oxygen) not a bag of fertilizer. Our planning should be flexible at the farm, environmentally sensitive, economically sustainable, and agronomically correct. The present research on intensive crop production, IPM initiatives and changes in animal feeding programs have elevated nutrient management into a newer realm. Its acceptance on the farm will reflect whether we are leading him, or him leading us!

Nutrient Management Plan Format

* slides to show examples of basic plan
* plan map
* soil map
* soil descriptions
* notes and calculations (optional)
* nutrient management job sheet
* narrative
* follow-up and assistance notes

Cover Letter - Should be a personal letter presenting plan, encouraging use, and offering additional assistance.

Left Side of Folder

1. Plan map and legend

   a. with ASCS field number and acreage
   b. with HEL and Wetland determinations
   c. with land use identified
   d. environmentally sensitive areas - (i.e. drainageways, wells, erosion control structures, wetlands, etc.)

2. Soil map - colored by productivity group

3. Soil descriptions - keep brief

   a. productivity group
   b. capability class
   c. permeability index - needed when irrigating to address ground water quality

4. Any field notes, calculations, worksheets, etc. (our copy share with land user on case by case basis). The Manure Utilization Worksheet and the Inventory of Farmer's Operation forms are provided to help you. USE IS OPTIONAL.

Right Side of Folder

1. Nutrient Management Jobsheet - to allow farmer quick access to recommendations.

2. Narrative description of operation - Things to include:

   a. briefly describe system (i.e. daily, hog, poultry, etc.)
   b. briefly describe manure handling system (i.e. daily haul, 30 day stack, 90 day liquid, etc.)

c. briefly describe how the number of animal units was derived
d. describe value of manure to farmer - nutrient & dollar values (may use the Manure Composition & Value Worksheet or something similar)
e. describe market if excess manure is being sold
f. list management considerations (i.e. tests, timing, etc.)
g. describe cropping practices (i.e. no-till, etc.)
h. list precautions (i.e. distances to streams, erosion control needed, environmentally sensitive areas, etc.)

3. Follow up and assistance notes (our copy only)

Nutrient Management Plan Issues

1. Yield goal vs. yield potential

   a. soil survey plans 10%
   b. documented yield history

   - Plan has to remain flexible to allow for varying degrees of intensive crop management, but underscore the limits of soil productivity.

   - Soil survey information often influences basic cropping decisions rather than specific yield goals.

2. Manure testing should separate ammonia nitrogen from total nitrogen.

   a. A site specific manure test initiates the process like a soil sample does for the fertilizer dealer.

3. Should we base our recommendations on nitrogen only, or include phosphorous?

   a. Promoting manure management to the non-producer requires phosphate consideration.

4. Job sheet should highlight excessive nutrient applications and when they occur; show how they are utilized in successive crops.

5. What is "effective" nutrient management when there is not enough land to properly dispose of the manure?

Speaker #4:

ANIMAL WASTE MANAGEMENT: ADDRESSING THE TOTAL PROBLEM

Samuel E. Young
Pennsylvania Department of Environmental Resources
Bureau of Soil and Water Conservation

From the Chesapeake Bay Assessment Report, Pennsylvania's Nonpoint Source Management Plan and the 208 Assessment Report, nutrient enrichment has been identified as a major factor in the decline of the Chesapeake Bay. The 1988 "Baywide Nutrient Reduction Strategy" has identified nutrient reduction goals for Pennsylvania. They are, 24,344,000 pounds of

nitrogen and 1,302,000 pounds of phosphorous. Nutrients from animal manures will constitute more than one-half of the nutrient reduction goals.

From the beginning of the Chesapeake Bay cleanup effort, Pennsylvania has used the approach that reducing the nutrients from animal manures involves evaluating and treating all the animal wastes generated on the farm. This premise is tied to the fact that whatever is done to manage animal wastes will also affect the total farm operation. Changes made in manure handling systems may require changes in:

a. The number and kinds of animals raised on the farm.
b. The amount of land needed for recycling nutrients.
c. The type of crops grown in order to utilize nutrients.
d. The amount and timing of major labor inputs.
e. The amount or type of equipment needed to handle the wastes.
f. Capital expenditures
g. The farm's net profit, i.e., usually the cost of agricultural waste management cannot recovered fully from the value of nutrients in the manure.

In evaluating Pennsylvania's nutrient reduction problems it was decided that the most feasible way of reducing nutrient pollution from farms is:

a. Control phosphorous losses by controlling erosion and runoff from fields where manure or fertilizer are applied.
b. Controlling manure nitrogen losses also requires control of erosion and runoff, but more importantly the proper handling, storage, treatment, rate, and timing of manure applications and its incorporation into the soil .

The control of animal waste and nutrient pollution is based upon the development of a nutrient management program. A nutrient management program consists of a nutrient management plan with the necessary erosion control for lands where the nutrients will be spread. The guidelines for this plan development are contained in the Chesapeake Bay Program "Administrative Manual" and its adopted USDA Soil Conservation Service, "Standard and Specification 312: Waste Management Systems".

The resource conservation planning and contracting steps are as follows:

a. Inventory the problems and resources.
b. Develop alternatives to solve the problem using suitable Best Management Practices as components of a Resource Management System.
c. Farmer select a management alternative that fits the farm operation and Chesapeake Bay program objectives.
d. Prepare final nutrient management plan and Chesapeake Ray Program Contract.
e. Implement the plan on an agreed-to schedule.
f. Farmer operate and maintain the system.
g. Update the plan as needed due to changes in farm operation.

The planning considerations that are used to develop the animal waste/nutrient management plan are as follows:

a. Recycle animal wastes through the soil and plants whenever possible by using good agronomic practices in deciding where, and at what rates to apply manure and/or fertilizer.

b. When there are more manure nutrients available on the farm than land and crops can safely recycle, plan to treat the manures by alternative methods such as aerobic or anaerobic lagoons, composting or hauling to other off-farm lands for agronomic utilization.

c. Keep clean water clean. Use rain gutters and downspouts to take roof runoff to a safe outlet. Install diversions to carry upslope runoff around feed lots or other animal or manure concentration areas.

d. Develop a nutrient management plan based upon availability of the manure and properly treated farm fields. Decide if manure storage is needed to implement the spreading plan.

e. Collect and treat or recycle polluted runoff and waste waters.

f. Provide adequate land treatment for erosion control that is compatible with animal waste recycling.

g. Evaluate the labor and when it is needed to implement the plan, i.e., has the plan taken 365 hours of manure hauling, based upon one hour per day throughout the year, and concentrated it into the same time period the farmer already has full labor utilization and created an impossible situation?

h. What is the total cost of this management system and how does it affect the farmer's ability to implement the plan.

In developing the management plan, many tools are used to determine which combination of Best Management Practices will provide the best overall resource management plan. Some of these tools are the PA Department of Environmental Resources Manure Management Manual, The Pennsylvania State University Farm Nutrient Management Work Sheet, The Pennsylvania Agronomy Guide, Soil Conservation Service Agricultural Waste Management Field Manual, County Soil Surveys and many other research publications. By using all the tools available we help the farmer develop a waste/nutrient management plan that is the best balance of Best Management Practices to reduce nutrient pollution to the ground and surface waters that is practical for that farm. And since the farmer has been involved in the analysis of how waste management fits into and affects his whole operation, the farmer should do a better job of installing, operating, and maintaining the practices needed to reduce the nutrient pollution from the farm.

In summary, Pennsylvania's nutrient reduction strategy is based upon the fact that managing animal manures can have a major impact on the whole farm operation. We must develop an acceptable waste/nutrient management plan that is compatible with the entire farm operation. That plan must be the best combination of Best Management Practices to provide state of the art nutrient management and erosion control if we are to reduce the pollution load from nitrogen and phosphorous off of Pennsylvania farms. We believe that manure storages constructed without an adequate nutrient management plan are unacceptable and will result in building monuments to manure.

WORKSHOP #6: FORESTRY SOLUTIONS

James Garner, Moderator, VA Department of Forestry

Speaker #1:

Robert J. Lundberg
VA Forestry Association

It is good to be here, especially representing Virginia's forestry community. This section of today's program is titled "Success Stories" and without a doubt, our current non-regulatory program can be termed a success at least at this time.

The forestry effort began as a task force which was set up by State Forester Jim Garner. Its main goal was to reduce N.P.S. pollution from silviculture using a voluntary program. Task force members came from every corner of the forestry community - loggers, landowners, industry, associations, educators, and government. No single element of our group could achieve the goals that were set. If loggers complied and landowners failed, the negative results would be no different.

The program consists of three major elements: 1. Secure a financial commitment from the major consumers, 2. education, and 3. fear. The financial commitment was not difficult and the educational effort will be forever.

Initially 30 regional training meetings were held to: 1) convince foresters/loggers of the need to comply and 2) immediately get them started thinking and using BMP's. The educational effort did not stop here. The whole concept we are using could be described as a funnel. The 30 initial efforts covered a broad base - and reached 1900 folks! The next sessions were held on a regional basis, the next level then at individual mill locations. If necessary, we will go to the individual. Specific issues or problem areas will be addressed separately. For example, a workshop dealing with forest rutting will be held March 6, 1990 in Wakefield. Pre-registration is close to 100. As our data base builds, we will have more specific ideas where our problems lie and will continue to modify programs to solve them.

The third part, fear, is simply fear of regulation. We face the most powerful variable man can face and that is weather. Flexibility is not only essential from an operational standpoint, but it is also key to doing the job right. When it rains on a Saturday, we need the ability to change sites quickly. Waiting for a permit would be costly and would also put pressure on people to push a day or two longer, perhaps damaging site.

Earlier I qualified our program's success with "at least at this time." You will also note that we do not refer to our program as voluntary. Our plan is such that we will not stop or reduce our efforts, and we especially do not want to transmit the image that our program is voluntary. We feel we have no choice. A regulatory program is based on a rule or law and enforcement. Our country has enough rules/laws, and in regulated programs you only draw attention if a problem is noted and a complaint is filed. In our program our goal is to conduct an inspection on every site and keep problems small. Pride is our motivating factor. The initial data says our program is effective, but I can assure you we will not stop here.

Speaker #2:

John P. Markovich
Supervisor of Urban Forestry
MD Forest, Park and Wildlife Service

Our forests have long been recognized for the many benefits they provide. Among the benefits is the ability to act as buffers and aid in the reduction of non-point source pollution. As a result of this knowledge and the ever increasing awareness of our environment it has become necessary to develop programs that encourage the retention of forest land, promote tree planting (reforestation, afforestation, and urban plantings) and maintain the health of the forest.

To accomplish this the State of Maryland has utilized many existing Federal programs such as:

1. Forest Incentives Program (FIP)
2. Agricultural Conservation Program (ACP)
3. Conservation Reserve Program (CRP)
4. Reforestation Tax Credit (PL 96-451)
5. Watershed and Flood Control Projects (PL-534 and PL-566)
    a. Upper Potomac River
    b. West and Rhode Rivers
    c. Linganore Creek

Maryland has utilized these programs and initiated numerous others as enhancements. At the same time programs addressing Maryland's specific needs have been initiated.

Although some of the programs are aimed at specific watersheds most are intended for statewide use. Watersheds receiving intensified attention are as follows:

1. Chesapeake Bay (Chesapeake Bay Initiative)
2. Susquehanna River
3. Monocacy River
4. Patuxent River

These watersheds along with the PL-534 and PL-566 projects have been identified for increased tree planting efforts. In these areas landowners are being contacted and encouraged to consider reforestation on open land that has moderate to severe erosion potential. Planting is also encouraged along streams with inadequate buffers.

Programs that have been developed in Maryland to encourage forestry practices are as follows:

1. Forest Conservation and Management Agreement (FCMA) is a property tax assessment program which allows landowners with five (5) contiguous acres or more of forest land to receive an agricultural woodland assessment on their forest land provided they follow an approved Management Plan and enter into a 15 year Agreement with the State. At this time there are 170,208 acres of forest land in this program.

2. Maryland Income Tax Modification for Reforestation and Timber Stand Improvement. This provides a double deduction of expenses incurred on a 10 acre or larger practice for reforestation or timber stand improvement. Landowners receiving this deduction must maintain the practice for fifteen (15) years.

3. Woodland Incentives Program (WIP) is a cost share program that provides for a 50% reimbursement of expenses associated with reforestation and timber stand improvement practices on 10 acres or more. Again this practice must be maintained for no less than fifteen (15) years.

4. Green Shores Cost Sharing Program is intended to encourage tree planting along streams throughout the State. This program provides a one time payment of $200 per acre, one (1) year after completion of the planting and adequate survival is verified. One (1) acre to fifty (50) acres are eligible and the practice has a life span of 10 years.

5. The Urban Grant is intended for use in the Chesapeake Bay Critical Area to encourage communities to use trees for the reduction of runoff and associated pollution. The grant requires matching funds from the community with the maximum match of $25,000.00.

6. The Reforestation Law is intended to minimize clearing of woody vegetation on one (1) acre or more when associated with construction projects involving State money (Grants, loans, Bonds, direct payments, etc.). Site Plans must be reviewed to determine the extent of clearing. Reforestation must be done when clearing exceeds one (1) acre or more. This may be done first on the construction site and if this is not possible then off site within the same County. If a site cannot be located a contribution of $500 per acre must be made into a Reforestation Fund that will be used when a site becomes available in that County.

7. Sediment Control Plan for Forest Harvest operations requires that all harvest disturbing 5,000 square feet or more must follow Best Management Practices (BMP's) and have an approved Sediment Control Plan.

8. Non-tidal Wetland regulations expand the need for use of BMP's to all non-tidal wetland throughout the State.

In summary forestry programs in Maryland aim to first ensure that the forest land base be maintained since this alone will provide desirable benefits including reduction non point source pollution. The second objective is to provide incentives to landowners and communities that will encourage the expansion of the forest land base. Finally, we must ensure that the forest we have and those recently established are healthy and maintained so as to provide the benefits we associate with forest such as improved water quality, improved air quality, wildlife habitat, recreation, an improved living environment and even fiber production.

Speaker #3:

David J. Gregg, Assistant CFM Supervisor
PA Department of Environmental Resources
Bureau of Forestry

Improving erosion and sedimentation control during logging operations has been a long-standing goal of Pennsylvania's forestry community. Cooperating with Conservation Districts ongoing statewide efforts educate loggers and landowners concerning the importance of clean water, and methods for protecting water quality when timber is harvested. These efforts will be continued and are important in maintaining the flow of clean water in the Chesapeake Bay drainage area within the Commonwealth, as well as in other parts of the state.

The most significant contribution to be made by forestry in solving nonpoint source pollution problems is to develop plans that result in the incorporation of trees and shrubs into agricultural, commercial, and residential development patterns. Well placed woody vegetation will provide areas that permit precipitation and runoff to infiltrate the soil and thus to be at least partially filtered before entering the stream channels.

In order to promote these basic concepts in Pennsylvania, the Bureau of Forestry has established a series of demonstration sites which focus on agricultural lands. These demonstrations include:

1. Planting of streamside buffer strips with trees and shrubs.

2. Planting of steep upland areas with trees or shrubs. This removes land from cropping or pasture use and converts it to a more stable, soil protecting woody plant cover.

3. A "cross-field" filter strip, which combines a diversion with the planting of shrubs to allow more complete infiltration by runoff from an upland cornfield.

4. Several sites where standard diversion systems have been modified so that discharge from these systems now enters woodland at a rate that permits infiltration of the soil. The discharge now passes through a "final filter" which was previously by-passed.

5. Liquified hog manure has been applied to woodland by spray irrigation in a county where the number of animal units produces more manure than can be used by the agricultural activity within the area. Woody vegetation makes more complete use of the nutrients thus applied than would cropland.

To really reduce nutrient and sediment loadings, these types of practices need to be incorporated into many more farms than these few demonstration areas. Broader application has been promoted during the past year by making contact with "Bay Cooperators" of several Conservation Districts. These visits have been made by consulting foresters under contract. Each willing landowner has received a farm-specific planting plan to show where and how trees/shrubs could be incorporated into the nutrient strategy for that farm's operation.

A further need that is being addressed during 1990 is to demonstrate reliably how varying widths of riparian woodland reduce nutrient loadings from adjacent agricultural zones. The demonstration will use monitoring wells in an actively cropped area and in the woodland border which serves as a buffer between the field and the stream. Such information as how much a specified width of woodland can reduce nutrient loadings in given circumstances is needed for effective planning and implementation.

WORKSHOP #7: MAKING VOLUNTARY PROGRAMS WORK

George Norris, Moderator, VA Soil Conservation Service

Speaker #1:

W. Richard Rossman
PA Association of Conservation Districts

I. Introduction

II. Background:

Evolution of Chesapeake Bay Program in Pennsylvania describing the involvement of key conservation district leaders.

Negotiation of contract with the Pennsylvania Department of Environmental Resources to serve as education coordinator for Agricultural Nutrient Abatement Program.

III. Operational Aspects of Successful Programs:

Advisory committee must be established among all members of the conservation "family" to ensure coordination and avoid duplication of effort.

Who should get the credit for educational products?

Adequate financing and competent staff are necessary to establish and maintain credibility with the agricultural community.

Trial and error are often needed to determine what works the best.

A little stimulation can go a long way in gaining support and understanding by allied organizations. Description of mini projects and their usefulness.

Networking - getting the word out. Establishment of speakers bureau.

Show & Tell - Pennsylvania has utilized major events such as Ag Progress Days, State Farm Show, County Fairs, to spread the word. DER developed mobile lab to demonstrate soil and manure testing out on the farm.

Recognition - Awards programs at local regional and state level are all needed.

IV. Voluntary vs. Regulatory:

Concept of purely voluntary program is a myth.

Creation of peer pressure will stimulate the voluntary system.

Enforcement actions on a selective basis will increase the number of voluntary participants. Under consideration in Pennsylvania is the delegation of enforcement responsibility to conservation districts for manure violations.

Voluntary programs can be made effective at the local level by developing strong conservation districts.

Careful analysis of the existing or potential agricultural pollution problems at the watershed level can force the worst polluters into becoming "volunteers."

V. Evaluating Voluntary Programs:

Measuring actual water quality benefits of educational programs is difficult at best.

Surveying attitudes at appropriate intervals can be an indicator.

Tracking trends of major agriculture commodity such as fertilizer.

Is demand for program services such as technical and financial assistance increasing or decreasing?

VI. Summary and Suggestions:

Blend of voluntary and regulatory aspects will get the best result. Carrot and stick approach still works.

Commitment by jurisdictions to provide resources at the local level to receive the most cost effective returns. BUILD STRONG CONSERVATION DISTRICTS.

Speaker #2:

G. Steele Phillips
Chairman
Dorchester Soil Conservation District

At the recent 44th annual convention of the National Association of Soil Conservation Districts, the theme was "Conservation - the Original Alternative." Conservation Districts have been working at conservation of natural resources for a long time.

Most farmers are aware of, and are dedicated to, protecting the environment. There are few industries that are as dependent upon the environment and conservation of natural resources as agriculture.

The Soil Conservation Districts, by working with farmers in developing and implementing Soil Conservation and Water Quality Plans, are addressing nonpoint source problems.

In Maryland, Districts have educational, technical, and in some cases, financial support from:

1. USDA, Soil Conservation Service
2. Maryland Department of Agriculture
3. University of Maryland Cooperative Extension Service
4. Maryland Department of Natural Resources
5. Maryland Department of Environment
6. USDA, Agricultural Stabilization and Conservation Service (ASCS)

Districts have always operated on a voluntary basis. Since 1985, Districts have received more resources to promote conservation and the bay initiatives. This has enabled Districts to become more active in promoting and implementing conservation plans.

In Federal fiscal year 1989 Soil Conservation & Water Quality:

1. State-wide - 526 plans were developed in the Chesapeake Bay Critical Area, covering 94,602 acres.

2. Districts developed 1,357 SCWQ plans protecting 204,549 acres while providing technical assistance so that 7,602 BMP's were installed. The Best Management Practices treated 101,801 acres of cropland and pasture, keeping an estimated 386,234 tons of soil on the land and away from water resources.

Farmers will, and are, adopting practices that mesh with their operations; that is, practices that provide both protection to the environment, and at the same time allow a profitable enterprise. A new voluntary program, the Nutrient Management Program is rapidly moving forward and being accepted by farmers. This program, implemented by the Cooperative Extension Service, provides technical assistance for soil and manure testing. It also provides proper management and application of manure and fertilizers.

1. In two quarters in 1989, 200 plans have been completed, covering 8,000 acres of farmland.

2. Estimates show nitrogen saved to be approximately 35 lbs. per acre, with a cost saving to the farmer of $15 - $20 per acre.

The Maryland Department of Agriculture has designed a cost-share program, MACS, to resolve agriculturally-related non-point source water problems. This program addresses nutrient and sediment erosion, animal waste, and agriculture chemical concerns. By working through SCD's, farmers are able to cost share certain Best Management Practices.

This program can be linked directly to the Agricultural Cost-Share Program (ACP) offered by the USDA, ASCS. Any farm is eligible that can show that run-off from that farm is causing a water quality problem. If approved by MDA, a farm could receive up to 87.5% of eligible costs, not to exceed $10,000 a project, with a farm limit of $25,000.

1. In the six year period 1984-1989, over 15 1/2 million dollars of state and federal money was spent, with farmers matching this with 2.1 million of their money.

2. In 1989, farmers completed installation of 826 BMP's, matching 3 1/2 million dollars of state and federal grants with $516,000 of their own money.

3. Of BMP's reported, farmers are cost-sharing only about 13.5%; landowner's are picking up the larger share.

4. Cost-Sharing grants may be viewed as second in effectiveness to educational efforts to promote BMP's.

5. Because of the high cost of implementation of BMP's and the fact that some take land out of production, thus adversely affecting farm income, cost-share is an important program. The farm economy is not strong enough to carry out the full program alone.

Voluntary programs are working, but we must stop and reflect, are they really that voluntary? With the 1985 Farm Bill, with the Sodbuster and the Swampbuster provisions; the 404 Clean Water Act, Critical Area law and now new wetlands guidelines and enforcement, what is so voluntary? If there is a complaint of a water quality problem, MDE or DNR Water Resources is quick to investigate. The Corps of Engineers has increased their jurisdiction and are engaging in more investigations.

In our local District, our staff watch for problems and work with landowners to get them corrected. We work with the Corps, MDE, and DNR to resolve problems they identify. We strive to get the landowners in compliance without fines or court costs if at all possible. We are usually successful.

How will the new efforts of LISA, Low Input Sustainable Agriculture, fit into the voluntary framework? LISA is not an entirely different type of agriculture, but an introduction of new concepts. I and other farmers have been using some of the concepts of LISA for years, and use more as technology develops. The economics of agriculture dictates that we must use the lowest input possible to produce a profitable crop. Some concepts already in use are:

1. Soil testing with nutrient and lime used according to the recommendations by the University or commercial companies.

2. Integrated Pest Management, using pesticides as required or dictated by identifying economic thresholds.

3. Use of conservation tillage or no till (at the NACD convention no till was called the way of the 1990's).

4. Use of cover crops to lock up residual nitrogen and prevent erosion of soil.

At the NACD meeting, Dr. Neill Schaller, who is Program Director of LISA Research and Education, USDA stated:

1. It is too soon to define LISA yet.

2. LISA is a way of thinking; it is a revolution in thinking, not technology.

3. LISA could open the door to the ethics of land conservation.

Maryland is moving ahead on reducing non-point source problems. We have a long way to go, but we need to give present programs time to work. More will be accomplished by keeping the voluntary approach. Going to more of a regulatory basis will cost more money and time and be less effective. We currently have the laws in place that are sufficient, when enforced, to assure reducing nonpoint source pollution and achieve the goals set forth. The awareness of and implementation of Best Management Practices has drastically increased. If we are observant, we can already see many improvements. The quality of the Bay is improving.

WORKSHOP #7: MODELING AS A MANAGEMENT TOOL

Lynn Shuyler, Moderator, EPA Chesapeake Bay Liaison Office

Speaker #1:

THE CHESAPEAKE BAY WATERSHED MODEL

Lewis C. Linker
U.S. EPA Chesapeake Bay Liaison Office
and
Anthony S. Donigian, Jr.
AQUA TERRA Consultants

The Chesapeake Bay Program has developed a comprehensive modeling system of two models, each with a specific role. These two models are the Watershed Model and the Time Variable Bay Model. The Watershed Model is a computer model of water quality providing estimates of basin loads to the tidal Chesapeake Bay. Load estimates may be output in hours, weeks, or years depending on the analysis required. Runoff, groundwater flow, river flow, and the associated nonpoint source and point source pollution loads of the entire Bay basin are simulated by the Watershed Model. Output from the Watershed Model is used as input to the Time Variable Model of the tidal estuary. The Time Variable Model is a continuous hydrodynamic and water quality model of the tidal estuary. These two models will be used in combination to provide information to guide the restoration program.

The Watershed Model is being developed in two phases. Phase I was initiated in October, 1988 with the following two goals:

- provide data needed for the 3-D Model calibration, and
- provide an initial analysis of Basin nutrient loads delivered to the Bay.

These goals were achieved by updating the model input and calibration, which were based on an earlier simulation of 1974-78, to the years 1984-85. Phase I also included refinements of the model's simulation of hydrology and water quality. Phase I was completed in March, 1990.

Phase II was initiated in March, 1989. Its two goals are:

- provide detailed scenario input data to the 3-D Model for the 1991 reevaluation of the nutrient reduction strategy, and
- provide information for large scale planning and tracking of NPS controls.

Phase II will upgrade the model by including sediment transport and sediment/nutrient interactions in the river/reservoir submodel. Simulation of detailed agricultural practices will be incorporated in the nonpoint source submodel. Development of interactive processors to facilitate model operation, data input, and results analysis is also included in the Phase II project. Phase II will be completed in November, 1990.

The Watershed Model consists of three submodels, a hydrologic submodel, a nonpoint source submodel, and a river/reservoir submodel. To calculate the stream flow, nonpoint pollution loads, and sediment loads in the Bay's 64,000 square miles drainage area, the Watershed Model uses extensive input and output data files including everything from meterological records to discharges from point sources. Transport and decay of nonpoint source and point source loads are modeled to the head of tide in the Chesapeake.

The model continuously updates the hydrology, including rainfall, runoff and subsurface flow, for the years 1984-85. The hydrologic submodel uses time series of rainfall, evaporation, and meterological data. From this, the soil moisture is calculated, and the rainfall input is converted into runoff, subsurface recharge to stream channels, soil moisture, evaporation and evapotransporation. The runoff and ground water discharge ultimately drive the model.

The model is divided into basins, such as the Potomac and Susquehanna, and the basins are further divided into model segments. There are 64 model segments in all, with segmentation generally becoming finer in model segments closest to the Bay. Finally, each segment is divided into seven land uses: conventional cropland, conservation cropland, pasture, manure production areas, forest, urban, and water surfaces.

The nonpoint source submodel uses rainfall intensity records as well as surface and subsurface output from the hydrologic submodel to simulate the degree of soil erosion and the surface and subsurface pollutant loads. This input is used to calculate nutrient and sediment loading to river channels. Pollutant and sediment loads from the land are loaded to the river/reservoir submodel on an hourly time step. Below the fall line, these loads are considered to be delivered directly to the tidal Bay.

The river/reservoir submodel routes stream flow and associated loads through the river, lake, and reservoir system of the Chesapeake drainage basin. Major physical, chemical, and biological processes of pollution decay and transformation are included. Input to this submodel includes point source loads, major water supply diversions, nonpoint source loads from the NPs submodel, atmospheric deposition loads, and flow from the hydrologic submodel. Since localized water quality conditions are not the focus of the model, rivers are modeled in one dimension, and relatively large model segments (mean size of 1,000 square miles) are used.

Coupled to the Watershed model, the Time-Variable Model now in development is the second generation in the Bay modeling program. Included in the Time-Variable Model are detailed simulations of sediment, plankton, and other water quality processes. Scheduled for completion in March 1991 (not coincidentally, the year the 40 percent nutrient reduction goal is to be re-evaluated), the model can profile an entire year, virtually day by day, providing a tool more flexible and more accurate than the previously used steady-state version. It also will be capable of a detailed evaluation of the reductions needed in phosphorus and nitrogen in specific tributaries and in areas of special concern. The new model will be able to answer questions such as these:

- What nutrient reductions are necessary to protect living resources in specific sensitive areas.
- Given the reservoir of nutrients in sediments, once controls are in place, how long will it be before measurable improvement occurs in the Bay?

Valuable as they are, the coupled Watershed Model and Time-Variable Model are incapable of providing absolute predictions of what will happen in the Bay. Models are not perfect, particularly in dealing with complex systems like the Chesapeake Bay. Modeling can't precisely predict how the adoption of better manure management practices on farms in Pennsylvania will benefit a particular oyster bed halfway down the Bay. But models and, and do, char. the directions that should be followed, and the mid-course corrections that may be needed, to achieve the restoration of the Bay. Models also improve our understanding as they challenge our knowledge and ability to simulate a tiny portion of the interchange of ties, currents, and life that we call the Chesapeake Bay.

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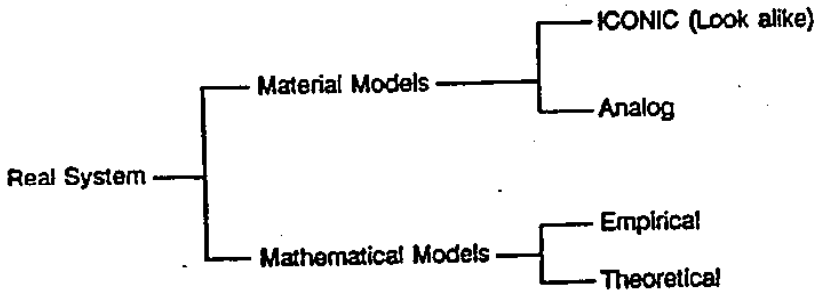
Speaker #2:

Adel Shirmohammadi
Agricultural Engineering Department
University of Maryland, College Park

To address the question, "Are models management tools?" one may need to have a proper understanding about the term "model" and the philosophy behind the model development. The term "model" may have different interpretations based on its discipline of use. In hydrologic, water quality and engineering sense models are used to explain the natural phenomena and under some conditions make predictions in a deterministic or probabilistic sense. Hempel (1963), in a book titled "Philosophy of Science," states that "we understand an event or a regularity if we can give a scientific explanation of it." The essence of Hempel's philosophy may be expressed as:

$$E = f(L1, L2, ..., Ln) + g(C1, C2, ..., Cn)$$

Where, E is a statement describing an event, L1....Ln are general laws or theoretical principles, and C1, ...Cn are statements of empirical circumstances. Therefore, a modeler tries to use the established laws or circumstantial evidences in order to represent the real life scenario. In doing so real system may be modelled using different approaches as classified by Woolhiser (1982) in the following form:



Although each of the above forms of models try to represent the real system but they have their own strengths and weaknesses depending upon the application conditions and scale of application. For example, an empirical model is derived from a set of measured data for specific site conditions and therefore its application to the other sites may create a real problem. Unfortunately, problems in misuse of nonpoint source pollution (NPS) models exist. Some users stretch the model use beyond model's capability or misinterpret the model output out of the intended scope.

Nonpoint source pollution (NPS) models are either empirical, theoretical, and/or a combination of the two. Their scale and level of application may also differ depending upon the capability of each model. Available transport models are either: 1) porous media oriented and lack the consideration of BMP impacts; or 2) they are solely BMP evaluation models and lack the comprehensive vadose zone transport component. Models reflecting the first category have been developed for environmental screening of pesticides through soil profile. Examples of such models are 2, 4-D diffusion model (Lindstrom et al., 1968), CMIS (Nofziger and Hornsby, 1984), LEACHM (Wagenet and Hutson, 1986). Models in the second category include ANSWERS (Beasley et al., 1983), CREAMS (Knisel, 1980), HSPH (Leonard et al., 1987). Each of the aforementioned models have their own degree of application limitations and the user must pay close attention for selecting an appropriate model for their intended use.

CREAMS (Knisel, 1980) is a well tested and widely used BMP evaluation model and has three components of hydrology, erosion and chemistry. It is a field scale model and may be used to provide relative comparisons between different BMP's. One should note the caution that CREAMS does not produce absolute values. This model has been and is being used by researchers, regulatory agencies, service agencies, and educators as a management tool. Shirmohammadi and Shoemaker (1988) used CREAMS model to evaluate the relative impacts of ten different BMP's on surface losses of nutrients and nitrate leachate below the root zone in three sub-basins in the Susquehanna River basin for 30-years of recording period. Their simulations resulted in different rankings of BMP's regarding their impact on surface losses of N and percolation losses of N03(Table 1). Authors believe that similar simulations may be conducted on different sub-basins of Chesapeake Bay Basin and results may provide overall guidelines regarding the selection of environmentally sound BMP's. For example, data on table 1 indicate that conventional till-terrace - with nutrient management plan (CT-TR-NMP) and CT-strip cropping-NMP (CT-ST-NMP) may be selected as the best practices regarding the reduction of N losses to surface runoff, respectively. However, consideration of the cost of terraces may dictate the selection of notill-contour-nutrient management plan (NT-CN-NMP) as the best practice for all sites. Close examination of the rankings based on the N03 leachate loss and economic considerations may prove that N-CN-NMP may be selected as the best alternative regarding both surface losses of N and percolation losses of N03. This example indeed proves that models may be used as management tools if their limitations are properly recognized.

Table 1. Ranking BMP's based on surface losses of N and percolation losses of N03 (Simulation period: 1949-1 978).

Simulation results of CREAMS may be used as loading parameter values in the Chesapeake Bay Watershed model. Impact of climate and crop rotation may also be determined using CREAMS results.

Field	Management Practices	Surface N Loss	Percolation NO_3 Loss A	C	E
A & C	*CT	1	5	5	4
	*CT-NMP	2	10	10	10
	*NT	3	3	2	2
	*NT-NMP	4	8	7	8
	*CT-CN	5	4	4	3
	*CT-CN-NMP	6	9	9	9
	*NT-CN	7	1	1	1
	*NT-CN-NMP	8	6	6	7
	CT-TR	9	2	3	-
	CT-TR-NMP	10	7	8	-
E	CT-ST	9(E)			5
	CT-ST-NMP	10(E)			6

A: Lower Susquehanna (Piedmont - Chester, Leck Kill, Penn Series)
E: North Branch Susquehanna (Appalachian - Volusia)
C: Western Lower Susquehanna (Blue Ridge Mountain - Berks Series)

FUTURE RESEARCH NEEDS

1. Field experiments must be conducted for proper understanding of hydrologic, chemical, and biological processes.
2. Inclusion of such understandings in item 1 into the transport models may enhance their use.
3. Consideration and addition of such aspects as spatial and temporal variability of hydrologic, chemical, and biological factors into the models should be on the priority list.
4. Handling the scale-concept of watershed system with multi land use or aspect should be devised in the models.
5. Multi-management aspects such as WTM and above-ground BMP's and their interactive impact on surface and ground water quality must be considered.
6. Clear guidelines on model selection criteria should be provided for the users. Dandy & Lichty (1968) have suggested 4 criteria:
   a. Accuracy of prediction
   b. Simplicity of the model
   c. Consistency of parameter estimates
   d. Sensitivity of results to changes in parameter values.
7. Research needs to be multi-disciplinary if proper outcome is desired.

Speaker #3:

VIRGINIA'S NONPOINT SOURCE (NPS) APPROACH

J. Michael Flagg
Virginia Department of Conservation and Recreation
Division of Soil and Water Conservation

The Department of Conservation and Recreation, Division of Soil and Water Conservation (DCR-DSWC) uses the technology of mathematical modeling to support three main

objectives in Virginia's NPS control program. These objectives are to identify areas of high NPS pollution, to prioritize and target, and to assess and evaluate NPS control alternatives. Modeling provides the framework for accomplishing each of these objectives by integrating land based resource information such as soils, topography, and land use with pollution abatement information provided in NPS control program tracking. Monitoring data is also used in this process to provide control and assure accurate and correct assumptions are made in the modeling processes.

Modeling provides NPS managers with a unique tool for evaluating the effects of land management practices on water quantity and quality. This is particularly important since, it is not possible to obtain experimental data for all combinations of management practices and hydrologic conditions. By approximating real environmental systems with mathematical abstractions under varied conditions, modelers can produce management alternatives that integrate many social as well as physical processes.

There are some difficulties that hinder a manager's ability to utilize modeling tools effectively. These difficulties can generally be identified under the component headings of NPS program progress tracking, basic data availability (monitoring and resource data) and, Model Applicability and Complexity. The factors that hinder modeling efforts are usually inter-related and involve more than one of the component headings. The combined contribution of these interfering factors is the delay or lack of responsiveness of modeled output to managers deadlines and needs. The DCR-DSWC is addressing these difficulties by utilizing or implementing programs in water quality monitoring, geographic information system (GIS) application, best management practice (BMP) and nutrient management tracking, and mathematical water quality model development and utilization. These programs serve independent functions for Virginia's NPS control effort; however, coordination and focusing of these efforts through the use of modeling broadens the capabilities of the program managers. This synopsis will focus on DCR-DSWC's model development and utilization efforts, two separate, more detailed, synopses of the other program efforts, prepared by Karl Huber and S. Mostaghimi, appear elsewhere in this conference summary.

NPS pollution problem identification, prioritization, targeting, assessment, and alternative evaluation are a continuous process involving interrelationships at various levels of the decision tree. DCR-DSWC has organized the state managers decision requirements into three distinctly different groups. The first group would include information required to make decisions at the interstate or Chesapeake Bay basin level. Second would be that information necessary to evaluate a total state perspective and thirdly information required to make decisions at the field and subwatershed level.

At the interstate or Chesapeake Bay basin level, DCR-DSWC is relying on the HSPF "Watershed" model as the interface and comparable reporting system for the Bay effort. At this level DCR-DSWC in acquiring the Virginia portions of the "watershed modeling effort" and working to interface their capabilities with that framework.

At the state level DCR-DSWC has been working over the past two years and developed a cooperative agreement with the Soil Conservation Service (SCS) to develop a subwatershed boundary system for Virginia. This system is being incorporated into the Virginia Geographic Information System (VirGIS) and merged with other resource information to provide better management capabilities at a subwatershed level. During 1990, this effort will result in a set of state subwatershed maps that are compatible with the USGS watershed system, as well as, a data base system capable of organizing information for management decisions in a timely and workable manner.

In addition to the broader efforts the DSWC has been working since 1985 to build a NPS control and natural resource geographic information system called VirGIS under contract to the Information Support Systems Lab (ISSL), Department of Agricultural Engineering, Virginia Tech. This system currently contains resource information for soils, land use, streams, elevation and many more layers for more than 10 million acres of Virginia's Chesapeake Bay-drainage. This information is at 1:24000 scale and represents units of .27 acres for most of the data layers. The VirGIS effort has also resulted in improved detailed modeling algorithms and model interfaces for water quality models such as AGNPS, FESHM, USLE, and other in house procedures. The VirGIS data base is very significant because it supplies much of the basic resource information such as soils, topography, land use, etc. at a detailed level, with spatial reference and in an automated computerized framework. This is significant because all of the present NPS water quality models rely heavily on this data as input. This type of data is usually the most laborious and expensive to collect and process for model runs. The VirGIS data base provides considerable coordination of information and greatly enhances DCR-DSWC's ability to make more detailed and timely model runs for management decisions.

By building the interfaces between GIS technology, conservation tracking systems, monitored data, and mathematical models, the DCR-DSWC has and will continue to develop, with the assistance of many organizations and groups, the capability to manage many significant sources of NPS pollution. New efforts are underway to broaden the scope of present capabilities and include more NPS categories of pollution in the data bases as well as establish workable evaluation tools and models.

EMERGING ISSUES
(Concurrent Workshops)

WORKSHOP #1: WETLANDS AS MANGEMENT TOOLS

Louise Lawrence, Moderator, MD Department of Agriculture

Speaker #1:

THE DRAGON RUN STORY

Blaine K. Delaney
District Conservationist
Soil Conservation Service

My presentation will focus on a very unique wetlands found in Tidewater, Virginia and the effort by a diverse group of citizens, county governments, private organizations and state and federal agencies to put together a comprehensive management plan to protect it. During the second half of this presentation I will explain my involvement and how I was able to utilize existing federal conservation programs to add an additional layer of resource protection beyond their initial work.

Dragon Run is a beautiful stream that splits Virginia's Middle Peninsula as it flows to the Piankatank River on the Chesapeake Bay. The Dragon wilderness is a unique ecosystem which has been ranked second in ecological significance among 232 areas investigated in a

Smithsonian Institution study which covered the entire Chesapeake Bay watershed. Along its 35 mile length it is flanked by the counties of Essex, King & Queen, Middlesex and Gloucester which lie in the Coastal Plain.

A group of local landowners, farmers and public officials formed the Dragon Run Steering Committee during the early 1980s and were reactivated in 1987 when a proposed subdivision threatened the tranquility of this pristine waterway. The Chesapeake Bay Foundation provided technical support by assigning Jerry Stokes to help guide this committee to develop some form of management plan to provide a first layer of resource protection for Dragon Run.

Their collective effort was successful and the Dragon Run Conservation District (DRCD) was created. Three of the four counties which control 90% of its watershed adopted it into their county ordinances.

Agricultural Best Management Practices (BMPs) were to be employed on all cropland that fell within the DRCD which created a 100 to 150 foot buffer inland of the outer edge of the hydric soils.

I decided to utilize existing federal conservation programs and to add a second layer of protection to the upper part of the Dragon's watershed that comes under the jurisdiction of the Three Rivers Soil and Water Conservation District (Essex and King & Queen counties). Through this approach we could deal with all of the cropland in this portion of the Dragon's watershed not just those acres that fell in the narrow corridor of the DRCD.

Two key conservation provisions of the Food Security Act of 1985 were invaluable for our work--Conservation Reserve Program (CRP) and Conservation Compliance.

RESULTS:

--over 500 acres of highly erodible land were enrolled in CRP
--about 30% of this acreage was planted to trees
--most of the remaining highly erodible acreage was adequately addressed by the conservation compliance plans

SUMMARY:

(1) A first layer of resource protection was provided to the Dragon Run through the adoption of the DRCD by three of the four counties.

(2) This unique coalition of individuals who represented a broad spectrum of interests was masterfully led by Jerry Stokes of the Chesapeake Bay Foundation (CBF). This is a role that I hope CBF continues to use into the future by providing the glue to bring various groups and agencies together for one common purpose.

(3) Once a coalition sets their sights on some goal such as protecting Dragon Run it is easy for others like myself with the Soil Conservation Service to target staff resources to help address NPS pollution through existing federal and state programs.

Speaker #2:

THE REGULATORY APPROACH

JoAnn Watson
MD Department of the Environment

I. Applicable laws and regulations

A. Clean Water Act, Section 401: Requires States to certify that no violation of State water quality standards will occur as a result of federally permitted activities which might result in discharges to State waters (usually section 404 activities).

B. Environment Article of Maryland: Basis for water quality protection goals and standards.

C. Federal regulations

1. 33 CFR 320 through 330, U. S. Army Corps of Engineers: Give States' requirements for denial and conditioning of water quality certifications.
2. 40 CFR 230, U. S. Environmental Protection Agency (404 B 1 guidelines): Gives states guidelines on the appropriateness of water quality certification issuance.

D. State regulations: COMAR 26.08.01 and .02, Water Quality Standards: Presents the "yardsticks" against which all projects requiring water quality must be measured.

1. Numerical criteria
2. Narrative criteria
3. Anti-degradation policy

II. Applied Science

A. Functions and values of wetlands

B. Environmental assessment: Systematic approach

III. Know your limitations

A. Legal, regulatory

B. Political, economic

C. Science

WORKSHOP #2: PESTICIDE MANAGEMENT IN THE NINETIES

Walt Peechatka, Moderator, PA Department of Agriculture

Speaker #1:

BEST MANAGEMENT PRACTICES FOR ENVIRONMENTAL PROTECTION

Orlo Ehart
CIBA-GEIGY Corporation
Greensboro, NC

There are many emerging issues that will affect pesticide uses and policies in the nineties. Some of them are existing issues where there are honest differences of opinion on the best course of action; some are issues as a result of new research which may have identified previously unknown results; and some are policy questions which are as equally affected by public opinions as they are by facts and science. The major areas of debate currently appear to fit within the areas of pesticide regulation and enforcement, water resources protection, sustainable agriculture, food safety, integrated pest and farm management, and the state's role in pesticide policy setting. All of those areas, and some others which I may not have mentioned, are important issues of concern that will be debated and remain important issues in the nineties.

Since this is a nonpoint source pollution conference, I will focus my attention on water resources management concerns and leave other areas to the question and answer period. I will discuss several best management practices that the industry supports. Most of the examples come from experiences that CIBA-GEIGY Corp., my employer, has been involved in. They all fit with in the concept of integrated farm management, and, I believe, are consistent with the broad view of sustainable agricultural practices.

One thing that we may need to be reminded of is that what is done on land can and does affect water quality. Since it is not possible to see what is happening below the surface of the soil, the significance of some activities and the effects they can have on groundwater quality are not always obvious. The application of agricultural chemicals generally can be done safely with the right soil and ground or surface water conditions. However, since these activities can directly affect water quality, land use practices must be carefully managed and water resources protected. Since clean-up can be costly in groundwater circumstances, and land lost forever as well as water potentially contaminated when erosion control is not practiced in surface water situations, prevention of problems is an important part of good pesticide management and environmental protection.

Best management practices and principles can help to assure water resource protection. When growers follow these recommendations, environmental risks are minimized, and ground and surface waters should be protected. The future of modern agriculture and a safe, healthy environment depend on cooperation between product manufacturers, researchers, dealers, users and policy makers. Water contamination problems can occur through improper application, handling, and disposal practices of agrichemicals. Problems have also been identified from proper applications of some chemicals.

Best management practices might include:

Cultural controls of pests
Comply with state and federal pesticide laws
Read and follow label directions
Become a certified applicator
Determine the susceptibility of groundwater
Minimize pesticide runoff

Match application rates to field characteristics
Select proper pesticides
Assess timing of planting and applying
Store pesticides in a safe place
Do not mix and load near water sources
Avoid backsiphoning
Properly calibrate application equipment
Follow proper and timely irrigation techniques
Do not apply pesticides near wells or sinkholes
Avoid overspray and drift
Properly dispose of pesticide containers
Keep accurate records
Develop plans

The management of each parcel of land where pesticides are used and each site where pesticides are stored or mixed will become more complicated in the future. The responsibility for proper and sophisticated management will rest with the pesticide user. The manufacturers and researchers will help to identify the best management practices in the form of changes in label directions and future recommended practices, including alternate methods of control. However, those landowners who recognize that the future use of their land will be regulated because of the potential for water contamination caused by current use practices, will benefit by using their creativity to develop practical solutions to reducing and hopefully eliminating the potential of water contamination by their agricultural operations. It is in everyone's best interest to do that. The willingness to modify current actions will impact future water quality and determine the extent of governmental regulations necessary to balance the right to do as one wishes on his/her land versus the need to assure a clean water supply for all Americans. The industry will continue to take an active role in assuring product stewardship and developing more environmentally compatible products and packaging to help reach the goal of a clean environment free from unreasonable risks.

WORKSHOP #3: PROTECTING GROUNDWATER

Bill Woodfin, Moderator, VA State Water Control Board

Speaker #1:

BAY LESSONS FROM DC GROUNDWATER REGIME

James V. O'Connor
Department of Environmental Science
University oF D.C.

Recommendation 4 from the Chesapeake Bay Nonpoint Source Programs Implementation Committee (Jan, 1988) is too limited in scope for urban groundwater contributions to the quality and health of the surface water system of the bay. The major urban settings (Baltimore, Richmond, and Washington) for the Bay system are Fall Zone cities. There is the drastic difference in the general geology and hydrology on either side of the Fall Zone. The variation in rock history and paleo-environmental settings yields unique quality and quantity stories. The urbiscape covering the natural setting is another component impacting on the groundwater behavior.

Gemeral Geological Factors:

The natural terrain carries its own groundwater characteristics and behavior. Piedmont bedrock itself has low groundwater yields but is highly fractured. Fractured zones will yield much higher values but at shallow to medium depths (300' or less). Groundwater decays this bedrock along the fracture zones creating saprolite deposits which are good water bearers. Numerous springs occur on hillsides at the boundary between the saprolite and its bedrock. In DC these springs are the headwaters for many tributaries to Rock Creek. While all three cities have Piedmont bedrock, it is not the same rock type. Baltimore marble and Richmond granite equivalents do not occur in DC. Coastal Plain sedimentary geology controls groundwater flow regimes. The ancient sedimentary environments left us perched water tables, old channel seeps and springs, and one true confined aquifer (Potomac Group). The old deltaic sediments of the Potomac Group control interstate transfer of groundwater, plus landslide and swelling hazards. This parent material yields a highly erodible soil in all three cities. The geology has a high iron content with high sulfur in the paleoswamp deposits noted for their coal and petrified logs. These naturally acidic waters react adversely with many underground structures today but were a positive economic source for the health spa industries in the last century.

Urban Groundwater--Special Research Needs:

1. Large city cemeteries are located on well drained local topographic highs. They serve both as recharge areas and as spring sources for city streams.

2. In select city neighborhoods, domestic roof drains provide about 20% of the overland recharge on permeable ground or are directly injected into the soil. This injection process is a bad idea in the landslide prone areas.

3. Construction dewatering generally lowers the water table below the foundation bed. Pumps are utilized until the work is complete. Deeper roots for high rise development, partly generated by offstreet parking regulations, create larger drawdowns. This highrise evolution means a larger stress to the urban groundwater system. Dewatering is an urban inverse analog to the rural/suburban perc tests.

4. Extracted groundwater in DC is pumped directly to the Potomac through the city storm sewers. Sediment laden construction water is filtered through tandem 55 gallon drums or baffled dumpsters. Barrels and dumpsters are our temporary sediment control ponds where there is no downtown projects per year during the 80's; conservative calculations indicate that approximately 1/2 million gallons were dewatered downtown daily. There is another 1/2 million gallons sump pumped from the federal enclave into the same sewers on a daily basis. Recent field checks indicate that some city blocks are not recovering from dewatering while the law says it must.

5. The laws and regulations concerning groundwater use and abuse have changed at all political levels. Underground storage tanks will have monitoring systems. Historic springs and recharge areas are now being protected. EPA laws govern monitoring and remediation of past spills. Groundwater basin maps and quality classification systems are coming online. The role of the interstate and intercounty groundwater migration has altered individual rights to states rights for the common good. In DC our one true federal endangered species is an isopod related to the quality of groundwater and springs. FIFRA laws and groundwater in the city involves rat poison

in subway waters, spraying street trees, plus chemical care of golf course and garden pests and weeds. Much of the recreational land for golf and gardens in DC is under the NPS which does not allow use of these substances. Lawn fertilization and spraying by companies is currently under scrutiny for controls by the city.

6. Buried landscapes in a 200 year evolution of the urban environment also haunt us through the groundwater regime. Buried stream valleys, sewered or not, become slow conduit of migration especially for contamination. The chemistry of estuarine dredge spoil and sludge create a new infiltration medium for groundwater interaction. The history of each neighborhoods land use changes may leave problems behind especially where heavy industry was replaced by other uses. Filled-in and built on tidal marshes and bogs still contribute to the deterioration of groundwater because these sites were not labeled or recognized as point sources or point repositories. The history of the development of the urban environment is an important link in the study of groundwater geomorphology.

7. Urbiscape development in our modern city has recreated a whole new host of scientific processes for groundwater management. Among the most interesting in DC are: underground ponding from tunnels and highrise basements; bathtub effect in tree planting; controlled freezing with liquid nitrogen; city water irrigation or sprinkling systems;redirected flow from construction site pumping or from trenching utility lines; overpumping; addwatering; inter aquifer leakage from drilling; broken water and sewer pipes; dewatering subsidence; quicksand or quickclay conditions: flow rate chemical changes; underground piping (erosion); water table rise and fall chemical changes; the porosity/permeability of back fill material related to the site material; and change of contaminent chemistry with the time of travel and reactions to underground conditions.

Summary

The subsurface environment is a dynamic local system. Each groundwater basin associated with a local stream should be a protected resource. The unsaturated zone must be investigated equally with each groundwater study. The recharge area, drilling punctures and overpumping of confined aquifers must be carefully monitored and managed especially as a water supply for an unknown emergency. The public, the legislators and the science educators must join forces to understand and properly utilize urban groundwater systems for a healthier bay region. The economies of all three cities were once based on the groundwater resource, but now urban groundwater is perceived as non-potable and a nuisance by many in DC. While the quality of our groundwater reflects the our stewardship, it also reminds us to appreciate and monitor the natural resources in the "land of pleasant living". The status of our urban groundwater ecology is a signal. Our commitment to life in the 21st Century revolves around the Bay's stressed hidden resource: its groundwater.

Speaker #2:

GROUND WATER IN PENNSYLVANIA

Mary Jo Brown
Pennsylvania Department of Environmental Resources

Even though ground water provides over 90 percent of the fresh water in Pennsylvania, groundwater protection and management has not been emphasized as much as surface water. On a

state-wide basis, ground water contributes approximately 70 percent of all stream flow under average conditions. Approximately one third of the state's population relies on ground water for domestic use. Almost all private supplies and two thirds of the public water systems depend on ground water as their water source.

Documented groundwater problems in the state include elevated levels of iron, sulfate, dissolved solids, hardness, and acidity in the coal mining regions of western and eastern Pennsylvania. Elevated nitrate-nitrogen problems have been found in the southcentral and southeastern sections of the state while leaking underground storage tanks have been responsible for local groundwater problems statewide.

Since the 1960's the commonwealth has been becoming more aggressively involved in groundwater protection. Some of this involvement has been the result of federal expansion into areas such as solid waste, hazardous waste, leaking underground storage tanks and mining regulation and some has been the result of state program initiatives.

Monitoring is an essential part of Pennsylvania's ground water strategy. Monitoring generally consists of two types; ambient monitoring and source monitoring. Ambient monitoring involves the collection of data from an area for the purpose of characterizing the water quality in that area. In contrast, source monitoring involves gathering data from an area to determine the impacts of specific activities on water quality.

In the early 1980's Pennsylvania started work on developing a systematic statewide ground water ambient monitoring program. The first phase of this program involved delineating and prioritizing the ground water basins. Fixed station sampling networks were established in higher priority basins with actual data collection beginning in 1985. It is anticipated that this program will provide information on the overall groundwater quality in Pennsylvania and will indicate areas in the state that have or may develop water quality problems.

Source monitoring has been the traditional type of groundwater monitoring conducted in Pennsylvania. In this type of monitoring a problem is identified and monitoring is conducted to determine the extent and severity of the problem.

One groundwater source monitoring program in Pennsylvania is part of the Conestoga Headwater Rural Clean Water Program (RCWP) project. This federal program provided money to farmers for the installation of Best Management Practices (BMPs) in the upper Conestoga River basin. Additional funding was provided to evaluate the effects of the BMPs on water quality. Ground water was monitored in the entire 188 square-mile area and on two farm field sites. The monitoring conducted in the entire project area showed that high nitrate-nitrogen and detectable pesticide concentrations were associated with agricultural land use and carbonate geology. The field site monitoring has shown that there can be wide variations in nitrate concentrations in the ground water within a very small area. For example, from 1984 through 1989 at a 48-acre site, nitrate concentrations ranged from 130 to 7 mg/l at the 8 groundwater sampling locations.

WORKSHOP #4: ERODING SHORELINES

Jack Frye, Moderator, VA Division of Soil and Water Conservation

Speaker #1:

VIRGINIA'S SHORELINE PROGRAMS: MISSION AND NONPOINT SOURCE POLLUTION RESEARCH

Carlton Lee Hill
Virginia Department of Conservation and Recreation
Division of Soil and Water Conservation
Shoreline Programs Bureau

The Commonwealth of Virginia is blessed with over 5,000 miles of tidal shoreline. Programs provided through the Department of Conservation and Recreation, Division of Soil and Water Conservation's Shoreline Programs Bureau enable local governments and private property owners on tidal waters to receive technical assistance and advice concerning Coastal Zone Management, as it relates to shoreline erosion and public beaches. Additionally, shoreline resource information archived at the Virginia Institute of Marine Science (VIMS) is provided to targeted user groups and the general public.

All property owners along tidal shoreline can request and receive assistance from the Shoreline Erosion Advisory Service, better known as SEAS. SEAS's engineers provide on-site inspection and technical analysis of shoreline erosion followed by written recommendations covering environmentally acceptable erosion control measures. Other services include contract review and construction inspection for properties previously assessed. Technical information is also provided to localities developing and administering coastal zone management programs. SEAS can provide guidance in establishing setbacks, minimum construction standards for erosion control structures and determining shorelines where non-structural measures are adequate for protection of private property.

To maintain and improve recreational beach access on tidal waters, a 50/50 matching grant fund for localities is administered by the Board on Conservation and Development of Public Beaches. Approximately 24 miles of public beach, as defined by the Board, exists within the Commonwealth. The Shoreline Programs Bureau provides administrative services and technical assistance to the Board. Localities are provided technical and financial assistance in planning and implementing beach projects.

A final aspect of the Bureau's activities provides direction and coordination of generic and applied shoreline erosion control research among other state agencies, universities and the federal government. Efforts include development and evaluation of innovative erosion control structures and marsh grass plantings for erosion control. Through annual contracts with VIMS, information is collected and databased on beach quality sand resources, public beach monitoring, wave data collection and native sand inventories. A hydrodynamic computer model has been developed to predict shoreline change as a result of wave and current interaction. Information from these databases are disseminated by the Bureau to local governments, engineering/design consultants, environmental interest groups and the general public.

Sediment and Nutrient Contributions of Eroding Banks

In the 1987 Chesapeake Bay Agreement, the participants targeted nitrogen and phosphorus contributions to the mainstem of the Chesapeake Bay for a 40% reduction by the year 2000. To meet this goal, all possible sources of point and nonpoint source nutrient

inputs need to be examined. Although research has been or is being conducted on agricultural, atmospheric and groundwater contributions of nonpoint source pollution, the role of sediment and nutrients from tidal shoreline erosion has not been addressed.

To examine the role of sediment and nutrients from tidal shoreline erosion, 14 eroding banks were selected on the Chesapeake Bay, Potomac, Rappahannock, York and James Rivers. Site selection was based on historical erosion rates of greater than 2.0 feet per year and erosion volumes of greater than 1.0 cubic yard per foot per year. Most sites were also located within 1400 feet of living marine resources. Soil samples were collected and analyzed for grain size, total nitrogen, total phosphorus and inorganic phosphorus.

Results of grain size analysis indicated a large difference between shore sediments and fastland sediments which can be attributed to the transport of fine grained fractions away from the foreshore. Fastland nitrogen and phosphorus concentrations were not found to differ significantly among the sites. Nitrogen concentrations at the sites showed a more consistent relationship with grain size and bank height than phosphorus concentrations. Nutrient loading rates differed among the sites due to the influence of bank height and erosion rate on the calculated volume rates.

A quantitative comparison of upland erosion with shoreline erosion indicates that the large volumes of material lost by shoreline erosion processes result in large nutrient inputs directly into receiving waters. An estimated 1.37 million pounds per year of nitrogen is entering the Bay ecosystem through shoreline erosion. This quantity of nitrogen is equivalent to 5.2% of the controllable nonpoint source nitrogen load. Additionally, an estimated 0.94 million pounds per year of phosphorus, equivalent to 23.6% of the controllable nonpoint source phosphorus load, is entering the Bay ecosystem. Further research is needed to better determine the total magnitude of nutrient inputs from shoreline erosion and to determine the influence of the shoreline erosion contribution on the 40% nutrient reduction goal.

Speaker #2:

MARYLAND'S SHORE EROSION PROGRAM

Chris Zabawa
MD Department of Natural Resources
Capital Programs Administration
Shore Erosion Control Program

Introduction

In the overall context of any Chesapeake Bay pollution control strategy, an important contribution towards reducing sediment and nutrients comes from the stabilization of eroding shorelines in the State of Maryland. This section of the conference proceedings presents a short overview of the problem of shore erosion in the State of Maryland, and a brief description of the State of Maryland's shore erosion control policy and programs.

Overview of the Problem

The shores of the Chesapeake Bay, tributary rivers, and streams in Maryland have a total length of more than 4,360 miles. Comparison of US Coast and Geodetic Survey charts dating back as far as 1841 with the latest available charts shows 1,221 miles (or 28%) of shoreline on the Bay in Maryland is eroding at rates which can be measured over the last few decades. The breakdown is as follows:

885 miles (20%) - eroding at 1-2 feet per year
206 miles (5%) - eroding at 2-4 feet per year
72 miles (2%) - eroding at 4-8 feet per year
57 miles (1%) - eroding at greater than 8 feet per year.

Impacts

Nearly 25,000 acres of shorefront land in Maryland were eroded away between the mid-1800s and 1947, and the continuing loss of land due to shore erosion is estimated at 325 acres per year. Other impacts include the loss of natural resources (beaches, timberlands, and agricultural lands); the loss of standing structures (houses, and other structures of historical significance); and the release of sediments, with resulting degradation of water quality and aquatic habitat.

Maryland's Shore Erosion Control Program

The Maryland Shore Erosion Control (SEC) Law legislates a program of financial assistance which includes interest-free loans for the design and construction of engineering structures, including groins, bulkheads, and revetments. The loans are repaid over 25 years. As part of the Chesapeake Bay Initiatives Legislation, the SEC Law was expanded to provide for a program of matching grants for vegetative erosion control projects. The law also provides for free technical services to be provided to shorefront property owners who request assistance in identifying erosion problems and seeking solutions for erosion control.

Annual funding for the design and construction of projects for which loans are issued generally consists of $2 million in general revenue funds and $800,000 in loan repayments. (The SEC Law provides for a "revolving loan fund" where loan repayments from property owners are reused to issue additional loans to qualified persons on the waiting list.) For work on State lands, the Capital Budget also provides an average of $1.5 million per year. A separate appropriation provides the funds for the Ocean City Beach Replenishment and Hurricane Protection Project.

During the past-20 years, the Maryland SEC Program has received appropriations in the amount of $22 million for loan projects. In addition, $6.5 million in loan repayments has been "recirculated" through the Revolving Loan Fund to provide for additional financial assistance. Another $8 million in Capital Funds has been expended for work on State lands. The projects for which loans have been issued have protected better than 35 miles of shoreline on the Chesapeake Bay and its tributary rivers in Maryland.

Since 1985, funds have also been appropriated by the Maryland General Assembly for the program of matching grants for vegetative projects. A total of $1.5 million in State General Funds have been made available, and have been supplemented by grants from the EPA Chesapeake Bay Program totalling $1.9 million. These funds have been used to encourage the

revegetation of more than 10 miles of Maryland shoreline with wetlands species since 1985, either by providing grants to individual private property owners, or by undertaking "Demonstration Projects" in different geographic areas of Maryland.

The States of Maryland and Virginia also participate with the Norfolk and Baltimore Districts of the US Army Corps of Engineers in the Chesapeake Bay Shoreline Protection Study. The program has produced Reconnaissance Reports and detailed project reports which will be used to seek funds from the Federal Government for the design and construction of projects to protect critically eroding areas of the Bay. Demonstration Projects have also been undertaken to restore wetlands along the shoreline, in conjunction with offshore breakwaters, and sills.

Besides providing locations where the public can inspect wetlands restoration projects, the Demonstration Projects also provide valuable laboratories for monitoring the effectiveness of installations, and are yielding a wealth of valuable data which will improve the design of vegetative projects.

LUNCHEON
Tuesday, February 27

NUTRIENT MANAGEMENT SPEECH

Speaker:

Hon. Jeffrey Coy
PA General Assembly

On behalf of the Pennsylvania delegation to the Chesapeake Bay Commission, I have introduced legislation which would establish a "Nutrient Management Act" in Pennsylvania.

The legislation has triggered a significant amount of interest, to say the least. I'd be lying to you if I denied that its generated some controversy as well. But those of us that advance new policy initiatives are used to that.

The new policy in the legislation which has generated all the attention is one that makes nutrient management planning on the farm a mandatory obligation. We have a voluntary program in Pennsylvania that has worked quite well by all indications and has been well received by the agricultural community throughout our portion of the basin.

Given the success, some have legitimately raised the question of why we need to go to a mandatory approach. We think we have good reason for it.

As I am sure most of you are well aware, the Susquehanna not only provides 50% of the Bay's fresh water, it also brings along 3 million pounds of phosphorus and 121 million pounds of nitrogen each year to the Bay. Our best data reveals that 82% of the controllable nitrogen load and 63% of the controllable phosphorus load comes from agricultural nonpoint sources. It also reveals that more than half of that total load comes from animal manure.

We re knee deep in it, to say it mildly. As a comparison, you should know that Pennsylvanians generated 12 million tons of solid waste every year. But as significant as that number is, you should also know that for each ton of trash we humans wheel out to the

curb, the animals we raise generate two tons of manure, or 25 million metric tons per year. That's why Pennsylvania's program has focused so sharply on the manure issue thus far.

We have all made a commitment to reduce controllable nutrients by 40% by the year 2000. Pennsylvania's share translates to a 1.3 million pound reduction for phosphorus and a 24 million pound reduction for nitrogen. Furthermore, in addition to reducing our 1985 levels by these amounts, we must also limit by 100% all new sources; be they agricultural, suburban or whatever, so that there's no new growth in the total load.

This is a courageous goal, to say the least. We have tried to address the phosphorus portion with better soil management practices and the invitation of P-ban legislation (which I sponsored), but the greater problem of nitrogen still eludes us. In fact, under our voluntary program we have spent close to $9 million to date and we estimate a resulting annual nitrogen reduction of 761,000 pounds. That's less than a million in 5 years. We've got another 23 million to go and only 10 short years to get there if we want to hit our target. And as others have alluded to at this conference, we may also have to do more with phosphorus because some of our original assumptions are off.

That's why we want to go beyond the voluntary and institute a prudent mandatory approach. Voluntary is good, but it is not enough.

The legislation will require our state conservation commission to develop criteria for use in writing nutrient management plans. The framework for that criteria has actually been developed under our voluntary program, where nutrient management planning is required for participation in the cost-share-program.

Within two years thereafter, anyone conducting commercial livestock or poultry operations, or any person conducting agricultural operations on whose land manure is applied, will be required to develop a nutrient management plan and fully implement that plan with 5 years thereafter. This should give farmers sufficient time to implement new practices without unduly burdening them.

For high density livestock and poultry operations, those plans must be reviewed by local conservation districts for approval. And if these operations are located in high priority watersheds, they must implement their plans within three years rather than five.

Besides imposing planning requirements on agriculture, the legislation will also force the appropriate state agencies to assess the impact of other more insidious nonpoint sources of nutrient pollution and come forward to the general assembly with some concrete recommendations. This would include things like malfunctioning septic tanks, urban runoff, residential application of fertilizers, improper water well constructions, and the like.

We think its a bold initiative, but we by no means think its the answer to all our prayers. We think it's a prudent first step beyond a voluntary program. If nothing else, planning to keep our nutrients on the farm and out of the bay would be tremendous accomplishment.

When a farmer is forced to look at how much nutrient is in the soil, how much needs to be applied, as well as the best way to keep it there for crop use, then I submit we'll have the problem half licked. And we think the time has come when its appropriate to say to the farmer: "YOU MUST PLAN."

Thank You Very Much.

WORKSHOP #5: RIPARIAN BUFFERS: DO THEY WORK?

Bruce James, Ph.D., Moderator, University of Maryland

Speaker #1:

LITERATURE SUMMARY AND ANALYSIS OF THE ROLE OF FOREST BUFFER STRIPS IN REGULATING NONPOINT SOURCE NUTRIENT LOADS

Joseph F. Tassone
Natural Resources Planner
Maryland Department of the Environment

Introduction

Forest strips along stream channels affect nutrient and sediment loads, and therefore water quality, in two principal capacities. First, their presence adjacent to streams results in lower direct nutrient yields to streams than would occur if the land were in other uses, due to their inherently lower export rates. Second, when discharge waters from upslope land uses pass through a buffer area in groundwater, in streams with natural hydraulic regimes and channels, and as diffuse overland flow, nutrients and sediment from those upland sources are retained, often at very high rates, within the buffer area. Stated another way, less nutrients are contributed to the stream from the buffer strip acreage itself in all cases; and in many cases, the buffer strip actually reduces the load delivered to a stream from other land uses within the watershed upslope of the buffer strip.

The ability of forested buffer strips to reduce delivery of nutrient loads from more intense land uses may be roughly estimated from existing data. The term "roughly" is used because the effectiveness of buffer strips in this capacity will vary considerably with conditions in the landscape. However, the hydrogeologic and biological parameters which determine the capability of buffer areas to regulate nutrient export can be clearly inferred from existing work, and effectiveness can be predicted in association with these parameters. The following synopsis of buffer strip effectiveness was developed from work by Peterjohn and Correll, 1984 (Ecology 65:1466-1475); Lowrance et al., 1983 (Agriculture, Ecosystems and Environment 10:371-384); Cooper et al., 1986, Fail et al., 1986 and Schnabel, 1986 (all from Watershed Research Perspectives, Smithsonian Institution Press); and Patrick and Smith, 1975 (USDA For. Serv. Res. Paper NE-324).

In those studies which calculated watershed nutrient budget parameters (Cooper et al. 1986, Peterjohn and Correll 1984, and Lowrence et al. 1983), 86, 87, and 67% of the nitrogen loads and 50, 79, and 25 % of the phosphorus loads released from upland land uses were estimated to be retained within buffer strips on an annual or longer basis. Cooper et al. estimated that 88% of the sediments and over 50% of the phosphorus from upland sources were retained within riparian buffer areas over a 20 year period in one watershed studied. And Schnabel (1986) observed 50% reductions in nitrate concentrations in shallow subsurface flow through a riparian area between agricultural fields and a receiving stream. Other data reported for these studies identify the mechanisms involved in these reductions, and indicate the conditions under which similar results can be expected.

In summary, forested buffer strips can be expected to significantly reduce nutrient transport whenever there is extensive contact between upland discharge waters and forest soils and vegetation. Appreciable contact and nutrient reductions occur under several common hydrogeologic conditions, described below. These include shallow lateral groundwater flow, flow in natural stream channels, and overland flow.

Groundwater Flow

Buffer strips are very effective in retaining nutrients, particularly nitrogen, where shallow groundwater movement occurs near streams. This function may be appropriately considered one of filtering. In each of the studies cited which report appropriate data, it is, from a quantitative standpoint, the most important mechanism through which forest buffers act to prevent excessive enrichment of aquatic systems. It occurs on both small and large streams in the Coastal Plain, where permeable soils are underlain by shallow, unconfined aquifers; in areas where permeable surface soils are underlain by slowly or impermeable subsurface layers; in the Ridge and Valley Province, where slopes are steep and layered soils result in shallow groundwater flow (interflow); in many headwater areas and on low order streams throughout the Piedmont and Coastal Plain, where significant proportions of streamflow originate from shallow groundwater flows; and, in general, wherever enriched groundwater approaches the soil surface near stream channels such as at the heads of some ephemeral (spring-fed) streams, around the perimeter of non-tidal wetlands, and in some cases where groundwater flows emerge within stream channels.

All of these areas function to filter nutrients from upland discharges moving primarily in groundwater. In order to be most effective, the intensity of agricultural and development activity in the contributing land area must be limited so that the discharge pattern within the area is not dominated by channelized surface flow. This requires that a significant proportion of the infiltration capacity of the upland area remain intact; that subsurface flows will intersect forested soils in the course of moving down gradient from the source area; and that the degree to which runoff is concentrated in surface channels is limited. These complementary approaches must be used in conjunction with buffer strips in both agricultural and development applications for maximum effectiveness, because the ability of the forested strips to filter groundwater is essentially bypassed when upland discharge crosses the buffer as channelized flow.

For this reason, the establishment of buffers in headwater reaches is essential to their use as a means of reducing nutrient loads in watersheds with deforested streams. The objective in such areas should be to maximize the percentage of streamflow in a watershed which enters surface channels through forested soils. Deforested upstream channels represent essentially unfiltered inputs, so it is important to extend buffer establishment to headwaters. Priority locations should be those where the greatest volumes of groundwater discharge and shallow groundwater flow occur. In many watersheds, this will in fact be in headwater areas.

Flow in Surface Channels and Overland Flow

One study examining surface flow through a buffer strip in a natural Coastal Plain channel (Peterjohn and Correll, 1984) reported reductions of 15.7 kg-N/ha of buffer strip (an 87% reduction of channel inputs) and 2.97 kgP/ha (also an 87% reduction). Based on concentration data, the majority of nitrogen retained was in the forms of particulate organic-N and nitrate; phosphorus was retained primarily in particulate material, although some reduction in orthophosphate was observed.

Cooper et al. (1986) and Jacobs and Gilliam (1983, Nitrate Loss from Agricultural Drainage Waters, Water Res. Inst., U.N.C.) report on nutrient retention and removal of nitrogen, phosphorus and sediment in a group of watersheds in North Carolina's Lower and Middle Coastal Plain. Sediment and phosphorus movement was examined in a Middle Coastal Plain watershed with slopes 2 to 7% and slope lengths which result in some erosion potential. Here, the authors estimate that nearly 90% of the sediment and over 50% of the

phosphorus moving from the uplands over the past 20 years has been retained in riparian areas
(on headwaters and low order streams) and flood plains (on larger streams), with the former accounting for the majority of sediment deposition and phosphorus retention.

Area and Width Requirements for Effectiveness

The literature previously cited provides useful guidelines regarding the relative areas and widths of buffer strips required for sizable reductions in nutrient loads exported from upslope areas in hydraulically similar conditions. Two studies reporting relevant data showed retention of 11 kg of nitrogen and .54 kg of phosphorus for each hectare of contributing agricultural upland by a buffer area comprising 30% of the total watershed area (Lowrance et al. 1983); and 34 kg-N and 1.6 kg-P per hectare by a buffer area comprising 36% of the watershed (Peterjohn and Correll 1984). These per-unit-area retention rates represent from 67 to 87% of the total N loads and from 25 to 79%of the total phosphorus loads received by the buffer zones in both surface and subsurface discharge.

Based on these data, a reasonable initial expectation is that such removal rates are achievable, under appropriate conditions, with approximately 1/3 of a watershed in forest cover, distributed predominantly along stream channels. However, based on the three studies reporting concentration data as a function of distance through the buffer, much of the nutrient removal was accomplished within 19 m (Peterjohn and Correll, 1984), 16 m (Cooper et al., 1986), and 15 m (Schnabel, 1986) of buffer strip. Hence, buffer strips of 50 to 65 ft. or greater in width, on each side of surface channels, can be expected to effectively reduce loads from contributing areas under appropriate hydrogeologic conditions. Where soils are less permeable and/or less subsurface water moves through short, shallow flowpaths than observed in these studies, wider buffer strips and a higher ratio of permeable to impermeable surface area in the contributing area would be needed to effect similar retention of nutrient export from uplands.

Mechanisms of Removal

A variety of mechanisms through which retention and removal of nutrients take place in buffer strips are reported in the literature cited. The following is a synthesis of these findings, integrated with some basic concepts on nutrient cycling and transport, which attempts to summarize the principal mechanisms at work.

Effectiveness on a given buffer strip site will be a function of rates of denitrification (for N), vegetative uptake (for both N and P), deposition, and adsorption (for P). These rates are in turn dependent upon both physical site characteristics (i.e. soils, topography, and site hydrology), and the attributes of the particular forest habitat. The physical site characteristics determine the relative proportions of discharge which traverse the buffer strip as deep groundwater, shallow groundwater, overland flow, and channelized flow. They will also influence the flow rates through each of these components, which in turn affects contact time between the nutrient load transported in the water and the soil, microorganisms, vegetation and bottom sediments which carry out the removal of nutrients. The specific forest attributes which appear critical include dense and diverse vegetation, (particularly decidous trees) which stabilizes soil, slows flow, and contributes organic material; high rates of both uptake and evapotranspiration of water; very rapid recycling of nutrients, which prevents mineralized forms from leaving the buffer; facultative increases in nutrient uptake in response to increased nutrient inputs; the presence of high organic content in the soil/litter, facilitating denitrification; and biological activity in the soil profile, which maintains permeability and texture, increases soil-water contact time, and probably maintains the availability of cation exchange sites within the soil.

Conclusion

Forest buffer strips will be extremely effective in controlling nutrient loads from upslope intensive land uses throughout much of Maryland when discharge patterns from these areas are properly managed. The extent and distribution of cover types, and the pathways through which rainfall leaves the site, are the major management elements of interest. The presence of forest buffers will reduce delivered loads under any circumstances by generating lower direct nutrient yields than alternative uses adjacent to a stream, and by minimizing lateral inputs to the stream. Ideal deployment of buffer strips would involve their use from headwaters to estuaries, but significant reductions in existing loads can be realized from judicious implementation in parts of a watershed. For the purpose of reducing existing loads, focus should be on headwaters, floodplains, and other areas where groundwater discharges and shallow subsurface flow occur. Protection of remaining buffer areas, on both perennial and ephemeral streams in Maryland's Bay watershed, appears to be essential if load increases from new development and other land use changes are to be adequately controlled for the purpose of achieving the State's nutrient reduction commitment.

Speaker #2:

EFFECTS OF VEGETATIVE FILTER STRIPS AND RIPARIAN BUFFERS ON SURFACE WATER QUALITY

Theo A. Dillaha, Associate Professor
Agricultural Engineering Department
Virginia Polytechnic Institute and State University

Riparian buffers and vegetative filter strips (VFSs) are bands of planted or indigenous vegetation that are situated between pollutant source areas and receiving waters to remove sediment and other pollutants from surface and subsurface flow. Riparian buffers are usually composed of indigenous vegetation while VFSs are usually composed of grasses and are specifically designed to remove pollutants from surface runoff. Both of these practices are being heavily promoted by state nonpoint source (NPS) pollution control programs in Virginia and Maryland, but little reliable data is available concerning their effectiveness. Currently, there are no standards or accepted methods for VFS design and many VFSs are installed in areas where they are ineffective for pollutant reduction or their effectiveness is grossly over-estimated (Dillaha et al., 1989a). This presentation deals primarily with the role of grass VFSs in removing pollutants from urban and agricultural runoff, but the same principles are also applicable to riparian buffers.

The major pollutant removal mechanisms associated with VFSs involve changes in flow hydraulics which enhance infiltration, deposition, filtration, adsorption, and absorption of pollutants. Essentially this means that if the VFS vegetation can slow surface runoff down, then there will be more opportunity for sediment and sediment-bound pollutants to settle out and more opportunity for surface runoff and soluble pollutants to infiltrate into the soil. Numerous researchers have found that under experimental conditions, grass VFSs are effective for sediment removal as long as flow is shallow and the VFS are not inundated with sediment. However, sediment trapping efficiency decreases dramatically at higher runoff rates which inundate the media (Dillaha et al., 1989b; Hayes et al., 1979). Flow conditions of this type would be expected under field conditions where runoff concentrates in internal field drainageways before reaching field boundaries. Several other short-term

experimental studies reported on the effectiveness of VFS in reducing nutrient, bacteria, and organics concentrations in agricultural runoff (Dillaha et al., 1989; Doyle et al., 1977; Magette et al., 1989; Norman et al., 1978; Young et al., 1980). These studies reported that with shallow flow in-experimental plots, VFSs had sediment and sediment-bound pollutant trapping efficiencies exceeding 50%. Dissolved pollutants such as nitrate and orthophosphorus, however, were not removed as effectively and several studies reported that runoff from VFS often had higher concentrations of dissolved nutrients than the runoff entering the VFSs (Dillaha et al., 1989b; Magette et al., 1989). This was attributed to the conversion of previously trapped sediment-bound nutrients to soluble forms that were subsequently released to surface runoff. VFS plots with concentrated flow, similar to that expected under Geld conditions, were reported to be 20 to 50% less effective than shallow flow plots for pollutant removal (Dillaha et al., 1989b).

VFS performance in the field was evaluated by observing VFS on 18 farms in Virginia (Dillaha et al., 1989a). Filter strip performance was reported to fall into two categories depending upon site topography. In hilly regions, VFSs were judged to be ineffective for pollutant removal because most surface runoff concentrated in natural drainageways within the fields before reaching the VFSs at the field boundaries. Flow across these VFSs during larger runoff producing storms, the most significant in terms of water quality, was primarily concentrated and the VFS were locally inundated and ineffective for pollutant removal. This assessment was confirmed by the fact that very little sediment accumulated in the majority or the VFSs observed in hilly regions.

In flatter regions, such as the Virginia Coastal Plain, VFS appeared to be more effective. Slopes were more uniform, and larger portions of stormwater runoff entered the VFSs as shallow flow. This observation was supported by significant sediment accumulations in many of the Coastal plain VFSs. Several one to three year old VFSs were observed that had trapped so much sediment that they were higher than the fields they were protecting. In these cases, runoff flowed parallel to the VFS until a low point was reached where it crossed the VFS as concentrated flow. These VFSs needed maintenance to regain their sediment trapping ability, but landowners had no economic incentive to perform the maintenance.

Recently, researchers have begun investigating the effectiveness of riparian buffers in removing pollutants from cropland runoff. Riparian buffers in North Carolina have been reported to trap 84 to 90% of the sediment (Cooper et al., 1987) and 50% of the phosphorus (Cooper and Gilliam, 1987) in surface runoff leaving cultivated fields. Riparian zone effectiveness for pollutant removal would be expected to be a function of the degree of concentrated flow entering the riparian zone. Like VFSs, riparian buffers will be most effective for pollutant removal when flow into the riparian zone is shallow and distributed throughout the riparian zone.

Several models have been developed or used for VFS design and evaluation, but these models simulate only single storms and cannot quantify the long-term effectiveness of VFSs. No riparian zone models currently exist. Consequently, most VFSs are installed based upon local customs or regulations which do not consider long-term effectiveness and site specific conditions such as the occurrence of internal field drainageways. Until reliable design methods and models are developed, the effectiveness of riparian buffers and VFS for pollutant removal will continue to be over-estimated and water quality goals will not be achieved. Sites in which most of the runoff crosses the VFS as concentrated flow are probably not suitable for VFS.

Lastly, it should be remembered that riparian buffers and VFSs are a last defense against pollution. They are much less desirable and effective than in-field best management practices (BMPs) such as conservation tillage, contouring, terracing, strip cropping, and nutrient and pest management which reduce pollutant generation and keep sediment and chemicals in the field where they are beneficial. VFSs cannot replace these practices, but they can "polish-up" surface runoff when used in conjunction with BMPs. It should also be remembered, that even though VFSs and riparian buffers may be ineffective for pollutant removal in many areas, they are still beneficial because they provide valuable wildlife habitat, localized erosion protection along streambanks where erosion is often most critical, and prohibit land disturbing activities immediately adjacent to water bodies.

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SPEAKER #3:

"RIPARIAN BUFFERS - MARYLAND'S APPROACH"

Jeffrey L. Horan
Associate Director, Chesapeake Bay Program
MD Department of Natural Resources
Forest Park and Wildlife Service

Forests are known to be the most protective land use surrounding the Chesapeake Bay. Because of this, many of Maryland's programs target the retention or restoration of forested buffers, also known as riparian buffers, adjacent to streams and waterways throughout the State.

It is important to understand why forests and, therefore, forested buffers are so effective at protecting water quality.

Rain has a very destructive nature with regard to unprotected soil. As rain falls from the clouds, it is constantly accelerating at a rate of 32 feet/second. This is easily enough energy to dislodge soil particles when there is no vegetation protecting the soil. As the water begins to move on the ground from a sheet flow condition to concentrated run-off, it is able to carry more soil with it, creating rills and gullies as it goes. This runoff often carries nitrogen in its nitrate form, and phosphorus bond to the dislodged soil particles.

In a forested situation, you have an upper canopy that can intercept the rainfall and reduce the destructive energy of the raindrop. In many forests a multi-teared structure exists where there are numerous canopy levels that will further defuse the rains energy. These many layers of canopy also provide habitat for a plethora of forest dwelling creatures. Different varieties of these creatures may live at different levels of this vertical habitat.

Finally the raindrops energy is completely dissipated when it reaches the herbaceous cover and the forest floor itself.

The forest floor is the key to the tremendous infiltration capacity of the temperate forest. The forest floor blankets the soil with three fairly distinct protective layers or horizons. The first or Oi horizon is made up of undecomposed organic matter such as leaves, twigs, bark and wood. The Oe is made up of partially decomposed organic matter. Very fine tree roots as thin as fishing line are also part of the structure of the Oe horizon. The Oa is the guey, very well decomposed organic matter that is now completely unrecognizable. In Maryland, it is not unusual for these three layers combined to be 6 inches or more in depth. Because of its incredible infiltration capacity the forest floor is often called "nature's sponge".

This infiltration process in which water passes through the surface layer of the forest soil has been carefully studied: using ring infiltrometers and percolation measurements, infiltration rates over 50-inches per hour have been measured in deciduous forest stands (Horbeck and Reinhart, 1964). Rain greater than 6 inches, over a 24-hour period, is 1/4 inch per hour and would not begin to approach the infiltration capacity of most forest soils. Infiltration capacities of forest not only exceed rainfall, they can absorb overland flow from adjacent agricultural land (Curtis, 1966).

Studies by Gillian, Lawrence and Correll have shown that wooded riparian areas as narrow as 50 feet in width, can completely remove excess nitrogen as it moves from the farm field through the riparian area to the adjacent stream (Meckley, Wrabel, et al). New research by James has also shown that the type of vegetation present on the site is a major factor in the ability of a riparian buffer to remove nitrogen from ground water. This same research shows nitrogen removal on red oak and black cherry dominated sites throughout the winter months. Results also indicate nitrogen removal by leguminous species like black locust has not been nearly as effective as the oak and cherry buffers (James). Nutrient retention by forests adjacent to agricultural land was estimated at 80% for phosphorus and 89% for nitrogen in the Rhode River watershed (Correll, 1983). Similar studies in North Carolina showed a reduction of 80% of the nitrogen leaving agricultural land as it passed through a forested buffer adjacent to a water course (Gillian, Skagg, 1983).

Retentior of forests became a major focus of Maryland's Chesapeake Bay Critical Area Protection Program because of the forests ahilitv to absorb water and filter out damaging nutrients and other pollutants from runoff and groundwater.

A "no net loss of forest land" approach was taken in the 1,000 foot strip of land adjacent to the Chesapeake Bay and its major tributaries called the Critical Area. The first 100 feet of vegetation next to the Bay and its tributaries became almost inviolate. Where development was allowed to occur in the Critical Area, only 20% of the forest vegetation could be removed, with replacement required on an acre for acre basis. Nonforested sites were required to be brought up to a minimum of 15% forest cover.

When development occurs in Maryland, the project plans are reviewed by foresters, wildlife biologists and natural heritage ecologists to assure that natural resources and sensitive areas are protected wherever possible.

In Maryland it is very clear that the days of engineering the site to meet our particular needs are over. We now are more likely to analyze the site for sensitive areas and species and then determine what development or use would be appropriate.

Some well known scientists, when discussing the needs of the Chesapeake Bay, have taken a slide of the Bay and turned it upside down. The result was an image that looked much like a tree, with the many tributaries feeding the main stem of the Bay being analagous to the tree roots. When the roots die, so follows the whole organism. Recognizing this, Maryland began developing programs aimed at the farthest reaches of the Bay's tributaries, hundreds of miles from the Bay's main stem.

Maryland's Green Shores forest buffer incentive program is an example of a program that applies techniques begun in Maryland's Critical Area to all the tributaries that feed the Bay. The Green Shores Program has two broad goals:

1. To plant forested buffers adjacent to streams to reduce nonpoint source pollution such as nitrogen, phosphorus and sediment, therefore, protecting the water quality of the Chesapeake Bay and its tributaries statewide. Maryland's Nutrient Reduction Strategy relies heavily on the planting of forested buffers to help us meet the goal of 40% reduction of non-point source nitrogen and phosphorus by the year 2000.

2. To educate the public about the value of trees and forests in watershed and overall environmental protection.

To accomplish these goals we have targeted 1,000 acres on public land and another 1,000 acres on private land directly adjacent to streams. State and local agencies as well as citizen groups such as Save-Our-Streams help locate sites in need of reforestation. If these sites are on public land Green Shores supplies the planting materials, usually seedlings, but occasionally larger balled and burlapped or containerized trees and shrubs. Technical assistance is also available to assure the proper species mixture for a particular site. In many cases, the actual planting is accomplished with the help of volunteers recruited through the Governor's Chesapeake Bay Clean-up Campaign. Last year, in the first year of the program, we involved 1,500 volunteers on nearly 70 sites, planting trees and learning the value of conservation first hand. This year, Maryland's DNR announced the Green Shores Private Land Buffer Incentive Program (B.I.P.). This new program pays eligible landowners (within 300 feet of a Bay tributary) $200 per acre to plant forested buffers, according to a planting plan written by a DNR forester. The program is designed to piggyback on top of existing programs such as the Federal Conservation Reserve Program to provide an attractive incentive to plant forest buffers next to streams.

To make sure programs like these are effective, it is important to educate the citizenry in general about conservation and management of our watersheds. Most people do not realize for

instance, that a stream covered by a tree canopy can be 15 degrees (fahrenheit) cooler than one that is not, making a non-buffered stream uninhabitable for fish like trout that require a cool water temperature. Working with the local school systems, we have helped develop curriculum and outreach projects to help students understand the environment around them. Arming our youngest generation with this information should pay large dividends for our future. Working together... we can continue to enjoy the many joys of the Chesapeake Bay region.

WORKSHOP #6: HOMEOWNERS AND LAWN CARE

Nancy Ragsdale, Moderator, MD Cooperative Extension Service

Speaker #1:

NUTRIENT LOSSES FROM TURFGRASS

J. Scott Angle
Associate Professor of Agronomy
University of Maryland

Turfgrass is currently the mid-Atlantic region's most valuable agricultural crop. In addition, it ranks second in acreage, behind only corn. Further, as the rate of urbanization increases, a concurrent increase in acreage planted to turfgrass will occur. It is predicted that within the next few years turfgrass will become the predominate cultivated crop throughout the region. The extensive acreage of turfgrass in the Chesapeake region, coupled with the intensive use of fertilizers and pesticides, makes these areas very important as related to quality of the Chesapeake Bay. Unfortunately, very little research has been conducted to investigate pesticide and nutrient losses from turfgrass and subsequent movement into the Chesapeake Bay.

The focus of the current paper will be to discuss the work we have conducted at the University of Maryland and to examine the limited data available elsewhere. Our investigations at the University of Maryland have examined nutrient losses from turfgrass both via leaching and runoff. Leaching of nitrates out of the root zone of turfgrass was found to be extremely low, with losses much less than that observed from properly fertilized corn or soybeans. The metered application of fertilizer to the turfgrass coupled with the rapid growth potential ensured that excessive pools of nitrates were never available for leaching. We also examined runoff losses of fertilizer nutrients (phosphorus and nitrogen) from turfgrass. Losses were initially estimated from natural rainfall events. We found however, that runoff losses from turfgrass were so small that they were often difficult to quantify. The dense, thatchy nature of turf prevents the generation of runoff from all but the heaviest of rainfall events. We subsequently examined runoff losses from turfgrass when the runoff was generated with the use of a rainfall simulator. It was observed that turfgrass dramatically reduced runoff losses when compared to barren soil. Even a poor quality stand of turfgrass significantly reduced runoff losses.

Several other studies have reported similar results. In all studies, runoff and leaching losses of nutrients from turfgrass have been found to be minimal. The lack of observed losses from turfgrass raises the question as to the fate of the applied nutrients. The most likely theory is that the thatch layer is immobilizing most of the nutrients which are

applied to the turfgrass. From the time of turf establishment to approximately 25 years after establishment, the thatch layer is increasing in thickness and density. Thus, it is possible that the nutrients are being incorporated into the thatch.

A question arises as to the fate of the immobilized or newly added fertilizer nutrients after the thatch layer reaches establishment equilibrium (ie. the thatch layer is decomposing as fast as it if forming). To date, no research has examined the fate of fertilizer nutrients on well-established turfgrass. It is postulated, however, that because established turfgrass does not have the capability to immobilize added fertilizer nutrients, fertilizer applications could potentially result in significant losses of nutrients to the environment.

Only a very limited number of studies have examined pesticide losses from turfgrass. The studies have tended to be somewhat incomplete and thus not fully representative of actual potential losses. With this in mind, it should be noted that losses of pesticides from turfgrass appear to follow a similar pattern as losses reported for nutrients. Extremely small quantities of pesticides are found in both runoff and leachate from turfgrass. It is generally believed that minimal pesticide losses are related again to binding within the thatch layer. Therefore, while losses from recently established turfgrass are generally low, we know nothing about potential losses from established turfgrass.

In conclusion, the preponderance of evidence suggests that nutrient losses from newly established turfgrass is minimal. Further, pesticide losses, while not as strongly supported, also appear to be very low from turfgrass. The problem of pesticide and nutrient losses from turfgrass remains unresolved due to the lack of information regarding losses from well-established turfgrass. Since more that one-half of all turfgrass is at least 25 years old, we are not currently in a position to determine whether turfgrass is a significant source of nutrients and pesticides entering the Chesapeake Bay. Additional research is required to answer this very important question.

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Speaker #2:

LAWN CARE AND THE CHESAPEAKE BAY

Marjorie J. Smigel
Springfield Garden Club of Montgomery County, MD

Urban/suburban contribution to deterioration of the Chesapeake Bay has been largely overlooked. Pesticides, developed from research on chemical warfare during World War II, spawned a new service -- the lawn-care industry. Advertising of lawn-care products by the chemical industry has also influenced the homeowner who cares for his own landscape. But most homeowners are unaware they are part of the Chesapeake Bay problem. The pesticide and fertilizer runoff from their properties carries toxic materials that feed into streams and ultimately to the Chesapeake Bay.

A 1980 report of the National Academy of Sciences, Urban Pest Management, raised serious questions concerning excessive use of toxic chemicals for nonagricultural or cosmetic purposes. Specific findings included the following: (1) Suburban lawns and gardens

receive heavier pesticide applications than most other land areas in the United States, yet there is no particular federal agency or specific policy to report on poisonings and illness that result, or to monitor problems, as is the case in agricultural application; (2) The public is at risk of exposure that can produce acute or chronic health effects (cancer, sterility, neurological and renal disease, teratogenic effects, behavioral disorders, etc.); (3) Damage to the environment includes toxicity to wildlife and domestic pets, deleterious effect on soil structure, decrease of bird populations, drift, runoff and damage to aquatic environment and fish; (4) Private market process creates incentives to overuse toxic chemicals and without external intervention, private pest control firms and individuals will not take into account impact of their actions on the welfare of others; (5) There is need for public education and for ordinances at state and local levels that emphasize Integrated Pest Management (IPM).

LACK OF REGULATIONS The state and federal laws governing landscape application are weak and poorly enforced. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) does not protect our health nor does it protect the environment. A report of the U. S. General Accounting Office, GAO/RCED-86-97, Nonagricultural Pesticides--Risks and Regulation, estimated that in 1984, 65 million pounds of pesticides were applied around homes and gardens. The findings were that (1) The public is poorly informed about pesticide risks and not aware that they are exposed involuntarily in numerous public places; (2) Professional applicators make deceptive claims that lawn products are safe, harmless or EPA-approved that may lead consumers to believe pesticides are safe although chronic health and environmental risks have not been assessed in accord with current standards; (3) The U. S. Environmental Protection Agency (EPA) has taken limited action against false and deceptive claims.

NEED FOR PUBLIC EDUCATION Homeowners use pesticides and fertilizers unnecessarily and with little understanding of the consequences. The EPA Consumer's Guide to Safer Pesticide Use finds that 9 out of 10 American households use pesticides; that less than 50% read pesticide labels for information; only 9% use pesticide products with caution. Customers may not even realize that "weed and insect controls" or "lawn-care products" are toxic pesticides, or that the EPA risk/ benefit registration formula weighs the benefit (increased crop yields) against the "societal costs" (human deaths, acute and chronic illness, environmental damage).

ENVIRONMENTAL DEGRADATION AND HUMAN HEALTH EFFECTS We are confronted daily with new evidence of the hazards of over-zealous pesticide and fertilizer application, groundwater contamination; diminished and diseased finfish or shellfish population; vanishing songbirds, butterflies and honeybee pollinators; toxic fog containing high concentrations of pesticides. Runoff from urban/suburban areas contribute to the pollution that kills vegetation and aquatic life in rivers. A fourth of our waterways are unsuitable for recreation, according to the EPA.

Human long-term or chronic health effects of pesticide exposure may include lower male fertility, miscarriage, birth defects, chemical sensitivity, liver and kidney dysfunction, heart disturbances, cancer, neurological and immune system disorders, etc. A study reported in the July 1987 Journal of the National Cancer Institute found a nearly seven-fold increase in leukemia for children from homes where pesticides were used indoors and in the garden at least once a month. Unfortunately, physicians may not associate an illness with pesticide exposure.

HOPEFUL SIGNS In response to concerned citizens, Maryland has enacted legislation that requires commercial landscape firms to post a standardized caution sign on property treated

with pesticides in order to prevent involuntary exposure of the public. The law requires that such companies give customers appropriate health, safety and environmental hazard information for the product applied. It also provides for prior notification to contiguous or adjacent property owners who are chemically sensitive or have a diagnosed condition or ailment that requires protection from pesticide exposure.

Reports in the media have helped to alert the public to the hazards of lawn-care products. The trend is away from high-maintenance manicured lawns. The new "wildlife" garden reduces grassy areas and features ground covers, native plants and shrubs, wildflowers, trees, rocks, foliage and water. This kind of landscape requires little fertilizer or pesticides and absorbs up to fourteen times more rainfall than mowed grass; thus it reduces runoff and helps prevent stream pollution. Homeowners are planting organic gardens because of their concerns over pesticides in market produce, and real estate agents report that many customers now want to know what pesticides have been applied to properties they are considering.

Lawn-care firms are beginning to respond to customer concerns, and some now offer IPM or non-toxic programs. Regulations need to be drafted to define IPM and ensure that such procedure is actually followed.

Churches are speaking out on the moral and ethical aspects of the ecological crisis. Rachel Carson Council held a symposium last November on "The Ethics of Pesticides." Schools are making environmental education part of the curriculum.

On January 30, 1990, the Montgomery County Executive and Council adopted a county government IPM policy through joint resolution. This was the result of a two-year review of pest management practices in county agencies. The county public school system has already adopted IPM.

The Alliance for the Chesapeake Bay Conference on Nonpoint Pollution is a landmark event and is evidence of the concern and serious commitment of those gathered here to meet the challenge of the nonpoint pollution problem.

WORKSHOP #7: IMPROVING SEDIMENT AND STORMWATER MANAGEMENT

Jessica Landman, Moderator, Natural Resources Defense Council

IMPROVING SEDIMENT AND STORMWATER MANAGEMENT

I. Introduction

A. In ASIWPCA's 1985 study, "America's Clean Water":

38 states reported urban runoff as a major cause of use impairment;

21 states reported construction site runoff as a major cause of use impairment.

B. NURP found that:

Suspended solids in separate storm sewers that drain residential/commercial/light

industry are at least an order of magnitude greater than secondarily-treated sewage effluent.

COD loadings from stormwater sewers are comparable to secondarily treated POTW effluent.

77 priority pollutants were detected in stormwater samples taken in NURP. Eleven metals were detected in more than 10% of samples.

C. Important sources of urban stormwater contamination:

1. Construction runoff, industrial site runoff and road runoff.

2. Illegal dumping and illicit connection.

II. Here in the Chesapeake Bay, both conventional and toxic pollutants in urban stormwater play an important role in causing pollution problems.

A. NRDC has made some effort to calculate the quantities of pollutants reaching our waters from urban stormwater runoff.

We used a method developed by the Council of Governments (Tom Schueler). To simplify: we multiplied the amount of runoff in a given time period (i.e., precipitation) by the concentration of a given pollutant in the runoff (based on NURP data) and the land area of the particular urban area. We utilized land use data to break the cities down into a number of land use categories, and made separate calculations for each category.

The results were predictable based on what we know, but they were still startling.

1. Some examples in Baltimore (we compared January October 1989 rainfall to 1988 Toxics Release inventory data):

a. Six times as much zinc was discharged to the Harbor by poison runoff as by industries.

b. Nearly as much copper came from urban runoff as came from industrial discharges.

c. Lead from runoff, 5800 pounds, was more than one-half the total factory discharges.

d. For BOD, the results are even more stark. From January-October 1989, in Baltimore City, we estimate that 3.25 million pounds of BOD were discharged in urban runoff. This dwarfs the estimated factory loadings of BOD to the Harbor, of about 730,000 pounds, about one fourth, in all of 1988.

e. Urban runoff contributed half again as much phosphorous, and one-fifth again as much nitrogen, to the city's waters, as the factories did.

2. Some examples in the D.C. metro area:

a. Three times as much zinc, and almost as much copper and lead, reached the Potomac from poison runoff as was discharged by all Virginia's and Maryland's factories in 1987;

b. Nine times as much phosphorous, eighteen times as much BOD and two-thirds as much nitrogen was contained in Washington area runoff in the first 10 months of 1989, as was discharged in all of 1987 by the Blue Plains sewage treatment plant.

Summary: there is a significant problem and the time is ripe for BOLD solutions.

III. Current State of Federal Stormwater Control Regulations

A. Current law and regulations-to-be are defined by 1987 Water Quality Act.

1. Stormwater has been the orphan stepchild of water quality protection, neither welcomed in point source nor fully admitted in nonpoint source control regime (or lack thereof).

2. EPA had postponed actual regulation of most stormwater sources for over a decade. Litigation by NRDC dates back as far as 1975, when NRDC challenged EPA's effort to exempt stormwater discharges from the NPDES program.

3. Several attempts at deciding on a regulatory approach were stalled and were very controversial.

4. When Congress reauthorized and revamped the Clean Water Act in 1987, with adoption of the Water Quality Act, it enacted a specific scheme for stormwater regulation through the NPDES program. New section 402(p) sets out which types of stormwater dischargers are required to have NPDES permits before October 1, 1992:

   a. a discharge that already was subject to a permit

   b. a discharge associated with industrial activity

   c. a discharge from a municipal separate storm sewer system serving 250,000 or more

   d. a discharge from a municipal separate sewer serving populations of 100,000 to 250,000; and

   e. a discharge that the Administrator or the State determines causes or contributes to a violation of water quality standards, or is a significant contributor of pollutants to waters of the U.S.

5. For discharges in municipalities of less than 100,000, the 1987 amendments provide that no permit can be required until October 1, 1992.

6. Federal rules requirements: the Water Quality Act mandated that EPA promulgate regulations for stormwater associated with industrial activities and for municipal systems of 250,000 or more by February 5, 1989, and for medium-sized cities by February 4, 1991.

7. Applications are required for:

   a. large systems and industrial stormwaters -- applications due by February 4, 1990;

b. medium municipal systems -- applications due no later than February 4, 1992.

8. Types of permits:

a. permits can be issued on a system-wide or jurisdiction-wide basis

b. permits must include a requirement to prohibit non-stormwater discharges into storm sewers; and

c. permits must require controls to reduce pollutants to the "maximum extent practicable."

9. Exemptions for:

a. stormwater runoff from mining operations or oil and gas exploration, production, processing or treatment operations if stormwater does not come into contact with or become contaminated with any overburden, raw material, intermediate product, finished product, waste product, etc.

b. agricultural stormwater also is excluded from definition of point source, and therefore is not covered by NPDES program.

10. Current status of rules:

a. EPA was required to promulgate first round of regulations by February 2, 1989. EPA has not yet done so. Proposed regulations were published on December 7, 1988. They have not yet been finalized. EPA has said that it anticipates publication of final rule in August of 1990.

b. The law's requirements call for large municipalities to submit permit applications by no later than February 4, 1990. Even in the absence of Federal permit application regulations that deadline still stands in the law.

IV. Summary of key provisions of the proposal: (NRDC thinks the proposed approach is inadequate in a number of key respects.)

A. The proposed rule consists of proposed permit application rules -- not specifics of actual pollution control. (NRDC's viewpoint: it is like a "write-your-own-permit" program; not what Congress envisioned. A few of the major deficiencies:

1. The proposed rule does not require industrial stormwater discharges into a municipal stormwater system to be permitted; instead it allows the permit of the municipality to be the only one issued. No requirements for flow rates, or stormwater treatment or resultant water quality, or programmatic requirements like financial resources, personnel, etc.

2. EPA's preferred option for defining the systems subject to the initial round of rules is as narrow as possible; EPA proposes to limit the more-than 250,000 population cutoff to incorporated cities or towns. In effect, if EPA adopted this approach, Washington, D.C. would be covered, but Montgomery and Prince George's Counties, Maryland would not be. (60 incorporated places in the U.S. with population of more than 250,000; 122 incorporated places with population of 100,000-250,000-)

3. Applications and requirements for municipal separate storm sewers:

   a. The proposal does require procedures for detecting and eliminating illicit discharges. Two permit application requirements:

      (i) a screening analysis to set priorities
      (ii) a management plan to detect and remove illicit discharges.

   b. Permit applications can be made on a systemwide or jurisdiction-wide basis. Ultimately, EPA may allow system-wide permits.

B. Two part permit applications, submitted in 2 phases:

   1. Part 1: (identify known sources and characterize pollutants)

      a. general information re applicant and legal authority in hand.

      b. information re source identification.

      c. information characterizing discharges, including any quantitative data and field screening data to detect illicit discharges.

      d. description of existing structural/nonstructural controls.

   2. Part 2:

      a. adequate legal authority demonstrated.

      b. supplemental source identifying information, focusing on "major outfalls".

      c. results of screening and establishment of pollutant loadings and concentration, via use of models rather than individual sampling at each outfall.

      d. proposed management program to provide maximum-extent-practicable controls.

      e. cost estimates.

      f. description of roles of co-applicants.

      g. its own proposed controls (no national requirements or minimum criteria)

3. Application requirements for construction activities: (permits for construction industry are important because localized impacts can be severe. Sediment runoff rates are typically 10-20 times that of agricultural lands (and as high as 100 times), and 1000-2000 times that of forest lands)

   a. Construction activity sites would have to provide descriptions of:
      (1) nature of construction activities;
      (2) total area of the site to be excavated;

(3) measures include BMP's to control stormwater discharges during construction, including erosion/sediment controls;
(4) measures to control pollutants in stormwater after construction is completed;
(5) increase in impervious area, and the runoff coefficient (fraction of rainfall that will appear as runoff);
(6) name of receiving water.

b. Exempt construction activities:

(1) less than one acre total land area and not part of larger common development site plan
(2) single family residential projects, less than five acres.

4. Deadlines for filing:

a. For discharges associated with industrial activities, EPA proposes to make application due one year after final rule (August 1991).

b. For large municipalities, EPA proposed that Part 1 be due within one year of final rule (August 1991). EPA would approve or disapprove within 90 days. Part 2 would be due two years after final rule (August 1992).

V. Summary: NRDC hopes final rules are significantly better and significantly simpler than proposed rule. EPA delay in and of itself is a problem, holding up state action.

Speaker #1:

MD's SEDIMENT CONTROL AND STORMWATER MANAGEMENT PROGRAMS - PAST AND FUTURE

Ron Gardner
Maryland Department of the Environment
Sediment and Stormwater Administration

In 1961, Maryland's Attorney General declared that sediment was a pollutant and that it is unlawful to discharge pollutants into the waters of the State. This declaration was significant because, for the first time, the importance of sediment pollution was recognized. Almost a decade later in 1970, the Maryland legislature passed the Sediment Control Law which mandated the establishment of the Statewide Sediment Control Program.

The concept of managing stormwater runoff has been evolving for many decades, beginning in the 1930's with the requirement of a permit for anyone who proposed "in any manner to change or diminish the course, current, or cross section of a stream". The next evolutionary step in stormwater management was actually flood management. People were beginning to realize that uncontrolled stormwater runoff was contributing to flooding problems. Finally, in 1982 the Maryland Legislature established the Stormwater Management Program. This program was primarily concerned with maintaining "after development, as nearly as possible, the predevelopment runoff characteristics, and to reduce stream channel erosion, pollution, siltation and sedimentation, and local flooding". As water quality issues have become more pronounced, the State has continued to improve practices designed to ameliorate stormwater pollution as well as providing quantity controls.

The original sediment control program was established as a division of the Water Resources Administration, Department of Natural Resources. When the Stormwater Management program was established, it was also made a division within Water Resources. The Sediment Control Program was targeted at stormwater runoff that occurs during construction, while the Stormwater Management Program was designed to control stormwater runoff that occurs after construction is complete. Therefore, both of these programs are treating the same problem, i.e., controlling stormwater runoff. The process for controlling runoff evolved again when the sediment and stormwater management programs were joined in the Sediment and Stormwater Division of the Water Resources Administration.

The next step in this developing process occurred in 1987 when the Maryland Department of the Environment was formed. The Sediment and Stormwater Division was transferred from the Water Resources Administration to the Department of the Environment. At the same time this division and part of the enforcement unit of the Water Resources Administration were joined to form the Sediment and Stormwater Administration. By elevating this program to the level of an Administration, Maryland was clearly stating its support for and underscoring the importance of controlling the runoff that occurred as a result of development.

When the Sediment Control and Stormwater Management Programs were first brought together, discussions were held to determine how to maximize the effectiveness of these efforts. One thing that became clear as these discussions continued was that an overall strategy needed to be developed to control pollution contained in stormwater runoff from all sources, not just from construction activities and development. The program that started as sediment control and had evolved to include stormwater management was now expanding to include the concept of nonpoint source pollution control.

Soon after the Sediment and Stormwater Administration was formed, the State's Nonpoint Source Pollution Control Program was transferred to the Administration. In addition, the State's Agricultural Nonpoint Source Inspection and Enforcement Program was also transferred to the Administration. This consolidated most of the nonpoint source inspection and enforcement programs into one Administration.

The question now becomes, what will be the next step of this continuing process in the development of a more holistic approach to controlling pollution. Part of the next step will be to implement Maryland's Nonpoint Source Pollution Management Program. The primary goal of this program is the reduction, by 40%, of the nutrient loading of the Chesapeake Bay by the year 2000. The strategy for the implementation of this plan is currently being developed by the Office of Planning. In accordance with the Nonpoint Source Management Program, the Sediment and Stormwater Administration will be developing strategies to meet the 40% nutrient reduction goal in our Sediment Control and Stormwater Management Programs.

In the Sediment Control Program, the State Law and Regulations will be reviewed with the intention of the clarifying and strengthening the Sediment Control Inspection and Enforcement Program. The sediment control manual is being updated with major changes to the sediment trapping devices that will substantially increase the efficiency for sediment removal. All of the other practices in the manual are being improved as the results of research projects are factored in the specification. These improved practices coupled with a renewed effort to ensure continued soil stabilization will markedly increase our ability to meet the 40% goal.

The stormwater management law and regulations will be reviewed and revised consistent with the 40% nutrient reduction goal. These revisions will include updating the priority listing of stormwater practices, including a section on maintenance of these practices and making the changes necessary to provide for the establishment of a stormwater management utility to help pay for the program.

The Best Management Practices (BMP's) currently being used to manage stormwater runoff are not adequate to meet the 40% nutrient reduction goal. Consequently, the Administration is developing a water quality strategy that will require pretreatment of stormwater runoff to remove pollutants contained in the runoff for quantity control.

Pre-treatment will involve processing the first one-half inch of runoff, which contains most of the pollutants. Pretreatment practices will include: vegetative buffers, the use of forebays to collect sediments and other pollutants, shallow marshes, wet pools in conjunction with extended detention times, and infiltration of the first one-half inch of runoff on site. By treating the first one-half inch of stormwater runoff, the Administration hopes to meet the 40% nutrient reduction goal.

Another aspect of Stormwater Management that will be addressed in the near future will be the development of an assessment and monitoring effort. This effort will include; watershed planning, inventories of existing facilities, developing models to help target BMP's and a monitoring program to measure the effectiveness of each program.

Assessment of the Sediment Control and Stormwater Management Programs is essential to the continued development of the process for controlling runoff. Assessment of nonpoint source pollution control activities in general is critical to achieving the 40% nutrient reduction goal. Currently, there are discussions concerning using the point source permitting process (NPDES permits) as a primary management tool for nonpoint source pollution control. Assessment of nonpoint source activities would then be conducted using point source techniques. When trying to control a pollution that is pervasive, it is essential to analyze the source of that pollution. That means that traditional methodologies used for point source assessment may not be effective, and that edge of field assessment capabilities must be expanded.

Maryland's Sediment Control and Stormwater Management Programs are moving rapidly to assimilate nonpoint source pollution control concepts and will continue to develop objectives for achieving the 40% nutrient reduction goal. In addition, these programs will continue to work toward our ultimate goal which is to provide needed facilities while protecting and enhancing the natural environment.

Speaker #2:

EPA'S STORMWATER MANAGEMENT CONTROL PROGRAM

Lawrence R. Liebesman, Partner
Weinberg and Green, Maryland

I. Statutory Background - 1987 Water Quality Act

A. Water Quality Act of 1987 - Congress established program to control runoff from municipal separate storm sewers and industrial sites. (Studies showed up to 63 toxic pollutants in municipal separate storm sewers.)

B. Section 405 amends Section 402 of CWA by establishing priorities, deadlines and requirements for stormwater permit sources. As a general rule, no permit will be required prior to October 1, 1992 for stormwater discharges except in four instances:

1. A discharge already subject to a permit issued before date of enactment

2. A discharge associated with industrial activity

3. A discharge from a municipal separate storm sewer system serving populations of 100,000 or more

4. A discharge that contributes to a violation of a water quality standard or is a significant contributer of pollutants to a water of the U.S.

C. A permit for a municipal separate storm sewer may be issued in a systemwide or jurisdictionwide basis

D. Exemptions

1. Stormwater runoff diverted around oil and gas mining and extraction that does not come into contact with raw materials or process waters

2. Stormwater that is not contaminated by contact with industrial or other process contaminants

3. Agricultural stormwater discharge

II. Proposed Stormwater Regulations - Proposed In Federal Register December 7, 1982 (Vol. 53 Fed. Reg. 49416) - Impacts On The Construction Industry

A. Proposal - specifies permit application rather than actual permit requirements. EPA intends to require Best Management Practices (BMPs) as conditions to permits. Many BMPs already required by local jurisdiction (e.g., straw bales, detention and retention ponds, sediment traps, etc.)

B. All stormwater runoff from industrial plants and residential subdivisions are regulated with exception of projects disturbing less than 1 acre of land area and single family residential disturbing less than 5 acres of land area

C. Indirect discharges into separate municipal stormwater systems - no permit required - municipality to get permit

D. Direct discharges - requires applicant to include:

1. Nature of construction activity

2. Total site and area expected to undergo excavation

3. Proposed pollution control measures, including BMPs, both before and after construction

4. Estimate of the site's runoff coefficient and the increase in impervious area after completion of construction

5. Name of receiving waters

E. Owners of construction activity generally do not have to submit sampling and analysis data with application

F. Indirect discharge application requirements

1. Municipalities operating separate storm-sewer systems will not need the traditional end-of-the pipe treatment technology

2. Instead, municipalities will need to develop comprehensive stormwater quality management programs covering new development and post-completion runoff

3. Programs may be implemented on individual outfall or systemwide, watershed or jurisdictional basis (BMPs)

4. Application requirements in two parts

a. Part One - identification of source and character of discharge and existing current municipal management practice

b. Part Two - proposed management control program including structural and nonstructural BMPs for construction sites. These include site planning procedures, procedures for identifying priorities, inspecting sites and enforcement and appropriate education and training measures

5. Data Submission by municipalities

a. Must provide estimate of the reduction in loadings of pollutants expected as a result of program

b. fiscal analysis of capital, operating and maintenance expenditures

c. first flush pollutant concentration data from samples taken during first 20 minutes of discharge

d. flow weighted average concentrations - to estimate pollutant loads and evaluate certain concentration based WQ impacts

6. Builder who discharges into a municipal separate storm sewer must notify the municipality of intent to discharge. The municipality then must insure that the builder's discharge will meet the permit requirements

G. Deadlines for Filing

1. For direct discharges associated with industrial activity, the applicant must submit an application 12 months after the final rule takes effect

2. For discharges from large municipal separate storm sewers (municipal separate storm sewer systems serving a population of 250,000 or more), the applicant must submit part one 12 months after the final rule takes effect, with the EPA approving or denying a sampling plan within 90 days of receipt; the applicant must submit part two 24 months after the final rule takes effect

3. For discharges from medium-sized municipal systems (municipal separate storm sewer systems serving a populations of 100,000 but less than 250,000), the

applicant must submit part one by November 4, 1990, with the EPA approving or denying within 90 days of receipt: the applicant must submit part two by February 4, 1992. A permit application shall be submitted to the agency within 60 days of notice

4. Small municipal separate storm systems are exempt until at least 1992

H. Final rule expected to be issued -- Summer, 1990

III. CWA SECTION 401 WATER OUALITY CERTIFICATIONS

A. Used by Maryland Department of Environment to address water quality impacts of stormwater discharge

B. Maryland Department of Environment issued stormwater management assessment guidelines on June 24, 1988 - addresses wetlands and stormwater issues

Speaker #3:

OUR EROSION AND SEDIMENT (E&S) CONTROL AND STORMWATER MANAGEMENT (SWM) PROGRAM

D. R. Vaughan
VA Division of Soil & Water Conservation

Erosion & Sediment

The E&S program consists of 171 local programs and state sponsored projects (about 15 state agencies have major capital improvement projects).

We monitor the effectiveness of local programs by reviewing their ordinance, plan review and approval techniques and inspection and enforcement procedures. We review and approve all state agency plans (or at their option approve their standards and specifications) prior to the initiation of land-disturbing activities. State project sites are inspected at a minimum of every two weeks by our staff.

The impacts from the 1988 legislation provided:

Civil penalties (up to $2000 for each violation) in addition to criminal penalties.

Erosion Impact areas that are defined as an area.

Stop Work Orders were added to provide an effective means of dealing with land-disturbing activities that have a significant negative impact on the environment.

As of today we have added new personnel in our central office and 8 regional offices. We had 5 staff people in 1984 that has now been expanded to a present total of 17 people. We can now:

Provide detailed reviews of local programs as mandated by the 1988 legislation. We review a minimum of 36 local programs every three years.

Develop a certification program for E&S inspection after mandated by the 1988 legislation.

Provide a complaint response for E&S violation.

Provide one-on-one assistance to local governments. This means at the local governments request we have a staff member visit the locality on a regular basis spending up to 2 days per week providing technical assistance in plan review and inspections.

We are processing revised regulations for promulgation by July 1, 1990. The significance here is moving from the "General Criteria" in our E&S Handbook which are implied to be regulatory to legal regulations.

An E&S tracking system is being planned. We selected 11 localities that have volunteered to feed input into our VirGIS (Virginia Geographical Information System) system for nutrient reductions.

Stormwater Management

The original GC-7 criteria (part of the General Criteria in State E&S Handbook) provided authorization to control "flow quantity" primarily focused on stream channel erosion. The authority for the criteria is from the State Erosion & Sediment Control Law.

The Stormwater Management Law created by the 1989 General Assembly addresses:

Water "quality control based on first one-half" of runoff for treatment.

Watershed planning.

Annual pollutant reduction reporting system.

Local administrative cost allowed.

Develop criteria for Keystone Pollutants. Regulations have been developed and are being processed for promulgation by July 1, 1989. The regulation will be voluntary for local governments, but is mandatory by all state agencies having land-disturbing activities greater than one acre after January 1. 1991.

New personnel to administer program consists of:

1 stormwater manager
4 field stormwater management engineers located in our Richmond, Suffolk, Staunton and Tappahannock Regional offices.

Summary

Progress is increasing with:

Pollutant reduction initiatives to help answer Chesapeake Bay issues on water quality.

The future of our program looks very good. We have received much support from the General Assembly, other regulatory agencies, and the general public.

WORKSHOP #8: HIGHWAY CONSTRUCTION

Charles Spooner, Moderator, EPA CBLO Director

Speaker #1:

C. Theodore Fridirici
Pennsylvania Department of Transportation
Bureau of Design

In the design, construction and maintenance of Pennsylvania's 27,000 bridges and 43,000 miles of highway, the Department of Transportation strives to reduce the impact that its activities have on the environment. Through cooperation between and coordination with resource agencies and the implementation of innovative and well conceived designs, PennDOT has taken great strides toward our overall goal of providing a safe and efficient transportation system while preserving the environment.

Following is one example each from the maintenance, design and construction process of how PennDOT has sought to reduce nonpoint pollution.

Maintenance

More than any transportation activity, maintenance has the potential to adversely impact aquatic resources. From shoulder cutting and ditch cleaning to the application of salt or anti-skid to the Commonwealth's roads, PennDOT seeks to reduce nonpoint pollution.

At the Pike County salt storage site in Milford Township, a pollution control plan has been formulated by PennDOT and the state Department of Environmental Resources to prevent pollution incidents. It reflects PennDOT's current policy of using Domar buildings for salt storage sites. These 116-foot diameter buildings allow enough room for delivery, storage and loading of salt and anti-skid while virtually eliminating the potential for the stored salt to contaminate the local environment, particularly groundwater.

Design features incorpoated in this development included sealing the entire floor with asphault cement; installing a "salt trap" across the entrance doorway to catch salt falling from vehicles leaving the building; extending the entrance doorway 12 feet and sloping the the entrance pavement into the building to reduce salt "tracking" outside the building; installing a slotted drain pipe across the site driveway to divert surface runoff away from the building entrance; and grading the gravel parking lot to divert surface runoff away from the entrance.

In addition to those design features, PennDOT will initiate a groundwater monitoring building at three nearby wells, sampling the water twice a year, in April and October.

Several operational procedures are incorporated in the plan, including a requirement that all salt and anti-skid mixtures are made and stored in the building; all trucks will be loaded in the building; all salt or anti-skid materials which spill on the sides of the trucks will be broomed or cleaned off before the truck leaves the building; all trucks returning with unused material will dump it in the building; all pothole patching material will be stored in the building; no bulk oil or asphault will be stored at the site; and any sodium or calcium chloride accidentally spilled outside of the building will be thoroughly cleaned up immediately.

Should an accident occur where either gasoline, fuel oil, anti-freeze or other materials are spilled, the spill will be contained immediately and DER notified. A sufficient quantity of absorbent material will be kept at the site at all times for immediate containment and to facilitate cleanup.

It is PennDOT's hope that these design features and operations plan will serve as a model for salt storage sites throughout the state.

Design

Several special features were designed into I-78 in the Allentown area to protect ground and surface waters from fuel and chemical spills. The design incorporates five spill containment facilities which collect highway surface runoff, and isolate potentially hazardous spill substances from highway runoff for proper treatment and removal before reaching water.

The containment system involves a network of surface drains which collect runoff from the highway surface and shoulder areas and channels it through pipes into one of the five concrete containment boxes located along the highway embankment. The boxes have an impervious membrane and each is designed to hold 30,000 gallons of spill material with a 38,900 gallon capacity. Baffles in the boxes reduce flow velocity allowing hazardous spill materials to separate from runoff. Water exits through a perforated, sand-filled PVC pipe into the containment basin associated with the box from which it is discharged through an outflow pipe. The spill material can be treated and pumped from the box once it has separated from the water.

In the event that contaminants flow out of the box into the basin, a concrete valve box equipped with a shear gate has been located at the basin's outflow which can be closed. The containment basin is also lined with an impervious membrane-to hold the spill.

The containment box must be cleaned out to remove typical roadway runoff and sediments which will accumulate.

Construction

During construction of the Blue Route expressway in suburban Philadelphia, an environmental monitor was directly involved with the design and maintenance of erosion and sediment control measures. The monitor's responsibility included serving as a liaison between the public and PennDOT; to act as an independent source of environmental expertese; to review and report on design and construction activities to ensure compliance with environmental requirements; and to search for further means of reducing project impacts and enhancing the environment.

Stormwater goals for the project were met by installing grassed channels and swales typically 200-400 feet long between inlets; installing detention basins to receive runoff; using detention basins as a cleanup point for spills from tanker accidents; having water from the basins be released into adjacent wetlands when possible; and installing these measures in sequence -- so they will be cumulative in their benefits -- rather than using them as alternates to each other.

The resultant effluent quality of stormwater runoff from I-476 reflects an overall average of 75 percent removal of total suspended solids.

WORKSHOP #9: NPS - WHO PAYS?

Richard Christiansen, Moderator, MD Soil Conservation Service

Speaker #1:

Timothy J. Kari Kari
Housing and Environmental Regulation Administration
Department of Consumer and Regulatory Affairs, Soil Resources Branch

The District of Columbia's stormwater management regulations (D.C. Law 5-188, Sections 509-518) state unambiguously that for all new construction, where it is determined by the Department of Consumer and Regulatory Affairs (the lead agency for D.C.'s nonpoint source program) that nonpoint source control measures are required, the developer is responsible for ensuring that such measures are incorporated in their development projects.

Similarly, through the District's "Erosion and Sediment Control Act of 1977", (D.C. Law 2-23), the developer is responsible for ensuring that all appropriate erosion and sediment control measures are installed for any land disturbing activity.

In both situations of curtailing nonpoint source pollution, the developer bears the construction cost.

Therefore in the District of Columbia, the issue of who pays for nonpoint source pollution is perceived by the Soil Resources Branch (the agency responsible for operating the District's erosion control and stormwater management programs) as a purely maintenance problem.

Recent statistics from our engineers and field inspectors show that of the 39 stormwater management facilities (BMPs) documented, 11 have been completed, while construction is still in progress for the remaining 28. Ninety eight percent of the BMPs are located on private property.

The records also indicate that some of the completed facilities are already facing maintenance problems; either poor maintenance or total lack of maintenance, although the law states that proper maintenance at all times is the property owner's responsibility.

Clearly, in such a situation, the responsibility of paying for nonpoint source control falls on the property owner.

However, when a property owner refuses to abate such violations, the District can invoke D.C. Law 5-513 which gives it the legal authority to correct the violations and assess the cost against the property owner or place a lien on the property.

Other scenarios are encountered with respect to erosion and sedimentation where the erosion process is so severe that it can create an eminent danger or cause destruction of adjacent properties and siltation in nearby streams.

On a number of occasions, the District has used its authority under D.C. Code 5-513 to correct the problems. However, because of the budget crises, the District will find it increasingly difficult to come up with the financial resources to continue to address these problems.

We forsee construction of more BMPs not only on private property, but on both District and Federally owned lands. The question we are constantly asked is, "Who will maintain these structures once the developer is gone ?"

To ensure that facilities that are built to control nonpoint sources of pollution are maintained properly and consistently, the Soil Resources Branch is considering the following initiatives:

l) Amend the District's Stormwater Management Regulations to include a provision whereby developers would be charged a fee-in lieu of doing stormwater management where it is determined that site conditions make the construction of stormwater management facilities impracticable. The fees would be used for District-wide environmental improvements related solely to nonpoint source pollution;

2) Amend the Erosion Control and Stormwater regulations to charge a fee for plan review, technical assistance and site inspections; and

3) Charge fees for technical manuals and other nonpoint source publications which are presently distributed free charge.

Based on the above discussions, we will like to conclude that on private land, the property owner should pay for nonpoint source controls. However, if a facility is developed by either a federal, state or local agency on public land, the particular agency or agencies should pay for the maintenance of the facility.

Speaker #2:

LONGEVITY OF BMP's

Donald R. Urban
VA Soil Conservation Service

There is relatively little information about the performance of -agricultural practices that control nonpoint source runoff after they have been installed for several years. This study considers BMP longevity, focusing on five practices: terraces, animal waste storage, vegetative strips, waterways, and conservation tillage. Expert judgements on the subject were elicited from 300 conservation district and local SCS personnel across the nation. In addition 123 practices in North Carolina, Pennsylvania and Ohio, with ages ranging from five to fifty years, were assessed in the field.

In general, there is a striking disparity between potential BMP longevity and the actual lifespan of practices. This highlights the significance of O&M activities in maximizing returns on investment in NPS controls. Study results suggest that existing Soil Conservation Service life expectancies may be too conservative and that many practices can last indefinitely if properly maintained. In particular, vegetative strips typically remain effective far beyond the five year SCS estimated life spans. Similarly, even though it is often classified as an annual practice, the vast majority of local experts did not put an upper bound on the potential longevity of conservation tillage. Despite the substantially higher price, no meaningful difference in the long term effectiveness of concrete, as opposed to earthen animal waste lagoons was detected. Both appear to effectively store wastes for periods upward of twenty years. Grassed waterways may be an exception to this

pattern, as site-visits and respondents revealed longevity to be somewhat lower than the 15 year SCS life-span.

The O&M activities required by different BMP's varies among practices. For vegetative practices, particularly waterways, the most important ones are passive "precautionary measures" (i.e., caution with farm equipment and herbicides) which do not require additional spending. Similarly, both human and environmental factors affect different BMP's longevity. In some cases operators' education and environmental attitudes are viewed as having the greatest influence on a BMP's lifespan. These can be affected by through educational initiatives. In other instances, especially for structural BMPs, economic prosperity may be the most important factor, requiring a different policy response. In general, BMP longevity should play a key role in the decisions of both regulatory and nonregulatory nonpoint source policy makers prior to promotion of a particular control strategy. Operation and maintenance activities hold the key to long term water quality improvement and should increasingly become central objectives of nonpoint programs.

Speaker #3

PAYING FOR POISON RUNOFF MONITORING PROGRAMS

Diane M. Cameron
Natural Resources Defense Council
Clean Water Program

Many cities are beginning to survey stormwater outfalls, as EPA readies its final rules for urban runoff control under section 402 (p) of the Clean Water Act 1. Unfortunately, these surveys often stop short of obtaining a full picture of the pollutants, especially toxics, present in urban runoff. While public works officials understand the necessary link between stormwater characterization, and choice and design of control and treatment devices, local elected officials are often unwilling to appropriate funds for characterization monitoring. The 1978-83 Nationwide Urban Runoff Program (NURP) provided the primary data base for stormwater quality information, and demonstrated the importance of the urban runoff problem 2. NRDC researchers have used NURP data to demonstrate that loadings of pollutants in the runoff from Baltimore City and the Washington, D.C. metropolitan region rival the pollutant output of factories and sewage plants in Maryland and Virginia 3.

Although the NURP study remains useful, and is highly respected among urban hydrologists and planners, a second generation of stormwater quality data is now required. Conducting up-to-date baseline monitoring studies of urban runoff can verify the validity and representativeness of the NURP data. Such studies can also improve the siting, choice, and design of detention and control devices, source reduction programs, and to water-quality-based planning and zoning programs 4. Despite these obvious benefits, few urban stormwater monitoring projects are now underway in the Chesapeake Bay Region. Urban water quality officials cite financial restrictions as the primary reason for the lack of current monitoring programs. This study compares the funding strategies of urban runoff monitoring programs in three Chesapeake Bay cities: Baltimore; the District of Columbia; and Hampton, Virginia; with the funding strategies of three other cities that have undertaken innovative monitoring programs: Bellevue, Washington; San Francisco, California; and Grand Rapids, Michigan. Officials in these six urban areas were interviewed by telephone in late 1989 and early 1990.

Background

In his 1988 survey of 20 urban stormwater utilities, Greg Lindsey of the Maryland Sediment and Stormwater Administration found that water quality monitoring, and other water quality programs, played second fiddle to other priorities such as construction of flood control devices. Out of 19 utilities responding to the survey, only 6 (less than a third) reported expenditures for water quality management programs (including runoff quality monitoring). According to Lindsey, "Twenty percent [of the total stormwater utility budget] seems to be a maximum that any utlity spends on water quality programs." 5

Stormwater policy analysts, including Lindsey, predict that this trend will change, and that in the near future water quality will be the driving motive behind the establishment of new stormwater utlities (and new components of existing utilities). The role that water quality considerations will play in urban runoff management will depend to a large extent on the final stormwater regulations that are expected soon from U.S. EPA. Regardless of the direction of the new EPA regulations, however, progressive urban water quality managers are now finding ways to fund stormwater quality monitoring and control, and these innovations can be applied to Chesapeake Bay cities.

SUMMARY OF THE SIX-CITY TELEPHONE SURVEY

Chesapeake Bay Cities

Current or Planned Monitoring Programs	Cost	Who Pays?
Washington, D.C.		
No significant mon. since NURP; a 2-site, multi-year project is planned. Purpose is to study the effect of diff. land uses on loadings.[6]	Not Avlble.	District of Colum.
Baltimore, Maryland		
Conducted a monitorng. project for nutrients at 5 stormwater detention basins; 2 were comprehensively monitored (inflows & outflows) for nutrients.[7]	$175,000	State, City, and Federal govts. all kicked in money.
Hampton, Virginia		
No stormwater quality monitoring at present. Industrial sites incl. shipyards will begin to implement BMPs; Virginia Beach is requiring BMPs for new developmnts., but not requiring monitrng. Virginia lacks enabling legisl. for stmwtr. utilts.[8]	Not Applicable	N/A

West Coast and Northern Cities

Current or Planned Monitoring Programs	Cost	Who Pays?
San Francisco		
Santa Clara And Alameda Counties undertook stormwater monitoring programs between 1987 and 1990. About 8 homogeneous L.U. stations, and 4 stream stations in each county were sampled and monitored for PPs, bact.,conven.,nutrients [9].	Santa Clara: $1.2 million Alameda: $1.4 million	Flood Control District: 1/3; 2/3 from local general revenues
Bellevue, Washington		
Proposal to conduct a 5-station stormwater monitoring program in 1990. Conventionals, 6 heavy metals, O & G will be analysed. Purpose is to develop a prototype NPDES storm-water permit application [10].	$199,989	State and City each kick in 50%. (City $ is gen. rev.)
Michigan (Grand Rapids & Ann Arbor)		
Storm drain sampling for industrial toxics & illicit connections (pilot project). (Grand Rapids)	Not Available	County Drain Commissnr provides funds.
Permanent program in-place to sample storm drains, dye-test and find illicit connections.[11] (Ann Arbor)	Not Available	County Drain Commissnr

Conclusions

Creativity is needed to devise a funding plan for stormwater monitoring projects, especially since stormwater monitoring is often an "orphan" project, often viewed as superfluous by the local elected officials who control the purse strings. Given this attitude, the paucity of general revenue sources for funding urban stormwater monitoring projects must be countered with an innovative funding approach that taps a variety of sources. All but one of the urban projects in the survey were funded by multiple sources and government entities. The following is a list of our preliminary conclusions:

* Urban Stormwater quality and quantity monitoring will likely be required by EPA for major cities as part of the permit application for NPDES stormwater permits.

* Even without the EPA monitoring requirement, stormwater monitoring has several benefits; among them is the ability to efficiently target runoff control resources.

* Stormwater utilities are an underutilized funding source for stormwater quality monitoring projects. Where they already exist, they should be tapped for monitoring funds. Where they do not yet exist, officials should explore the possibility of establishing such a utility.

* County-level Flood Districts or Drainage Districts are more common than are special stormwater utilities. These flood districts can and should be tapped for funds to support stormwater monitoring, especially where statutory authority for establishment of stormwater utlities is lacking.

* Experience with monitoring techniques and equipment maintenance gained during the baseline study can be applied to later work of monitoring the reductions achieved by control devices.

* Most local policymakers are taking a reactive rather than a pro-active stance toward urban runoff monitoring and control; they are waiting for the EPA regulations to take effect before they are willing to embark on a baseline monitoring project. In contrast, a few aggressive local policymakers, such as those in the San Francisco area, are not waiting for the EPA regulations to force their hand; they are acting now to characterize their stormwater runoff and to design targetted control strategies.

INTO THE NINETIES: ISSUES AND STRATEGIES

Roland Geddes, Moderator, VA Division of Soil & Water Conservation

Speaker #1:

NONPOINT SOURCE POLLUTION INTO THE NINETIES: ISSUES AND STRATEGIES

Ernest C. Shea, Executive Vice President
National Association of Conservation Districts

Nonpoint pollution is not a new problem. In fact, it is a problem that has existed since the beginning of time and will be with us until the end of time.

What is new, however, is the growing awareness and recognition of what it is and, more specifically, how land use activities contribute to the problem. At the heart of nonpoint pollution is human activity and, as such, NPS pollution is primarily a "people" problem. It is also deceptive in nature due to the fact that the cumulative effect of seemingly small, insignificant, individual human activities results in significant impairment of water quality, degradation of aquatic resources, and loss of ecosystem diversity and integrity.

No segment of society escapes responsibility for contributing to nonpoint pollution. It is not a problem where responsibility can clearly be placed on any one group of individuals or activities. Farmers, developers, homeowners, boaters and backyard gardeners all contribute to the problem. As a result, any successful NPS strategy must involve all segments of our society.

Although considerable progress has been achieved in elevating public awareness of this problem, efforts to implement comprehensive abatement programs have only recently been initiated.

Water quality experts agree that there are a number of forces which are impairing or blocking widespread adoption of NPS abatement efforts. Efforts to overcome these impediments represent a priority agenda item for the 1990's.

The first and primary impediment is the public's lack of understanding and awareness of the nature of nonpoint pollution, its causes, its impact on society, and the consequences of not addressing ongoing problems. Until this basic impediment is overcome, little progress can be expected in developing and implementing effective NPS control programs. Closely related to this point is the widespread belief among many policy makers that the problem is too big to tackle. Although NPS pollution is pervasive, we must demonstrate that individual actions do make a difference.

A third major impediment is the "quick fix." piecemeal approach that is often a characteristic of poorly designed NPS control programs. Successful NPS programs are holistic in nature and are based on an integrated watershed approach. Failure to develop this type of approach can result in simply transferring pollution to other mediums and expending limited resources without seeing significant improvements in water quality. Lack of cooperation and coordination on the part of the numerous federal, state and local government agencies with nonpoint responsibilities represents a fourth serious impediment that must be overcome. Turf battles coupled with poor communication and coordination of efforts at the local level contribute to the lack of progress in addressing NPS pollution. Incomplete science and gaps in technology are also major impediments which impede further progress. Despite our best efforts to implement best management practices, there are still many unknowns which complicate control efforts. For example, the movement of many pesticides through soil is still not fully understood, nor is the synergistic effect of chemicals which combine or interact in the soil profile.

A sixth fundamental impediment is conflicting public policy and laws which exist at all levels of government. This can perhaps best be exemplified by federal farm policies which, in the past, have encouraged the production of agricultural commodities on fragile, environmentally sensitive land areas. Last but not least is the lack of resources which have been made available to combat this problem. Despite the fact that NPS has now been clearly identified as the last major barrier to meeting the goals and objectives of the Clean Water Act, federal appropriations for NPS abatement have been almost nonexistent. Not until the public and private sectors commit the resources that are needed to address this problem will any real progress be achieved.

It will take more than overcoming these seven impediments if we hope to control NPS pollution in the 1990's. It will also require the development and execution of a comprehensive abatement strategy. This strategy, at a minimum, must incorporate the following key ingredients.

First and foremost, education must be the cornerstone of our future NPS control efforts. Our goal should be to get people to accept personal ownership and responsibility for solving NPS problems. If we succeed in getting the public to understand and recognize the problem, it will be much easier to convince citizens to take actions to correct the problem. Without cooperation and support from the public at large, NPS pollution will continue with serious consequences to the resource base.

Second, we must continue to develop comprehensive NPS abatement programs that place primary emphasis on pollution prevention. These plans must deal with the problem holistically on a hydrologic unit basis.

Third, we must continue to improve communication among all management agencies with NPS responsibilities. No one unit or level of government has the expertise, resources or ability to solve the problem on its own. Therefore, it is critical that we develop goals, objectives and action steps that are understood and supported by all parties participating in prevention or cleanup efforts.

Fourth, we must do a better job of targeting our resources. Given the fact that we most likely will never have all of the resources we need, we must continually monitor our efforts to insure that our resources are used as effectively as possible. It is also critical, particularly in the early stages of new NPS programs, that we find projects and programs where it can be clearly demonstrated that the abatement efforts make a difference.

Speaker #2:

AGRICULTURAL POLLUTION CONTROL: AN AGENDA FOR THE 1990's

Patrick Gardner
Agricultural Policy Coordinator
Chesapeake Bay Foundation

Introduction

Good Morning. Before I jump into the substance of my remarks, this morning, I would like to thank Fran Flanigan and her very capable staff for making this conference possible, and I would like to extend my appreciation to the Nonpoint Source subcommittee as well for sponsoring the event in the first place. I think it has been a productive conference, and a necessary one. We all know that cooperation and communication are essential to making progress towards the goals we have set for ourselves in the nonpoint source area in order to "save the Bay."

The charge to this panel, as you know, is to look ahead to the upcoming decade and to identify issues that we must face and satisfactorily resolve in order to clean up the Bay, or more specifically, to meet the 40 percent nutrient reduction goals. One such issue that I believe is essential to address is the question of the direction that our agricultural pollution reduction programs should take. By that I mean to bring into the open the debate about whether largely voluntary agricultural programs will suffice or whether more regulatory programs are necessary to meet our water quality goals.

Now, for those of you who are saying to yourself, "here it comes, CBF is finally going to reveal its true self and demand a badge and a gun and a court order in order to literally force farmers to adopt conservation measures." Of course, I'm not going to say that, because I do not believe that that is the direction we ought to be taking. Indeed, I think that the current debate, which seems to admit only two options-- pure voluntarism or heavy-handed regulation--needs a fresh perspective. You see, I think that the basic premise of the current debate, that voluntarism and regulation can be divided by a narrow "bight line" is incorrect. In fact, I would like to suggest that there is a wide area of policies and programs that fall between "voluntary" and "regulatory." This in-between area is largely unexplored territory, and in my view, offers policymakers and program administrators the greatest opportunity to clean up nonpoint source problems in the 1990s.

Let me give you some examples of programs or policies that lie in between voluntarism and regulation that could reduce adverse water impacts attributable to agricultural sources:

A. Quid Pro Quo

The basic idea here is that government confers on farmers (and many other sectors and groups) certain benefits including commodity price and income supports, subsidized crop insurance, and low-interest loans, to name a few. But, as we all know, nothing comes for free, and each of these benefits carry with them certain obligations. The essence of quid pro quo as it relates to agriculture is to assure that those obligations serve the purpose of pollution abatement.

We have seen this approach already in the 1985 Farm Bill. That law created "swampbuster," "sodbuster," and "conservation compliance" which were all predicated on the idea that the Federal government ought not to be in the business of subsidizing poor land use practices. Each of these programs require farmers to comply with conservation measure in order to maintain eligibility for Federal farm programs.
A host of opportunities to build on this approach exist. Dairy producers, for example, collect hundreds of millions of dollars annually through the dairy price support programs which could be tied to improved nutrient management planning. In addition, the states confer benefits on farmers that could be tied to soil and water conservation. One example of this is use-value taxation. Presently, many counties within the watershed allow for reduced property taxes on farmland in order to encourage farmland preservation. This lower assessment should be tied to proper farm management, especially for landowners that are not farm operators. Another state-funded benefit that should be tied to improved conservation is drainage construction and maintenance.

In summary, Quid Pro Quo stands for the proposition that, if you want government assistance, by all means take it– but take it with the proviso that you spend it wisely and in concert with efforts to improve our environment.

B. Point and Pay

Point and Pay begins with the proposition that conservation is not free, and that there is a limit to the money available (both public and private) to spend on nonpoint source pollution abatement. It stands to reason, therefore, that we have to maximize the returns to our conservation dollars if we are to attain the water quality goals we have established. To do this, we must target our limited resources to address the worst problems first.

Under a purely voluntary system you cannot effectively target your remediation resources to the most serious problems because even after you identify the source, there is no guarantee that the "problem" will participate in one or another of the voluntary programs. It is not surprising, therefore, that at present we spend much, if not most, of our program money and technical expertise on the better farmers, the ones who are better informed, and probably better managers because they are the ones who ask for assistance.

The exclusively voluntary approach also suffers from the fact that there are no assurances that sufficient numbers of farmers will volunteer to either meet our water quality goals, or to spend all the money allocated for these programs. Presently more than one Bay state faces the embarrassing situation that it cannot give away all of its nonpoint source program dollars.

Point and pay is an effective targeting technique that falls well short of heavy handed regulation. The idea is simple: the government agrees to pay the full cost of establishing water quality BMPs and in turn is granted the authority to mandate which farmers shall install them. In that way the government can target its remedial efforts to the most serious problems without unfairly burdening farmers. This is not "regulation" in the usual sense because the government is paying the full freight. It is also not purely voluntary because wherever the government points, farmers must act.

This approach is not likely to bust the budget either. Indeed, the added cost of 100 percent cost-share is small: in Maryland it would amount to a 15 to 33 percent cost increase per BMP, an increase that could more than be offset through greater program efficiency resulting from better targeting. Conversely, program surpluses would vanish because the state could keep "pointing" until all funds were expended.

In a nutshell, point and pay offers the opportunity to better target our resources without simply shifting the clean-up burden onto farmers who cannot pass on costs to consumers. It would markedly improve the efficiency of our programs and eliminate any program surplus.

C. Concentrated Livestock Operations

There are very good reasons why farmers should not be subjected to excessive regulation. The foremost rationale is that it is impractical. There are simply too many farms and fields and too much producer variation to enable effective centralized water quality regulation. The fact that all farms should not be regulated, however, does not mean that no farms should be regulated. Indeed, some types of farming, notably concentrated livestock operations, readily lend themselves to conventional point source pollution regulation. And, not surprisingly, authority already exists to require Clean Water Act NPDES permits for concentrated livestock operations above certain federally established thresholds.

The attraction to increased regulation of animal production stems not only from the fact that regulatory authority exists, but from the fact that ownership in the livestock industry tends to be highly concentrated. This is particularly true for the chicken and hog industries. The largest layer operations, for example, constitute less than 1 percent of producers, but generate as much as 40 percent of production output, which is a good proxy for manure and nutrients. If the Bay program can control the manure on these mega-farms, then significant water quality reductions can be achieved without impacting a large number of farmers.

The essential point here is that not all farms are alike, and not all farms are equally important to water quality. If we focus on the largest and most concentrated operations, we will get greater water quality benefits for our efforts, and we will not have to pass new laws to do it: authority already exists to regulate animal agri-industry.

D. Alternative Technology

When people think of "regulation" they usually are imagining government edicts, usually of little apparent rationality or value, that are imposed by "faceless, nameless bureaucrats." But bureaucrats enforcing laws and ordinances are not the only mechanism by which human behavior is regulated. Consider the following example.

You are in the market for a new car. You stroll into your neighborhood Cadillac dealer's showroom, and there in the center of the showroom floor is the automobile of your dreams. It's a cherry-red, rag-top, eight-cylinder, El Dorado with power windows, brakes and seats. The salesman appears out of nowhere and tells you this car is yours for just $49,999 plus tax. So, you visit your banker, who upon reviewing your salary and credit report, advises that you consider a chevrolet. Result: no loan, and no El Dorado.

Now consider an alternative scenario. Once again you are in the showroom, and you decide that the same cherry-red El Dorado is the car for you. Only this time the salesman tells you that EPA has recalled the car because it does not meet national fuel efficiency standards. Result: once again, no El Dorado.

The point is, in both cases you did not get the car. In the latter case you come away convinced that you have been "regulated." But in the former case, you conclude you were merely "thrifty." The fact is both events "regulated" your behavior. The point is that economics is a potent influence on our activities, and where we can make economics work in our favor– that is to encourage non-polluting behavior– we can avoid governmental "regulation" altogether.

One example of this approach can be found in conservation tillage. Maryland and Delaware have the highest proportional rates of adoption of conservation tillage in the country. And while conservation tillage has salutary environmental benefits through reduced soil erosion, area farmers adopted this new technology primarily because it saves time and money. Integrated Pest Management (IPM) is a similar case in point. So is the fast developing alternative agriculture technology. Each of these alternative technologies offers economic incentives that improve farm profits and also bring environmental benefits. And, no doubt similar opportunities can be discovered if we spend the time and effort to look for them.

Conclusion

Incentives and motivation are the keys to changing human behavior. There are a host of incentives that farmers will respond to including voluntary stewardship, gentle persuasion, economic realities, and regulatory threats. The challenge ahead is big enough, and the benefits of success are important enough that I believe we ought to carefully consider and employ every valid option to ensure success. I have touched upon several incentive policies in my remarks, all of which, to my mind, fall between pure voluntarism and universal regulation. And whether it is the proposals that I have put forward or some others, I think that the area most likely to suit our water quality policy and program needs in the future lies in between those bounds.

SUMMARY OF STATE CAUCUSES

Conference participants met over breakfast on Wednesday morning in three groups: Pennsylvania, Virginia and Maryland. Each group was led by a neutral facilitator and was given the same set of questions designed to focus discussion. After introductions, each group was asked to take 5 minutes to quietly jot down answers to the questions. The facilitators then led each caucus in discussing the questions and attempting to reach some consensus on state priorities. Those discussions are summarized below.

STATE CAUCUS DISCUSSION QUESTIONS

1. Hypothesis: (Pennsylvania, Maryland, Virginia) is presently well positioned to meet the 40% nutrient reduction target from nonpoint sources. List as many yes's and no's as possible.

2. Pennsylvania's (Maryland's, Virginia's) most pressing research need in the nonpoint area is _____

3. Pennsylvania's (Maryland's, Virginia's) most pressing program implementation need is _____

4. If you could recommend one policy change in the nonpoint area, what would it be? _____

Each group developed long lists of yes's and no's in response to the basic hypothesis. Some comments are state specific; many appear on all three lists.

On the following three pages, the responses to question #1 from Pennsylvania, Virginia and Maryland are listed. Responses to questions #2, #3 and #4 begin on page 117.

YES

- good education program has begun
- nutrient management legislation will be very effective in agriculture section
- dedicated folks in DER & conservation districts & cooperation among groups
- in a position to measure objectively
- our numbers are very conservative (doing better than we think we are)
- support of farm groups
- support of governor & legislature
- shifted focus to water quality
- media involvement & local organizations are helping
- if proposed regulations are adopted will help us get there (i.e. 102, wetlands, ground water)
- strong basic philosophy
- mandatory recycling/composting law presents opportunities (Act 101)
- nutrient management becoming more science than art (better plans)
- Penn Vest program helping improve STP's
- good startup program all-around (BMP, tech assist) - good base to build on
- phosphate ban now in place
- national visibility helps (ahead of Puget Sound & others)
- involving farmer (total farm involve)
- high percentage of FSA plans developed
- waste management plans effective
- increased technical capability
- public aware of growth management need
- public aware of agribusiness' understand/commitment (to include environmental concerns)
- training and guidelines for nutrient management technicians
- now include industrial and other segments of population - not just farmers
- moving toward individual comp. resource management plan (better integrated)
- NY involvement essential to PA progress

NO

- much rhetoric but funding limitations exist
- insufficient staff
- total economic picture (from values, ind. values, taxes, etc.)
- population growth
- growth of livestock industry & importance of livestock feed
- difficult to get more farmers to enroll in programs
- "green lawns" measure wealth - not reaching average homeowner
- not enough enforcement of E & S regulations
- comprehensive land-use planning doesn't exist
- need to get to grassroots level
- under best circumstances, will take a long time to accomplish goals
- competition for $ resources
- failing septic systems
- atmospheric deposition working against us
- greenways & forested buffers along streams (PA lags behind)
- over 2500 municipalities makes coord/progress difficult
- frontier mentality proliferates in PA
- targeting of resources is under emphasized
- lack of agreement between researchers re: nitrogen application rates and fate of N when applied
- programs driven by fiscal rather than nutrient reduction concerns
- national cheap food policy
- not all agriculture players are at the table
- our objectives are very expensive - public doesn't understand
- international competition from less regulated countries

YES

* Division of Soil & Water and Conservation Districts are excellent
* local and regional initiatives since 1970's have helped
* strong support from General Assembly
* effective cost-share program
* state plan for 40% reduction is in place
* some successful experiments ie. Occoquan
* educational activities have created high visibility
* good cooperation between state and federal agencies
* good forestry BMP's
* Tayloe Murphy Commission on growth
* Chesapeake Bay Preservation Act - resource management & protection areas
* VIRGIS program
* move to low input agriculture
* strong base for volunteer efforts
* Planning District Commissions' initiatives
* General Assembly authorized local Stormwater planning
* Political atmosphere for environmental issues is positive
* improved sewage treatment
* clear goals
* beginning of reasonable regulations
* basically sound governmental structure
* motivated, enthusiastic staff
* phosphate ban in place
* Farm Bill programs well underway
* Section 319 money will help
* good protection of tidal wetlands
* higher land values may deter some development
* needs have been identified
* localities seem willing to make changes

NO

* lack of nontidal wetlands protection
* lack of local enforcement, especially on construction sites
* lack of infrastructure planning
* failure to effectively address growth and development
* lack of coordination within nonpoint programs
* no I/M on urban storm systems
* no I/M on BMP's
* tension between economic interests & environmentalists on development
* need more local landowner involvement
* no handle on air pollution
* lack of open space acquisition money
* vesting legislation could restrict local efforts
* improperly installed BMP's
* Dillon Rule
* No funding or user fees for local stormwater planning
* ineffective targeting of resources
* agriculture needs to be more proactive
* need money to finish soil surveys
* lack of long term monitoring
* inadequate programs for homeowners
* need more forest buffers
* long term funding not guaranteed
* Department of Transportation not involved
* developers, farmers, citizens all need more education
* VA budget limitations
* need state-level planning leadership
* lack of incentives for conservation easements
* too much reliance on Farm Bill to solve problems
* need better ways to track and quantify nutrient reductions
* must address septic systems, other groundwater problems
* lack of technical expertise at local level
* need BMP's for highways
* landfill teaching
* groundwater problems not well understood
* too much reliance on voluntary participation

YES

* there is a strong, effective commitment in Maryland to nonpoint source reductions
* effective sediment control program
* agricultural community offered education in nutrient management techniques
* Soil Conservation Districts and Soil Conservation Service have the expertise to work on NPS problems
* strong retrofit stormwater management program in Prince George's County
* strong tree conservation and woodland preservation program in Prince George's County
* Metro Washington Council of Governments doing excellent job of coordinating programs
* more people interested in protecting the Bay
* strong commitment, adequate funding, good delivery system to farmers for NPS controls
* University of Maryland expertise
* wide variety of interests and programs support Bay cleanup
* there are lots of NPS programs and cooperation is improving
* there is good emphasis on providing implementation funds
* there are BMP's for large farmers... and a lack of BMP's for small property owners.
* modeling effort helps
* programs to preserve stream buffers/Green Shores
* use of agricultural chemicals is decreasing
* economic dependence generates strong motivation
* state Critical Areas program
* good education program in place
* SCD's are well-organized

NO

* inadequate technical information
* groundwater research inadequate
* weak enforcement; need more staff, funding
* inadequate maintenance of stormwater facilities
* current technology of moving sludge to uncontrolled rural areas poses problem
* uncontrolled population growth
* need to monitor local (planning/zoning) ordinances; too many exceptions and waivers granted
* development pressures drive decisions
* lack of knowledge about land conservation programs
* lack of of programs for plots of 5/10 acres or less
* too many chiefs, not enough Indians
* efforts are not coordinated..."We need more of a holistic approach."
* lack of funds for NPS compared to point sources
* stronger commitment by legislature needed (executive branch of government is committed to NPS reductions but legislative commitment is lacking. "They give us work to do, but not the funds to do it.")
* lack of urban stormwater retrofit
* State and counties should increase frequency of household hazardous waste collections (batteries, antifreeze, used oil, etc.)
* need more boat pumpout stations
* inadequate evaluation system to decide what is most cost-effective
* lack of social science involvement ("we are throwing technology at the the problem")
* inadequate understanding of value of various lands ("all wetlands do not have the same value")
* incentives to pollute have not been curbed

Question #2 concerning research needs also generated many responses:

Virginia - Several key needs emerged:

1. Information on program effectiveness
2. Correlations between programs and effects on living resources
3. Socio-economic research
4. Funding

Pennsylvania - Caucus identified these needs:

1. Research to refine nutrient management
2. Impacts of on-lot septic systems
3. Research on groundwater protection
4. Evaluation of cost-effectiveness
5. Waste disposal

Maryland - Participants saw needs for research in these areas:

1. Effectiveness of BMP's
2. Groundwater/surface water interface
3. Functional value of non-tidal wetlands
4. Contributions of urban sources
5. Growth management

Question #3 concerning Implementation needs elicited these responses:

Pennsylvania:

1. Need to reach farmers not presently involved
2. Need to coordinate into one plan individual components on pesticides, nutrient management, and erosion control.
3. Need to improve cooperation between PA and EPA
4. Develop better ways to measure and display program progress
5. Implement growth management efforts at the local level

Maryland:

1. Need better teamwork among urban and agricultural interests
2. Concentrate more effort on "low-input" agriculture
3. Focus programs on a watershed basis
4. Provide more technical training
5. Need more money

Virginia:

1. Need to develop ways to measure progress, account for work accomplished and results achieved
2. Maintenance of BMP's
3. Emphasize pollution prevention
4. Deal with development issues, costs associated with urban BMP's, and necessary legislation
5. Education to develop a nonpoint ethic in citizenry.