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PROCEEDINGS
NORTH CAROLINA 208
PROBLEM ASSESSMENT
WORKSHOP

Edited by

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Water Resources Research Institute
of
The University of North Carolina

Sponsored by

Water Resources Research Institute
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and
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North Carolina Department of Natural and Economic Resources

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SUMMARY

North Carolina 208 Problem Assessment Workshop

*May 4, 1977
Ramada Inn
Apex, North Carolina*

On May 4, 1977, a workshop on North Carolina's 208 problems was held. The objective of the workshop was to identify 208 program requirements which present significant technical challenges to the State and to determine whether these requirements can be met within the limitations of current capabilities. The workshop format began with brief presentations by 208 program participants. Each participant discussed his group's accomplishments to date, projected accomplishments over the next two years with the present level of technology, and problem areas where assistance is needed.

These proceedings contain a record of the presentations and comments made at the workshop. Some conclusions and questions raised were as follows:

1. Successful completion of 208 studies seems to require the understanding of many complex cause and effect relationships. How can the plans be completed when it is clear these relationships will not be understood by November 1978?
2. How can Best Management Practices (BMP) be enforced until Point 1 above is resolved?
3. Since 208 is an interdisciplinary planning process, how can we develop a common language and the appropriate standards, especially to confront the requirement for a continuing planning process?
4. How can we arrive at acceptable definitions of the desired levels of water quality established by PL 92-500? What are "fishable and swimmable waters?"
5. What field data collection programs are called for by the 208 requirements?
6. How can 208 planning be related to other environmental management programs?
7. How can equity be maintained in the establishment of BMP's, especially at the level of the individual or small enterprise?

8. A great deal of work is needed to improve approaches to the public participation process. How can we overcome the barriers to achieving this?

It is expected that follow-up workshops and seminars will be conducted to take advantage of the information gained at this initial problem assessment workshop.

INTRODUCTION

*Neil S. Grigg, Director
Water Resources Research Institute*

We were happy to participate in the planning and arrangements for this initial 208 problem assessment workshop. Section 208 of PL 92-500 has implications for our nation's water quality far beyond the completion of the present on-going studies. This workshop gave us an opportunity to meet and grapple with some of the immediately obvious problems already known. We expect that comprehensive water quality management planning will improve as an art and science in the future and that our initial exercise will be viewed as a first step toward this improvement.

The objective of the Proceedings is to make available to interested persons the results of our meeting. It did not really result in the solution of problems; rather, a great deal of coordination, communication, and identification of issues was accomplished. The Proceedings constitute a record for attendees and others of these accomplishments.

Although the Water Resources Research Institute has received credit for conducting the workshop, the efforts of Mr. Robert Van Tilburg, Chief, Technical Services Branch of the Division of Environmental Management, North Carolina Department of Natural and Economic Resources, and his staff, and Dr. Frank Humenik of North Carolina State University should certainly be noted. They were instrumental in conceiving and carrying out the workshop.



WORKSHOP PURPOSE

James M. Stewart
Associate Director
Water Resources Research Institute

The Federal Water Pollution Control Act Amendments of 1972 are a comprehensive piece of legislation designed to implement a procedure by which virtually all sources of pollution to the nation's waters are to be eliminated and the purity of these waters restored. That Act contains Section 208 which mandates and authorizes funds for areawide management planning for water quality control. A Section 208 effort must develop a management plan to upgrade water quality and recommend the agencies which should be responsible for implementing the plans.

Last year the Division of Environmental Management was given the responsibility for developing a statewide 208 plan by November 1978. Non-point source pollution control is the primary focus of the plan. Among some of the areas that must be considered in this statewide planning effort are non-point sources such as urban industrial stormwater runoff and agricultural, silvicultural, mining and construction runoff.

The 208 plan includes among its technical considerations an evaluation of (1) water quality sampling and analysis, (2) waste load allocations, (3) water quality standards, (4) data base development and maintenance, (5) development of abatement options, (6) water quality management plan maintenance, and (7) water quality management plan development.

Institutional capability to evaluate the non-point source pollution problem and provide a means of implementing structural and non-structural alternative programs of control must be included in the 208 plan. Public involvement to insure maximum state and local level participation in the decision-making process is another important element. Pollution must be controlled at the local level, and maximum citizens' and locally elected representatives' input is necessary and desirable. They should be offered the opportunity to participate directly in these plans designed to improve water quality.

Today's session is being held to encourage communication among those who are directly engaged in non-point source pollution control planning and resource persons who can have important input to the planning effort. It should become obvious that to meet the objectives of Section 208 of the Water Pollution Control Act, a major effort by the Division of Environmental

Management, other state, local, and federal agencies, resource persons, and the public is essential. The primary objective of this session is to mutually explore work requirements and problems that do not appear to be solvable within existing capabilities. To accomplish this we will have, this morning, a series of presentations by individuals responsible for key components of the 208 program who will briefly summarize accomplishments to date, anticipated work procedures and problem areas in which help is sought. It is the final area of problem and needed help that we will be concentrating on today. Most of our afternoon session will consist of open discussion to fully explore these problem areas. As a result of today's workshop, we expect to identify needed work programs, research needs, and possible future training needs.

The workshop provides all of us with a valuable opportunity to jointly participate in discussions concerning this comprehensive and important look at the non-point source problem. I encourage you to participate fully and enjoy the session.

REMARKS

*A. F. McRorie, Chief
Planning and Management Section
Division of Environmental Management
North Carolina Department of Natural and Economic Resources*

First, I'd like to say that we very much appreciate the efforts of WRRRI in setting up this workshop to identify the problems and needs associated with the 208 effort in North Carolina. I would also like to welcome all of the participants here today. Your presence and involvement in today's session will contribute greatly to our long-range goal of fishable and swimmable waters in North Carolina.

From the beginning of the 208 process in North Carolina, we have attempted to provide mechanisms for full participation in the planning process through which the programs which will influence, and be influenced by, the 208 process can be heard.

I will admit that I have great difficulty in comprehending the full scope of 208. I have great difficulty in determining how we will be able to put a plan together which will incorporate the coordination required to make it a good and effective plan. However, I am certain that however we proceed with 208 planning, we will need the full input and participation of each group represented here today. We will strive to establish ways in which that participation can be channeled into, and fully coordinated in, the planning process.

One issue which we have not adequately addressed so far in our program is the issue of local government and regional planning agency participation. These groups must be informed and involved in the planning process if 208 is to be successful.

Another item which should be considered in the areawide planning process is water resources planning. Along this line, we expect to receive funding for a Level B for the Yadkin-Pee Dee River Basin in FY 1978. In addition, a Type IV USDA study is getting underway there. Also, we have already begun distribution of the North Carolina Water Resources Framework Study which is the State's first attempt at a comprehensive overview of all important aspects of water resources in North Carolina. In it we have tried to include some consideration for specific water resource needs--water supply, water quality, flood management, fish and wildlife, and other topics--which have been put into a common framework to guide the State's action through this century. The current

framework study is a working document which will be evaluated and revised after comment has been received over the next year. The study is one step in our progress toward a state water plan.

Again, on behalf of the Division of Environmental Management, I'm happy to welcome you all to this conference. I know that North Carolina's 208 effort will benefit from your involvement.

INSTITUTIONAL PLANNING

*Boyd DeVane
Division of Environmental Management
Water Quality Management Planning Branch
North Carolina Department of Natural and Economic Resources*

I'm going to try to explain what the Institutional Planning Unit is and define its responsibilities. First of all, EPA generally talks about two types of planning in 208. Either technical or institutional. Most planning is technical planning, but that which cannot readily be called technical planning is grouped in the institutional category.

The Institutional Planning Unit is often called the legal, financial, and institutional unit. This originates from the requirements in the guidelines that for every solution or alternative solution there must be (1) adequate legal authority for its implementation, (2) methods to finance its implementation, and (3) institutional organizations or arrangements in existence or will be in existence to assure its implementation.

From the beginning of 208 you've been hearing about all types of requirements which are supposedly in the law and the regulations. If we look at the actual parts of the law concerning these institutional aspects, we find the following stipulations:

Section 208b 2E states that 208 Plan must include:

"(E) the identification of the measures necessary to carry out the plan (including financing), the period of time necessary to carry out the plan, the costs of carrying out the plan within such time, and the economic, social, and environmental impact of carrying out the plan within such time;"

This is important because it clearly does not limit 208 planning to a determination of technical solutions alone. A major ingredient in the Plan is the formulation of an implementation plan. This is made extremely clear in the regulations produced (40CFR part 131) which show the requirements for a 208 Plan. Section 131.11(o) requires the identification of the agencies necessary to carry out each of the provisions of the Water Quality Management Plan. It requires a description of all regulatory programs required to implement the plan including the statutory basis for the program and the relevant administrative and financial needs.

The regulations require additional institutionally related tasks which are to determine the social and economic impact of certain actions. Section 131.11(p)

requires an overall assessment of the social and economic impact of carrying out the Plan and Section 130.17 requires that social, economic, and institutional factors be considered when establishing or changing water quality standards.

Much of this, as explained in the clarification of direction of program which you received, will be the responsibility of the agency budgeted for that certain point or non-point source program. The role of the Institutional Planning Unit will be to coordinate the work of the groups to eliminate duplication of effort, help produce products that can work, and provide assistance when requested.

Now, to get back to what was originally asked of me. What has been accomplished? It is my opinion that our biggest accomplishment was when we decided to allow for the legal, financial, and institutional aspects of the plan to be done by the various groups responsible for the technical planning. We decided that our best possibility of coming up with an implementable plan was not to attempt to do all of this within the Division but let the people who had experience and expertise in these areas be responsible for the total plan.

Now, other than this, in all candor I must admit that as an official group, the Institutional Planning Unit has made very little progress toward developing the institutional aspects of the Plan. There are basically two reasons. One is the hackneyed excuse of a lack of any EPA guidance, which I won't rely very heavily upon; and the other is the totally valid excuse that because of the personnel freeze, we just haven't had anybody to work on it.

Now, the second question is, what we think can be accomplished in the next two years with the present level of technical knowledge? Since the institutionally related work is different from most of the other work being discussed here today, in that the accomplishments of the institutional unit are not directly tied to a certain level of technical knowledge, this question cannot be satisfactorily answered. Accordingly, I cannot accurately list the areas where technical assistance is needed but can provide you with the program areas which I feel need to be strengthened.

The foremost problem confronting the Institutional Planning Unit is determining how to assess the social and economic impact of (a) changes in stream standards, (b) implementation of various plan alternatives, and (c) the impact of implementation of the final plan.

These are new and totally different considerations which heretofore have not been a part of the water quality planning effort, and in order to produce an intelligible and useful product, more guidance must be provided.

PUBLIC INVOLVEMENT

*Todd Llewellyn
Division of Environmental Management
North Carolina Department of Natural and Economic Resources*

This morning I've organized my remarks into three categories--what we have accomplished, what we think we can accomplish in the next two years, and what technical issues we face.

Our accomplishments to date can be divided into three areas. The first, without tooting my own horn, is that the Branch now has on board a person to handle public involvement exclusively. This means that while everyone will have duties in this area, there will be one person with the ultimate responsibility for these efforts. Now public involvement won't be an "add on," something a person untrained in the field has to do in addition to many other duties.

The second accomplishment is that Drs. Davis and Godschaik^{1/} may be funded to do a study of the public participation program of the North Carolina 208 effort. This would be aimed at determining which methods for involving the public are most effective and which are less so. If the proposal is funded, the Doctors have also agreed to give advice and comment on the design of the public involvement program prior to scrutinizing the effectiveness of the methods.

The third accomplishment of the public participation group can best be described as a general "gearing up." We have our Technical Advisory Committee named and are about to have our Policy Advisory Committee "on line" also. We have made contact and given presentations on 208 to several interest groups around the State. Most of our efforts so far have been at one-way communication--telling people what we're trying to do. The future of 208 lies in establishing two-way communication--a real exchange of views. But at least at the beginning, any sort of communication is a step in the right direction.

The biggest single goal of North Carolina's 208 public involvement effort for the next two years will be developing two-way communication with citizens. Finding out what water quality issues are important to local citizens in various areas of our State is the basis for public involvement. Another project will be to coordinate this information with the technical studies also being conducted to see that the concerns of citizens are addressed and that the citizens are aware of what is being discovered about their local bodies of water. Especially important to this effort will be the actions by the Division of Environmental

Management to coordinate 208 activities with local governments--cities, counties and COG's--in the areas which will receive intensive study.

It's hard to pinpoint technical problems with the public involvement program. It's not really the same technical issue as you might face in trying to develop a valid model.

Any science which is at all related to public involvement is a soft science, indeed. The field is very new; and while most everyone agrees that public involvement is of utmost importance, few know what public involvement really entails and fewer still know how to do it.

The nature of 208--that is, the fact that it is a planning process rather than an effort to build a reservoir of something also visible--will make it extra hard to interest people in the effort. We will have to show them how water quality management planning can benefit them. Participation must be in their own interest.

One final point about public involvement--without it, nothing else we do here today will have much meaning. We can develop good models and effective institutional devices to control non-point pollution, but it will mean nothing if we can't convince average citizens that it matters. The real decisions of 208 won't be made by the people in this room but, rather, by representatives of the people in the State's legislature or city councils. If these people don't come to believe in what we're doing, it all goes down the tubes.

208 is worth all of our efforts. We have the tremendous opportunity to make a real difference and to do some real good for the people of North Carolina.

1/ Beginning July 1, 1977, Dr. D. R. Godschalk, City and Regional Planning, UNC-Chapel Hill, project *Evaluation of Public Participation in "208" Area-wide Waste Treatment Programs* will be jointly funded by the Division of Environmental Management and the Water Resources Research Institute.

NATURAL RESOURCES ASSESSMENT

*Alfred M. Duda
Division of Environmental Management
Water Quality Management Planning Branch
North Carolina Department of Natural and Economic Resources*

The Natural Resources Assessment Group will be working closely with the Interagency Planning Group to evaluate the effect that non-point source pollutants have on water quality. We will also be working with the group to assess the impact that alternative control strategies have.

In order to honestly assess the ramifications of these diffuse sources of pollution, we have been exploring methods for determining two key considerations: (1) the capability of different types of land for supporting various activities, and (2) the capability of the stream system for assimilating pollutants resulting from these land use activities.

In determining the capability of land for supporting activities without causing water quality problems, we have looked at combinations of soils, climate, geology, topography, and landform units so that we can relate these groups to water quality responses by their land use. In the coming years, we will need an intensive monitoring effort to develop these relationships. In addition--and this is the key--we will rely on the expertise present on the Interagency Planning Group and the various committees to help us delineate which land uses on which land may cause water quality problems.

We are limited as to what we can do in this area because of three major factors. First, detailed soil surveys will only be available for 20 percent of the State; second, 40 percent of the State does not have 7 1/2 minute topographic maps, and 20 percent doesn't even have 15-minute maps; and finally, remote sensing maps of land use may not be ready for the eastern half of the State until January of 1978 and for the western half until March 1978.

The second part of our charge is to investigate the capability of the stream system--both physically and biologically--for assimilating these pollutants without degradation. It will be important to consider not only the receiving stream but also any downstream reaches, impoundments, or estuaries. We have approached this impossible task by reviewing previous aquatic biological studies in North Carolina and have concluded that much more needs to be done. In our biological sampling, we have used the diversity or mix of bottom dwelling macroinvertebrates to provide an index of biological water quality. We have focused on sampling the U.S.G.S. Clean Water Stations for background

information and on five specific studies dealing with agriculture, silviculture, pesticides in mountain orchards, urban streams, and condominium and road construction. With our present limitations, we might be able to biologically sample five study areas in detail or ten with only limited work.

The truth is, there are huge gaps in our basic knowledge of the biological status of North Carolina's waters. Sediment appears to be the most widespread problem so we are focusing on that. How much sediment can our streams withstand before degradation? How severe is the sediment problem today? We cannot, now, set a suspended solids standard based on scientific, biological evidence. Will background sediment from a century of land abuse exceed the desired standard? Where are the smaller, suspended particles a major problem, and where are the larger, sandy particles a major problem. If we eliminate the fines, will eutrophication problems develop? I propose that we hold a technical workshop on in-stream aspects of the sediment problem as soon as possible.

The Division would like assistance in determining what Congress meant by fishable waters and in identifying exactly in what biological state are our waters today. We would like to see a second technical workshop that would not only bring together information on the state of North Carolina's streams but it would also bring in experts to help us develop a methodology for looking at habitat degradation in various size and gradient streams. The recovery time of degraded streams should also be explored in this workshop. Higher gradient streams probably do recover in the short run, but are they flushing their pollution problem downstream to the lower gradient reaches? Do these lower gradient streams recover, both physically and biologically, and what effect does flow regulation have on their recovery?

On another topic, we can probably make assumptions by using loading functions to approximate downstream contributions of pollutants from upstream sources. But we cannot now separate the biological degradation which occurs downstream because of one source from that which occurs because of another source in complex watersheds. I would suggest a third technical workshop which would focus on the methodology for differentiating between the chemical and biological degradation caused downstream from different upstream sources in complex watersheds. This would run the gamut of pollutants from sediment to pesticides to nutrients and organics. This workshop would also cover predictive methods for assessing downstream recovery following the elimination of certain amounts and types of pollutants from these upstream sources.

We do not know a great deal about the biological integrity of North Carolina's streams. However, we will all soon find out that biological considerations will become the focus of our 208 efforts.



CLASSIFICATION AND STANDARDS

*David C. Park
Division of Environmental Management
Water Quality Management Planning Branch
North Carolina Department of Natural and Economic Resources*

The North Carolina Water Quality Standards program will play an important role in the 208 Planning effort. The review and revisions of the Water Quality Standards in the early stages of 208 Planning will provide a framework for establishing minimum water quality goals for which control measures must be devised. The 208 Planning Process will provide information and guidance which will be instrumental in developing further water quality standards revisions where necessary to attain the goals of the 1972 Federal Water Pollution Control Act Amendments. The close interaction between 208 Planning and standards revisions will be essential in the development of reasonable standards that will provide for the maximum attainable protection of the State's waters.

The water quality standards review process is well underway. On January 31 of this year a first draft of proposed revisions was completed and distributed in-house for staff review and comment. A second draft is currently being prepared and when completed, will be distributed for inter-agency review. Public hearings are tentatively scheduled for the latter part of July of this year for public comment on the proposed revisions. As a result of responses to a questionnaire sent to various city, county, regional, and State health departments, recreational departments and other agencies, as well as environmental groups and other persons, 177 stream segments have been identified which are currently being evaluated for possible reclassification to Class "B" in order that the waters will be protected for water-body contact recreation activities such as swimming, skiing, skin diving, etc. It is anticipated that upon completion of this review process that approximately 100 stream segments will be presented at the July public hearing with the proposal that they be reclassified to Class "B."

Other planning activities scheduled for the next two years include:

1. Development of an implementation procedure for the Antidegradation Policy.
2. Identification of Outstanding National Resource Waters in North Carolina on which no degradation shall be allowed.
3. Development of maximum flow and rainfall conditions above which certain standards will not apply.

4. Development of drainage area specific standards for parameters subject to regional background variations.
5. Development of standards to address eutrophication and over-enrichment problems in our lakes, sounds, and estuaries.

Several difficulties have been encountered in the process of developing water quality standards to control eutrophication and overenrichment. Obviously, the intent of such standards is to prevent the proliferation of algae and other aquatic plants beyond the point where they become offensive or harmful to the aquatic community. This is usually accomplished by limiting nitrogen, phosphorous, or both. Establishing a uniform statewide standard for these nutrients becomes impractical for several reasons:

1. Algae growth is dependent on many other conditions such as hydrologic retention time, water transparency, other nutrient sources and sinks, and availability of other nutrients.
2. In some cases it may be necessary to control only the limiting nutrient.
3. Background nutrient levels vary across the State.

For these reasons, the staff is now considering the establishment of a standard for chlorophyll-a. Maximum levels for nitrogen and phosphorous will then be determined on a case-by-case basis by the department using mathematical models, field investigations, and professional judgment.

The technical assistance needed by the staff is as follows:

1. Is the chlorophyll-a standard a reasonable approach? If not, what other approach should be investigated?
2. What numerical standard for chlorophyll-a should be applied?
3. What procedures should be followed in determining, on a case-by-case basis, the nitrogen and phosphorous levels which will maintain the chlorophyll-a level within the numerical standard?
4. Is it necessary to establish a water quality standard for the control of rooted aquatic plants? If so, what standards approach should be used?

Another water quality standard under investigation relates to suspended solids control. It has long been recognized that excess suspended solids deplete fish populations or inhibit fish growth rates by inhibiting sight feeders, weakening fish to a point where their resistance to disease and other toxicants is lowered, chock fish spawning grounds, and modify natural movements and migrations of fish. We believe it is essential that suspended

solids standard be established which will control the introduction of suspended solids to the aquatic system from land clearing, mining and dredging activities, point source discharges, and other sources.

Two major problems arise when one attempts to develop a numerical limit for suspended solids.

1. Natural background levels vary throughout the State. A reasonable limit for the mountain region would be unattainable in Piedmont streams such as the Yadkin River. An attainable standard for Piedmont streams would not protect the mountain trout fisheries, and
2. Suspended solids concentrations increase dramatically during rainfall events. It is not practical to require land activities to be controlled to a point where no increase in suspended solids occurs during rainfall events; yet, a practical standard that could be achieved during wet weather periods would not provide for adequate control of other sources of suspended solids.

The staff is currently evaluating the possibility of establishing a dry weather standard and a wet weather standard as well as more stringent standards for Trout Waters.

Several technical problems exist in this approach. They involve the determination of:

1. wet and dry weather numerical standards for Trout and Non-Trout waters,
2. flow or rainfall conditions under which the wet weather standard would apply, and
3. should a flow or rainfall event be specified under which no suspended solids limit would apply.

The third area in which technical assistance is needed involves the evaluation of the social, economic, and environmental impact of the implementation of the proposed water quality standards. There are three areas of particular concern in this regard:

1. Recognizing that there are limitations on time and resources, how does one evaluate the economic cost to industries, municipalities, and the citizens, required to achieve the new water quality standards.
2. Once the benefits are defined, how can they be compared to the cost? Due to the intangible and unquantifiable nature of most

environmental benefits, expressing benefits in dollars is virtually impossible. What is the dollar benefit of a mesotrophic lake versus a eutrophic lake? What is the dollar benefit of reducing the suspended solids concentration in the Yadkin River by 50 percent?

3. What other environmental problems will result from more stringent control of a particular pollutant, such as increased energy requirements, air pollution, solid waste disposal, and chemical reagent production.

A strong water quality standards program is essential if the quality of the waters in North Carolina is to continue to improve. However, water quality standards must be established at reasonable and attainable levels or else the water quality standards will become counter-productive and unusable as a planning tool.

INTENSIVE FIELD SURVEY

J. M. McCarthy
Division of Environmental Management
North Carolina Department of Natural and Economic Resources

A basic premise of the 208 effort has been that the Plan should be formulated on as sound a data base as possible. For this reason, a portion of the 208 funding has been allocated to field studies. The purpose of the Intensive Survey Group is to determine the nature and extent of pollutants due to both point and non-point sources.

We have been developing a point source survey capability for the past three years. Most of these surveys are done to calibrate and verify models for wasteload allocations. Several types of studies are done, including time-of-travel studies with water quality sampling for determining decay rates and reaeration rate (K_2) studies. Many of the field techniques learned for point sources can be applied to non-point source studies.

We are just moving into the intensive data gathering portion of the non-point source activity. Given time and manpower limitations, it will be impossible to study total pollutant loads across the State. We will instead study a limited number of catchments which have particular land use types. On the order of 10 stage-activated automatic sampling stations will be set up with corresponding recording rain gages. Water quality samples will be taken throughout the hydrographs of storms of various intensities and durations.

The major accomplishments to date in non-point studies center around training new personnel, obtaining equipment, and locating potential sampling points. In this latter regard, we have relied heavily on the Triangle J urban studies. At the present time, we are instrumenting four urban stations including three which were sampled by Triangle J. As part of the urban program, we will also be doing extensive D.O. profiling of the Neuse River, beginning in May. A street solids sampling program will begin in the summer, including an evaluation of urban BMP's such as street sweeping, vacuum cleaning, and the use of catch basins. Some particle size work will be done on the solids. Tom LaPointe and Dave Moreau of UNC have been giving us guidance in setting up the urban studies program.

In our rural studies we will rely to a large extent on the Phase I outputs of the responsible State agencies. We also hope to make use of the NCSU report, "Pollution from Rural Land Runoff" (EPA R80 3328-03-0). Recently,

the possibility of missing a key sampling period this year has arisen because of delays in the 208 schedule. For this reason, two agricultural catchments have been selected and are being instrumented: a high activity piedmont drainage area with some existing records and an area with a high percentage of the total apple orchards in the State. Storm event sampling on selected urban and rural catchments will begin in May.

Accomplishments in the biological program include preliminary sampling at potential stations, and acquisition of equipment. Because we have only one biologist, it is necessary to concentrate mainly on macroinvertebrates as indicators. Over the two-year period we hope to define the effects of 10 drainage areas of different land use on the macroinvertebrate population.

Technical assistance is needed in the evaluation of BMP's to aid the participating agencies in their Phase II-III 208 outputs. With a non-point source staff of five for field studies, DEM will at best be able to evaluate only a few BMP's.

Cooperation will be needed in the evaluation of data from the urban and rural studies. At this time, it is difficult to predict the extent of such need. In studying certain BMP's, the distribution of pollutants by particle size in runoff and receiving streams are needed. Techniques for doing this sort of work on the silt-clay fractions are lacking.

In general, information is lacking on macroinvertebrates native to various areas of the State. For example, our biologist is supplying the State Museum of Natural History with a reference collection. A survey modeled after the famous "Illinois Natural History Survey," only on a smaller scale, may be what is needed. Furthermore, the effects of sediments, heavy metals, pesticides, and oxygen deficit on native macroinvertebrates should be determined in more detail than our biologist will be able to do.

The field staff welcomes any comments and suggestions that will aid in the data-gathering effort.

MODELING AND ALLOCATIONS

*R. F. McGhee
Division of Environmental Management
Water Quality Management Planning Branch
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The Modeling and Allocations Unit has historically worked on discharges from point sources. The development of waste load allocations for point source discharges is an integral part of the 208 Plan. The development of up-to-date point source allocations was initiated in February of 1976 and is scheduled for completion in October of 1977. The majority of the allocations are for protection of stream dissolved oxygen levels. Some toxics are allocated; however, controls over nutrients have not been required.

In the development of point source allocations, many differences of opinions occur between the State and groups receiving allocations. During the past few years, the impact of nitrogenous BOD has been one of the more controversial topics. Despite over 50 years of study, agreement among professionals is still elusive. The need for further study has been the one area of agreement. At the present time, Dr. Donald Francisco of UNC-Chapel Hill is completing a study of the occurrence of nitrifying bacteria in several North Carolina streams. This study, while providing further knowledge, will need additional follow-up. One puzzling phenomena concerning nitrogen in streams is the disappearance of organic and ammonia nitrogen without an increase in nitrites and nitrates. Although it appears to be the result of denitrification, sufficient evidence has not been presented to draw indisputable conclusions.

The problem of excessive nutrient enrichment of streams, lakes, and reservoirs has in the past been only discussed. Most everyone is aware and concerned over nutrients; however, the development of a program to control nutrients has prevented abatement. Two main factors, a water quality standard and an adequate modeling technique, have kept North Carolina as well as other states from effecting a program of nutrient control. A water quality standard for controlling nutrients in lakes and estuaries which seems most logical would be to limit levels of algae or chlorophyll-a. Although this approach is not a biologist's dream, it has many advantages. The modeling approaches developed to date trend towards predicting these parameters, and measurements of these parameters are made routinely by water quality investigators. Control of rooted aquatic plants has also become apparent from the situations that have developed in many North Carolina impoundments.

The recent litigation over the proposed Jordan Reservoir serves as an example of the need for nutrient standards and adopted modeling techniques at the state level. Until a program is developed, control of discharges causing existing nutrient problems will continue to go unchecked. In addition, proposed water resource and waste treatment projects will continue to add to nutrient problems unless a program which will serve as a basis for State decisions can be developed. It is obvious that control of nutrients will have to be aimed at both point and non-point pollutant sources.

The control of point source toxic waste discharges can be attained through the NPDES permit program. The permit program can only be as effective as the water quality standards and allocations that serve as the basis for permit limits. The current water quality standards are difficult to utilize in the control of metals, pesticides, and other toxics. We need to expand and clarify our water quality standards for toxic materials so that a more effective program can be implemented. In the area of non-point sources, potential problems need to be investigated and abatement actions required where necessary.

The concept of allocating non-point source waste loads is difficult to perceive. It would appear best to implement management programs which would abate problem non-point source pollution after establishing probable cause of the problem and investigations into management techniques. To run a program with any similarity to the point source permit program appears impractical for control of non-point sources. We are charged with requirement of investigating alternatives and could benefit from suggestions.

NONPOINT SOURCE MODELING

*Dean Cunningham
Division of Environmental Management
Water Quality Management Planning Branch
North Carolina Department of Natural and Economic Resources*

Since with the time and money available it is impractical to monitor all the situations statewide that might influence non-point pollution, the choice was made to attempt to monitor homogeneous land uses at different activity levels and to calibrate a model to simulate the recorded field data. Our first goal, then, was to determine the cause and extent of non-point pollution on selected watersheds and to determine what type of watersheds to sample.

The sampling and modeling work done by TJCOG 208 Program was, particularly helpful to us in this area. Through field investigation of TJCOG sites and review of the modeling results, the realization was soon made of how extremely important it is to be aware of all influences on the chosen watersheds. On large study areas there is a tremendous amount of policing necessary to be aware of a typical influence; also, it is harder to know what occurs there normally. Therefore, by staying with smaller size watersheds we will obtain more complete knowledge and control of the test watersheds and will establish more accurately a cause-effect relationship. We have had a considerable amount of difficulty in finding homogeneous watersheds in the field; however, we have selected some sites and feel we can obtain useful results from these sites. For the other categories, such as agricultural and silvicultural, sites will be chosen by the task forces in charge.

Our main task presently in the Non-point Modeling Group is becoming aware of and familiar with the existing non-point pollution models. Also, Dr. Moreau and Mr. Tom LaPointe at UNC-Chapel Hill are developing and refining models that will be useful in our urban non-point modeling program. We are not just looking at one type model but are trying to be prepared to use a range of models. Some of the models are only capable of gross assessments of non-point loads while others are intricate enough to model loads to the stream and in the stream impacts. Presently, we are not sure how much modeling will be required but would like to be prepared for whatever our sampling results suggest.

One area of concern to us in assessment of our future modeling results is the statistical confidence we can expect from the sites we have (and will select) and the types and frequencies of samples collected. It would be nice

to be able to set up a sampling program and predict the confidence limits possible from our model and to compare costs and increased confidences in decision-making processes.

We monitor and model based largely on chemical constituents with coordinate biological monitoring where possible. A better understanding of chemical-physical-biological relationships, in stream, is most important. For instance, if we are capable of clearing up high chemical levels in a stream, will the stream then be capable of substantial biological activity? Or are some streams irretrievable or too costly to retrieve? This is a technical problem we might be confronted with and will need additional information and understanding to tackle.

In our sampling program an attempt has been made to be as aware of (and able to quantify) all influences in each watershed sampled. One problem we are encountering is that of stream scour/slump. We would like to be able to determine if scour/slump is an appreciable addition to non-point runoff loadings; also, not only its effects quantitatively but also qualitatively.

After we have defined and quantified storm-related problem areas, we would like to be able to present effective abatement techniques to the public. Since much of our sampling time will be spent in development of non-point load definition, we will not have the time to adequately research all best management practices available. Much research needs to be done to compare costs and effectiveness of different best management practices with special regard to the best management practices' effect on all water quality constituents, not just the one to be limited.

TECHNICAL PLANNING

*Alan Klimek
Division of Environmental Management
Water Quality Management Planning Branch
North Carolina Department of Natural and Economic Resources*

So far, the Division of Environmental Management has done most of the talking, and it is in this second portion of the morning session that the participating agencies discuss their accomplishments, both real and projected, and also their problems--which I am certain are all very real and, in fact, are the very reason this workshop is being held. It is possible that some of these problems are actually misunderstandings or confusions on some particular aspect of the 208 program. Many of these types of problems can be cleared up today, and this alone would demonstrate that the workshop has served a useful purpose. But more importantly, if by the time this workshop terminates we have summarized and categorized these numerous real technical problems that loom before us, this workshop will have been a success. It is only by identifying these weaknesses in our program that a truly reasonable and realistic approach can be jointly decided upon--and I emphasize jointly.

In regard to the Technical Planning Unit, without a doubt the major accomplishment to date has been the formation of the 208 Interagency Planning Group. Each of the budgeted agencies in this group will be making a brief presentation this morning. Several of the non-budgeted members of this group are also present and, hopefully, will be very active in the discussion sessions that are to take place this afternoon. To date, this group has not been functioning at full speed mainly because of the Governor's freeze on the hiring of new personnel already mentioned by Boyd DeVane. But all the memoranda of agreement and memoranda of understanding have now been signed, and I am confident that Phase I will be completed by August 1. (Perhaps before making such a bold statement I should hear what the other agencies have to say.)

As far as what can be accomplished in the next two years, and Mr. Van Tilburg said "we have no choice but to say that a statewide 208 Plan, addressing the eight major non-point source categories, will be produced by November 1978." The level of detail with which each category is addressed should be the maximum allowable under the severe resource and time constraints placed upon us. If we have reasonably proven to ourselves that certain management practices are needed, means for implementing them should be included in the final document. If more study is needed or cost incentives must be developed before certain Best

Management Practices can be required, the plan should state this fact. But whatever the level of detail, it should be a plan that all the participating agencies are satisfied with, one which defines the direction of the continuing 208 Planning Process and provides the cornerstone to build upon.

As far as listing the problem areas in which technical assistance is needed for Technical Planning Unit, two areas come to mind. The first is how are we going to determine the non-point source wasteload allocations to be made between the various categories of pollutants when two or more different categories contribute to a specific water quality problem. As an example, let us suppose a particular watershed consists of several point sources of discharge and numerous small farms. Further, suppose this watershed drains into a reservoir that is on the verge of becoming eutrophic, choked with algae. We determine that the only way to prevent this is to reduce the annual phosphorus load by 50 percent, and we further determine that agriculture contributes one-half of this load and point sources contribute the other one-half. Do we ask point sources to treat and remove all of their phosphorus? Do we ask agriculture to remove all of their contribution? Do we recommend a mix? Perhaps both categories can show that it's too expensive for either one of them to remove any significant amount. We could use technical assistance in developing an equitable method of accomplishing this task.

The second problem, while not so technically oriented, may be one that could benefit from a workshop or workshops, and that is the problem of how to keep the non-budgeted agencies truly involved and cognizant of the 208 process. There is no question but that every agency listed as a member of the 208 Inter-agency Planning Group should be budgeted and involved. They would not be listed if they were not affected by the program and if 208 could not benefit from their participation. While regularly scheduled meetings may be a step in the right direction, I cannot help but feel that a slightly different approach may be more effective.

With that, I'd like to turn the program over to Whit Collier, who represents the Division of Forest Resources.

INTERAGENCY PLANNING

Whit Collier
Division of Forest Resources
North Carolina Department of Natural and Economic Resources

A. Accomplishments

The Division of Forest Resources designed and distributed a questionnaire which will inventory forestry activity by counties throughout the State. Distribution was made to:

1. Each county forest ranger
2. Major forest industries with significant forestland ownership in North Carolina.
3. Federal and State agencies with significant forestland holdings in North Carolina.

Questionnaires are intended to collect information regarding type and level of forestry activity including:

1. Harvesting
2. Site preparation
3. Type of equipment used for logging and site preparation
4. Debris placed in streams by poor forestry practices
5. Use of fertilizers
6. Use of herbicides and insecticides
7. Industrial and other agency feedback on 208 planning
8. Quantity of water pollution directly caused by certain forestry practices.

Questionnaires have been received and are being tabulated.

B. Accomplishments within two years

We will be able to identify best management forestry practices. In many cases BMP's already exist and are being used. These BMP's will vary depending on topography, soil type and region.

Inventories will be conducted and evaluations made leading to silvicultural BMP's for various soil types, sub-basins or regions. Achievements should include (1) increased interest in pollution abatement relative to forestry practices by forest landowners, forest operators, forest industries and the general public, (2) some quantifying water pollution data by BMP's, and (3) a schedule of continued 208 silvicultural planning.

C. Problem areas

1. Sediment yield ratio
2. Chemical yield evaluation
3. Quantify yields by BMP and by soil types or regions.



GROUNDWATER

I. I. Laymon
Groundwater Section
N. C. Department of Natural & Economic Resources

A. Accomplishments to Date

1. Groundwater Classification and Standards

A prerequisite to establishment of regulations for the protection of the groundwater is the development of a groundwater classification system.

The Groundwater Section has been working for several years on a workable classification system. With the assistance of other state and federal agencies, we have developed a system which we feel will fit the needs of North Carolina.

A public hearing will be held this summer on the proposed regulations.

2. Sub-Basin Priorities

The Groundwater Section is developing a system for ranking each of the sub-basins for the purpose of selecting a study area.

Factors to be used in ranking the sub-basins include:

- a. Availability of hydrogeologic and groundwater quality data.
- b. Potential for groundwater contamination.
- c. Ground and surface water classifications to be protected.
- d. Water supply potential of the area.
- e. Degree and effect of groundwater development.

B. Anticipated Accomplishments in the Next Two Years with the Present Level of Technical Knowledge

1. We do not have sufficient groundwater quality data available to develop BMP for groundwater protection.

During the next two years we will collect geologic, hydraulic and quality data in the area(s) selected for study. Based on the information obtained, we will attempt to assess the pollution potential of the area and apply the knowledge gained from this study to develop monitoring requirements for other areas of similar hydrogeological conditions.

C. Problem Areas in Which Technical Assistance is Needed

We have not, to date, given much thought to problem areas requiring technical assistance.

A major problem will probably be resource limitations. Physical and chemical analysis of the field data will be of major concern.

We can possibly use the assistance of the WRRRI in studying the reaction of different soils when loaded with different type pollutants. Also, there will be a need to develop a modeling system for projecting the impact in groundwater quality from pollution source densities under different hydrological conditions.

HUMAN RESOURCES

*James F. Stamey
Assistant Chief
Sanitary Engineering Section
Division of Health Services*

I thought it might be of interest and help to acquaint you with some of the responsibilities of the Division of Health Services so that you would know why our agency is participating in the 208 Plan development. First of all, we are the regulatory agency for solid waste systems and landfills. Secondly, we are the state regulatory agency for septic tank systems of less than 3000 gallons capacity which discharge underground. This responsibility is implemented by a cooperative program with the local health departments. Thirdly, there are other areas of interest and responsibility in which we may be able to assist the rest of the 208 group such as in the implications of the Federal Safe Drinking Water Act, A-I watersheds, shellfishing areas and perhaps others.

In relation to these things, I must admit that our accomplishments toward the 208 effort are minimal to date. However, we have prepared a statewide solid waste management plan and a county plan for most every county. Also, we have finally completed a new set of regulations for septic tank systems which is for the most part the same regulations used by the Division of Environmental Management. These documents will be most helpful in defining the best management practices for solid wastes and septic tank systems. As far as specific 208 accomplishments are concerned, we have entered into an agreement with Environmental Management to fund a position on our staff to work on the 208 plan development. We do not at this time have a person on board to do this work.

Accomplishments in the Next Two Years

There is not expected to be a great deal of problem regarding the septic tank question on a statewide basis. However, there will be some local and regional problem areas where water quality is effected. With the probable exception of some coastal counties and a few other areas, we anticipate that this portion of the 208 Plan can be completed on schedule. Likewise, since there are so few sanitary landfills in operation, no major difficulties are anticipated in this area.

Problems

We do anticipate problems in regard to certain developments because they are developing now and are to some extent beyond our control at present. For

instance, P.L. 94-580 is the Federal Resource Recovery Act which amends the Federal Solid Waste Act. Also, there is the Hazardous Substances Act. Under these new acts, new programs are being developed along with new definitions. It is definite that these developments will have major impact on our existing solid waste program scope. The definition of solid waste is expanded to include almost everything that doesn't go up the smokestack or out through the liquid discharge system such as sludges removed from the liquid waste stream. Certain wastes are excluded such as animal wastes. Close coordination in developing the State's program between us and Environmental Management will be critical.

Also, there is the groundwater resources protection program required by the Federal Safe Drinking Water Act. The State's position on this new federal requirement is not yet developed. However, it is certain that EPA will require that this be considered in developing the 208 Plan.

I think that wherever possible, it will be necessary to have access to the water quality data already accumulated by Environmental Management to evaluate areas where water quality problems are already identified because time and laboratory facility constraints will limit our ability to do field study and sampling for very many watersheds.

Finally, there is underway in certain areas experimental evaluation of alternative designs to standard septic tank systems. The problem associated with this is, of course, one of time. It takes years to properly evaluate such systems.

I am sure that there are many more problems ahead which we have not identified and may be even more difficult than those I have mentioned.

208 INPUT OF THE LAND QUALITY SECTION

James C. Simons

Division of Earth Resources

North Carolina Department of Natural and Economic Resources

I. Accomplishments to Date

The Land Quality Section is responsible for administering two laws relating to erosion control, The Mining Act of 1971 and The Sedimentation Pollution Control Act of 1973. Therefore, the Section's involvement to date with the 208 program has been erosion and sediment control for mining and construction activities, and man-made channel modifications either intentional or accidental. Accomplishments to date include:

- A. Review, approve, and comment on approximately 100 erosion control plans per month for construction sites.
- B. Inspect approximately 325 construction sites per month to insure compliance with erosion control plan.
- C. Inspect approximately 60 active mining operations per month to insure that precautions are being taken to prevent or minimize offsite sedimentation.
- D. Assist in implementing 37 sedimentation control local programs throughout the State giving sediment control enforcement to most of the more populated cities and/or counties. Review existing local programs.
- E. Interview prospective engineer to coordinate 208 Land Quality Section program.

II. Anticipated Accomplishments

In the fiscal years 1977-78 and 1978-79, the Section anticipates that it will increase the number of on-site inspections of mine and construction sites by 20 percent and implement additional local sediment control ordinances where needed as well as monitor the enforcement of existing ordinances to insure compliance with State standards. The section will also work with the Soil Conservation Service and other agencies to estimate quantitatively the amount of existing sedimentation pollution and the amount of damages caused by sedimentation pollution caused by mining, construction, or hydrologic modification activities.

III. Areas Where Technical Assistance is Needed

Technical assistance is needed to determine the character and amount of stream sedimentation that is the most damaging. Further research is also needed to determine the erodibility of surface soils. The present soil loss equations were based on the A & B soil horizons whereas the C horizon is the chief source of sediment at mine and construction sites.

The magnitude and extent of parameters causing streambank degradation should be studied. Such parameters include:

- (1) Velocity of flow
- (2) Duration of flow
- (3) Frequency of flow

Possible design techniques to prevent the degradation from these factors need to be determined.

Finally, a Statewide assessment of mine waste types, volumes, disposal practices, and waste stabilization should be made.

AGRICULTURAL TASK FORCE

*S. Grady Lane
Soil and Water Conservation Commission*

The North Carolina Soil and Water Conservation Commission is charged by State law with the responsibility of developing and implementing a statewide soil and water conservation program working through the State's 92 Soil and Water Conservation Districts. With this in mind, the North Carolina Division of Environmental Management delegated statewide planning responsibilities for non-point source pollution resulting from agricultural activities to the Commission on September 24, 1976. In this agreement was an endorsement and pledge of support to the Commission and the Districts from the following agencies:

1. The North Carolina Department of Agriculture
2. The USDA - Soil Conservation Service
3. The North Carolina Agricultural Extension Service
4. The North Carolina Farm Bureau Federation
5. The North Carolina State Grange

referred to as the 208 Agricultural Task Force. An amount of \$400,000 was received in March 1977 by the Commission for the purpose of developing such a plan. Formal agreements with the previously named agricultural agencies for technical planning studies on agricultural pollutants were entered into on April 1, 1977. The Commission will be responsible for coordinating planning efforts and assembling the inflow of technical studies from the various disciplines into a singular product specified by the Division of Environmental Management.

The Commission feels that with the expertise of the 208 Agricultural Task Force that it can achieve the requirements of the 208 agricultural plan by November 1978. We have just yesterday received the first monthly status report from the Task Force agencies. We are pleased with their progress.

Probably, the most perplexing problem that the Commission will face in the role of coordinator is the consolidation of incoming technical studies from the various agencies into one resulting study in a form with all required output. We foresee this problem especially in the Phase I study. Can a standard rating system be developed for the 128 drainage basins in reference to agricultural pollutants? If so, how should each of the three agricultural pollutants - sediments, pesticides, and nutrients - be weighted against each other in the final analysis? Although we do not know all the answers at this time, we are

actively pursuing them. We encourage research in the management of technical studies such as 208 and would consider this and the research requests of the Task Force agencies as being of great benefit to us.

EROSION AND SEDIMENT INVENTORY

*James H. Canterbury
State Resource Conservationist
USDA Soil Conservation Service*

The Soil Conservation Service in cooperation with soil and water conservation districts in North Carolina will conduct an erosion and sediment inventory (EASI) for 128 sub-basins delineated by the North Carolina Department of Natural and Economic Resources. This study is part of SCS's assistance in developing the State's water quality management plan under Section 208 of Public Law 92-500 for non-point sources of pollution. The Erosion and Sediment Inventory will be coordinated through the Agriculture 208 Planning Group that is chaired by the North Carolina Soil and Water Conservation Commission.

The Erosion and Sediment Inventory will include all sources of sediment, both agricultural and non-agricultural. This will include cropland; pasture; forest; urban and built-up; roadsides; streambanks; construction sites; surface mines; gullies; and sound, river, and reservoir shore erosion. The 208 EASI will be coordinated with the National Erosion Inventory.

The Universal Soil Loss Equation (USLE) with North Carolina Factor Values dated October 1976 will be used for developing gross erosion for sheet erosion on cropland, pasture, forest, urban and built-up, surface mines, and construction sites. Streambank, roadside, and gully erosion will be determined by lateral recession.

Field sampling will be done to determine necessary data to compute erosion. The statistical laboratory at Iowa State University has drawn a one percent sample of the 1967 Conservation Needs Inventory plots. There are 160 acres in each plot. The statistical laboratory will tell us what CNI plots and what specific points within these plots to sample. At each of these points, field technicians will gather data that will be used for the factor values in the Universal Soil Loss Equation. A two percent sample will be made for roadsides and streambanks and a five percent sample for construction sites, gullies, and surface mines. When completed, we will attempt to rank the sub-basins into four or five categories from best to worst.

All sections of Public Law 92-500 are supposed to lead us to the common goal of improved water quality where attainable by July 1, 1983. This interim water quality goal is normally referred to as fishable and swimmable water. Section 208 of the act requires a plan to be developed under areawide waste

treatment management planning process that shall include a process (1) to identify, if appropriate, non-point sources of pollution, and (2) set forth procedures and methods including land use requirements to control, to the extent feasible, such sources.

During Phase II of the 208 planning process, SCS will study the existing land management practices on agricultural land in the high priority water quality limited sub-basins as determined by the Division of Environmental Management. SCS will develop alternative systems of best management practices needed to reduce erosion to given levels and determine cost of these best management practices for the different alternatives.

Maybe the No. 1 limiting factor in developing a good 208 plan is that of time. The deadline of November 1, 1978, to have a 208 plan developed does not allow much time. I think we all recognize that 208 planning is a continuing planning process. Planning certainly will not be completed by the above date.

Problems

We in the Soil Conservation Service feel research is sorely needed to determine the cost effectiveness of best management practices on reducing sediment pollution from non-point sources. We have been using the Universal Soil Loss Equation for many years in computing soil loss. We have in our technical guides standards and specifications for many conservation practices which we know will reduce soil loss to an allowable limit and are proven conservation practices from the standpoint of economics and reducing erosion. However, we don't know how effective these same conservation practices such as filter strips and waterways, that you are all familiar with, will be for improving water quality from a standpoint of reducing sediment, pesticide, and nutrient pollution. There is limited research on the effectiveness of filter strips and filtering out sediment. I believe that we have only touched the surface when it comes to knowing the effectiveness of best management practices in improving water quality.

Several years of monitoring will be required to determine the effectiveness of best management practices. Is the State going to require best management practices for only those sub-basins that are water quality limited or will best management practices first be applied along the streams throughout the State? If farmers are required to install BMP's to protect public waters, is there going to be cost sharing available to implement these BMP's?

ANIMAL WASTE, FERTILIZER AND DRAINAGE

*F. J. Humenik
In Charge, Extension
Biological and Agricultural Engineering
North Carolina State University*

Accomplishments to Date

A work group consisting of five faculty members, two research assistants, and supporting hourly labor has been assembled to develop the plan of attack and begin execution. The faculty members and research assistants have experience in the areas of animal waste, fertilizer, and drainage as it applies to surface and groundwater quality. Hence, all positions defined in the memo of agreement are filled, and the total work team is operational.

A questionnaire has been sent to each county extension person requesting technical data relating to project objectives and personal observations concerning current water quality and projected goals. A follow-up session was held at the State Extension Conference, and efforts to finalize collection and display of this data are nearing completion. This questionnaire and follow-up session with the representative from each county extension staff, as well as state specialists, served both to retrieve information on a statewide basis and set the basis for public participation programs, as well as to update the extension staff on the 208 process.

The general approach is to evaluate intensity of agricultural activities on a county-by-county basis. The agricultural intensity indices will then be refined to a subbasin-by-subbasin evaluation. This intensity ranking will then be compared with existing water quality data from NER and USGS and all other sources such as relevant research projects and WRRRI reports.

Work is now in progress to develop a rating system to determine potential water quality limitations resulting from agricultural activities to be used instead of priority ranking for all 128 subbasins. A method to translate countywide data to subbasin units which is based on land mass rather than total area (which includes substantial amounts of water in some areas of the State) is being developed.

Anticipated Work Procedures

The production intensity-water quality relationships will be developed for each work area; i.e., animal waste, fertilizer and drainage on a subbasin-by-subbasin unit normalized to total land mass. Anomalies between intensity

and water quality indices will require further investigation. Ultimately, results for animal waste, fertilizer, and drainage impacts on water quality will be coordinated into one ranking scheme which uses the grading basis rather than a priority for all 128 subbasins.

Problem Areas in Which Help is Sought

1. Our major concern is the request to develop a numerical priority listing for all 128 subbasins for the three elements in our work assignments: animal waste, fertilizers and drainage. Such a refinement is not technically justifiable and would consume a disproportional amount of time and energy because of the elusive nature of the current state-of-the-art. Therefore, a grading scale of 1-5 is recommended so that more effort could be expended on determining the relative impact of all agricultural activity in a manner that would be technically feasible and of use to people and agencies interested in 208 planning.
2. Several questions exist as to the method of comparison. Will water quality be measured on one scale statewide or will regional ambient qualities be the method of comparison?
3. Will long-term average concentrations or mass transport be more important in determining potential water limitations due to agriculture? More specifically, what importance is given to steady-state stream conditions versus rainfall-runoff transport?
4. The problem of defining impact on a subbasin unit is that most available data is by county accounting; and thus, it does not seem appropriate to linearly extrapolate this information to subbasins, particularly when some of the subbasin units may contain large water areas.
5. The ability to exclusively determine the impact of agriculture throughout a total subbasin remains difficult because it is virtually impossible to separate out the effects of point sources and agricultural inputs as they integrate throughout a stream reach.
6. The overriding concern continuously expressed is that insufficient data and basic understanding of fundamental processes are real and, thus, represents a major problem, but this should not invalidate the total process. Therefore, it is proposed that more applicable stream sampling data be procured and areas in which insufficient understanding exists be identified as requiring further research in the final report regardless of resistance from regulatory agencies.

SUMMARY OF PENNSYLVANIA COMPREHENSIVE
WATER QUALITY MANAGEMENT PLANNING PROCESS (COWAMP)

*Ken Bartal, Chief
Comprehensive Water Quality Management Planning
State of Pennsylvania*

Mr. Bartal provided an overview of the operation of the Pennsylvania Comprehensive Water Quality Management Planning Process (COWAMP). Rather than present his full remarks, a summary of the COWAMP itself is presented.

Objective of COWAMP Study

The overall objective of the COWAMP effort is to establish a sound, long-range basis for water quality management for the protection of Pennsylvania's waters. The planning effort involves carrying out nine studies which will determine methods to be implemented for the enhancement of surface and groundwater quality throughout the State. The studies will recommend plans to meet both short-term needs and projected growth requirements in the study areas.

The COWAMP study will encompass municipal and industrial wastewater collection, conveyance, treatment and disposal, abatement of combined sewer and agricultural pollution, maintenance of groundwater quality, acid mine drainage, and the disposal of sludges and other process by-products. It will inventory and define the pollution problem posed by each activity, identify the engineering, management, institutional and financial alternatives and recommend an implementable program to achieve water quality and environmental objectives in the study area. In cases where identification of specific solutions is not possible, recommendations will be made for additional special studies required to support COWAMP activities.

The COWAMP study will establish priorities and time schedules for all recommended activities in three categories: (a) actions required immediately to solve present problems, (b) actions to achieve short-term objectives, and (c) actions recommended to accomplish long-term objectives.

For categories (a) and (b), the study will assign responsibility for required action to existing organizations or will recommend the establishment of new organizations to achieve the recommended objectives when this is advantageous. When new organizations are recommended to be established, the required agreements, approvals, and the steps leading to creation of the new organization are to be delineated.

To accomplish immediate and short-term objectives, the COWAMP study will identify the existing wastewater treatment facilities which are to be abandoned, expanded or upgraded and the new facilities which are required for effective water quality control.

All wastewater management facilities required through the year 2000 are to be defined at the detailed functional level of planning, together with the organization which will construct, operate, and administer these facilities. Reconnaissance level planning will suffice for facilities projected as being required beyond 2000. The plan is to cover the period through 2020.

The general study procedure will be to collect and evaluate existing information followed by additional original investigation when necessary to verify the existing information and develop new data.

Function of COWAMP

Four specific functions will be served by the COWAMP study as follows:

1. Plan will meet the current requirements of the Environmental Protection Agency (EPA) under the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) and regulations promulgated thereunder by the EPA.
2. Plan will become a basis for formulating policies and taking actions under the Pennsylvania Clean Streams Law and the Sewage Facilities Act and Article 1, Section 27, of the Pennsylvania Constitution.
3. Plan will assist evaluation of sewerage projects that may be eligible for grant funds.
4. Plan will provide a basis for evaluating projects proposed by other agencies as they may affect or be affected by the water quality management plan.

When completed, the nine COWAMP plans will be the water quality management element of the State Water Plan.

Study Organization and Administration

To achieve study objectives, the following organizational arrangement will be established. A chart describing the organization and administration of the study is shown on Fig. 1.

1. Department of Environmental Resources (DER) is the study sponsor. Its key responsibilities for the COWAMP study are:
 - a. Compliance with PL 92-500 and planning regulations and guidelines issued by EPA thereunder.
 - b. Coordination with the Water Resources Coordinating Committee, Environmental Quality Board, and the Environmental Protection Agency.

- c. Administration of the Clean Streams Law and the Sewage Facilities Act.
- d. Approval of study program and recommendations.
- e. Coordination of planning with Interstate Agencies.
2. Policy Advisory Committee (PAC) will consist of representatives of interested local, state, and interstate agencies. PAC will have the following duties:
 - a. Advises DER on:
 - * Alternative planning objectives, and alternative environmental futures.
 - * Alternative water quality management strategies.
 - * Environmental areas to be protected, enhanced, and/or preserved.
 - * Recommended water quality management plan/program.
 - * Proposed changes/modifications to study program.
 - * Interim planning decisions required during study program.
 - b. Approves proposed public coordination and information program.
 - c. Reviews and acts on TAC/SAC comments and recommendations.
 - d. Assists DER in coordinating study program with other (on-going) planning programs in the study area.
3. Technical Advisory Committee (TAC) will be drawn from the agencies and organizations which participate in the conduct of the study. Study Advisory Committee (SAC) is the chief vehicle for obtaining input and comments from official agencies, industries, and voluntary organizations such as civic associations, sportsmen, and conservation groups, etc. Through it, local (municipal) government, industry, voluntary organizations, civic associations, sportsmen, and conservation groups and citizens at large will be provided with information about the study and be given the opportunity to have their views made known. Major functions of the TAC/SAC will be to:
 - a. Provide expert advice to Study Consultant and PAC on:
 - * Identification of local (Study Area) alternative planning objectives, including environmental objectives.
 - * Required and/or desirable changes/modifications to study program.

- Suggested interim planning decisions required during study program.
- b. Assists Study Consultant and PAC in identifying:
- Major water quality and related problems and problem locations.
 - Environmentally fragile areas to be protected.
 - Environmentally degraded areas to be enhanced.
 - Environmentally valuable areas to be preserved.
 - Complementary actions to water quality management need to protect, enhance, and/or preserve identified areas.
 - Major water quality management alternatives.
 - Alternative financial/management systems/programs.
 - Existing (local) water quality surveillance programs required.
- c. Reviews, on behalf of PAC, Study Consultant recommendations and/or projections on:
- Population, land use, and economy.
 - Water use and wastewater generation.
 - Design parameters and planning techniques.
 - Alternative water quality management programs.
 - Economic and environmental comparisons.
 - Financial and management systems.
 - Recommended water quality management plan/program.
- d. Advises Study Consultant in:
- (Local) Data acquisition, analysis, and evaluation.
 - Existing facilities inventory.
 - Financial and management systems inventory.
 - Evaluation and selection of alternatives (for detailed evaluation).
 - Development of public information/education program.
4. Study Consultant (SC) will be a private consulting firm, selected by DER. The SC will actually develop the plan under the guidance of DER, PAC, AND TAC. The SC will formulate a viable plan that takes cognizance of the environmental needs of the study area.

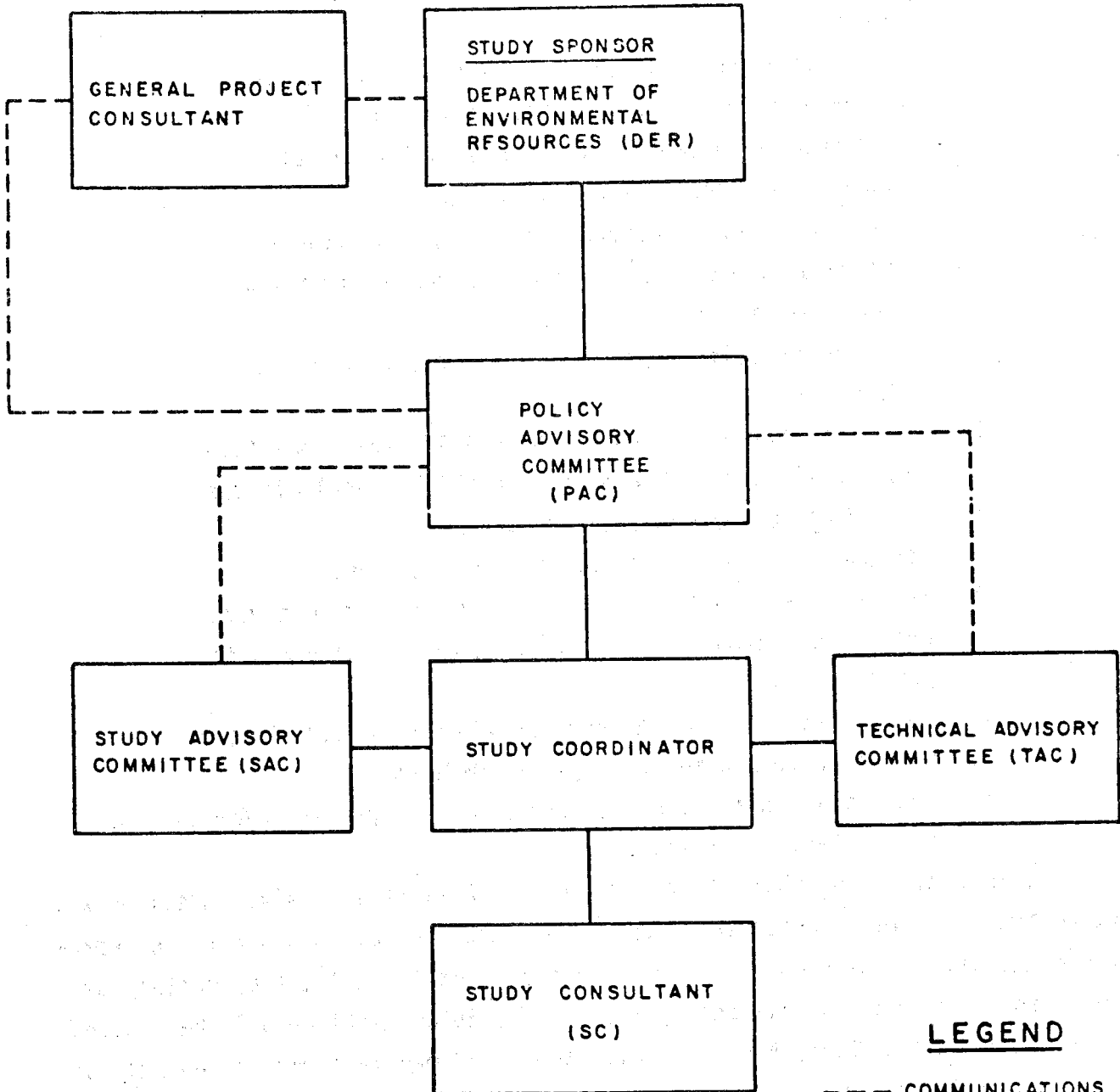
5. General Project Consultant is Camp Dresser & McKee, Inc., Boston, Massachusetts (CDM). CDM is under contract to DER and is available for consultation with PAC and TAC. CDM will also assist DER in the administration of the study program and in the review of work performed by the SC.
6. Study Coordinator will:
 - a. Act as Contract Officer for COWAMP Study Consultant Contracts.
 - Monitor consultant performance for adherence to technical specifications and work plan.
 - Coordinate review, analysis and evaluation of Consultant Progress/Technical reports.
 - Provides overall guidance to Study Consultants on data acquisition, interpretation, evaluation, and other technical issues.
 - Act on Consultant progress reports and invoices for payment.
 - b. Act as chairman of Study/Technical Advisory Committee.
 - c. Provide liaison with appropriate DER Regional Offices.
 - d. Attend all study committee meetings.
 - e. Approve all study committee meeting agendas.
 - f. Provide training and information on study objectives, procedures, progress and content to committees and the public.
 - g. Coordinate interim planning decisions with COWAMP Study, provide guidance to DER Regional Offices.
 - h. Prepare/approve press releases and other public information material for study.

It is anticipated that PAC will meet on a bi-monthly basis. Meetings will be chaired by a representative of DER. The Study Consultants are to be represented at all PAC meetings. TAC will meet bi-monthly at least or monthly as required. SAC and TAC will meet jointly. The joint meetings will be chaired by a member of the Study Advisory Committee. TAC may meet more frequently as required by the study.

FIG. 1

COWAMP

ORGANIZATION AND ADMINISTRATION CHART



LEGEND

- - - COMMUNICATIONS
- COMMUNICATIONS RESPONSIBILITY AUTHORITY

WORKSHOP RESPONSES

The following are the participants' responses to a series of questions in the afternoon session.

Question No. 1: What difficult or intractable 208 problems have we identified?

1. Identifying the present statewide water quality from available data. Making the best use of the data we have individually and pooling the data in an easily accessible form and location.
2. We have not yet determined that we have a non-point source pollution problem except possibly in urban areas.
3. Effects of urban non-point on biological integrity of streams.
4. The advanced treatment of point versus non-point (urban and rural) sources *must* be addressed. This is a fundamental policy/technical problem.
5. Best Management Practices (BMP's) for urban non-point sources.
6. The program, *i.e.*, 208, does not have a clearly defined purpose. If, as appears, it is to "upgrade water quality," how is water quality degradation or improvement to be determined? Will D.O. be different? Will there be more fish? Will species diversity be different?
After the above is determined, how are the effects of the various causes to be determined? I don't think it can be done.
7. a. Relating the degree of pollution with the effect of stream biota.
b. Evaluating the social, economic and environmental impact of BMP's.
8. Effectiveness of sediment control BMP's. Effectiveness of urban BMP's.
9. Field data accumulation and assessment to accurately identify cause and effect on water quality related to each non-point source.
10. A data base sufficient to establish water quality criteria which will spell out specific numeric criteria will not be available. (And criteria are the cornerstone for programs to control pollutant reduction.)
11. Must address not only the amount of non-point pollutants but also their effect on water quality.
12. Establishing causal relationships on a stream-specific basis on non-point residual runoff to stream quality.
Being able to define-justify, on cost-effectiveness basis, and carry into effect-specific land use practices and controls that affect the private sector--agriculture--forestry--mining, urban development, etc.
13. How do chemical levels long and short-term affect stream biological life? Are there streams that are irretrievable due to complex physical-biological problems we do not *now* understand?
14. Most problems indicate a research approach which we have little time for.
15. Interagency communication channels need to be more defined with particular consideration to non-funded participants.

16. Waste load allocations for non-point sources--the technology is not sufficient or the system quantifiable enough to allow allocations which result in expenditures of significant funds for control--particularly in the area of non-point sources.
17. Definition of fishable and swimmable for North Carolina.
18. It seems impossible to establish a link between measurable aspects of non-point source activity and water quality. There are two steps: (a) measured characteristics of non-point source activity and measured pollutant levels, and (b) measured pollutant levels and water quality.
19. The need to coordinate effort to assess existing water quality on a statewide basis to determine where *real* water quality problems exist due to non-point sources.
20. Obtaining an adequate data base in the time allotted.
21. To what extent must we tie BMP's to specific courses? Must we have scientific certainty, a strong possibility, a hunch or what?

Question No. 2: What instructional or experience-sharing workshops would be helpful to confront these problems?

1. What water quality data is available for North Carolina and how can we pool this information to be easily accessible to all interested parties? How to obtain the data? Where to store it? What computer storage and retrieval format? What data is of highest priority? Participants should be essentially made up of some people at this workshop plus computer specialists.
2. A workshop on present status of stream quality with the objective of trying to identify any non-point source pollution problems that may exist.
3. A workshop on the advanced waste treatment/non-point controversy would be an excellent mechanism for initiating policy formulation.
A workshop series on non-point BMP's. Since urban BMP's are the least well understood and could be the most controversial, the first workshop should begin the investigations in this area.
4. Sharing workshops--how to measure and predict the biological effects of changes in water quality.
5. Establishing goals for desired water quality (water quality standards).
6. Non-point source effects on estuaries even from sediments entering streams far upstream.
7. Extent and nature of damaging sedimentation; public participation.
8. At the proper time a workshop on effective coordination and integration of the State Water Quality Planning activities and State overall water related land resources planning and policy activities.
9. Instructional--non-point source modeling--optimization of modeling, BMP evaluation, and statewide technique implementation (to allow the optimum approach to statewide 208 for maximum benefits).

10. A workshop on public participation would be good.
11. Various sorts of modeling; public participation; drafting plan for State 208.

Question No. 3: What research is necessary to solve these problems?

1. Effect of changing various management practices, especially in-stream and reservoir effects downstream.
2. Water quality impacts of different non-point source loads.
3. Effects of water quality constituents (flow included) upon the community structure of the water resource. Then, the environmental, social, and economic cost/benefit of upgrading or downgrading water quality.
4. Research is needed in determining what the natural stream biology is (or was), mechanism of biological recovery, and effect of pollutants on stream biology.
5. Effects of physical/chemical conditions on benthic macroinvertebrates. Survey of native macroinvertebrates; BMP effectiveness; Scour/slump effects on streams after land use modification.
6. Compile available data on existing water quality and other data into a retrievable format for all agencies updated regularly.
7. Non-point pollution (source and effect) of a selected coastal county.
8. Study to determine the cost-effectiveness of BMP's for reducing non-point pollution from agricultural lands.
9. Participant observation on water quality planning (as related to overall water resources, land use, and coastal zone management) by knowledgeable persons outside of State government.
10. We need to place more emphasis on resource recovery and recycling--such as land application of sewage--both sludge and processed effluent rather than concentrate on methods of disposing of them.
11. Effective means of public involvement vs. not so effective means.

Question No. 4: What agency initiatives should be mounted?

1. Try to coordinate data acquisition and sampling statewide.
2. Workshops on BMP's and policy direction.
3. Agencies need to get involved in problem-oriented research.
4. Strong biological monitoring program.
5. Increase scope of biological program. Get a marine fisheries person involved--sediment loads from far upstream affect estuaries.
6. At this time, it is best to concentrate on doing a good job on defining and carrying out the 208 planning job and tying it into other State planning and policy activities.
7. A conference of unit leaders and higher to rethink the major issues of 208 and following that meetings within each unit to map ways to meet the new goals.

Question No. 5: What is the overall conclusion of the workshop:

1. Contrary to the general feeling of the workshop, some decisions can be made. Specifically, relative contributions and best management practices. We should labor under the illusion of a "continuous planning process."
2. I think we have assembled a marvelous interagency task force to find a solution to a problem that has not yet been defined.
3. We have been advised of other problems and ideas coming from various programs and how these programs overlap and interrelate.
4. Public participation is very important. More interagency discussions are needed.
5. An identification of the planning process now being used by Environmental Management Division. In general, information exchange-- and identification of the major problems as perceived by the participants.
6. It seems to me that implementation will require some fundamental changes in national philosophy and individual life styles; *i.e.*, a strong curbing of individual freedom and development of sense of social responsibility because we cannot subsidize incentives ad infinitum. We may, for example, have to develop penalties for improper farming methods--or for violation of regulations pertaining to land use practices.
7. There are some concerned and sharp people involved in this effort.

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