

ABSTRACT

This report evaluates an environmental education in-service teacher training institute for middle and high school science teachers in North Carolina, entitled "Developing an Environmental Report Card". The four week, residential program was designed to prepare the 24 participating teachers to lead their students through a holistic assessment of their local environment. Several innovative aspects of the Institute, including its scope, content, local focus, and method of implementation, warrant its examination as a potential model for future, similar efforts. Evaluation data was collected using a variety of methods, including pre and post-tests, questionnaires, and interviews. The information collected was used to assess the strengths and weaknesses of the Institute's implementation as well as its outcomes during the subsequent school year.

The results of the evaluation suggest that the Institute was successful at providing activities, resources, and information relevant to the participants' classroom teaching. The wide use of environmental professionals, throughout the Institute's implementation, provided the participants with a network of local and state level professional contacts to support their environmental education teaching. The evaluation also highlights the importance of providing the participants with an atmosphere in which they can exchange information and ideas among themselves. It further suggests that, at times, a lack of consistent focus for the Institute's activities may have detracted from its ability to provide the teachers with a systematic approach to the integration of environmental education into their classes.

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I dedicate this report to my parents, John and Maureen Leopold, whose unwavering faith in me is a consistent source of strength.

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COMMONLY USED ABBREVIATIONS

CC - The Institute's seven member Coordinating Committee

DEHNR - The North Carolina Department of the Environment, Health, and
Natural Resources

DERC - The Institute, "Developing an Environmental Report Card"

DPI / NC-DPI - North Carolina's Department of Public Instruction

EE - Environmental Education

EPA / US-EPA - The United States Environmental Protection Agency

ERP - The University of North Carolina at Chapel Hill's Environmental
Resource Program

NC - North Carolina

OEE - North Carolina's Office of Environmental Education

RTP - Research Triangle Park, North Carolina

UNC-CH - The University of North Carolina at Chapel Hill

CHAPTER I: INTRODUCTION

This report evaluates an in-service teacher training institute, Developing an Environmental Report Card (DERC), which was sponsored by the United States Environmental Protection Agency (US-EPA), and the North Carolina Sea Grant program, and coordinated by the University of North Carolina's Environmental Resource Program (ERP). The Institute lasted four-weeks and was intended to provide the participants with the knowledge, resources, and skills to integrate local environmental topics into their classrooms. Although the participating teachers were exclusively science teachers, the Institute aspired to be much more than an environmental science workshop. In addition to providing the participants with a solid understanding of environmental concepts, it sought to provide insight into the economic, social, and political context of these concepts. The planners of DERC believed that the knowledge, understanding, and skills gained through the Institute would serve to empower the participants, and subsequently their students, to be knowledgeable and responsible advocates for environmental health. The Institute's planners intended to use environmental science as a stepping stone to affecting positive change in the local environment. DERC, was therefore, intended to be an environmental education (EE) in-service workshop and to serve as a model for similar training efforts for teachers.

I.1: Background

Environmental education (EE) is a term used to describe a discipline that emerged during the late '50s and early '60s to promote an understanding of the

environmental problems facing an increasingly industrialized and urbanized world and stimulate participation in their solutions. Stapp, et. al. defined EE as follows:

Environmental education is aimed at producing a citizenry that is knowledgeable concerning the biophysical environment and its associated problems, aware of how to help solve these problems, and motivated to work toward their solution (p. 30, 1969).

As the awareness of the scope and severity of environmental issues increased during the late 60's and 70's, so too did the rate of evolution of EE (Bones, 1994). Today, due to the global nature of many environmental problems, EE is the focus of much international attention. It has been the subject of at least two international conferences (Tbilisi, Georgia, USSR in 1977, and Adelaide, Australia in 1990), and is viewed by the United Nations Educational, Scientific, and Cultural Organization as the fundamental means to the achievement of sustainable development (UNESCO, 1988).

The importance of pursuing EE in the United States was first officially recognized by the United States government in 1970 when the first Environmental Education Act was signed into law. This law was repealed in 1981, after which followed a "noticeable decline in federal support for EE" (Marcincowski, 1990, p. 7). The support was renewed in 1990, under the Bush administration with the passing of a second law, the National Environmental Education Act. This act promised both money, technical support, and recognition to EE programs and was designed to prepare and "encourage students to pursue careers related to the environment" (The National Education Act, 1990b, p. S 17161). EE is viewed in the United States, however, as a means not only to prepare students for careers, but also to make them aware of their relationship, and that of society, to the environment, and to prepare them to be responsible environmental citizens, thus enabling them to make well informed "decisions that affect (directly and indirectly) the environment" (Stapp, et. al., 1969, p. 30). EE

also receives continuous support in the non-governmental sector through non-profit environmental and educational organizations and institutions.

Although EE programs are prevalent at museums, zoos, aquariums, summer camps, nature centers, and other similar venues, the scope and effectiveness of these programs is limited by the nature of the organizations, and the exposure of students to them. Therefore, a significant effort on the part of the EE community has been aimed at formalizing EE and integrating it into the public school curriculum, thereby making it a part of every student's education. For example, Ruskey and Wilke advocate for the inclusion of EE "in every school, at every grade level, and in most, if not all, subject areas" (1994, p. 2).

Nonetheless, the response to this push at the state level has been slow. Ruskey and Wilke report that as of 1994, only three states, and 5 counties and communities outside of those states had well developed EE programs that strongly facilitated or mandated the implementation of an EE curriculum within their public schools. They report only smaller steps toward progress in 41 other states. These steps include the establishment of state agencies, or the employment of state personnel to oversee the state's EE efforts, and/or the existence of written strategies and curriculum for the pursuit of EE (1994). In addition to these state and community level efforts, individual schools and teachers often find ways to implement their own EE programs with minimal external support (Bones, 1994, Carlson, 1993).

Despite this apparent progress the pursuit of EE in public schools has remained largely ineffective. Ramsey, Hungerford, and Volk claim that, "environmental education, if it exists at all, is loosely organized and has little sense of direction (p. 36, 1992)." This conclusion is clearly the result of several factors, including the lack of clarity regarding what constitutes effective EE, the

lack of flexibility in the structure of public education enabling it to assimilate EE, and a lack of properly trained personnel to teach EE.

There has been a long standing debate over what constitutes effective EE, and the discipline faces what has been termed a "definitional problem" (Gigliotti, 1991; Hungerford, Peyton, and Wilke, 1983; Van Matre, 1990). This has resulted in several attempts to characterize and define EE in order to develop a uniform approach to its pursuit (Hart, E. P., 1981; Hungerford, Peyton, and Wilke, 1980; Tudor, M. T. 1991). There continues to be, however, wide spread agreement with Stapp's definition. For example, as expressed by Hungerford, Peyton, and Wilke the overall goal of EE is:

to aid citizens in becoming environmentally knowledgeable, and above all, skilled and dedicated citizens who are willing to work, individually and collectively, toward achieving and/or maintaining a dynamic equilibrium between quality of life and quality of the environment (p. 43, 1980).

The term environmental literacy has been coined to describe the body of knowledge described within this goal. It is defined by Dashefsky as, "the basic level of understanding an individual should possess to make intelligent decisions about managing our environment"(p. 85, 1993). Environmental literacy thus requires understanding of ecological concepts, the nature of interactions between humans and the environment, and basic civics principles. The goal of EE goes beyond the development of environmental literacy, however. It seeks to motivate environmentally literate citizens to act.

Both the interdisciplinary nature of environmental literacy, and the lack of understanding of what motivates environmentally responsible action have contributed to the challenge of implementing successful EE programs in public schools. The "compartmentalization" of knowledge into defined disciplines such as biology, chemistry, and social studies in public schools makes addressing

environmental literacy difficult (Cortese, 1993, Singletary, T. J. 1992). Two suggested solutions to this problem have been the development of specific EE classes, or the use of a synthesized and coordinated intra-course team teaching approach (Singletary, T. D., 1992). In general, however, EE regularly falls under the umbrella of science due to its foundations in ecological concepts.

The challenge of achieving the action component of the overall goal of EE, continues to be problematic in the establishment of a structured EE curriculum. There has been much research on what promotes changes in environmentally related behavior (Leeming, Dwyer, Porter, and Cobern, 1993; Ramsey, J. M. 1993). The results suggest that providing knowledge alone is not sufficient (Stevenson, R. B., 1993). One of the factors governing behavior is an individual's value system (Hungerford, H. R., Litherland, R. A., Peyton, R. B., Ramsey, J. M., Volk, T. L., 1992). Not only are values difficult to teach and to change, but the introduction of values into a classroom raises ethical questions. Hungerford et. al suggest that with appropriate sensitivity, the challenges of addressing values and other factors related to behavior change may be overcome. They have developed a curriculum to help achieve this goal, as well as the goal of environmental literacy as defined above (1992). Nonetheless, the question of the most effective way to achieve behavior change remains the subject of a significant amount of EE research.

I.2: The Need to Train Teachers

Given the presence of Hungerford's EE curriculum, as well as many others including the widely used *Project Learning Tree*, and *Project Wild* curriculum supplements, one of the remaining challenges to the implementation of EE in the K-12 public school curriculum is the lack of, teachers with appropriate training to administer such curricula. Samuel concluded, in a 1993 study of a school's EE

program, that the "teachers' understanding of environmental issues and their concepts of environmentalism were limited, and as a result they were unable to assess the pedagogical soundness of some of their ideas or envision the many ways in which their subject areas could be related to an environmental framework (p. 27)". In a study of teachers in Indiana, Bueth and Smallwood characterized their level of environmental literacy as "low" (1987).

Although the two studies cited in the previous paragraph, represent very specific populations within the teaching community, there is no evidence to suggest that outside of these populations the situation is very different. To remedy the lack of teacher preparation in the area of EE, there is a significant push to include EE as an essential part of the pre-service training for teachers. This is the education which a teacher receives prior to entering a classroom. Ruskey reported that as of 1994, pre-service education in EE was, "one of the least frequent EE components across the country." And that only "three states had a pre-service EE teacher training requirement: Arizona, Pennsylvania, and Wisconsin" (p. 4, 1994). The slow rate of change in this area, combined with the low level of environmental literacy of teachers receiving current pre-service education training create a significant need for in-service training opportunities (Volk, T. L., Hungerford, H. R., and Tomera, A. N., 1984). These are educational programs presented to current teachers. Every state presently offers opportunities for in-service training for teachers and efforts to improve the quality of this in-service education continue (Wilke, 1994).

1.3: EE in North Carolina

The State of North Carolina expressed its support for EE through the Environmental Education Act of 1993. This act mandated The Office of Environmental Education (OEE), within the state's Department of Environment,

Health, and Natural Resources (DEHNR) to support EE in the state, and to oversee cooperation between DEHNR and the State's Department of Public Instruction (DPI) in the promotion of EE (The North Carolina Environmental Education Plan, 1994). In December, 1994, OEE held a state level conference to plan a course of action for the pursuit of EE in North Carolina. The proceedings from the conference presented a modified goal for EE:

The goal of environmental education in North Carolina is informed citizens with the knowledge, understanding, and skills necessary to take proper care of this the 'goodliest land under the cape of heaven' through sound decision making and responsible behavior as stewards of North Carolina's environment (The North Carolina Environmental Education Plan, p. 5, 1994).

This goal calls for a local approach to EE, which has traditionally emphasized more global concerns (Schaefer, 1993). Another result of the conference was a reiterated support for effective in-service teacher training in EE in the State.

1.4: Purpose For Research

This research evaluates an EE in-service teacher training institute, "Developing an Environmental Report Card", which took place in North Carolina. "Developing an Environmental Report Card" (DERC) was an EE in-service teacher enhancement institute for middle and high school science teachers. The one-month program involved 24 science teachers from across the state. Many aspects of the Institute made it innovative. Among these factors were the scope of its content, the amount of funding which it received, and especially its local approach to EE making it consistent with NC's goal.

As a potential model for pursuing EE in-service training in NC, the information gained from the evaluation of DERC may be useful in helping shape EE in-service efforts in the state of North Carolina. The formal evaluation of this Summer Institute is intended:

- (1) to provide information that will be useful to the Institute's staff in planning their future educational activities to be maximally effective; and
- (2) to provide information to other educators planning to undertake similar endeavors or use the Institute as a model for an EE in-service program.

These objectives were used in shaping the evaluation of the Institute.

Although information gained by this evaluation is intended to be used by in-service program planners to help shape their EE efforts, it may also be valuable to other audiences. Planners of related programs, such as pre-service programs for teachers, and adult EE programs, and designers of curriculum materials may also find the information useful in focusing their efforts. Funding agencies may benefit from the information in that it may help them in focusing their RFP's and selecting programs to receive assistance. Additionally, it may help prospective participants in EE in-service programs choose a program that best suits their needs. Finally, educational institutions may find the information valuable in shaping curricula, and setting educational objectives.

The remainder of this report will provide a description of DERC and present the results of its evaluation. The next chapter will describe the Institute, its goals and objectives, and the process used to plan it. Chapter III presents the evaluation methodology used for the purpose of this report. The ensuing two chapters, IV and V, contain the results of the evaluation, respectively focusing on the outcomes of the Institute during the subsequent year, and the strengths and weaknesses inherent in its implementation. This report concludes with a summary of the evaluation's findings and recommendations for similar institutes.

CHAPTER II: INSTITUTE DESCRIPTION

Developing an Environmental Report Card (DERC) was one of a group of Institutes funded as part of the program known as STEP (Summer Teacher Enhancement Programs) by the United States Department of Energy (DOE) through the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET). The council called for proposals designed to "expand content knowledge and enhance pedagogical skills of teachers of science, mathematics, engineering, and technology through participation in four-week summer institutes which utilize the unique resources of Federal research facilities." (FCCSET, 1993). Dr. John O'Neil at the Office of the Senior Official of Research and Development, United States Environmental Protection Agency (US-EPA) invited a group of environmental educators from around the Research Triangle Park area in North Carolina to respond to the RFP. The resulting proposal described an environmental education program that would draw on the vast array of technical and scientific resources (including three major universities, available in the area). The program, DERC, was intended for middle and high school science teachers (O'Neil, 1993).

The proposal described DERC as a program that would enhance participants' awareness of "local and regional environmental issues and available scientific and managerial resources (O'Neil, p. 1, 1993)." It also promised to help teachers to "understand how physical and biological factors interact as components of ecosystems and how humans play a critical role in

affecting these systems (O'Neil, p. 1, 1993)." As conceived, DERC was a 19-day Institute based at the US-EPA facility in RTP, NC, with some presentations taking place at UNC-CH and many off-site field trips. The broad plan was to examine local environmental quality in a holistic manner, from gathering information on all aspects indicating and effecting environmental quality, to synthesizing the information into a grade or report card, which would then be useful from a policy standpoint. The one-month Institute was funded to the amount of \$230,000.

At this point it would be useful to acknowledge a potential source of confusion within this report. "Developing an Environmental Report Card" is the title of the Institute. Additionally, the planners of the Institute intended the concept of an environmental report card to be a metaphor for synthesizing various discrete pieces of information regarding environmental health into a meaningful descriptive result, a "grade". Therefore the act of developing this environmental report card was to be performed at some point or points during the Institute. Throughout the remainder of this report, to avoid confusion, the four-week learning experience that is the institute entitled "Developing an Environmental Report Card" will be referred to simply as the Institute, or by the acronym DERC. In contrast, when referring to the metaphor or the explicit use of the metaphor, the whole phrase "developing an environmental report card" will be used.

II.1: Goals and Objectives

The "overall goal" of the Institute, as described in the proposal, was "to reach under-represented teachers with exciting information and instructional methods for development of environmental strategies in the classroom..."

(O'Neil, p. 1, 1993)" Six "sub-goals" are identified as the vehicles for the achievement of this goal. They are to develop:

1. Scientific concept /knowledge: increased awareness and understanding of ecosystems and ecosystem health.
2. Skills: increased understanding of basic methods of comparisons, analysis and evaluation of ecosystem health.
3. Management: increased familiarity of the structures and roles of resource management agencies at federal, state, and local levels.
4. Resources: increased understanding of the resources -- data bases, services, laboratories, curricula, personnel, and publications -- available to educators and how to access these resources.
5. Implementation: increased transformation and transference of the experiences from the institute to the classroom in a manner that supports systemic reform in the school and local district.
6. Leadership: increased involvement of past participants as "Master Teachers" and development of new participants as leaders in environmental education in their local areas (O'Neil, pp. 1-2, 1993).

The four-week Institute, was intended to make incremental progress toward the achievement of the overall goal through the achievement of weekly goals also specified in the proposal. These proposed "weekly goals" appear in Table I below. The first week was intended to provide basic knowledge of natural systems and environmental health. During the second week teachers would be provided the opportunity to apply the knowledge gained in the first week and practice methods of environmental monitoring. The third week was to be a week focused on gathering information from various sources and assimilating this information with the first hand observations of the previous week. The fourth week was intended to be the week in which the teachers would develop their own plan for integrating the Institute experience into their classroom and share it with the other participants. These "weekly goals" introduce the concept of developing an environmental report card, as a tool to be used by the Institute.

Table I: Weekly goals of DERC, as specified in the grant proposal.

Week	Goal
1	"To introduce the concepts of ecosystems, environmental health and basic information sources in light of their personal development of an Environmental Report Card."
2	"To experience, and when possible measure, the natural environment, observing the integration of air, water, and land through travels in a water basin."
3	"To assimilate experiences to create an Environmental Report Card format for the waterbasin of the previous week and develop a framework for the report card in the participant's home environment."
4	"To devise an implementation strategy for the individual's own classroom and utilization of the Master Teacher and the institute for school involvement."

(O'Neil, pp. 2-4, 1993)

To "reach the under-represented teachers", as required by the "overall goal", the proposal outlined a recruitment strategy that would target rural counties and ones designated "at-risk" by the North Carolina Department of Public Instruction (NC DPI) educators. It did not, however, specify any numerical objective regarding this aspect of the overall goal. (O'Neil, 1993)

Further, the proposal specifies two specific "Teacher/Student Outcomes". The first was that participating teachers "will be leaders in the development of environmental education classroom strategies to meet the NC DPI 1994 science standards." It cites the participants' "participation in the NC Science Teachers Association Conference", as evidence for the achievement of this outcome. The second outcome specified in the proposal is that the students of the participating teachers will "take on an environmental education project in which they evaluate the water, air, and land management of their local area, paralleling the efforts of their teachers..."

II.2: Planning

The UNC-CH Environmental Resource Program was contracted to plan and implement DERC and Melva Okun, who had been involved in the writing of

the proposal, was charged with leading the effort. Ms. Okun assembled a Coordinating Committee (CC), consisting of seven educational and environmental experts; including two representatives of US-EPA, three professional teacher trainers, and two graduate students. The CC was involved in all aspects of the Institute's planning. Additionally, select members of this committee were also responsible for the day-to-day implementation of the Institute's activities.

During the early planning stages, the CC solicited advice on overall content, access to resources, and reinforced alliances and partnerships, with local agencies that are involved in environmental issues, by assembling a Steering Committee comprised of officials representing these agencies. Further, the CC assembled a Planning Committee once the framework of the Institute had been developed, to solicit more detailed advice regarding the agenda, logistics, and specific content.

Due to the postponement of funding for one year, the planning of DERC took place over a period of roughly one and a half years, with intensive planning beginning eight months prior to the Institute. During this period, the CC met on a weekly basis to work out the details of the program and met with content experts representing the fields of land use, water, air, and ecosystem health evaluation. During this period the CC also met with the Steering and Planning Committees to incorporate their collective ideas and advice. Based on these meetings the coordinating committee tentatively hammered out the details of the four-week Institute, designed to meet the goals and objectives specified in the proposal. This schedule addressed the "overall goal" and six "sub-goals" of the Institute, and adhered loosely to the "weekly goals". The Institute's agenda as originally planned is included in this report as Appendix A

Although planning the format and prospective content of the Institute took place over an extended period as described above, complications in funding resulted in the lack of money "in-hand" until almost April of 1994 and dominated much of the time and efforts of the CC. This problem severely limited the ability of the committee to finalize ideas and commit to any of the details of the Institute until the money was received. Such details included selection and notification of participants, scheduling and preparing speakers and daily activities, and collecting and organizing materials for the program. By the time the money was guaranteed, the time remaining to finalize the Institute's details and prepare its participants was shortened to approximately two months.

II.3: Participant Recruitment and Selection

The importance of recruiting a diverse participant body with strong representation from schools with low performance records, and areas that have limited access to the educational opportunities of the Research Triangle area was established in the grant proposal for the Institute. Meeting this aspect of the "overall goal" was a high priority of the CC. They spent a substantial amount of time preparing and disseminating the Institute's brochure and application to reach a wide audience. Additionally, a list of 36 school systems with special needs was identified in North Carolina for more intensive recruitment. The two criteria used to choose these school systems were per student spending, and performance as determined by NC's end of the year exams. Members of the CC telephoned the science representatives from each of these school systems to discuss the Institute and encourage applications from these districts. A total of 98 applications was received by the established deadline; 26 of these were from the school systems that were actively pursued.

The CC established a prioritized list of selection criteria which was used to choose the 25 participating teachers. The list of criteria used by the acceptance committee follows:

1. Participants must be middle or high school science teachers.
2. At least one half of the participants must come from the one of the 36 target school systems.
3. Applications must include strong letters from both the teacher and their principal.
4. Participants must represent a geographic mix from across the state of North Carolina.
5. There must be a mix of new teachers (less than five years experience) and veteran/model teachers.
6. There must be a mix of teachers from middle and high schools, and a mix of males and females.

The letters from the teachers and their principals were read and scored by at least three members of the CC and the applications were categorized by gender, target vs. non-target school systems, and region of the state (mountains, piedmont, and coastal plain). The strongest 25 applicants were then chosen from these categories and 14 applicants were wait listed. Of the 25 invitees, 4 declined and due to an administrative error 5 new participants were selected. Two of the official participants, attending as a pair, dropped out of the Institute on the third day, citing health problems caused by hot weather and frequency of outdoor activities as their main reason. Therefore, the official participant body consisted of 24 middle and high school science teachers. Thirteen of these teachers represented school systems targeted for intensive recruitment. In addition to the official participants, two un-funded participants, both teacher trainers, were also invited to attend the Institute in its entirety. To

add further diversity to the participant body, 2 international guests also attended the Institute as unofficial participants.

The remainder of this report will present the evaluation of DERC. The next chapter will describe the approach used to conduct the evaluation. The subsequent chapters will present the results of the evaluation: the outcomes of the Institute, the determinant factors of its success, and recommendations for similar EE in-service teacher training efforts.

CHAPTER III: EVALUATION METHODOLOGY

Michael Quinn Patton defines utilization focused evaluation, as evaluation which provides the "information needed and wanted by decision makers, information users, and stakeholders that will actually be used for program improvement and to make decisions about the program (p. 347, 1986)." This statement provides the basis for the evaluation of DERC. The intended beneficiaries of the information from this report are planners of in-service environmental education teacher training institutes. The planners of DERC were interviewed and consulted throughout the evaluation in order to ensure the usefulness of its reported results. They were involved in each step of the evaluation procedure: focusing the evaluation on the appropriate parts of the Institute, reviewing the instruments used to ensure their validity, and guiding the writing to ensure that the findings were communicated in a useful manner.

The implementation evaluation of DERC was formative in the sense that the information gained from it was both used to shape DERC while it was in progress, and intended to be useful in shaping future In-service Institutes for teachers. However, the evaluation also used summative data to characterize the successes of the Institute. Data collected for the purpose of this evaluation were both qualitative and quantitative, and a great variety of instruments and methods was used. These included: pre and post-Institute interviews with the staff; pre and post-Institute questionnaires; daily evaluations of the Institute's sessions; field notes compiled by the evaluator throughout the Institute; a focus group discussion; an evaluation session; a questionnaire administered during the school year following the Institute; and field notes compiled by the evaluator

during two post-Institute meetings with the teachers. Each of these will be described in the sections which follow.

III.1: Pre-Institute Interviews and Institute Objective Clarification

To help focus the evaluation and ensure its usefulness to environmental institute planners, interviews were conducted with four members of the seven person CC. The purpose of these interviews was three fold. First, they sought to clarify the goals and objectives for DERC since they had become somewhat clouded during the extensive planning and preparation. Second, they were used to illuminate the aspects of the Institute considered by the planners to be critical to the programs success. And lastly, the interviews attempted to elicit the information that the planners felt would be most useful to them both during the Institute, to maximize its effectiveness, and at the Institute's end in order to improve future programs that they may be involved in.

Three of the interviewees were chosen because they had the most experience in educating teachers and designing curricula. These were Melva Okun, the Institute's director and a professional teacher trainer; Dr. Lundie Spence, the representative of one of the sponsoring agencies (NC Sea Grant) and a professional teacher trainer; and David Smith an educational consultant with extensive experience in teacher training. The fourth interviewee, Dr. John O'Neil was chosen because he represented the funding agency's interests on the committee. The interviews were conducted during the week and a half immediately prior to the initiation of the first official Institute activities. A list of the questions used for these is included as Article 1 in Appendix B.

In addition, in order to further clarify and prioritize DERC's objectives and better focus the evaluation effort, an instrument was administered to the entire CC. The instrument consisted of a list of 25 objectives and the respondent was

asked to rank these on a 5-point Likert scale based on their importance to the success of the Institute. The objectives on this objective index were taken from the interviews, Institute planning materials, and letters from the chosen participants explaining why they wished to attend the Institute. Additionally, through the use of a single open-ended question the instrument was intended to capture any additional information that might help to direct the evaluation. This instrument is contained in Appendix B as Article 2.

III.2: Intra-Institute Data Collection: Daily Evaluations, Field Notes, and Notebook Reviews

Throughout the Institute, information was collected in order to describe and evaluate the Institute's implementation. This was done through the use of formal instruments administered daily, through field observations recorded in a journal by the evaluator, and reviews of participant notebooks. Participants were required to complete an anonymous "Daily Evaluation". This instrument consisted of two parts. The first part specified each session that took place during that day and asked the respondent to rank the session, based on its value to them, on a 5-point Likert Scale (of no use at all - extremely valuable). The second part of the Instrument solicited general comments regarding the strengths and weaknesses of the day. An example of this daily evaluation instrument is contained as Article 3 in Appendix B. These instruments were administered at the end of the day when logistics allowed, and the following morning when they did not.

The evaluator of the Institute attended almost every Institute session and was present throughout almost every day. During this time the evaluator kept a journal of field notes that consisted of observations and reports of informal feedback and discussions with DERC's staff and participants. Recorded

observations generally consisted of qualitative descriptions of the level of interest and engagement of the participants during the sessions; the basic content of each session; and the general format of each session (in terms of hands-on vs. lecture vs. interactive discussion). Participants were regularly, randomly, and informally questioned regarding their level of interest in the sessions, general concerns, and the applicability of the Institute to their classrooms. These interactions, as well as solicited and unsolicited comments regarding the Institute by the staff, were described in notes recorded by the evaluator.

In addition, to supplement the evaluator's journal notes, the notebooks of six participants were collected and read. The information from these notebooks was used to fill in gaps regarding the content of presentations or sessions for which direct observations did not take place. Three men and three women were asked to make their notebooks available. These participants represented a wide variety of teaching subjects and educational backgrounds but were not chosen randomly. They were chosen based on their high level of engagement throughout the Institute under the assumption that this might reflect a greater likelihood that they would take written notes during the sessions.

II.3: Pre and Post-Institute Surveys

Two questionnaires were administered to the participants, one at the beginning of the Institute and a second upon the completion of the fourth week. Each instrument included an identical series of three indices to help assess changes in participants' attitudes that took place over the duration of the Institute. In addition, each instrument solicited additional information from the participants. Both instruments were reviewed for content validity by the planners of DERC. These instruments are included in Appendix B as Articles 4 and 5, respectively. All of the Institute's official participants were required to complete both

instruments. The content unique to each questionnaire will be described below and then a description of the measures of change included on both will follow.

To assess the correlation between the participants objectives for the Institute and those of the planners, the pre-Institute survey contained a list of 25 objectives identical to the one administered to the CC, requiring the participants to rate the importance of the same 26 objectives. Additionally, the pre-Institute survey contained items that asked how the participants intended to use information gained during the institute, why they attended the Institute, their educational background, their computer access and experience, the extent of their past use of environmental topics in their classrooms, and the strengths and weaknesses of past in-service Institutes which they had attended. This information was intended to further focus the evaluation and provide a basis for comparing the change measures.

The questions unique to the post-institute instrument were employed to help identify the strengths and weaknesses of the Institute. It asked the participants to rate the Institute's success at achieving each objective on the same list included in the pre-survey. In addition, it asked the participants in a number of specific ways about the Institute's strengths and weaknesses, and also what might keep them from using the information. To supplement this data, comments regarding the strengths and the weaknesses of the Institute and what the teachers had gained through their participation in the Institute, provided in response to a survey administered to meet the requirements of the funding agency, were used (Article 6 Appendix B).

The pre and post-instruments also contained three indices, utilizing 5-point Likert scales, to assess participants changes in attitudes. The first index was intended to measure change in the participants perception of the strength of various barriers to the integration of information learned in the Institute into their

classroom. The items on this index are roughly consistent with those suggested by Ham and Sewing (1988). The second was used to identify any change in the level of comfort the teachers felt for teaching a list of different topics. These items reflected a variety of subjects to which the Institute's content may be applicable. The last index sought to demonstrate change in the likelihood of the participants using a variety of resources and teaching techniques in the classroom. These items reflected techniques and resources used or provided in some way by the Institute.

III.4: Pre and Post-Institute Concept Maps

Although it may be inferred that a change in the comfort level on the part of the participants for teaching various topics at least partly demonstrates a change in their content knowledge, concept maps were utilized to more directly measure a change in the participants understanding of environmental concepts. As with the pre and post-Institute questionnaires, participants were asked to complete a concept map at the beginning and at the end of the Institute using the same list of concepts.

Novak, Gowin, and Johanson first introduced concept maps as a learning and assessment tool in 1983. A concept map is a schematic diagram that illustrates the manner in which distinct concepts are related and build upon each other to form "understanding" of a topic. It is drawn around one central concept, from which branches of words, representing increasingly specific ideas, grow. New relevant branches may grow from each word added to the map. In a sense, each branch represents a train of thought relating to the concept from which it stems.

The concept map was chosen as the tool to assess change in the participants' understanding of environmental issues because it facilitates a more

creative approach to organizing and expressing ideas than most objective tests, while providing more structure and allowing a more objective approach to scoring than an essay test. It was also particularly useful as an assessment tool for the Institute because the CC sought not only to develop an understanding of the natural physical processes of the environment but also how these processes interact with each other and how human actions interact with these processes. The concept map is uniquely qualified to illustrate these types of connections.

To ensure content validity of the measurement, the word list used for the concept maps was generated by asking each of the experts involved in designing the Institute to independently list at least 25 words or phrases representing environmental science or management concepts. These concepts were to be ones which they felt represented the body of knowledge critical for the teachers to understand and be able to explain by the completion of the four-week Institute. The six coordinators generated a list of 68 different words. Many of these words and phrases were listed by as many as four of the contributors. The most frequently cited concepts were then chosen for the final list of 27 words and phrases. For the sake of validity, it is important to mention that this word list was constructed after the Institute was already designed, therefore, the extent to which this list reflects Institute's intended content, prior to the development of the schedule, is unknown.

Prior to the start of the Institute and on the second to last day of DERC, instruments that included concept mapping instructions and the same 27 word list were distributed to the teachers (see Appendix B, Articles 7 and 8). The teachers were instructed to use at least 15 of these words in the maps that they constructed. The fifteen word minimum was chosen to ensure that some variation would exist in the resulting maps. It was also expected that the option to utilize more words would contribute heavily to the variance among the maps.

This allowed the teachers freedom to make the maps as complex and inclusive as they wished within the 27 word maximum which was established to keep the task of scoring the maps manageable. The resulting concept maps were collected the following morning.

This approach to administering concept maps as an assessment tool was unique to the Institute. In all cases reviewed, the skill of concept mapping is taught to the respondents who are subsequently given an opportunity to practice the skill and receive feedback prior to the administration of the maps as a test (Novak, Gowin and Johansen, 1983; Novak and Gowin, 1984; Wallace and Mintzes, 1990). The coordinators of DERC, however, felt that the basics of concept map construction could be explained through brief written instructions which were provided to the participants along with the list of concepts to use. Because of time constraints the participants were neither given a lesson in concept mapping nor an opportunity to practice the skill. The resulting concept maps clearly indicated that the participants' understanding of the assignment which they were expected to perform independently was limited and varied greatly. To the extent that no intervention was given between the pre and post administration of the test, this varied level of skill in concept mapping does not invalidate the resulting comparison of the pre and post tests as a measure of the change in the participants' content knowledge.

III.5: Post-Institute Evaluation Sessions

To further facilitate a complete analysis of the Institute's strengths and weaknesses and what the participants gained from it, two formal evaluation sessions were held at its completion. The first was a 7 participant round table discussion held on the second to last day of the Institute. This session was facilitated by an individual that had no prior contact with the participants,

however, two Institute staff members that remained silent were present to take notes during the ensuing discussion. The seven participants in this discussion were chosen by the evaluator based on two criteria: they were a representative sample of the participant body in terms of gender, race, subjects and levels taught, and years of teaching experience; and they had not been very vocal during formal or informal opportunities to provide feedback, yet based on the manner of their participation throughout the Institute, they would be likely to discuss issues in this type of forum.

The second formal evaluation session took place on the morning of the last day of the Institute and involved all of the participants. The first half of the session was facilitated by the evaluator, and the second was facilitated by a staff member of the Institute. During this session, the staff members were only allowed to ask questions to further probe participants' comments. They were not allowed to respond to participants' concerns during the session so that the discussion would flow freely and not be stifled by the staff's explanations or points of view.

III.6: Post-Institute Staff Interviews

Following the Institute, debriefing interviews were held with the four staff members that had been most present throughout the Institute, and therefore had the most influence on the DERC's implementation. The objective of these interviews was to obtain the staff's perceptions of the strengths, weaknesses, successes, failures, and immediate outcomes of the Institute as well as to which aspects of the Institute these may have been attributable. These were held during the week immediately following the completion of the Institute. The questions used to focus these interviews is contained in Appendix B as Article 9.

III.7: Post-Institute Participant Activity Reports

In order to assess the impact that the Institute had on the participants teaching, information regarding their classroom activities was collected at three points during the following school year. The participants reconvened on October 14, 1994 and April 22-23, 1995, for follow-up activities during which they presented what they had begun to implement or were planning to implement in their classrooms to the staff and their fellow participants. The evaluator recorded field notes during these sessions. Additionally, in the beginning of February, 1995, approximately mid-way through the school year, participants were asked to complete a questionnaire. It solicited information regarding changes in their teaching, their use of resources provided by the Institute, and their students classroom activities. This questionnaire is included in Appendix B as Article 10.

III.7: The Participant Sample

Except in the cases of the data collected from the CC, the staff of DERC, the focus group, and the daily evaluations, the sample used for this evaluation was 24 classroom science teachers from NC (daily evaluations were collected from the unofficial participants as well as the official ones). The diversity of the official participant body in terms of demographic characteristics, backgrounds and other independent variable is reflected in Table 2 on the following page.

III.8: Data Analysis

The quantitative data collected included the concept maps, the indices used to measure changes in attitudes, and the participant and staff ratings for the various objectives intended and achieved by DERC. These were simply scored and analyzed using various statistical analysis procedures. The majority of the data collected, however, was qualitative.

Table 2: Characteristics of the Official Participant Body.

Variable	Category	# of Part's
Gender	Male	13
	Female	11
Race	White	20
	Black	4
Home Region of NC	Coastal	5
	Piedmont	14
	Mountain	5
Level of School Taught	Middle School (Grades 6-8)	11
	High School (Grades 9-12)	12
	Middle and High School	1
Years Teaching	Less than 5	8
	5 or Greater	16
Recruitment Status	Target School System Rep.	13
	Non Target School System Rep.	11
Science Background *	No Science Degree	12
	Science Degree	11
Formal Ed. Background**	No Education Degree	10
	Education Degree	14
Residential Status During DERC ***	Residential	15
	Commuter	7

* One participant did not report their level of science education.

** NC does not require teachers to have a degree in education.

*** Two participants commuted part time and resided at the Institute part time.

The post-Institute activity reports were examined in order to assess the achievement of DERC's objectives. In order to do this, various categories describing ways in which the Institute was being applied to the participants classes were established. The reports were then compiled and tabulated in accordance with these categories. The results were then compared with the goals and objectives of the Institute, as specified within its proposal. Chapter IV presents this outcome evaluation.

The analysis of the qualitative data for the implementation evaluation was guided by information obtained through the pre and post-Institute interviews with the members of the CC. These interviews were used to illuminate the aspects of

DERC's implementation which gave it its character and were critical in affecting its outcomes. These aspects included the manner in which it directly or indirectly intended to address its goals, as well as issues which arose unintentionally during its implementation. These aspects were then categorized.

Data collected from participants was then examined for any patterns which would not be described by the categories defined from the analysis of the staff's interviews. Once it was ascertained that no new categories were necessary, data collected from the staff, participants, and field notes relating to each category were organized, tabulated (where possible), and summarized in a manner to provide as complete a description of the value contributed to the Institute, by the category, as possible. Chapter V of this report presents the results of this evaluation, as organized by these categories, and the recommendations resulting from it. Chapter VI presents a summary of what was learned through this research. Appendix C contains the participants' responses to the open-ended questions on both post-Institute questionnaires, and Appendix D contains their responses to the daily evaluations.

CHAPTER IV: IMPACTS OF THE INSTITUTE

This chapter presents evidence documenting the extent to which the goals and objectives of DERC were met. All of the planners interviewed prior to the Institute indicated that the most useful indicator of the Institute's overall success would be the changes in the participants' teaching resulting from their participation in DERC. The results summarized in the following section describe the impact that the Institute had on the participants' professional lives.

The majority of the information in this chapter was collected via a questionnaire at approximately mid-way through the school year following the Institute. This questionnaire solicited information regarding the types of activities and projects the teachers had undertaken in their classes since the completion of the Institute, and the types of resources and materials they had used to support these activities and projects. Additional information was collected at two follow-up meetings that occurred at approximately one month after the school year began and one month before the school year was completed. At these two meetings teachers were required to report what they were doing in their classes as a result of the Institute. Information reported by the teachers during both meetings was used to complement the data obtained from the questionnaire.

IV.1: Results

After the Institute ended, one of the participants left teaching and three others either moved out of the area or did not participate in any follow-up reports. Therefore, the results in this section reflect the impact the Institute had

on only 20 of the original 24 participants. All 20 of these participants reported that their awareness of local environmental issues had increased as a result of their participation in DERC, and they indicated a strong desire to apply the Institute's content to their classes. In the case of 19 of the 20 participants, the Institute had made a concrete contribution to their teaching by mid-April of the school year following the Institute. One participant reported a change in the subject he was teaching so the Institute was no longer relevant to his teaching.

The 19 participants using their summer experience reported an increase in the use of environmental examples and lessons in their classes. The data indicated that in some cases, this increase was slight. For example, one teacher integrated a brief overview of fresh water quality into her oceanography class, for the first time. In several other cases the change was more substantial. One teacher claimed that prior to the Institute he had spent two to three weeks on the environment. The change in his confidence and knowledge as a result of the Institute had caused him to increase this to more than 10 weeks. Another teacher reported that she dedicated part of one day each week to environmental topics. Five teachers claimed a dramatic increase in the use of environmental topics in their classes explaining that they had found a way to tie the environment into almost everything they teach. For, example, one teacher wrote, "I have added an environmental unit of study to chemistry (7 1.5-hour lessons), but ... environmental issues permeate the whole curriculum." Another teacher said, "I am now using the environment as the umbrella under which I teach."

All of the teachers said that they were using specific activities and labs they had learned from participating in the Institute. Water-based activities were most popular. The majority of the teachers, 14, reported involving their students in local water quality monitoring activities. Eight teachers reported using air information and activities and the same number reported using soil-based

activities. Several of the activities being used did not reflect activities explicitly performed as part of the Institute's schedule, but were related to its content, or gained as a product of participation in the Institute. Four participants reported using activities based on lesson plans they compiled as a requirement of the Institute. A strong local emphasis was apparent in the majority of the activities reported by all 19 teachers. One teacher reported changing environmental activities she had done prior to the Institute to make them more locally relevant.

Some of the activities in which teachers were engaging their students closely paralleled parts or all of the Institute. One teacher led a student through an independent study project that involved investigating the quality of the stream on his school's campus. This student presented his project at the last Institute follow-up meeting and demonstrated a strong knowledge of water quality issues and monitoring techniques. Also, five teachers reported attempting to perform a holistic assessment of their local environment with their students. Information collected from only two of these, however, gave detailed accounts or demonstrated that there was a systematic approach to this effort. One teacher led her environmental club through an assessment of the county's environmental quality and presented the results at the Institute's final follow-up meeting. The other teacher was assessing the health of his school's grounds with his class at the time of the questionnaire, but did not attend the end-of-the-year meeting to report the outcome of his project.

Ten of the teachers said they were using some activities that were neither performed as part of the Institute nor directly based on its content. Four of them were using activities they had learned from other Institute participants. It was not clear from the data collected from the other 6 participants what the connection between their activities and DERC was, but it could have been the same. These

tangentially related activities included things such as performing inventories of road kills, and building butterfly gardens.

In general, the activities, being used by the teachers with their classes, were consistent with the general goals of environmental education in NC. They were using activities, such as local ecological studies, designed to increase their students' awareness and understanding of NC's natural systems. They were also performing activities designed to increase students awareness of local environmental issues, and impacts of human behavior on natural systems. For example, students were studying water pollution and the environmental degradation resulting from land development. Finally, the teachers reported engaging their students in activities designed to increase their students' ability to be stewards of the local environment, such as recycling programs and dialogues with local environmental managers. It was not clear from the questionnaires and reports, however, whether teachers had implemented activities, addressing each of the three aspects of NC's environmental education goal, systematically or as part of a comprehensive program.

All 19 teachers reported using resources obtained from the Institute to support their classroom activities in some manner. Resource materials used included overheads made from presenters' hand outs, and testing kits and videos ordered through the Institute. The most widely used resource, however, were the human contacts made as a result of participation. For example, some of the local environmental professionals, whom the teachers met during the Institute, made presentations to the classes of six participants. Sixteen of the participants found the environmental management and science professionals they met as a result of the Institute to be useful resources, and reported either contacting them directly, or having their students contact them. Presenters, borrowed directly from the Institute's schedule, made presentations to the students of three participants. In

one case, a presenter from the Institute spent two days at a teacher's school, presenting to the entire eighth grade class (350 students) and all the eighth grade teachers. In contrast to this use of content expert contacts, participants did not use each other as resources. Only one group of four teachers reported having regular contact with each other.

The Institute also had an impact on the teachers' lives outside of their scheduled classes, according to the data collected. Four teachers facilitated or organized a training session for their colleagues. Additionally, two teachers started environmental clubs focusing on local issues, and another teacher was designated both Environmental Specialist and Recycling Director for his school, as a result of his participation in the Institute. Four other teachers wrote grants or received money to enhance their schools' environmental programs during the year following the Institute. Furthermore, all of the teachers indicated that they were attempting to be more involved in and stay up to date on local environmental issues and were continuing to collect information to use with their students.

IV.2: Limitations

There are several problems with the data collected that should be noted. First, it was self-reported and no observations of either the teachers classrooms or resulting projects were made. The only exception to this was the student presentation at the final follow-up meeting. This data therefore reflects a strong sensitivity bias. Realistically, it would have been unlikely for a teacher to report, "I am not doing anything differently as a result of the Institute." Secondly, the teachers knew at the completion of the Institute that they would be required to report on how they had transferred their experience to the classroom, and that two of these reports would be presented to their fellow participants. Therefore,

the extent to which their activities reflected the pressure of this accountability cannot be determined. Third, a significant emphasis was placed on the quantity of implemented activities in all of the participant's reports, while, there was very little (if any) discussion of the quality of these activities. Finally, given the lack of a control group used for this study, and the lack of baseline data describing teachers activities prior to the Institute, it is not possible to establish definitively a cause-and-effect relationship between the teachers activities during the school year examined and their participation in DERC.

IV.3: Summary

Despite these questions regarding the validity of the data, it appears that the Institute's participants were including studies relating to their local environment in their classes. The teachers were integrating water-based activities and lessons most, but were also including some studies of air and soil issues in their classes. For the most part, however, they were not making an attempt to synthesize the variety of information regarding environmental health into an environmental report card. As indicated by how actively they were employed, professional environmental science and management contacts were the most useful resources obtained, by the teachers, as a result of participation in DERC. Overall, the participants maintained a high level of motivation and enthusiasm for environmental education throughout the year following the Institute.

The impact that DERC had on the participants' classrooms suggests that the Institute was successful at achieving its goal of providing teachers with "exciting information and instructional methods for the development of environmental strategies in the classroom (O'Neil, p. 1, 1993)." The results also indicate, however, that the Institute fell short of its desired outcome of involving

the students of participating teachers in an "environmental education project in which they evaluate the water, air, and land management of their local area (O'Neil, p. 5, 1993)." With the exception of two teachers, the participants appeared to utilize only various parts of the Institute, and either chose not to or were unable to involve their students in synthesizing an environmental report card. The results also suggest that the Institute did achieve success at the second intended outcome: producing teachers who are, "leaders in the development of environmental education classroom strategies (O'Neil, p. 5, 1993)." Finally, the activities teachers had implemented in their classes suggest that the Institute had made some progress toward achieving the goals of EE in NC. There was little evidence, however, of a systematic approach by the teachers to the integration of EE into their classrooms.

The Institute's level of success is both a product of its content and implementation. The following chapter will examine which aspects of the Institute were strongest in contributing to or limiting its overall success.

CHAPTER V: DETERMINANTS OF DERC'S SUCCESS

The preceding Chapter suggests that DERC succeeded in providing an experience that was relevant to the teachers' professional lives, and prepared them to use environmental topics more actively in their classes. Nonetheless, the transference of the Institute into the participants' classrooms had some potential weaknesses, particularly the general lack of an apparent systematic approach to the integration of EE into the teacher's classrooms. The following chapter presents the results of the data obtained from immediately prior to the Institute to immediately following its completion, evaluating the Institute's implementation.

These results describe how the Institute attained its impacts and are presented in thematic units. These units focus on DERC's efforts at:

1. increasing understanding of environmental science and management concepts;
2. providing field skills;
3. increasing access to resources;
4. developing an environmental report card;
5. facilitating transference into the classroom;
6. providing current and locally relevant information through the use of guest presenters;
7. developing participant rapport and collegiality;
8. managing time; and
9. meeting the needs of the participants.

The first five sections represent the core of the Institute. These aspects of the Institute's implementation reflect the Institute's direct and intentional attempts to address the goals of DERC. The following two sections describe factors which were intentionally designed into DERC to enhance the overall program, but only indirectly address its goals. The eighth section, describes an issue which emerged during the implementation of the Institute and impacted on its overall

success. Finally, the last section will describe the Institute staff's efforts to use feedback from the participants to shape the Institute, as it was in progress.

V.1: Increasing Understanding of Environmental Science and Management Concepts

Environmental science and management concepts formed the foundation for DERC. The Institute intended to address air, land, and water issues; their interactions; and the management of the environment. The "sub-goals", in the proposal for the Institute, specified that DERC would increase participants' understanding of ecosystems, ecosystem health, and environmental management. In practice, however, the content provided participants an increased understanding of concepts of environmental science, environmental health, and environmental management. Ecology was presented within this broader framework.

These concepts were taught throughout the Institute, generally through lectures and presentations by content experts. Early in the Institute, brief introductions of the basic science relevant to studies of air, water, and land issues were provided. These introductions addressed basic concepts such as the hydrologic cycle, mineral weathering, concentrations of gases in the atmosphere, and the mechanism for the generation of acid rain. Following the introduction of these basic concepts, the science content of the Institute was provided as it pertained to specific environmental health issues or the management of the environment. Therefore, there was a consistent and strong connection drawn throughout the Institute between environmental science and environmental management.

V.1a: Concept Maps

A measure used to assess the participants' change in content knowledge relevant to the Institute was a concept map. The concept mapping instrument was designed to measure change in the participants' mastery of the body of knowledge defined as relevant by the planners of DERC. The test required each participant to develop a map which demonstrates the connections between various concepts represented in a list of 27 words and phrases compiled by the planners (Table 3). This list contained phrases representing various topics to be addressed by the content of DERC.

Table 3: List of Words and Phrases Provided to Participants on Pre and Post-Concept Mapping Instruments*

air quality	estuary	particulate matter
algae	eutrophication	non-point source pollution
amphibians	fish	environmental policies
benthic macro-invertebrates	flora	rivers
best management practices	habitat	run-off
development	human values	sedimentation
ecosystem health	land use	water quality
environmental report card	nutrients	watershed
erosion	ozone	weather

*Participants were asked to use at least 15 of these to construct their maps.

Novak and Gowin suggest that three different aspects of a concept map combine to create a tool that can measure understanding of a particular topic (1984). This tool provides the format to describe the relationship between closely related concepts. This is demonstrated by connecting two concepts from the list and describing the connection using a phrase, thus forming a "proposition". Second, it provides the opportunity to organize concepts into "hierarchical levels". Connecting propositions in a particular order demonstrates the ability to distinguish which concepts are subsumed by a more general concept in such a way as to provide a more complete understanding of it. And lastly, the use of "cross links" allows a concept map to demonstrate the ability to connect and describe the

relationship between different, discrete lines of thought. A cross link connects concepts on discrete hierarchical threads with a phrase describing the relationship.

A score is determined for each of the three aspects of the map by allocating a specific number of points for the inclusion, respectively, of each proposition, cross link, or hierarchical level that correctly reflects an actual relationship. A cumulative score for the map may then be determined by summing the scores for each of these factors. Although a theoretical maximum score for a given concept mapping scenario exists, for the purposes of this assessment, only the change in a participant's score from pre to post-testing is relevant. The absolute score of one individual map, outside of the context of its corresponding pre or post-score, does not provide any useful information. Figures 1 and 2 provide examples of 15 word, concept maps generated from the list of words and phrases provided to the participants. On these examples, propositions are illustrated using solid lines, and cross-links are illustrated using dashed lines. Sample calculations for the cumulative score of each map are also shown.

Two different protocols were used to score the participants' maps in an attempt to provide some evidence for the validity of the results. The first scoring method used, "method 1", was consistent with the one established by Novak and Gowin (1984). This method allots a specific number of points for each accurate and successful inclusion of one of the three features of a map. The second approach, "method 2", was based on the "revised concept evaluation scheme", developed by Westbrook and Mareck (1992) and utilized by Sechler, Spence and Westbrook (1994). It is similar to the first method described, however, it allots partial credit for connections that are ambiguous: neither clearly correct or clearly incorrect. Table 4 outlines the protocols for the two methods for scoring the pre and post-concept maps used to assess the change in the participants' understanding of the body of knowledge relating to DERC.

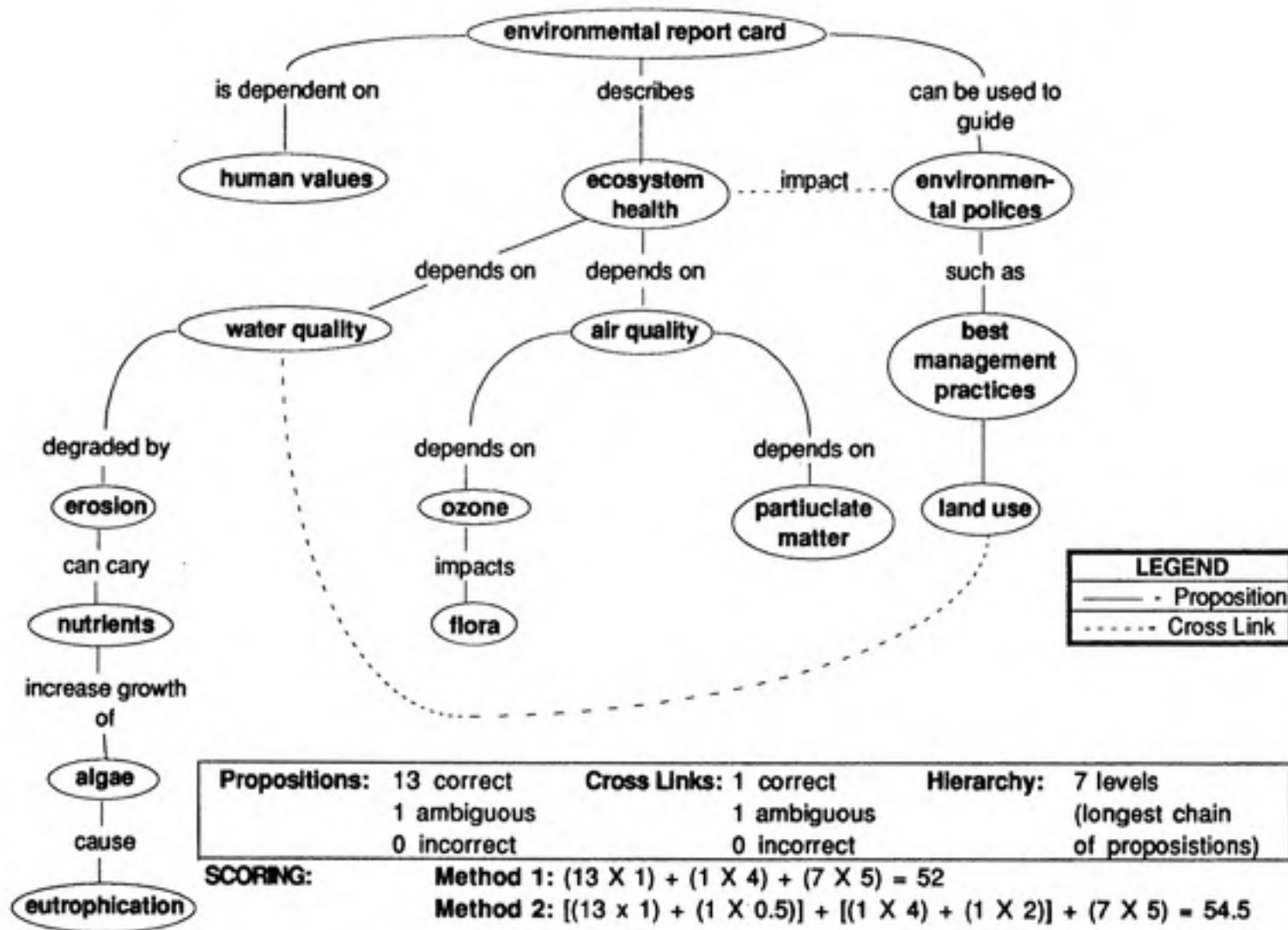
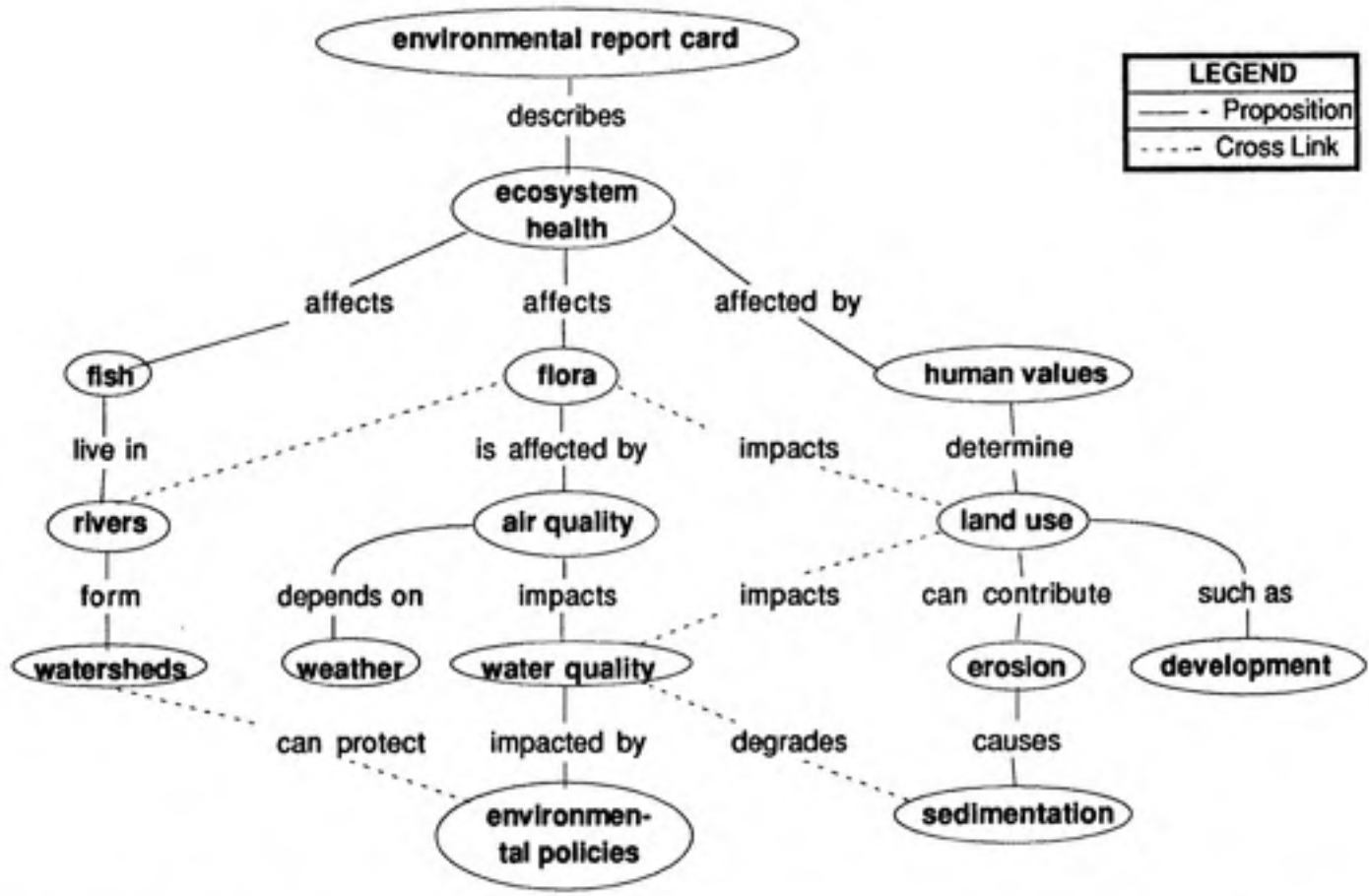


Figure 1: Concept Map Example and Sample Calculations for Cumulative Score



LEGEND	
—	Proposition
---	Cross Link

Propositions:	14 correct	Cross Links:	4 correct	Hierarchy:	6 levels
	0 ambiguous		1 ambiguous		(longest chain of propositions)
	0 incorrect		0 incorrect		

SCORING: Method 1: $(14 \times 1) + (4 \times 4) + (6 \times 5) = 60$
 Method 2: $[(14 \times 1) + (0 \times 0.5)] + [(4 \times 4) + (4 \times 2)] + (6 \times 5) = 62$

Figure 2: Concept Map Example and Sample Calculations for Cumulative Score

Table 4: Concept Map Scoring Protocol: Method 2***PROPOSITIONS:**

1. One point is awarded for each correct proposition that demonstrates clear and complete understanding of the relationship between two concepts (must contain a linking word).
2. One-half of one point is awarded for each proposition that demonstrates limited or ambiguous understanding of the relationship between two concepts. Such a proposition may not contain a linking word but does connect terms that are related in an apparent manner, or it may express some minor misconception.
3. No points are awarded for incorrect propositions, including: propositions that link two related terms but indicate an entirely incorrect relationship, linked concepts without a linking word that are not related in a readily apparent way, etc..

CROSS LINKS:

1. Four points is awarded for each cross link that demonstrates a clear and complete understanding of the relationship between two concepts on discrete threads (must contain a linking word).
2. Two points is awarded for each cross link that demonstrates limited or ambiguous understanding of the relationship between two concepts. Such a cross link may not contain a linking word but does connect terms that are related in an apparent manner, or it may express some minor misconception.
3. No points are awarded for incorrect cross links, including: propositions that link two related terms but indicate an entirely incorrect relationship, linked concepts without a linking word that are not related in a readily apparent way, etc..

HIERARCHY:

Five points is awarded for each concept in the single longest unbroken chain of correct propositions.

CUMULATIVE SCORE:

The cumulative score is the sum of all of the points awarded for each of the categories above.

* **Note:** The protocol for method 1 is the same, however, no points are awarded for ambiguous connections.

V.1b: Concept Map Results

The results of the pre and post-concept mapping results appear in Table 5, for both methods of scoring. This table displays the mean of the participants scores for each of the three factors of the map, as well as the cumulative scores. Table 6 displays the percentage change between the pre and post-tests accompanied by the power of the statistical difference between the pre and post-

scores, as computed using a paired samples t-test, for each individual factor and the cumulative scores.

Table 5: Mean Pre and Post Scores for the Different Factors of the Concept Maps, as Scored Using Two Methods.

Scoring Method	Propositions		Cross Links		Hierarchy		Cumulative	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
1*	8.08	12.41	17.91	19.37	6.00	18.16	32	49.96
2**	12.65	16.13	25.54	24.67	11.13	23.91	49.32	64.72

* - credit only allotted for correct connections

** - full credit allotted for correct connections and half credit allotted for ambiguous connections

Table 6: Percent Change in Pre and Post-Scores and Results of Paired Samples T-tests Performed on Pre and Post-Institute Concept Map Scores as Established Using Two Scoring Methods (N=23).

Scoring Method	Propositions		Cross links		Hierarchy		Cumulative	
	Change	p<X	Change	p<X	Change	p<X	Change	p<X
1*	53.5%	0.034	8.2%	0.636	202.7%	0.001	56.3%	0.013
2**	27.5%	0.008	-3.4%	0.618	115.0%	0.000	31.2%	0.001

* - credit only allotted for correct connections

** - full credit allotted for correct connections and half credit allotted for ambiguous connections

The results of the concept mapping tests demonstrate a statistically significant increase in the participants cumulative understanding of the concepts listed on the instrument, independent of the scoring protocol used. Additionally, the participant's abilities to draw connections between discrete concepts and organize them into hierarchical levels were improved at statistically significant levels. On the other hand, participants' ability to draw cross links between various threads remained unchanged. This may reflect a failure of the Institute to demonstrate the relationship between some more distantly related concepts. For example: water and air. Despite the lack of change in this one factor, and to the extent that the map measures the impact of DERC, the results of the concept maps reflect that the Institute was very successful at increasing the Institute-related content knowledge of the participants.

Although qualitatively similar results were achieved using both scoring methods, the magnitude of the results was clearly dependent on the method of scoring used. In each case where a statistically significant change occurred, the first scoring approach indicated a change of almost two times the change indicated by the second method. This demonstrates that the magnitude of the change is dependent upon the subjective interpretation of the correctness of the connections drawn on the map. It further suggests that caution should be employed in using the concept maps to define the strength of DERC's impact on the participants content knowledge. The qualitative similarity of the results obtained using both scoring methods, however, allows the conclusion that DERC had a statistically significant impact on the participants' understanding of the body of knowledge defined by the planners as relevant to the Institute. It should be observed that further evidence for the validity of the concept mapping results could have been obtained if they had been scored by more than one person and the resulting scores had been compared. This further step to validate the results, however, was not taken.

V.1c: Qualitative Results

Although it was the intent of the Institute to provide a strong background in all areas pertaining to the environment, qualitative data collected from both the staff and participants at the completion of the Institute revealed that they felt it was most successful in addressing water issues. "Excellent knowledge of water," was the statement of one participant in their list of two fundamental strengths of DERC. Another participant simply said, "the water quality issues presented were the strongest feature [of the Institute]." All four staff members shared this sentiment. Okun explained this as a product of the staff's area of expertise: "We did the best on water ... we were all clearly water people and I think the workshop

reflected that." Despite, the involvement of air and land issue content experts in the planning of the Institute, the content of the Institute clearly reflected a water bias providing an unbalanced number of sessions addressing water issues. A participant listed the comment, "None of the leaders had expertise with soil or air," as one of three weaknesses of the Institute.

Participants largely credited the Institute's strength in water quality to Dr. Don Francisco, a water quality scientist. Dr. Francisco presented the introductory lecture on water quality on the second day of the first week and was present consistently throughout the first two weeks. He remained accessible during much of the remaining two weeks and checked in with the participants regularly. Twelve out of the 24 participants listed Dr. Francisco among the five presenters most valuable to them. Although he was credited as being an excellent teacher and role model for the participants by the participants and staff, discussion during the final evaluation session suggested that much of the value in his presence for the duration of the first two weeks was the continuity which he added to the water related content of the Institute. In comparison, issues regarding land appeared regularly on the schedule and the individual sessions were often regarded as extremely valuable, however, this content area, as a unit, did not clearly emerge as a strength in any of the data collected.

In contrast, during the final evaluation session, the air contribution to the Institute was largely viewed as a weakness of the Institute, apparently because of the lack of consistent attention it received. The presentation of air concepts was largely limited to one day during the first week which was planned and presented by content experts from the US-EPA. This day addressed air quality, air quality management, and air quality monitoring and was extremely well received by the teachers. Informally, several of the participants noted the applicability of the content to their classes and the comments on the daily evaluations corroborated

these observations. One teacher's comment seems to reflect the participants' overall sentiment regarding this day: "The lectures were very informative and helpful for my lectures and lesson plans." Despite this, no participant included a presentation on air issues in their list of the five most valuable presentations to them, and only three participants listed an air presenter among their list of the five most valuable presenters to them. One explanation for this apparent inconsistency could be that there were only three more presentations relating to air quality during the remainder of the Institute, and that in comparison to water and land use issues, it seemed that air issues had not been adequately addressed or had been over-shadowed by the Institute's other aspects.

Participants indicated, during the evaluation session on the last day of the Institute, that they were very disappointed with the minor role that the EPA played throughout the Institute. The Institute was based at and sponsored by EPA's national center for air research and it was apparent that the participants had expected to have more involvement with the EPA's air labs and a greater opportunity to interact with its scientists. Therefore, the lack of agency involvement with the exception of one day's worth of presentations also could have contributed to the perception that the Institute was weak in air quality content. Three participants specifically mentioned the lack of EPA's involvement in the workshop as one of its fundamental weaknesses. One wrote, "I question EPA's fulfilling their commitment to this workshop." Another suggested, "Visits to research areas of EPA would have been appreciated." This subject also received a considerable amount of attention during the final evaluation session.

The staff and the participants agreed at the completion of the Institute, during the closing evaluation session and the debriefing interviews that having air and soil content experts, playing a role similar to the one played by Dr. Francisco, would have increased its strength in these areas, and the quality of the Institute.

This statement is supported by comments on the closing evaluation questionnaire as well. "Have soil and air experts as well as water," suggested a participant." Providing such experts would have helped to tie together information from the various discrete presentations, providing more continuity to the content. Additionally, it would seem by inference that the Institute may have been more successful at addressing air quality if presenters had been spread out throughout the Institute instead of clustering them on a single day.

The realized implementation of environmental topics in the participants classroom, following the Institute, would serve to validate this observation.

The qualitative results presented in this section suggest two ways that the change in participants' content knowledge, as demonstrated by the concept maps, may have been made more dramatic. First, it serves to highlight the role of content experts in the planning process to ensure that all topics are adequately addressed. Greater use of the EPA in planning the day-to-day activities might have helped to ensure that they were well represented throughout the Institute and that air quality issues were thoroughly addressed. Second, facilitating ongoing or regular contact between the participants and a content expert not only makes a direct content contribution, but also lends to the continuity of the Institute, tying together various discrete presentations. Providing an expert in each area addressed by the Institute, who is familiar with both the program and teaching processes, may help to maximize the potential of an Institute.

V.2: Providing Field Skills

The "sub-goals" of the Institute, state that the Institute will increase participants skills and understanding of methods of monitoring ecosystem health. Although much of the information regarding how the environment is professionally monitored was presented by content experts and is subject to the

analysis contained in the preceding section, the Institute also intended to provide participants with field skills to monitor environmental quality first hand. In practice, the field techniques presented were limited to water and soil monitoring. This was due, in part, to the technological needs of accurately testing air quality and, again, the lack of expertise of the staff in this area. Water and soil monitoring skills were demonstrated and practiced primarily during the first two weeks of the Institute.

Prior to the Institute, field monitoring kits were assembled which included D.O and pH kits, conductivity testers, dip nets, and thermometers to measure water characteristics; shovels and kits to measure the nutrient level of the soil; and other assorted items such as field guides and hand lenses which were provided as resources. These kits were brought on each Institute field trip.

Soil monitoring skills were introduced during the first week of the Institute by a demonstration presented by soil scientists. A number of problems regarding this session were observed and the observations were corroborated by informal feedback, and written comments on the daily evaluations. First, the soil scientist with whom this session was originally organized sent substitutes who were either not prepared or did not seem clear on the objectives of their presentation. One participant commented, "The people presenting were a little unprepared and seemed a little weak in their subject." Secondly, the presentation immediately beforehand ran significantly beyond the scheduled time. This severely limited the amount of time that the participants had with the soil scientists and left no time following the demonstration for the teachers to practice the skills under their supervision. This prompted comments similar to, "I wanted to do the tests myself." Finally, although the monitoring techniques demonstrated by the scientists were simple and required only inexpensive materials, the Institute was not prepared with soil kits or equipment analogous to those demonstrated. The

soil testing kits provided by the Institute were not used during this demonstration. One participant commented regarding this discrepancy, "I would have liked to use the test kits we had."

The teachers received a list of the contents of the scientists soil testing kits with instructions to make the items from common inexpensive materials, and returned the second week with equipment to measure infiltration rates. Therefore, throughout the second week, teachers practiced measuring infiltration rates and using the soil nutrient measurement kits. Time allocated to practice these tests was considered to be very valuable by the participants.

Although conductivity meters were used during the first week, most of the water quality monitoring skills were introduced by a combination of Institute staff and water quality experts during a session early in the second week. This session introduced the use of the pH and D.O. kits provided by the Institute, the monitoring of benthic macroinvertebrates using kick nets, and use of the mass spectrometer to measure nitrate and phosphate levels. Participants worked in groups learning the various skills, and rotated among the various stations. In general, this session was regarded extremely highly by the participants. On the daily evaluations, 19 participants rated it a '5', and three rated it a '4'. Furthermore, 16 participants listed the activity as one of the 5 sessions most valuable to them. The only negative or constructive feedback regarding the activity indicated that they would have liked more of the same. "It would be valuable to spend more time at the Eno River ...," commented one participant, whose comment reflected the sentiment of at least three others. With the exception of the benthic sampling, and the phosphate and nitrate monitoring, the teachers were given several other opportunities to practice their field skills during the remainder of the week.

Participants were, in general, enthusiastic about the opportunity to practice field skills. During the closing evaluation session and the focus group discussion, several participants cited field skills among the most valuable things which they got from the Institute. Three participants, however, wrote on the post-Institute questionnaire that they would have liked to have spent more time on soil testing. One participant commented, "I would have liked to have done more soil tests and in greater variety." Additionally, three participants also considered the lack of hands-on activities relating to air as a weakness of the Institute.

The teachers further suggested during the closing evaluation session that it would have been beneficial to do some "make and take" projects and assemble kick nets and soil testing equipment which they could take with them. Three participants made specific comments suggesting this on the post-Institute evaluation questionnaire, and one participant actually cited the lack of make-and-take projects as one of four fundamental weaknesses of the Institute. The Institute did provide each participant with up to \$100 to order items from a list of resources and equipment used by the Institute, however, the simple items such as kick nets which could be simply assembled from accessible materials were not included on the list.

The level of proficiency attained by the participants, in the field skills practiced during the Institute was not tested and was not readily apparent. Although the participants were given a significant amount of time to practice these tests, the time was not strongly structured, therefore some participants inevitably became more proficient with these skills than others. All four of the staff members interviewed after the Institute expressed that the level of skill at using the tests, attained by the participants, depended on their motivation to learn the skills, as well as their level of experience upon entering the Institute. They also agreed that it was not clear that all of the participants had mastered all of the

skills. The actual use of field skills in the classroom during the year following the Institute, however, would suggest that the majority of the participants were functional in using the tests.

The preceding discussion allows a number of conclusions to be drawn. First, participants enjoy performing field monitoring tests because they provide hands-on activities which they can use with their students and they are fun to practice. From this stand point, it would seem that, where the inclusion of these tests is relevant, they can make a strong contribution to a workshop. Secondly, attention to providing proper equipment to perform these tests is important. The equipment provided to the participants should be the same as the equipment used for demonstrations. Third, an attempt should be made to send the participants home with monitoring equipment to be used in their classes, and make-and-take projects may provide one way to do this inexpensively. Lastly, it would seem that an attempt to ensure that all participants attain the same level of proficiency at performing the tests would be helpful in maximizing the value of their use. Utilizing a cooperative learning approach in which the participants teach the tests to each other may be helpful in achieving this objective, and would also provide participants an opportunity to practice teaching the skills as they would to their own students.

V.3: Access to Resources

The "sub-goals" in the proposal for DERC specify that the teacher training effort would increase the participants' understanding of and access to environmentally related resources and their familiarity of the structures and roles of resource management agencies at different levels of government. Although several activities and content driven sessions addressed these goals indirectly, this was the central focus of two particularly unique activities. Additionally, the

Institute made several attempts to increase participants access to resources through the use of technology.

V.3a: At the State and Local Level

The first activity addressing resources and the agencies of environmental management was intended to provide access to resources and information collected at the state level. It required the teachers to hunt down various pieces of environmental information, pertinent to their local area, in the Archdale Building, which houses the various offices of NC's Department of Environment, Health, and Natural Resources. To prepare the teachers for this activity, they were given a presentation intended to familiarize them with the various parties responsible for managing NC's environment, and a list of items to locate within the building. The teachers were given about 2 hours to try to find these pieces of information. The group then reconvened to discuss what they found and learned. During this debriefing session they were welcomed by Jonathon Howes, the secretary of DEHNR, and addressed by Debra Crane, DEHNR's public relations person whose responsibility is to assist the public in their inquiries.

During the debriefing session, it was apparent that the teachers were very excited at the reception that they received from the various staff members in the offices they visited as well as the information they had come across in these offices. They were, however, generally frustrated with the difficulty they experienced in locating specific pieces of information. Additionally, with the exception of some articles of information, the teachers did not seem to have clear ideas regarding how they would use the information that they were successful in collecting.

The presentation designed to prepare them for the activity was largely at fault for their frustration in locating materials. The presenter did not address the

intended topic and offered little information to help guide them through their search. Comments on the daily evaluations clearly reflected this presentation's failure at meeting its objectives. "She couldn't direct us to anyone," wrote one participant. "Just plain fuzzy. Seems like it'll be nearly impossible to track down things ... ," said another. A third participant's written comment summarized the feelings of many: "What was the point of the second speaker?" they asked.

After meeting with the public relations liaison, at the end of the activity, it became clear to both the participants and staff that she would have been the appropriate person to prepare the teachers for their treasure hunt and guide them through it. One comment on a daily evaluation stated, "Debra seems like a super resource. Let's use her and get the valuable data we need." Several other comments also suggested the need for better planning prior to the activity. For example, "We needed Debbie before our search or more time to 'discover'," and "[the activity] could have been of more benefit had we known what we were doing to begin with." This second comment also implies that the purpose of the activity on the whole was not clear. This was also suggested by the comment of another participant, "Another 'assignment' at the Archdale building would be nice." Both the purpose of the assignment and the usefulness of the information could have been enhanced by a different assignment. For example, the teachers could have been given a specific question to answer, asked to decide what kind of information would help them answer that question, and then assigned to collect this information.

On the whole, however, the teachers related that they felt that the activity was valuable despite these weaknesses. Twelve of the participants rated the activity a '5', extremely valuable, and seven rated it a '4'. "I understand better how to find information at the Archdale building now," commented one. On the post-Institute evaluations, eleven participants listed the activity as one of the five

most valuable presentations to them. The activity also provided the teachers with a greater understanding of the role of state government in managing the environment. Finally, the most valuable lesson gained from the activity may have been to start a search with the person whose job it is to assist the public in such endeavors.

The second activity addressing environmental information and exposure to agencies managing the environment targeted the local level. The teachers were given a full day of the Institute during which they were required to interview various people in their local area involved in managing the environment. The teachers were notified of this activity in advance allowing them to set up their meetings prior to the day of the activity. On the designated day, teachers met with county planners, county managers, and representatives of other public and private organizations with a responsibility for the environment.

Teachers met on the next day the Institute was in session to discuss their experiences. The response to the activity was overwhelmingly positive. On the daily evaluations, 20 participants rated the activity a '5', and three rated it a '4'. Furthermore, 13 participants listed the activity among the five most valuable presentations to them. They reported that this activity opened the door to a new and previously untapped resource to assist them in their classroom teaching. Regarding the application of the activity to their classes, one teacher wrote, "I learned about all the environmental programs available for students." The comment of one teacher, taken from a daily evaluation, provides the best description of how the teachers, on the whole, felt about this activity: "I learned a lot and was pleased at all the respect I got from the people I interviewed." The value of this activity was also addressed during both the closing evaluation session and the focus group discussion. It was confirmed by the teacher's prevalent use of some of the contacts made during the following school year.

Several participants expressed that the timing of this activity was an important factor in its success. On the positive side, one participant stated, "Doing this several weeks after the start of the Institute was very beneficial in knowing what questions to ask and understanding the information. I felt more confident about the subject material and also didn't 'waste' the interviewers time." Some teachers, on the other hand, had some trouble maximizing the usefulness of this opportunity because it took place on a Friday before a long weekend and they had trouble scheduling as many meetings as they would have liked.

These two activities succeeded in providing teachers with several contacts and access to several resources locally and at the state level. These two activities, empowered the participants by placing the burden of responsibility to make contacts and collect information on them, and modeled a realistic manner in which information is collected, and contacts are made. It could be inferred, that one significant result of the Institute which, at least in part, reflects the success of these two activities is that at the completion of the Institute, on the evaluation questionnaire, 18 out of the 24 participants indicated that they intended to become more involved in environmental issues as a result of the Institute. This would suggest that the participants gained a greater sense of access to state and local government. It would seem from the implementation, however, that the value of such activities could have been optimized if the participants were given a very realistic problem that they were trying to solve through the use of these resources.

V.3b: Through the use of Technology

The Institute also made several attempts to expose the participants to various technological tools as resources to help them access, understand, or use environmental information. These tools included the internet, GIS, and visual

computer models. In short, the success of these various presentations, activities, and demonstrations was extremely limited. Nine participants specified on the post-Institute evaluation questionnaire that general aspect of the Institute relating to technology, or attempts to integrate computers into the Institute were the "weakest feature[s] of the Institute."

There were two basic reasons for this problem. First, the teachers considered GIS, and the computer models to be inaccessible to them for use in their classroom, and on that basis questioned the value of these presentations. One participant wrote, "I feel like I am being teased with something I will never be able to use but would very much like to." Despite this sentiment, when successful, these sessions did serve to "expose" teachers to technology being used to monitor the environment and helped them to visualize some of the abstract concepts that they had been learning about, such as air pollution and the relationship between land use and water quality.

The primary reason for the failure of the technology based sessions, however, had to do with the Institute's success at getting the technology to work in the first place. On almost every occasion that computers were required for an activity, presentation, or demonstration, there was some delay due to technical problems. The worst of these problems occurred during two sessions that were intended to be opportunities for the teachers to get experience using a GIS program, and the internet. On both of these occasions the technological problems were so bad that the presentations degenerated into demonstrations. The technological problems frustrated the teachers and in some cases they viewed the associated sessions as "a waste of time". Many of the teachers comments regarding these two activities in particular reflected disappointment. "Could have been excellent," commented one participant. "Technology once again let us down, commented another". Three of the staff members expressed,

during their debriefing interviews, that the Institute had done the participants a disservice by portraying technology in a negative light. The fourth disagreed and felt that the Institute had given an accurate portrayal of the current state of technology. In short, the technologically based sessions of DERC contributed little or nothing to the implementation of the Institute to the participant's classrooms.

The lack of success DERC achieved at presenting technology as a resource suggests that certain precautions must be taken when attempting to integrate technology into an Institute. It is clear from the experiences of DERC that all applications of technology should be checked far in advance of its actual presentation to ensure that all machines are working, and that any software required is compatible with these machines. It should also be double checked immediately prior to its intended use. It must be understood that the planning required to use technology in a presentation is time consuming. Experts in the use and troubleshooting of the technological application should be on hand during the presentation, and if money permits these experts should be responsible for planning the details of the presentation. Finally, in case a technological failure occurs, back-up equipment should be available or alternative plans should be made for the use of this time.

V.3c: Summary

In conclusion, despite the technological failure's, DERC did succeed at increasing teachers access to useful resources for their classes. These resources included information collected and held by various agencies responsible for the management of the environment, and contacts to serve as resources for their teaching efforts. Further, DERC provided participants with an increased familiarity of and sense of access to the process of managing the

environment, by involving them with their local resource people. The outcome evaluation of DERC demonstrated that these contacts were the most valuable resources provided by the Institute.

V.4: Developing an Environmental Report Card

As implied by the goals specified in the proposal and the title of the Institute, all of the information, resources, and skills mentioned to this point were to be applied to the synthesis of an environmental report card. Instead of discretely assessing various components of the environment, this report card was intended to tie various pieces of information regarding environmental quality together to place a qualitative "grade" on the environment as a whole. The process of this synthesis was not only intended to provide a framework for the various aspects of the Institute but was also intended to provide the participants with a systematic process for the implementation of DERC in their classes.

The Institute contained several activities to assist the teachers in establishing value-based criteria upon which to grade environmental quality. This was perceived by the planners to be the first logical step in the process of developing an environmental report card. The Institute, however, failed to progress past this step according to Smith, one of the staff members. By observation, as the Institute progressed, the process of developing an environmental report card received increasingly less attention.

One reason for the failure in providing a process for either developing an environmental report card, or synthesizing a holistic assessment of the environment at a local level, was the lack of consensus of the planners on their interpretations of the importance of the development of an environmental report card as a goal. Smith's statement "the goal of the workshop is to prepare the teachers to lead their students to develop an environmental report card" defined

the most extreme position. On the other hand, as indicated by pre-institute interviews, others involved in the planning and implementation of the Institute considered the term "environmental report card" to be a catch phrase, which was perhaps a useful metaphor in provoking the participants to think about the assessment of environmental quality.

This confusion could have been a product of the way the goals and objectives were written in the Institute's proposal. While neither the "overall goal, or the related "sub-goals" allude to the development of an environmental report card, the "weekly goals" written in the proposal are based on this concept. The planners of the Institute never reached a consensus regarding the concept's importance. This resulted in a lack of consistency in addressing the concept both in the planning and implementation stages of DERC.

Without successfully addressing the theme of developing an environmental report card there was no clear focus for the Institute on the whole, and very little to tie the various discrete sections of the Institute together. This may have resulted in the lack of change in the participants' ability to "cross-link" concepts, as demonstrated by the concept maps discussed in the first section. The staff intended to perform daily debriefs in order to tie together various aspects of the Institute, however, these mainly took place at the end of the day when both time and participant's attention were limited and often degenerated into general discussions without a consistent theme.

At the completion of the four weeks, the manner in which everything fit together did not seem to be clear to the participants. Responses to the question, "What did you understand the overall goal of the Institute to be?" represented a wide range of interpretations of the Institute's purpose. "To become more familiar with our environmental state," wrote one participant. Another responded, "To enable and empower teachers to teach about their local environment." "To get

teachers (and their students) concerned enough about their environment to do something about it in their communities," stated a third. "To enhance my knowledge of the environment ... to be able to use that knowledge to teach my class, and make them more aware of environmental issues," wrote another. Seven other responses alluded to the environmental report card or grading to the environment. Although each of the goals stated was one that would be considered desirable from an environmental education standpoint, the range of responses reflects a lack of clarity in the Institute's purpose.

The value that a central concept or theme, running throughout the four-weeks, would have contributed to the Institute is difficult to estimate. Such a focal point was provided during the second week, however, and appeared to make a significant contribution to its value. The second week of the Institute was designed around the investigation of various factors impacting the quality of water in the Neuse River. All of the activities of this week were summarized and linked together during a debriefing session at the completion of the week. This discussion was considered by the participants to be extremely valuable. Seventeen rated this session as a '5' on the daily evaluation, and the other five participants present rated it a '4'. This discussion elicited comments such as "Great wrap-up;" "best ideas and discussion;" and, "The debrief helped tie together everything for the week." The week on the whole received similar comments. "Very exciting week," wrote one participant. These results suggest that a focal point for the entire Institute may have made a dramatic contribution to its overall value.

The lack of a single specific focus for the Institute could have been the cause of the apparent lack of a systematic approach to the participants' application of environmental topics to their classes during the year following the Institute. One participants written suggestion for improving the Institute serves to

support this conclusion. He wrote, "Conduct the workshop as a model of what we should be doing in the classroom."

In conclusion, there are several lessons which are highlighted by the discussion in this section. First, it underscores the necessity to write a proposal for an Institute with appropriate, clear, and easily interpretable goals. Second it serves to demonstrate the necessity for all of the people involved in the planning and implementation of the Institute to have a clear and consensual understanding of what these goals are and how they are to be attained. Third, it suggests that providing a theme or concept to tie together various aspects of the Institute may help to make the program more than the "sum of its part." And finally, to reiterate the position of the final participant cited, it serves to demonstrate the importance of using the Institute to provide an explicit model of the process intended for the teachers to implement in their classrooms.

V.5: Facilitating Transference into the Classroom

The Institute "sub-goals" specify that the Institute will "increase transformation and transference of the experience from the Institute to the classroom" Although the Institute may have failed to model an explicit process for the transference of the Institute's content into the classroom, there was a significant emphasis placed on the transference of the Institute's content to the classroom by its staff. Such efforts included regular discussions regarding the application of certain activities to the classroom, a discussion of field trip logistics, the utilization of model teachers, and the provision of classroom related materials as resources. Most significantly, the Institute participants were addressed by the NC Department of Public Instruction regarding integrating environmental education into the new state curriculum, and asked to complete an

assignment which would prepare them to apply the Institute's content to their classes.

V.5a: Barriers, Comfort, and Resources

The barrier, comfort, and resources indexes contained within the pre and post-survey instruments were designed to help measure the overall success of the Institute at facilitating the transference of the Institute's content into the participant's classrooms. The barrier index was designed to determine the participant's perceived importance of various barriers to the integration of environmental topics into the classroom. The comfort index was designed to measure how comfortable the participants felt teaching lessons on a variety of topics. And the resource index was designed to measure the participant's perception of how likely they were to use a variety of resources, techniques, and teaching approaches that would facilitate the integration of the Institute's content into their classrooms. The comparison of the pre and post-results from these indexes provides a measure that is useful to describe the impacts of the overall efforts of the Institute to facilitate the transference of its content to the classroom.

Each participant's score for each index was calculated by summing the ratings of the items in the index, the pre and post-scores for each index were then compared for all participants using paired samples t-tests. The results of the comparison of the pre and post-scores for each of these measures (displayed in Table 7) demonstrate a strong statistically significant difference in the desired direction for all three of the indices. The participants' perception of the strength of the barriers listed on the barrier index, in total, dropped an average of approximately 25%. The teachers' scores demonstrated an increase of similar magnitude in their comfort in teaching lessons on the topics listed on the comfort index. The results from the third index illustrate that the likelihood of the teachers

using the resources and techniques listed on the resources index increased a statistically significant 7%. It is clear from these results that the participants' Institute experience strongly relevant to their classroom teaching.

Table 7: Results representing the change in scores of indexes used to help measure the transferability of the Institute to the participant's teaching (pre and post scores compared using a paired samples t-test).

Index	Mean of Pre-Test	Mean Difference Between Pre and Post-Tests	Level of Statistical Significance
Barrier (N=24)	28.917	-7.33	p<0.000
Comfort (N=23)	60.478	13.56	p<0.000
Resources (N=24)	68.167	4.87	p<0.009

Given the potential inter-relatedness among the constructs measured by these three indices, and between these constructs and the content knowledge changes which were measured by the concept maps, it is necessary to establish evidence for their independence before conclusions may be drawn based on their results. Toward this end, the correlation among each of these measures was examined. Table 8, on the following page, contains the resulting Pearson Correlation Matrix. With the exception of the expected high correlation between the two methods used to score the concept maps, this matrix describes a low correlation existing between the various measures used (-0.091 - 0.360). This provides evidence that indeed these tests were measuring distinct constructs, and do not simply reflect the changes in the participant's content knowledge which were demonstrated earlier.

These results suggest that the Institute was successful in providing an experience that was relevant to the teachers' classrooms. The source of the change in the teachers' level of comfort for teaching various topics; their decreased perception of barriers to the inclusion of environmental topics in their classrooms; and the increased number of resources and teaching approaches

available to them is most likely a complex function of the various aspects of the Institute described within this report. The remainder of this section, however, will describe two aspects of the Institute specifically intended to facilitate transference of the Institute's content to the participants' classes.

Table 8: Pearson correlation matrix for different quantitative methods used to assess changes in various factors relating to the achievement of DERC's objectives.

	Barrier Index	Comfort Index	Resource Index	Concept Map*	Concept Map**
Barrier Index	1.000				
Comfort Index	0.219	1.000			
Resource Index	0.264	0.315	1.000		
Concept Map*	0.360	0.154	-0.049	1.000	
Concept Map**	0.327	0.145	-0.091	0.898	1.000

* - scoring method allowing partial credit for ambiguous connections

** - scoring method allowing no credit for ambiguous connections

These results suggest that the Institute was successful in providing an experience that was relevant to the teachers' classrooms. The source of the change in the teachers' level of comfort for teaching various topics; their decreased perception of barriers to the inclusion of environmental topics in their classrooms; and the increased number of resources and teaching approaches available to them is most likely a complex function of the various aspects of the Institute described within this report. The remainder of this section, however, will describe two aspects of the Institute specifically intended to facilitate transference of the Institute's content to the participants' classes.

V.5b: Presentation by the Department of Public Instruction

During the third week, a representative from North Carolina's Department of Public Instruction addressed the teachers on the topic of the compatibility of EE and the North Carolina Science Curriculum. The theme of her presentation was that the State's curriculum objectives provide a forum within which teachers have the flexibility to use EE activities and still achieve them, and that many of the objectives are specifically environmental in nature.

Although the staff felt that this presentation was well done and useful, the teachers responded to the presentation with harsh criticism. On the daily evaluations, participants referred to it as "the pits," "goble-d-gook" and "a waste of our time and the leaders time." The comment of another participant, also indicated that the presentation had not been helpful. They wrote, "I'd like to see the curriculum and some instructional materials that are useful."

The comment of one participant serves to illustrate their major complaint regarding the presentation: "To avoid the issue is not to discuss the real foundation of the new science curriculum." They felt that she avoided their questions regarding the State's end of the year exams, which are more specific than the objectives and define what a teacher's students must learn. These tests are a significant factor in how the teachers must allocate their time. The presenter said little about these tests other than that the department was looking at ways to build more flexibility into them, such as utilizing more open ended questions. As a result, the participants found little value in this presentation.

During both the closing evaluation session and the focus group discussion, the participants expressed their disappointment that DPI's representative was not willing to engage in a constructive dialogue regarding the constrictions that they felt the Department placed on them. The teachers' bitterness toward the Department was apparent when one teacher expressed

that they had sent a "puppet" to talk with them and several others agreed. The presentation seemed to make little, if any, progress toward facilitating the integration of the participant's Institute experience into the classroom. Four participants stated at the end of the Institute that curriculum restrictions remained the most significant barrier to their implementation of the Institute's content to their classes. These results emphasize the need for EE in-service institutes to make their content relevant to the State's Curriculum, and address the limitations which the curriculum places on its participants.

V.5c: The Institute Assignment

To facilitate the transference of the Institute in a more concrete manner, the participants were given the assignment of producing ten lesson plans, individually or as a group, which reflected the content of the Institute and were specifically designed to meet the needs of their students. Each participant was also asked to produce a statement describing how they intended to implement the lesson plans during the following year. These plans were intended by the staff to provide a framework for the participants to lead their students through an assessment of their local environment, as well as some specific activities to use within that framework. This assignment was given to the teachers during the first week with the intention that they were to work on it throughout the Institute and specific times were set aside in which much of this work was intended to take place. A resource library, containing classroom related resources and books of environmental activities and curricula, was provided by the Institute to assist the teachers in completing this assignment.

In practice, this assignment became quite confusing to the teachers. The teachers were not clear on what specifically was expected of them. This lack of clarity was a result of inconsistent messages from the staff members. For

example, the assignment was initially introduced as 10 lesson plans per person and was then changed to ten lesson plans per group, and different staff members had different ideas regarding what the lesson plans should accomplish. On the mid-course evaluation, five teachers expressed their concerns regarding this aspect of the Institute. "Please give the whole group a very detailed description of the lesson plans you want," requested one participant on this questionnaire. After regrouping and coming up with a consensus regarding what the plans should accomplish, the staff addressed the participants concerns during the third week. The confusion subsided at the beginning of the fourth week during which the teachers were provided a significant amount of time to work on their assignments.

The second to last day of the Institute was dedicated to providing each teacher the opportunity to present one of their lessons to the other participants and the staff. This was done both to allow teachers the opportunity to practice the lessons in a forum which facilitated feedback from their peers, and to expose all of the participants to a wide array of ideas for integrating the concepts and tools gained from DERC into their classes.

Approximately two thirds of the participants actually presented specific activities that could be transferred to the classroom. Fewer than half of these participants actually tried to walk their fellow participants through the activities which they would use. The other third of the participants vaguely explained how they would try to use the Institute in their classes. From comments on daily evaluations, it was apparent that some participants were not clear on what the presentations were intended to entail. One teacher commented, "Instructions to participants were not completely clear, so many people made speeches instead of presentations." Additionally, one participant commented, "Everyone did not

follow original directions for presentations Next time be very specific about what is expected."

Despite the lack of specificity of some of the presentations, participants generally regarded the session during which these presentations were made and listened to as valuable: 16 participants rated this session a '5', and seven rated it a '4' on the daily evaluations. One participant wrote, "This is one of the most important things for teachers to do." Another wrote, "[It] produced some good ideas." One participant's criticism, however, reflected the weakness of the content of many of the presentations as well as the written assignments turned in. They wrote, "I would have liked one "hands-on" activity from each person (prefer an original idea, or original adaptation, rather than a rehash of already published lessons)."

Similarly to the content of the presentations, the written plans turned in by the participants seemed to illustrate a lack of concrete and creative ideas regarding how to transfer their Institute experience into the classroom. In most cases the written assignments consisted of activities taken directly from the published curricula provided by the Institute. These activities had just been copied from the curricula provided as a resource by the Institute and passed in without significantly addressing how they would be customized to fit into the participant's own curriculum. In many cases, participants documented or presented activities which they had been using in their classrooms prior to the Institute without any significant changes. Finally, the lesson plans lacked any description of how resources, contacts, or specific information from the Institute would facilitate their implementation.

In addition, the statement by each participant, accompanying his or her own or their group's plans, demonstrated very little concrete evidence for how the plans could be used in conjunction with each other. Some teachers expressed

an intent to apply the lessons to an assessment of their local environment, but failed to concretely express how their plans, or their Institute experience would allow them to accomplish this. In short, only one participant provided a written description of a systematic approach to use his lesson plans to lead his students in an investigation and assessment of their local environment.

In conclusion, at the completion of the Institute, the three staff members who had reviewed the assignments, that were interviewed, expressed that it did not seem that the results of the assignment contributed very much to what the participants gained from the Institute. Instead they claimed that these served to illustrate that, at the completion of the Institute, the participants generally lacked clear workable plans to integrate their experience into their teaching, despite their expressed intentions for doing so. The primary reason cited for this was because the lesson plans themselves were too generalized, and in general, teachers were unable to present a systematic approach to applying them.

In practice, however, the assignment did appear to have some value. During the following year, at least four participants were using the lesson plans which they developed as a result of it. Furthermore, it would seem that the process used to develop and present the plans had some value because several teachers were using activities which they had learned from other participants. However, the application of these plans, did not reflect a systematic approach, remaining consistent with the results of the assignment.

In conclusion, from the realized transference of the Institute, it would appear that the assignment did make a contribution to the applicability of the Institute, the quality of the contribution, however, is not clear. The weaknesses in the assignment suggest some ways in which the utilization of a similar assignment may yield better results. First, it is important that the assignment be relevant to the teacher's classes, and presented in such a way that it

complements their teaching efforts. Second, it is important that there is consensus among the implementation staff regarding both the objectives, and expectations for the assignment. Third, these objectives and expectations must be clearly communicated to the participants. And last, from the experience of DERC, it would seem that it is valuable to promote the exchange of ideas among the participants. The use of group projects, and presentations appeared to be useful in this regard.

V.6: Providing Current and Locally Relevant Information Through the Use of Guest Presenters

The planners of DERC paid careful attention to providing an Institute that would be refreshing and exciting to the participants. This was done by employing the wide use of guest presenters who were experts in their fields and by focusing on current environmental topics which were strongly relevant to NC. These efforts strongly contributed to a sense of recharge which participants reported feeling after the Institute, as well as sense of increased credibility with their students which several of them claimed to gain from it and which indirectly contributed to the achievement of DERC's overall goal.

The vast majority of DERC's sessions were facilitated or taught by guest presenters. These presenters included other teachers, lab scientists, environmental managers, university professors, environmental activists, representatives of industry, and farmers. In general, the participants felt that the variety of the speakers was one of the strongest points of the Institute. On the post-Institute evaluation questionnaire, eight participants cited either the quality or the variety of the Institute's presenters, in general, as "the strongest feature of the Institute". Two others specified that the presenting scientists were the strongest feature, and one other specified that the water presenters were.

Furthermore, four participants stated that the most valuable thing that they gained from the Institute was the opportunity to interact with environmental scientists and professionals.

Teachers also suggested that there were some weaknesses in the use of guest presenters. One said, "Choose presenters for both knowledge and speaking ability." Another suggested more bluntly, "Weed out some boring speakers" This was supported by the comment that some "presenters were uninspiring," which he or she listed as the "weakest feature of the Institute". According to the teachers they would have liked more of an opportunity to interact with the presenters at greater depth. "Don't schedule as many speakers and allow more time for them," said one participant. Another participant reflected a similar feeling. He claimed that "the lack of ability to pursue questions of presenters" was one of four fundamental weaknesses in the program. He or she added, "We pushed on when it was evident that people were interested in specific topics and were cut off." Finally, it was evident from both observations and feedback from the presenters and staff that some presenters did not address the intended topic. "[A] few presenters were either off topic or did not know what was expected out of them," wrote one participant.

Discussions during the final evaluation session and the focus group suggested that the use of guest presenters also contributed to the success of the Institute by presenting interesting and current topics on the environment, which was another intention of the planners of DERC. The environmental issues that the Institute focused on were generally very current and relevant to the environmental quality of NC. These topics included ground water problems in North Carolina; algae blooms in North Carolina and the impacts of land use, municipal waste water, and air pollution on these blooms; the impacts of land use and air pollution on NC's amphibian populations; and the impacts of agriculture

on environmental quality. These presentations generally were met with enthusiastic responses from the participants.

During both the final evaluation session and the focus group, participants credited the range of topics presented with providing them with an increased awareness of environmental issues in NC and "charging them up", exciting them to stay current and become involved in these issues. Furthermore, participants claimed that the opportunity not only to learn about these issues, but to learn about them from the people working on them, and interacting with these professionals first-hand, gave them an increased sense of credibility with their students and a renewed sense of confidence. One participant even claimed on the post-evaluation questionnaire that this increased credibility was the most valuable thing they gained from participating in the Institute. These factors likely played a large part in motivating the teachers to integrate environmental topics into their classroom lessons.

In summary, the use of guest speakers and presentations of local, exciting, and current issues made a strong contribution to the overall success of DERC and may be very useful in similar efforts. The experience gained during DERC suggests that there are a number of ways to maximize the value of their use. In the words of one participant, "Keep on looking for the current issues - be on the cutting edge," while attempting to make topics as relevant to the participants as possible by using local issues. It appeared from DERC that it is valuable to have a current issue presented by a professional working very closely with it.

The use of guest speakers requires careful planning. Professionals should be selected according to their ability to communicate what they are doing well. Efforts should be made to make sure they know what is expected of them. Providing them with pertinent information about the Institute, the objectives of

their presentation, and information about their audience will help them develop an effective presentation and frame their presentation within an appropriate context. Review the presentation they are intending to give, if possible. Finally, it is important to make every attempt to ensure that the participants have ample opportunity to interact with the presenter and pursue questions they have. This requires not only scheduling a larger block of time than one expects to be necessary, but also making presenters aware of strict time limitations.

V.6: Developing Rapport and Collegiality Among Participants and Staff

As indicated by the planners pre-Institute interviews, one of the indirect means to attain DERC's goals was by building rapport and a sense of camaraderie among the participants and staff. The purpose of establishing a congenial atmosphere was two-fold. First, it was intended to facilitate the exchange of ideas and provide a network of support, both during and after the Institute, among participants representing diverse backgrounds and a wide range of expertise in the environment. And second, it was intended to open lines of communication between staff and participants allowing timely, honest, and valuable feedback throughout the Institute to ensure that DERC was meeting the needs and expectations of the participants. Toward these ends, the planners scheduled a team building activity on the first day, assigned participants to small groups to work with throughout the duration of the four weeks, and provided a residential option for participants. The Institute staff, also dedicated themselves to developing a climate of openness and sharing in many informal ways, such as initiating social events.

The first half of the first day was dedicated to a morning of team building. This session took place off-site at an outdoor challenge course, the Triangle

Training Center and was facilitated by consultants contracted to provide this service. The morning consisted of a number of events ranging from simple, fun games to more intense problem solving activities.

This morning was regarded by both the participants and the staff to be an overwhelming success at breaking the ice and opening lines of communication both among the participants and between the participants and staff. Fourteen of the participants rated the activity as extremely valuable on the Daily evaluations, nine rated it a '4' on the five point scale, and four of the participants ranked it among the top five most valuable activities performed during the Institute. During the closing evaluation session of the Institute one participant described this as an activity that "made [everyone] equal" and facilitated the sharing of knowledge among people with varied levels of expertise. During the small group evaluation session, one participant said that it succeeded in "opening people up", and that the "bonding" that begun during that activity continued throughout the Institute. All four of the staff members interviewed also considered it a highlight. Two experienced staff members indicated, informally, that it would normally have taken almost a full week to develop the rapport that was established during this three hour team building session.

Daily evaluations also indicated that the activity could have been more productive if the momentum of the morning had been allowed to continue. Instead, the activity was followed by an afternoon of presentations, allowing little continued interaction among the teachers. One participant wrote, "The afternoon lectures were a bit slow after being outside all morning." Two of the planners echoed that sentiment during debriefing interviews. Dr. Spence commented, "We had an exciting bonding [opportunity] with the challenge course...and we didn't get an opportunity to carry it through mentally [in the afternoon] as we had done physically that morning."

In order to further enhance the quality and quantity of interaction among the participants, DERC provided many opportunities for participants to work in small groups. Each participant was assigned to one of five fixed groups based on the geographic location of the school which they represented. There were two reasons for establishing groups by this criteria. First, it would help maintain the focus on the participant's local environments. And second, it was believed that it would help create a local, and therefore more accessible, support group for each participant after the Institute ended. These groups were widely used for small group discussions, field work, and working on assignments.

Although in many cases, it seemed that the use of small groups provided a valuable forum for the discussion and the sharing of ideas, it was clear from comments on the post-Institute evaluation questionnaire that different participants, and different groups had varying experiences with their assigned groups. The groups originally consisted of five or six members, however, the loss of two participants on the third day of the Institute left one of the groups with three members, increasing the burden of responsibility on each member and considerably decreasing the idea pool for that group. Additionally one of the five groups was unable to establish a dynamic allowing them to work constructively with one another. One participant wrote on the post-institute evaluation survey that "unbalanced groups" was one of three fundamental weaknesses in the Institute. Another wrote, "My group could have been more involved." In contrast, the assignments completed by two of the groups demonstrated a high level of cooperation among their members. By observation, both of these groups had a high level of camaraderie among their members.

There seemed to be general agreement among the participants and the staff that the criteria upon which the groups were based did not suit all of the activities for which they were utilized. For several activities, especially ones

pertaining to planning the integration of the Institute's concepts into their classrooms, some participants felt that establishment of groups by subject area would have been more effective. One participant wrote, "Breaking us down by subject area could have been better," on a post-institute evaluation survey. Okun, one of the planners, expressed during her debriefing interview that either grade level or subject area groupings may have been more effective. Another participant suggested during the final evaluation session, "Mix up groups to [allow us to] get closer to all people rather than one [fixed] small group." In conclusion, it appears that allowing some flexibility in the groups or establishing groupings based on criteria specific to each situation would have helped to maximize the benefits of the small group activities.

Another factor that had an impact on the sense of camaraderie and interactions among the staff and participants, was the residential aspect of the Institute. Approximately one-half of the participants resided on the UNC-CH campus for the duration of the Institute, commuting home only on the weekends. The other half commuted on a daily basis, and in some cases were commuting as far as two to three hours to and from the Institute. Participants living further than one hour away were given the choice of whether to commute or be residential and participants living within one hour's distance were encouraged to commute.

Although it was not apparent from written data collected at the end of the Institute, it seemed from the evaluator's observations and informal feedback from the staff that the residential participants developed stronger relationships with one another. They also had a stronger support network throughout the Institute and had far greater opportunity to learn from each other. The two small groups, mentioned earlier, which performed most effectively were comprised primarily of residential participants. The commuters also had somewhat less of an

opportunity to interact with the staff than the residential participants had. Okun commonly stated that she felt there were two different Institutes, the one that took place during scheduled time and the one that took place during the off-hours. Although the benefits derived from living on campus were not apparent from data and feedback collected directly from the participants, it would seem that they were significant. Offering the opportunity to be residential to all participants, and actively encouraging participants to take advantage of this option, would have helped to ensure that more participants could have derived whatever benefits existed.

The summative data collected indicate that the cumulative efforts of the Institute to establish a rapport among the teachers met with a great deal of success. Out of the 24 teachers completing the post-institute evaluation survey, 14 of them listed the objective, "This Institute has helped me to interact with fellow science teachers interested in the environment," in the five objective statements which they agreed with most, and none placed it in the list of statements they agreed with least. The opportunity for the teachers to meet and learn from each other also emerged as one of the Institute's clear strengths during the small group discussion, and the final evaluation session held with all of the teachers. All four of the staff members interviewed at the completion of the Institute recognized this aspect of the Institute as one of its clear strengths. Spence said, "One of the strengths [of the Institute] was allowing some of the specific talents of the participants to be highlighted." These results suggest the importance of recognizing that each participant has a contribution to make to the learning of all of the other participants, and that careful attention should be paid to the development of an atmosphere which facilitates opportunities for this contribution.

V.8: The Management of Time

Although decisions regarding the types of changes to be made to the Institute's schedule were based largely on the participants' preference for a more activity driven Institute, the need for those changes developed as a result of the time management problems which permeated DERC. Time management problems not only limited the amount of time available for hands-on activities, but also had a negative impact on participant morale throughout the Institute, as well as the effectiveness of many of its individual sessions. In short, DERC, as originally scheduled, attempted to sustain too rapid a pace over too long a period of time.

During the first week, daily evaluations regularly contained comments regarding the Institute's pace. Several times during the week the need arose to cut time for questions following presentations short, and in one case time intended for participants to practice a skill which had just been demonstrated to them never materialized. Comments such as, "We need to slow down," "We needed more time at...", "We needed time to get our own hands dirty," "Too much rush," "...were hurriedly done," and "Long day!" reflected a sentiment among many of the participants that the Institute was moving too fast, and trying to do too much. On the fourth day of the Institute, one participant wrote, "...schedule fewer topics/speakers per day in order to allow for a deeper analysis of the issues." Despite efforts by the staff to mitigate the problem, time management persisted as an issue throughout the entire Institute.

There were several factors contributing to the time management problem during the first three weeks. First, there were regularly too many items on the day's agenda. In general, the schedule contained between three and five scheduled sessions of varying lengths per day in addition to a morning or afternoon session devoted to "housecleaning" issues and debriefing of the

scheduled sessions. In general, it seemed, by both observation and a review of comments on the daily evaluations, that days containing more than three sessions were regarded as being over scheduled. Second, many of the presenters spoke longer than their allocated time, thus cutting into time for the participants' questions or causing the session to run longer than the intended duration. In most cases, presenters were asked in writing by the planners to speak for a maximum of a half- hour and then to field questions for the same amount of time. It was rare that presentations followed that format, and often presenters would speak for the entire hour. Third, the actual amount of time needed to meet logistical and organizational needs was regularly more than expected. There were very few days in the first three weeks when the Institute did not change sites at least once, and on several days as many as two to three site changes occurred. The time required to implement these moves was generally underestimated.

As the time management problem became apparent, the staff attempted to address each of these factors to solve the problem. Presentations were removed from the schedule, and changes in sites were eliminated where possible. The Institute staff asked presenters, immediately prior to their presentations, to stay within the half-hour limit and conclude early enough to leave time for interactions between themselves and participants. When presenters ran overtime, staff members would often interrupt the presentation and open the floor to questions, a practice which three participants expressed frustration about on written evaluation comments, one calling it, "embarrassing."

Despite the continuous efforts, on the part of the staff, the problem of over scheduling and time management persisted. Shortages of time often resulted in a sacrifice of time originally allocated for breaks, lunch, and for participants to work on plans to implement the Institute in their classes. Further, important

debriefing sessions which were facilitated by the Institute staff were often shortened or eliminated yield time to more formal presentations by guest speakers. Days consistently ended later than scheduled. A typical Institute day ran from eight a.m. to five p.m. or later with limited breaks.

Responding to participants' demands for more unscheduled time to work on their assignments and review Institute materials, the planners canceled several scheduled presentations, clearing out large blocks of time during the first three days of the final week. This was responded to very favorably by the majority of the participants and it appeared by observation that the time was fairly well used by many of the teachers. Some participants indicated, however, on the daily evaluations for the last of these three work days, that there may have been too much unscheduled time during these three days. One participant wrote, "We had already finished our unit." Another commented, "Still too much time for this," with regard to the time allocated for working on implementation plans. Still another wrote, simply, "Too long." The comment of another participant, "I was already finished, but I used the time to look up information in the Health Sciences Library," would suggest that optional activities and assignments should have been provided for others who were done but did not know what to do with the time.

On the second to last day, participants presented their work, and once again, participants responded that having all of the presentations on a single day was too much, and the over-scheduling issue resurfaced. "Too much is being squeezed into one day. Time seems to be a factor," concluded one participant on the daily evaluation. Another wrote, "Too drawn out." Another wrote a suggestion that would help to alleviate the time problem on that day, "I think today was great, however, it was a little overwhelming. Suggestion: pre-assign (if possible) time slots for a group or person to present and spread the

presentations out over 2-3 days. This would take the 'overwhelming' factor out and allow a period of time for feedback on presentations." It seems that this arrangement may also have helped to solve the "under-scheduling" problems of the previous three days.

In summary, the issue of ineffective time management had a dramatic impact on the Institute's overall effectiveness. On the post Institute questionnaire, one-half of the 24 participants either specified some aspect of time management as the weakest feature of the Institute or responded to the request for suggestions to improve the Institute with a suggestion regarding the issue. The general sentiment of these comments is reflected in two participants' statements, "...not enough time to do all [that was] planned without being rushed," and "Long days: some seem to go on forever." One teacher expressed their frustration in the comment, "Time was always off, breaks and lunch were always late, and some days [there were] no breaks at all."

Three participants indicated that the Institute, on the whole, may have been longer than necessary and suggested that it be shortened to three weeks. "Distill it - select the best activities and make the workshop one week shorter," was the suggestion of one of these participants. This sentiment that the Institute lasted too long validated observations that the attention level of the participants seemed to decline steadily after the second week.

Similar themes regarding time management also emerged during both the focus group and the final evaluation session, as well as one of the staff debriefing interviews. During her interview, Okun acknowledged the strength and scope of the time management problem. On the holistic level, she stated, "...one month was just too long." Claiming that this was a particular problem for the staff, but was also an issue for the participants. On a daily level, she cited the need for shorter days to allow the staff time to finalize details for the next day before the

business day ended and to give some relief to the participants. She suggested, "the staff needs to be back in the office by 4 o'clock each day." Further, Okun reflected on the need to trim back the schedule, claiming, "There would have been more quality had we done less and people could have more gotten into it."

Although the issue of time management was not discussed directly during the other three debriefing interviews, it was apparent that the Institute staff members became exhausted by the pace which kept them working regularly from 7:30 in the morning to six and sometimes seven in the evening. The pace also limited opportunities for quality staff meetings thus limiting communication among staff members, a problem that was cited during each of the other three staff members interviewed.

In conclusion, the scale of the time management problems which haunted DERC underscore the need to pay careful attention to this issue during the planning of an Institute. The logistics of each day must be carefully and realistically examined, paying close attention to the needs of both the staff and the participants. Time limitations must be strongly emphasized to speakers prior to their presentations, and there must still be enough time in between presentations to accommodate such sessions running over schedule. Further, it is necessary to weigh depth against breadth, and plan the Institute as a whole, as well as the individual days with the resulting priorities in mind. Finally, the overall duration of an Institute and the intensity of the daily activities must be balanced to ensure that participants and staff do not burn out before the Institute concludes. Given the feedback from the participants of DERC, it would seem that it is better to err on the side of caution during the planning of an Institute, because not only can time management issues cast a shadow over the program, but they also may be difficult to mitigate once the program is underway.

V.9: Meeting the Needs of the Participants

Prior to the Institute, each staff member and participant rated a list of 25 objective statements on a five-point Likert scale based on how strongly they agreed with each. The Pearson Correlation Coefficient describing the relationship between the ratings by the two groups was 0.318, based on the mean rating of each item for each group. Although this number reflects, at least in part, the statistical limitations imposed by the high number of items and the low sample sizes of each group (24 participants and 5 planners), it suggests that at the onset of the Institute the planners and participants had a somewhat different idea of what would constitute a successful Institute.

Two factors may have contributed to this discrepancy. First, there was a lack of explicit clarity in the Institute's promotional materials regarding its goals and objectives. Although the planners main objectives for the Institute were contained in the Institute brochure, they were contained within a general description of the intended Institute activities and were not strongly emphasized. Secondly, applicant's objectives for participation in the Institute were not used, by the planners, as a selection criteria in choosing teachers to take part in DERC. As a result, a review of statements written by the participants as part of their application revealed that 9 of the 24 participants specified objectives too vague to be useful, or none at all. In short, there was not a strong effort on the part of the planners to ensure that the objectives of the selected participants were aligned to those of the program.

Nonetheless, as DERC progressed, it appeared that it was largely meeting the teachers expectations. Daily evaluations regularly reflected that the teachers found the Institute's sessions valuable and the comments on these evaluations were generally positive. During the first week, comments such as, "I believe what we learned today will be highly instrumental for use in my classroom," and

"Today I got several ideas that I can use in my classroom," validated the evaluators observations that the teachers were highly engaged and that the participants felt that overall, the Institute was progressing well.

Although both content and activity driven sessions were highly regarded, sessions of the Institute involving hands-on activities generally received the most positive comments. For instance, one day which focused almost entirely on outdoor hands-on activities relating to water was regarded overwhelmingly by the teachers as positive. "This was a good day," "Excellent day," and "This was a great day," were three representative comments on the daily evaluations for that day. Conversely, most negative or constructive feedback regarding the Institute's content during the beginning of the Institute generally regarded the lack of time allocated to hands-on activities. This is well illustrated by two participant's comments: "I would prefer less conversation while we are out in the field and more hands-on;" and "We needed time to get our own hands dirty." In addition, members of the Institute's staff commonly reported receiving requests for more time for hands-on activities. The sentiment among the participants was effectively summarized by one participants general comment on a daily evaluation: "Activity is good."

The Institute's staff responded to the participant's feedback by eliminating some presentations and rearranging some scheduled sessions to provide the participants more opportunity for practicing field skills. The staff significantly lightened the schedule further during the last week of the Institute, in response to participant's requests for more time to work on the Institute's assignment: to produce lesson plans for classroom activities based on the Institute. In short, the Institute staff made changes to the Institute's schedule based on the participants' preferences for an Institute strongly driven by interactive and hands-on activities which could be directly applied to their classrooms.

Dr. Spence reflected during a debriefing interview, "the staff's "egos" did not get in the way of the Institute's ability to meet the needs of the participants". This flexibility illustrated the respect that the staff held for the participants, and the staffs desire to meet their needs. In general, the participants viewed the Institute's flexibility as a strength. On the post-Institute evaluation, four of the participants cited this characteristic of the Institute as "the strongest feature of the Institute." One teacher wrote, "The ability of the participants and staff to communicate and the staff making necessary changes when needed [was the strongest feature of the Institute]." A general appreciation for the flexibility of the Institute was also expressed during the closing evaluation session.

On the other hand, some of the participant comments on the evaluation questionnaire indicated that the agenda of the Institute may have flexed too much. For example, one participant commented that "You can never please us all. Take some input then go with your best judgment." Another participant wrote, "I felt that the original schedule was better than the changes that were made." A different participant also commented during the focus group discussion that she felt there may have been too many changes in the schedule. This suggests that perhaps, as one participant wrote, "the leaders listened too much to the whims of the participants," and indicates that not all of the participants were taken into account when the decisions to make changes were made.

Another participant wrote on the post-Institute evaluation questionnaire, "The weakest feature of the Institute is the lack of organization and the deviation from a clear focus to a collection of disjointed activities." This raises questions of how the decisions regarding changes in the Institute's schedule were made and what impact the changes had. In his debriefing interview, Mr. Smith, one of the staff members stated, "...we accommodated their comfort, but we did not accommodate our goal of preparing them to develop an environmental report

card with their kids." This opinion suggests that some of the changes to the Institute may have compromised its ability to meet its goals and objectives.

On the post-Institute evaluation questionnaire, the participants were asked to rate the success of the Institute at achieving the same list of objectives that was used in the pre-survey. The means of the ratings for each item were compared to the means taken from the pre-survey results rating the importance of the objectives to both the planners and the participants. The resulting correlation coefficient matrix is shown in Table 9. The correlation between the participants' perception of the Institute's success at achieving the objectives as compared with the importance that the planners placed upon the objectives at the start of the Institute was 0.215. While the correlation between what the same parameter and the importance that the participants placed on the same objectives themselves was 0.646.

Table 9: Pearson Correlation Coefficient Matrix Comparing the Post Institute Participant Ratings of Institute Success at Achieving the Various Listed Objectives to the Objective's Importance as Rated By the Participants and Planners on the Pre-Survey.

	Importance		Achievement
	Participant Pre	Planner's Pre	Participant's Post
Participant Pre	1.000		
Planner's Pre	0.318	1.000	
Participant's Post	0.646	0.215	1.000

Although in neither case could the correlation coefficient be considered high, these results indicate that the Institute was more successful in achieving the objectives prioritized by the participants than those prioritized by the planners. Once again, these results could in large part reflect the small sample size of the planners as compared to the sample size of the participants, however, they do suggest that the planners objectives for the Institute may have been compromised. This could be, at least in part, due to the changes in the Institute's schedule, aligning it more closely with the objectives of the participants.

The discussion in this section allows four conclusions to be drawn. First, it is important that the objectives of an in-service Institute, such as DERC, be valid and important to the teachers for whom it is intended. Second, it is important that promotional materials for the Institute accurately and completely describe the objectives and activities of the Institute. Third, applicants should be selected in a manner that ensures that the objectives of the participants are as closely aligned to those of the institute as possible. Fourth, a certain amount of flexibility in the schedule is appreciated by the teachers. Changes to the schedule, however, should be minimized and must be weighed carefully against the original objectives of the institute. Further, it is important that the opinions of all participants be taken into account when such changes are being considered.

V.10: Limitations of the Evaluation

In light of the preceding conclusions, it is necessary to discuss some of the clear limitations of the evaluation of DERC. First, the external validity of the results presented within this report is limited. Although, the participant body reflected a diverse cross section of North Carolina's science teachers, they were selected carefully from a large pool of applicants based largely on their interest in the topic and their level of motivation as represented in their own letters, and ones written on their behalf by their supervisors. It is likely, therefore, that administering the same Institute to a random selection of science teachers from North Carolina would produce very different results.

Other questions regarding the validity of this evaluation also exist. This study did not use a control group, therefore it is impossible to draw a definitive cause and effect relationship between the Institute, and the measures of change despite the qualitative data lending some evidence for the validity of their results. Additionally the use of a single rater to score the concept maps a single time, raises questions of the validity of this measure of change. Further, although attempts were made, no useful or detailed concrete baseline data was obtained regarding participants use of EE in their classrooms prior to the Institute. Therefore following the Institute, the teachers were asked to self-report, the changes in their teaching that resulted from the Institute, this presents problems of both recall and sensitivity bias. It was clear in many of the participant's self reports, that teachers discussed activities which they had performed before they had attended the Institute. Although several of the participant were very actively pursuing EE prior to the Institute and it is likely that the Institute at least subtly had an effect on their efforts, it is impossible to qualify or quantify these changes.

There were also several weaknesses in the instruments used. Although the pre and post Instruments were reviewed for content validity they were not

piloted and it was apparent that some errors were made in their design. Additionally, with the exception of daily evaluations, names were requested on surveys for tracking purposes. More valid results would have been obtained from these surveys if they had been completed anonymously. Each of these weaknesses in the instruments could have contributed a significant amount of error to the results, however, no measure of the reliability of the instruments was performed.

Finally, it is important to point out that the person serving as the evaluator of the Institute was also a staff member of the Institute who contributed to both its planning and its implementation. The results of the evaluation, therefore, may contain bias which reflect the stake that the evaluator held in the Institute's success, despite sincere attempts to remain objective.

In conclusion, the preceding evaluation of DERC, suggests some interesting conclusions, however, due to the lack of scientific validity and reliability of the evaluation design, these findings must be regarded with caution. Further research on these points would allow a clearer picture of the potential implications of DERC on the pursuit of EE via in-service teacher training.

CHAPTER VI: SUMMARY AND RECOMMENDATIONS

The outcome evaluation of DERC demonstrated that the Institute made significant steps toward achieving its goals and provided an experience that was valuable to the teachers. During the year following the Institute, at least 19 of the participating teachers shared knowledge, resources, field skills, and/or specific activities gained by their participation in DERC, with their students. These classroom based changes, reported by the participants, reflected both the direct content of the Institute, and the contributions made to the Institute by their fellow participants. All of the changes in the participants' classroom EE efforts demonstrated a strong local emphasis.

The wide use of state and local environmental science and management contacts, reported by 16 of the participants, was among the most exciting of the Institute's outcomes. The use of these contacts demonstrated that the Institute had been successful in facilitating the participants' access to these professionals, through whom they and their students could become involved in affecting positive change in the environment. Furthermore, the Institute appeared to motivate the teachers significantly to become involved in protecting their local environment and the activities they performed with their classes indicated that they were attempting to involve their classes in these efforts as well. Therefore, not only was DERC successful in achieving its own explicitly-stated goals, but it also made progress toward achieving the goals of EE in NC.

The primary weakness in the transference of the Institute's content into the participants classrooms appeared to be the general lack of a systematic approach to these efforts. Although participants were utilizing parts of

the Institute, they were not, generally, performing holistic assessments of their local environment with their classes. Nor, did it appear from the results of the evaluation that the teachers activities were systematically addressing the generalized goals of EE.

The implementation evaluation of DERC illustrated the various strengths and weaknesses of the manner in which its goals were pursued by the planners and staff of the Institute. The evaluation suggested that the program owes its success, in part, to the following five strengths.

1. The Institute increased the participants' understanding of the fundamental concepts of environmental science and management. The program was most effective in providing knowledge in the area of water quality and its management. This was partly due to the involvement of a water quality expert who maintained continuous contact with the Institute and its participants, contributing to a sense of continuity among the water-based presentations. DERC was also successful in providing better knowledge of air quality, land use issues, and the management of the environment. This knowledge provided the basis for a meaningful EE in-service program, a foundation upon which all other factors built. It also increased the teachers' confidence and sense of credibility, and provided the crucial link between the Institute and the teachers' science classes.
2. The Institute developed the teachers' field skills and provided equipment with which to utilize these skills with their students. DERC engaged the participants first-hand in studying the environment which helped to raise their awareness of the quality of the environment and made the Institute more interesting to them. This also provided participants with examples of hands-on activities to conduct with their students. The provision of \$100 worth of equipment helped to facilitate the integration of these activities into the teachers' classes.

3. The Institute promoted environmental science and management contacts at a state and local level and developed an increased understanding of a variety of environmental management agencies. This was largely accomplished through the use of activities that engaged the participants with resource people and agencies in an interactive and independent manner. Meeting with environmental professionals served to increase the teachers' access to environmental information and human resources from which to draw support in developing EE programs. Also, these meetings helped to instill a sense of accessibility to state and local government, which in conjunction with their increased knowledge and awareness of the science of environmental issues opened the doors to environmental action. This was a critical factor in the Institute's achievement of EE's general goal of increasing environmentally-positive action.

4. The Institute was exciting. This helped to maintain the teachers' enthusiasm throughout and following the Institute and served to refresh their excitement about science and the environment. Exciting content also gave them fresh ideas for their classes. In addition to providing hands-on experiences, the Institute provided presentations on current and locally-pertinent topics given by the professionals that work closely with them. These presentations increased the participants' knowledge of local environmental issues. The teachers' personal interaction with experts contributed to an increase in their confidence and sense of credibility in their classrooms.

5. The Institute developed and maintained a positive atmosphere that encouraged constructive interactions among the teachers. The teachers learned a lot from each other by sharing and discussing ideas. Much of what they later implemented in their classes, had been learned from one another. The focus on building a sense of camaraderie began on the first day with formal team-building activities and was maintained throughout the Institute by infusing an element of

fun in both formal, and informal activities. Several opportunities for small-group discussions helped maximize the benefit of this atmosphere. This congeniality among the participants contributed greatly to the realization of collaborative learning during the Institute.

The strengths discussed above contributed to both the overall quality of the Institute, and the quality of its transference to the classroom. Similarly, the implementation evaluation of DERC suggests some factors of DERC which detracted from its overall effectiveness. These include the following.

1. The lack of correlation between the lesson plans, produced to meet the requirements of the Institute's assignment, and the Institute's goals limited the teachers' preparedness to utilize the Institute directly as a model for their own classrooms. This was, at least in part, due to problems with the administration of the assignment which resulted in confusion on the part of the participants. Although many of the participants valued the activity of developing these plans and many also implemented some of these plans the following year, in most cases they did not directly reflect the Institute's goals.
2. The lack of clear and consistent focus on a theme weakened the Institute's ability to tie together its various sessions and activities. While most activities were successful, their connection to the goals of the Institute was sometimes vague. Attention to the metaphor of the environmental report card was sporadic, disorganized, ineffective, and, by the end of the Institute, abandoned. Despite the fact that several participants and some of the staff members questioned the value of the metaphor at all, the void created by not following through with it may have contributed to the lack of a systematic approach to the integration of EE into the participants' classrooms.
3. The Institute did not consistently expose the teachers to the use of technology in a constructive manner. This frustrated the participants, and subtracted from

the pool of resources, that the Institute intended to provide. The Institute's attempts to demonstrate and facilitate the use of technology as a tool to enhance the participants' educational efforts often failed. This was due largely to the staff's lack of understanding of the challenges of promoting technology-based education. As a result the objective of exposing the participants to technological tools to enhance their teaching of the environment was partially undermined.

4. Poor time management weakened the Institute. This was a cause for frustration, as well as exhaustion, for the participants. It also detracted from the effectiveness of the staff. The Institute's attempt to do too much, resulted in tight scheduling, rushed presentations and activities, and an inability to focus on some topics in sufficient detail. Time management was also the primary cause of changes in the Institute's schedule. These changes may have contributed to the Institute's inability to achieve all of its goals.

This lists of strengths and weaknesses above imply several ways to maximize the potential of an Institute similar to DERC. Some less implicit recommendations are examined below.

1. Teacher educators should promote the use of state and local environmental science and management professionals as classroom resources through activities which place the burden of responsibility for making these contacts on the participants. When this was done by DERC, it served to empower participants. The warm welcome and respect the teachers generally received from these people make it likely that they will pursue similar contacts outside the context of the Institute. This empowerment along with an increased understanding of environmental management and environmental management agencies provides a solid groundwork from which teachers can lead their students to become involved in decisions regarding environmental quality.

2. Teacher educators should ground their environmental education Institute in the participants' local environment. DERC presented exclusively issues and topics which were pertinent in a direct way to the participants' environment. This focus further served to empower, and motivate the teachers. The Institute's director often used the motto, "think locally, act locally," to describe the Institute's emphasis, and this approach contributed to the Institute's positive impact.
3. There should be a clear and definitive focus for an Institute's activities. The use of the "environmental report card" as a metaphor for the assessment of environmental quality did not seem to be useful. The potential benefits of this innovation are unknown because of the Institute's failure to follow-through with it. One large reason for this lack of follow-through was the staff's inability to fully translate or interpret the metaphor concretely. This would suggest that it was, perhaps, too abstract to be useful for a teacher training institute of this type and that a more concrete approach should be pursued to synthesize material presented in a similar type of program. Nonetheless, a focus for an Institute's activities is important, and any deviation from that focus should be carefully weighed against the program's goals and objectives.

The value of examining the specific components of the Institute itself is difficult to assess. Not only are there complex interrelationships among the factors discussed in the implementation evaluation, but the components of DERC also existed within a context of factors that were independent from the planning of the Institute. These would be difficult if not impossible to control in planning a similar Institute. These independent factors most notably include the strength of the staff and the particular needs and strengths of the participants. Furthermore, the duration and structure of the Institute also combined with the other variables to contribute to this complex system. For these reasons, the value in drawing independently on some specific activities and presentations of the Institute for

future Institutes may be limited. Other activities clearly provided excellent experiential training and may be universally applied with positive results.

Despite some weaknesses, DERC provided the participating teachers with a strong foundation for their environmental education efforts and provided them with the seeds for improving environmental quality. DERC serves as a challenging example of an in-service EE teacher training institute and the lessons learned from its evaluation should prove to be useful to others planning or implementing similar programs in the future.

VI.2: Suggestions for Further Research

The results of the evaluation provide some evidence that, with regard to EE in-service teacher training, the needs of middle school teachers may be different from those of high school teachers. This was suggested by the results of the barrier and comfort indices but was not validated by the data collected on actual classroom implementation during the following year. This lack of validation, and the small non-random sample of teachers comprising the participant body render this finding inconclusive at best. However, it does suggest an area in which further research should be conducted to help optimize the efficiency of EE in-service teacher training in the State.

In addition, NC-DPI's presentation to DERC's participants failed to provide teachers with a clear way to include EE in their teaching and still meet all the State's mandated objectives. At the completion of the Institute, the State's curriculum presented a significant barrier to the implementation of EE in the teachers' classrooms. This point underlines an area which should receive special attention from educators and researchers in order to maximize the potential of EE efforts in NC. Further, it suggests that DPI, curriculum designers, and teachers should cooperate in order to develop syllabi for teacher training

programs that will both satisfy the need for training in EE, and help teachers prepare their students to meet state mandated objectives. In summary, DERC faced the challenges that most efforts to integrate environmental education into public schools face. Although it was able to overcome some of these challenges, it is clear that a continued effort to align the goals of environmental education and the objectives of public schooling is necessary.

VII: REFERENCES

- Bones, D., *Getting Started: A Guide to Bringing Environmental Education into Your Classroom*, Amway, Ada, MI (1994).
- Buethel, C. and Smallwood, J., "Teachers' Environmental Literacy: Check and Recheck, 1975 and 1985", *The Journal of Environmental Education*, Vol. 18, No. 3, pp. 39-42 (1987).
- Carlson, Patricia, "Environmental Investigations", *The Science Teacher*, Vol. 60 No. 2, p. 34-37 (1993).
- Cortese, A. D., "Building the Intellectual Capacity for a Sustainable Future", *The Presidents Symposium Volume V: Environmental Literacy and Beyond*, Virginia Polytechnic Institute and State University, Blacksburg, VA (1993).
- Dashevsky, H. S., *Environmental Literacy: Everything You Need to Know About Saving Our Planet*, Random House, New York, 1993.
- Federal Coordinating Council for Science, Engineering, and Technology, Committee on Education and Human Resources, "Summer Teacher Enhancement Program", Oak Ridge Institute for Science and Education, Science/Engineering Education Division, Oak Ridge, Tennessee (1993).
- Gigliotti, L. M., "Environmental Education: What Went Wrong? What Can Be Done?", *The Journal of Environmental Education*, Vol. 22, No. 1, pp. 9-12 (1991).
- Ham, S. H., and Sewing, D., "Barriers to Environmental Education", *The Journal of Environmental Education*, Vol. 19, No. 2, pp. 17-24 (1988).
- Hart, E. P., "Identification of Key Characteristics of Environmental Education", *The Journal of Environmental Education*, Vol. 12, No. 1, pp. 12-16 (1981).
- Hungerford, H. R., Litherland, R. A., Peyton, R. B., Ramsey, J. M., Volk, T. L., *Investigating and Evaluating Issues and Actions: Skill Development Modules*, Stipes Publishing Co., Champaign, IL, (1992).
- Hungerford, H., Peyton, R. B., and Wilke, "Goals for Curriculum Development in Environmental Education", *The Journal of Environmental Education*, Vol. 11, No. 3, pp. 42-47 (1980).
- , "Yes, EE Does Have Definition and Structure", *The Journal of Environmental Education*, Vol. 14, No. 3, pp. 1-2 (1983).

Leeming, F. C., Dwyer, W. O., Porter, B. K., and Cobern, M. K., "Outcome Research in Environmental Education: A Critical Review", *The Journal of Environmental Education*, Vol. 24, No. 4, pp. 8-21 (1993).

Marcinkowski, T. J., "The New Environmental Education Act: A Renewal of Commitment", *The Journal of Environmental Education*, Vol. 22, No. 2, pp. 7-10 (1991).

The National Environmental Education Act, October 26, 1990b, *Congressional Record, United States Senate: Proceedings of the 101st Congress, Second Session, No. 149 (Part 3)*, Washington, DC, U.S. Government Printing Office (1990), pp. 17160-s 171646.

The North Carolina Environmental Education Plan, The Office of Environmental Education, Department of Environment, Health, and Natural Resources, Raleigh, NC (1994).

Novak, J. D., and Gowin, D., B., *Learning How to Learn*, Cambridge, MA: Cambridge University Press (1984).

Novak, J. D., and Gowin, D. B., and Johansen, G. T., "The Use of Concept Mapping and Knowledge Vee Mapping with Junior High School Science Students", *Science Education*, Vol. 67, No. 5, pp. 625-645 (1983).

O'Neil, J., "Developing an Environmental Report Card", Unpublished Grant Proposal, (1993).

Patton, M. Q., *Utilization-Focused Evaluation*, Newbury Park, CA: Sage Publications (1986).

Ramsey, J. M., "The Effects of Issue Investigation and Action Training on Eighth-Grade Student's Environmental Behavior", *The Journal of Environmental Education*, Vol. 24, No. 3, pp. 31-36 (1993).

Ramsey, J. M., Hungerford, H. R., and Volk, T. L., "Environmental Education in the K-12 Curriculum: Finding a Niche", *The Journal of Environmental Education*, Vol. 23, No. 2, pp. 35-45 (1992).

Rusky, A. and Wilke, R., *Promoting Environmental Education: A Handbook for Strengthening EE in Your State and Community*, The University of Wisconsin-Stevens Point Foundation Press, Stevens Point, WI (1994).

Samuel, H. R., "Impediments to Implementing Environmental Education", *The Journal of Environmental Education*, Vol. 25, No. 1, pp. 26-29 (1993).

Schaefer, V. H., "Thinking Globally in Environmental Education: The Victoria, B. C., Experience", *The Journal of Environmental Education*, Vol. 24, No. 1, pp. 5-8 (1993).

Sechler, P. C., Spence, L., and Westbrook, S. L., "Using Concept Mapping as an Instrument to Evaluate Teachers' Understandings During a Marine Ecology Workshop". Unpublished Evaluation of an In-Service Program, "Paddle to the Sea II", at North Carolina State University (1994).

Singletary, T. J., "Case Studies of Selected High School Environmental Education Classes", *The Journal of Environmental Education*, Vol. 23, No. 4, pp. 35-40 (1992).

Stapp, W. B., et. al., The Concept of Environmental Education, *The Journal of Environmental Education*, Vol. 1, No. 1, pp. 30-31 (1969).

Stevenson, R. B., "Becoming Compatible: Curriculum and Environmental thought", *The Journal of Environmental Education*, Vol. 24, No. 2, pp. 4-9 (1993).

Tudor, M. T., "The 1990 International Environmental Education Conference: A Participant's perspective", *The Journal of Environmental Education*, Vol. 22, No. 2, pp. 11-15 (1991).

United Nations Educational, Scientific, and Cultural Organization, "Sustainable Development Via Environmental Education", *Connect*, Vol.13, No. 2, pp. 1-3 (1988).

Van Matre, S., *Earth Education: A New Beginning*, The Institute for Earth Education, Warrenville, IL (1990).

Volk, T. L., Hungerford, H. R., and Tomera, A. N., "A National Survey Of Curriculum Needs As perceived by Professional Environmental Educators", *The Journal of Environmental Education*, Vol. 16, No. 1, pp. 10-19 (1984).

Wallace, Josephine D., and Joel J. Mintzes, "The Concept Map as a Research Tool: Exploring Conceptual Change in Biology", *Journal of Research in Science Teaching*, Vol. 27, No. 10, pp. 1033-1052 (1990).

Westbrook, S. L., and Marek, E. K., "A Cross-Age Study of Student Understanding of the Concept of Homeostasis", *Journal of Research in Science Teaching*, Vol. 29 No. 1, pp. 51-61 (1992).

Developing an Environmental Report Card
June 20th - July 15, 1994
Daily Agenda

WEEK ONE**Monday, June 20th**

- 9:00 "Welcome and Overview of Institute"
Melva Okun, Environmental Resource Program
and Dr. John O'Neil, U.S. EPA
Triangle Training Center, Pittsboro
- 9:20 "The Critical Generation!"
Dr. Mike Hogan, N.I.E.H.S.
- 9:30 "Team Building/Get Acquainted"
Staff from the Triangle Training Center
- 12:30 Depart for E.P.A.
- 1:00 Lunch
- 1:30 "Values and the Environmental Movement"
Dr. John Sigmon, Duke School of the Environment
- 2:30 Panel- "Values: Bridging the Gap Between Science and Policy"
Dr. Marge Holland, EPA; Brian Morton, NC Environmental Defense
Fund; Dr. Doug Crawford Brown, UNC-CH Department of
Environmental Sciences and Engineering; and Peter Principe, EPA
- 3:30 Break
- 3:45 Discussion
- 4:30 Debrief the Day

Tuesday, June 21

- 9:00 Integrated Case Study and Role Play
"Threat Analysis for the Swift Creek Population of the Tar River
Spiny Mussel"
Melva Okun, ERP
- 10:20 Depart for Northeast Creek

10:30 "Stream Structure and Function"
Group observations and discussion
Dr. Don Francisco, UNC-CH Environmental Sciences and Engineering

12:00 Lunch

1:00 "Debrief field trip

1:30 "Water Cycle, Water Quality and Stream Ecology"
Dr. Don Francisco, UNC-CH E.S.E.

2:30 break

2:45 Questions and Answers and Discussion

3:30 Reflection on Day
Melva Okun, ERP

Wednesday, June 22

8:30 "Soil Science, Conservation, Land Use, Geology and Topography"
Dr. Betty McQuaid, U.S. EPA EMAP-Agroecosystems
Alex Hitt, Farmer and member of the Sustainable Agriculture Research
and Education Group
Alex Hitt's farm in Alamance County

12:00 Lunch

1:30 "ArcView: Using Technology to look at the Land and Soils"
Dawn Capellini, ArcView
UNC-CH

4:00 Reflection on Day
Dr. Lundie Spence, NC Sea Grant Program

Thursday, June 23

9:00 "Overview of Air Issues"
Dr. Jim Vickery, U.S. EPA

10:00 "U.S. Policy Plus Indoor Air Issues"
Dr. John Bachmann, U.S. EPA

10:45 Break

11:00 "How's the Air in North Carolina?"
Sheila Holman, NC Air Quality Section, DEHNR

12:00 Lunch and Curriculum Time

1:45 "The Supercomputer and Air Modeling/Visualization"
Ken Gallupi and Bob Gotwals, MCNC, and
Sheila Holman, NC Air Quality Section
MCNC

4:00 "Health Effects of Air Pollution"
Dr. Hillel Koren, U.S. EPA
Health Effects Research Laboratory at UNC-CH

Friday, June 24

9:00 "Stress and Salamanders: An Integrated Case Study"
Dr. Alvin Braswell, NC Museum of Natural Science

10:00 Video: "In Search of Clean Air"

11:00 Break

11:15 Group Discussion

12:00 Lunch

1:00 "Developing An Environmental Report Card"
EMAP staff and Institute Staff

3:30 Debrief Day and Develop Environmental Report Card
Melva Okun, ERP

4:00 Prepare for Next Week's Field Trip
Dave Smith, Smith and Strozier Consultants

WEEK TWO**Monday, June 27**

- 8:00 Depart Friday Conference Center Shared Ride Lot
- 9:00 "Land Formations, Water Sheds and Rivers"
David Cook, Eno River State Park
Eno River State Park
- 10:00 "Determining Water Quality: Using Physics, Chemistry, and Biology"
Eno River State Park Rangers; George Norris, NC StreamWatch Program,
and Dr. Don Francisco, UNC-CH
- Group time to perform water, soil, and air measurements
- 12:15 Lunch (provided) and "Botany and Adaptations to Different Systems
Along the River"
Tom Howard, NC State Parks
Eno River State Park
- 2:30 depart for Water Treatment Plant
- 3:00 Tour of Durham's Wade Brown Water Treatment Plant
Water Treatment Plant Staff
- 4:00 Debrief Day and Depart for Chapel Hill
John Leopold, ERP

Tuesday, June 28

- 8:00 Depart from Friday Center
- 9:00 "Protecting NC's Water Supply Watersheds"
Allen Clark, NC Division of Environmental Management and
Dale Crisp, City of Raleigh Public Utilities Dept.
Falls Lake Resource Management Center
- 10:15 Break
- 10:30 "Competing Uses for Multiple Use Reservoirs"
Matt Flint, U.S. Army Corps of Engineers,
Dr. Don Francisco, UNC-CH E.S.E.,
- 11:00 Field Work

- 11:30 Lunch (provided)
- 12:20 Depart for NC State Fairgrounds
- 1:00 "Air Issues in the Raleigh Durham Area and Monitoring Techniques"
George Murray, NC Air Quality Section, DEHNR
NC State Fairgrounds and Air Monitoring Lab
- 3:00 Debrief Day, Prepare for Next, Develop Environmental Report Card
Dave Smith, Smith and Strozier Consultants

Wednesday, June 29

- 8:00 Depart from Friday Center
- 9:30 "NC Hydrogeology"
Jay Zimmerman, NC Groundwater Section, DEM
Neuse River Wastewater Treatment Plant
- 10:30 "Wastewater Treatment: Tour of Raleigh's Wastewater Treatment Plant"
Carol Bond, Raleigh Department of Public Works
Neuse River Wastewater Treatment Plant
- 12:00 Lunch (provided) at Lake Wheeler Road Field
- 1:00 "Vegetative Buffers for Agricultural Operations"
Dr. John Parsons, NCSU Biological and Agricultural Engineering
Labs Experimental Station
- 2:30 Depart for New Bern, debrief day
- 5:00 Sheraton Hotel Check-in in New Bern and Dinner On Own
- 7:15 Debrief Day
- 7:45 "Connecting Air and Water Quality to the Integrity of Marine Life"
Dr. Hans Paerl, UNC-CH Institute of Marine Science

Thursday, June 30

- 9:00 "History of Swampland Development in NC: Changes in Rural Land Use"
Dr. Paul Lilly, NC Cooperative Extension Service
Training and Education Building at Weyerhaeuser
- 10:15 "Weyerhaeuser's Operation and Associated Environmental Issues"
Tour of mill and wastewater treatment system

- 12:00 Lunch (provided)
- 12:30 Issues of the Neuse and Citizen Efforts to Protect the River's Water Quality"
Rick Dove, the Neuse River Keeper
afternoon on the Neuse
- 5:00 Depart for Morehead City, Debrief Day,
Comfort Inn Check-in in Morehead City and Dinner

Friday, July 1

- 8:30 "Estuarine Observations and Characteristics"
Dr. Lundie Spence, NC Sea Grant Program;
Irving Hooper and Margie Misenheimer, Carteret County Crossroads
Duke Research Vessel Boat Ride on the Pamlico- Bottom dredge and
trawling
- 11:00 Debrief trip
- 11:30 Lunch in Beaufort
- 1:00 Debrief Week's Activities and Information Learned
Auditorium, Duke Marine Lab, Piver's Island
- 2:30 Depart for Chapel Hill

WEEK THREE**Tuesday, July 5th**

- 9:00 "Fish Kills on the Neuse and Associated Dinoflagelates"
Dr. Joanne Burkholder, NCSU
- 10:00 "Who's In Charge of NC's Environment"
Anne Taylor, NC Office of Environmental Education, Director
- 12:00 Lunch and Curriculum Time
- 1:30 "NC's New Science Curriculum: Environmental Links" and PSINET
Clara Wiggins, NC Department of Public Instruction
- 3:30 Preparing for the DEHNR "Environmental Treasure Hunt"
Julie Yamamoto, Melva Okun, and Dave Smith

Wednesday, July 6

- 9:00 "Using Technology to Understand the Environment"
Michael Rink, NC Center for Geographical Information
US E.P.A. or UNC-CH
- 11:00 depart for Raleigh
- 11:30 Lunch (provided) and Tour of the NC Museum of Natural Sciences
- 1:00 "Environmental Treasure Hunt"
Archdale Building
- 3:00 Debrief Day and Prepare for Tomorrow

Thursday, July 7

- 9:00 "How Are We Doing Protecting NC's Environment?"
Connie Alred, Friends of the Rocky River
Anne Coan, NC Farm Bureau
Jim Cummings, NC Cost Share Program
Cal Ogburn, C.P.&L.
Margaret Pollard, NC Environmental Management Commission
Paul Thames, Orange County Engineering
- 10:30 Break
- 10:45 Questions and Answers and Discussion

12:00 Lunch

1:00 Prepare for Day in the Field or Work on Lessons

3:30 Debrief Day and Developing An Environmental Report Card

Friday, July 8

8:00 Conduct interviews with representatives of government, business and industry, environmental groups, school officials, etc.

3:30 On Your Own: Summarize day and Prepare Field Notes Report

FOURTH WEEK**Monday, July 11**

- 9:00 Small Group Meetings to Debrief Day in the Field and Work on Presentation
- 10:00 Work on Lesson Plans
- 12:00 Lunch
- 1:30 "Population as an Environmental Issue"
Educational Activity: "Food for Thought"
Sheila Jones, Wake Co. Soil and Water Conservation District
Luann Bridle, Project Teacher at Hanes Middle School, Winston-Salem
- 3:00 Break
- 3:15 Debrief Day and Developing an Environmental Report Card

Tuesday, July 12

- 9:00 "Environmental Equity"
Dr. Marion Johnson Thompson
National Institute for Environmental Health Sciences
- 9:30 Discussion of Environmental Equity Issues in Our Home Communities
- 10:00 Break
- 10:10 Review Curriculum Materials and Prepare Lesson Plans
- 12:00 Lunch
- 1:00 Work on Lesson Plans
- 4:30 Debrief Day

Wednesday, July 13

- 9:00 Learning InterNet
- 11:00 Work on Lesson Plans

12:00 Lunch

1:00 Work on Lesson Plans

4:00 "Building a Community Water Distribution Model"
Melva Okun, ERP

4:45 Debrief Day and Prepare for Tomorrow

Thursday, July 14

8:30 Green Team Presents

9:30 Red Team Presents

10:30 Break

10:45 Yellow Team Presents

12:00 Lunch

1:00 Purple Team Presents

2:00 Blue Team Presents

3:00 Break

3:15 Debrief and Plan for Next Year's Follow-Ups

Friday, July 15

9:00 Concept Mapping Activity

10:00 Evaluation of Institute

11:45 Luncheon Celebration (provided)
"Nursing North Carolina's Environment"
Linda B. Rimer, Assistant Secretary for Environmental Protection
NC Department of Environment, Health, and Natural Resources

1:30 Next Year's Expectations and Staying in Touch

APPENDIX B: ARTICLE 1

**Interview Questions for the Planners of
Developing an Environmental Report Card**

The purpose of these interviews is to clarify the objectives of the Institute as it has been planned by those with the most impact on it's format and it's curriculum: Melva Okun, Lundie Spence, David Smith, and John O'Neil. These objectives along with those of the participants will formulate the criteria for the evaluation of the Institute. These questions attempt to solicit these objectives.

This first set of questions address your role in the planning of the Institute: Developing an Environmental Report Card as well the role of the other members of the Coordinating Committee whom I have identified as having had the most influence on the design and curriculum of the Institute.

- Why are you involved in the planning of Developing an Environmental Report Card (DERC)?
- What do you feel has been your primary role in the planning of this Institute?
- What are the roles of [Melva, Lundie, John, Dave]?

This next set of questions asks about the goals and objectives for the Institute.

- In a statement, what is the mission of this summer institute?
- What are your goals for the teachers participating in the Institute?
- Which one of these goals do you see as the most important one to meet?
- What are some specific objectives directly related to this goal?
- How would you describe the week by week design of the Institute in terms of your goals and specific objectives? Where it's important please refer to specific, activities or presentations.
- In what ways do these sets of weekly objectives build on each other to achieve the goals of the workshop as a whole?
- What indicators will you look for during the Institute to know if your objectives are being met?
- Do you feel that your goals and objectives for the Institute are shared by the Coordinating Committee as a whole?

- *(if no)* What are the Coordinating Committees Goals for the Institute as a whole?
- *(also, if no)* What will be the most valid methods for the CC to assess their success at meeting these goals?

The following set of questions addresses DERC in light of other in-service teacher education programs.

- What characteristics make DERC unique?
- How would you compare this Institute to other in-service teacher training workshops that you have been involved with?
- What characteristics or aspects of the Institute do you feel will be most useful to people planning in-service environmental education teacher enhancement institutes in the future, who may look to DERC as a model?

These next two questions will ask you about how DERC should be evaluated and what information will be most useful to get from the evaluation.

- What would an ideal evaluation of DERC entail?
- What Information will be the most helpful for you to get from this evaluation, as feedback both throughout the Institute to help fine tune it, as well as at the end of the Institute to help you plan the follow-ups and your own workshops in the future?

This final question just asks you for an opinion.

- What do you feel will be the most important outcome of the Institute?

APPENDIX B: ARTICLE 2

**Debriefing Interview Questions for the Staff Members of
Developing an Environmental Report Card**

The purpose of these interviews is to debrief the people that were most responsible for the implementation of the Institute, "Developing an Environmental Report Card": Melva Okun, David Smith, Julie Yamamoto, and Lundie Spence. These interviews along with the remarks of the participants will be used in an evaluation of this Institute that will hopefully help to shape similar programs in the future.

This first set of questions address your role in the implementation of the Institute: Developing an Environmental Report Card as well the role of the other members of the Coordinating Committee whom I have identified as having had the most influence on the outcome of the Institute.

- What do you feel was your primary role in the **implementation** of this Institute?
- What were the roles of [Melva, Lundie, Dave, Julie and John]?

This next set of questions addresses your goals and objectives for the Institute and how successful the Institute was at meeting them.

- Briefly, describe what your overall goals and the most important objectives for the Institute participants were at the onset of the Institute?
- Which of your objectives were met by the Institute?
- What were the strongest indicators that these were met?
- What other specific feedback did you receive from the participants and other staff members that helped you come to the conclusion that the Institute was successful at meeting these objectives?
- What are the features of the Institute that made it successful at achieving these objectives?
- Which of your objectives were **not** met by the Institute?
- What were the strongest indicators that these were **not** met?

- What other specific feedback did you receive from the participants and other staff members that helped you come to the conclusion that the Institute was **not** successful at meeting these objectives?
- Was it the result of planning, implementation, or practical constraints that these objectives were **not** met?
- What could have been done differently to ensure that these objectives would have been met?

These next two questions will ask you more generally, about the implementation of the Institute.

- Aside from the achievement of goals and objectives, what were other high points, strong features, and successes of the Institute?
- Aside from the goals and objectives that may not have been achieved, what were some low points, weak features, or failures of the Institute and what went wrong to cause these?
- What went wrong to cause these problems?
- For both yourself in the future, as well as others planning a similar program, what are the most important lessons to be learned from this Institute?

The next set of questions addresses what the teachers gained from the Institute.

- What **new** tools and resources did the teachers leave the Institute with?
- How will they use these new tools and resources?
- What else will the participants take from the Institute and use in the future?

This final question just asks you for an opinion.

- What do you feel was the most important **outcome** of the Institute?

Developing an Environmental Report Card Daily Evaluation

Date: 6/23/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This morning's session, "**Overview of Air Issues**", was:

1	2	3	4	5
of no use at all				extremely valuable

2. The session on **U.S. Policy and Indoor Air Issues** was:

1	2	3	4	5
of no use at all				extremely valuable

3. The session, "**How's the Air in North Carolina?**", was:

1	2	3	4	5
of no use at all				extremely valuable

4. The session, "**The Super Computer and Air Modeling/Visualization**", was:

1	2	3	4	5
of no use at all				extremely valuable

5. The session the **Health Effects of Air Pollution** was:

1	2	3	4	5
of no use at all				extremely valuable

Comments (what did/didn't you like?, What was missing?, Any suggestions for improvement?, etc.):

Developing an Environmental Report Card Participant Questionnaire

Thank you for taking the time to fill out this questionnaire in its entirety. Your responses and remarks will help us to focus the Institute on the issues that are important and relevant to you; and help us to assess the Institute's success upon its completion. **Your time and effort is greatly appreciated.**

1. For each of the following statements, please check the response which you feel most accurately reflects its importance.

	ENTIRELY UNIMPORTANT	NOT VERY IMPORTANT	IMPORTANT	VERY IMPORTANT	EXTREMELY IMPORTANT
At this workshop I would like to:					
a. develop units and lessons to use next year.					
b. gain an understanding of how science is used to manage the environment.					
c. gain an understanding of how to assess ecological health.					
d. gain exposure to computer technologies such as Internet and GIS.					
e. gain skills to use in my science teaching.					
f. get a better idea of the available materials to supplement my science teaching.					
g. have fun.					
h. improve my field skills.					
i. increase my knowledge about the applications of environmental science.					
j. increase my repertoire of activities to use in my classes.					
k. interact with fellow science teachers interested in the environment.					
l. interact with people involved in the management of the environment.					
m. interact with professional environmental scientists.					
n. learn about environmental management in North Carolina.					
o. learn about how environmental science fits into NC's new science curriculum and competency based standards.					
p. learn about the management of my local environment.					
q. learn about the quality of North Carolina's environment.					
r. learn about tools and resources that are available to help me teach my classes and how to access them.					
s. learn how to incorporate new computer technologies into my classes.					
t. learn to assess the health of my local environment.					
u. learn to incorporate environmental issues into my science classes.					
v. learn to involve my students in investigating and protecting their local environment.					
w. learn to spark my students interest in the environment.					
x. obtain ideas for outdoor activities to perform with my students.					
y. stay up to date on the hottest environmental issues.					
z. other (please specify)					

2. For the items in section 1, select and rank the top (5) in order of importance. (Please write the appropriate letter in the space provided):

- most important _____
 2nd _____
 3rd _____
 4th _____
 5th _____

3. In the past year, please estimate the number of class periods or the class period equivalent of the amount of time that you have devoted to environmental topics.

_____ Periods

4. Please check the response that most accurately reflects your feelings about the following statements.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
I do not spend more time teaching about the environment because:					
a. environmental topics are not easily integrated into NC's science curriculum.					
b. I already include enough environmental information in my classes.					
c. I am uncomfortable teaching about environmental topics, due to my lack of knowledge.					
d. I don't think I'm good at teaching about the environment.					
e. I have trouble making environmental information relevant to my classes					
f. I run out of new ideas for integrating environmental topics into my classes.					
g. there is a lack of administrative support for teaching about the environment.					
h. there is a lack of interest on my own part for teaching about the environment.					
i. there is a lack of interest on my students part for learning about the environment.					
j. there is a lack of parental support for teaching about the environment.					
k. there is a lack of resources or materials for teaching about the environment.					
l. there is not enough time to include more environmental topics in my classes because I have too many other topics to cover.					
m. other (please explain)					

5. Please indicate how comfortable you would be teaching a lesson on the following topics.

	ENTIRELY UNCOMFORTABLE	NOT VERY COMFORTABLE	COMFORTABLE	VERY COMFORTABLE	EXTREMELY COMFORTABLE
a. Air quality					
b. Biology					
c. Chemistry					
d. Computer use					
e. Developing an environmental report card					
f. Current environmental issues					
g. Ecological health					
h. Ecology					
i. Environmental careers					
j. Environmental ethics and values					
k. Environmental management					
l. Environmental monitoring and assessment					
m. Environmental monitoring technology					
n. Environmental science					
o. Geology					
p. Physics					
q. Soil quality					
r. The relationship between the environment and human health					
s. Water quality					
t. Ways for students to be involved in protecting the environment					
u. Other (please specify)					

6. Please indicate how likely you would be to use the following in your classes.

	ENTIRELY UNLIKELY	NOT VERY LIKELY	LIKELY	VERY LIKELY	EXTREMELY LIKELY
a. Computers					
b. Discussions that are not scientifically focused (i.e. public participation, environmental policy, etc.)					
c. Field trips					
d. Geographic Information Systems (GIS) Data					
e. Guest scientists (from outside the school)					
f. Guest speakers other than scientists (from outside the school)					
g. Indoor, hands-on activities					
h. Information accessed by computer					
i. Information obtained from a local industry					
j. Information obtained from a scientific journal					
k. Information obtained from a television program, news article or magazine					
l. Open discussions					
m. Outdoor, hands-on activities					
n. Visual aids (video, movies, filmstrips)					
o. Information obtained from government					
p. Lectures					
q. Teacher demonstrations					
r. A teaching approach that places the lab activity before the related lecture					

7. Please check all appropriate responses and circle the correct grade level/s.

I intend to use the information gained during this Institute primarily in my:

- a. ___ biology classes for grade/s 6 7 8 9 10 11 12.
 b. ___ chemistry classes for grade/s 6 7 8 9 10 11 12.
 c. ___ ecology classes for grade/s 6 7 8 9 10 11 12.
 d. ___ physics classes for grade/s 6 7 8 9 10 11 12.
 e. ___ geology/earth science classes for grade/s 6 7 8 9 10 11 12.
 f. ___ other: (please describe) _____

8. Please check all appropriate statements and circle yes (Y) or no (N) to indicate if the computer/s have modem access.

- a. ___ I do not have access to a computer.
 b. ___ I have access to a computer at home. With a modem? Y N
 c. ___ I have access to a computer at school. With a modem? Y N
 d. ___ My students have access to computers during class time. With modems? Y N

9. Please check all appropriate responses.

I have a working knowledge of computers in the following capacities:

- a. ___ word processing.
 b. ___ programming.
 c. ___ Geographical Information Systems.
 d. ___ spreadsheets/worksheets/charts.
 e. ___ graphics.
 f. ___ use of the Internet.
 g. ___ other (please specify) _____
 h. ___ none. I have no working computer knowledge.

11. Without specifying the name or type of workshop/s, please give us an idea of some of the outstanding strengths and/or weaknesses of in-service teacher training programs that you have attended in the past.
12. Why did you choose to spend your summer with us (The Institute, "Developing an Environmental Report Card")?
13. What is/are your degree/s and what subjects are they in? _____

14. Approximately how many science education courses were part of your pre-service education? _____ courses
15. Approximately how many science courses were part of your pre-service education? _____ courses
16. Approximately how many environmental science in-service workshops have you attended (excluding this one)? _____ workshops
17. How many years have you been teaching? _____ years

Name: _____

Developing an Environmental Report Card Institute Evaluation Survey

Thank you for filling out this questionnaire in its entirety. Your responses and remarks will help to assess the Institute, shape the follow-up sessions, and make future Institutes more effective. Your responses and comments are confidential (your name is required, at the end, only to allow a comparison between this survey and the one previously completed by you). All information will be reported anonymously.

1. Please check the response that most accurately reflects your feelings about the following statements.

		STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
a.						
b.						
c.						
d.						
e.						
f.						
g.						
h.						
i.						
j.						
k.						
l.						
m.						
n.						
o.						
p.						
q.						
r.						
s.						
t.						
u.						
v.						
w.						
x.						
y.						
z.						

This Institute has helped me to:

- a. develop units and lessons to use next year.
- b. gain an understanding of how science is used to manage the environment.
- c. gain an understanding of how to assess ecological health.
- d. gain exposure to computer technologies such as Internet and GIS.
- e. gain skills to use in my science teaching.
- f. get a better idea of the available materials to supplement my science teaching.
- g. have fun.
- h. improve my field skills.
- i. increase my knowledge about the applications of environmental science.
- j. increase my repertoire of activities to use in my classes.
- k. interact with fellow science teachers interested in the environment.
- l. interact with people involved in the management of the environment.
- m. interact with professional environmental scientists.
- n. learn about environmental management in North Carolina.
- o. learn about how environmental science fits into NC's new science curriculum and competency based standards.
- p. learn about the management of my local environment.
- q. learn about the quality of North Carolina's environment.
- r. learn about tools and resources that are available to help me teach my classes and how to access them.
- s. learn how to incorporate new computer technologies into my classes.
- t. learn to assess the health of my local environment.
- u. learn to incorporate environmental issues into my science classes.
- v. learn to involve my students in investigating and protecting their local environment.
- w. learn to spark my students interest in the environment.
- x. obtain ideas for outdoor activities to perform with my students.
- y. stay up to date on the hottest environmental issues.
- z. other (please specify)

2. For the items in section 1, select and rank the five that you agree with most strongly (or disagree with the least). (Please write the appropriate letter in the space provided.)

Strongest agreement _____
 2nd _____
 3rd _____
 4th _____
 5th _____

3. For the items in section 1, select and rank the five that you disagree with most strongly (or agree with the least). (Please write the appropriate letter in the space provided.)

Strongest disagreement _____
 2nd _____
 3rd _____
 4th _____
 5th _____

4. For the coming year, please estimate the number of class periods that you plan to devote to environmental topics. (If you do not teach in class periods, please estimate the amount of time in hours that you intend to devote to environmental topics.)

_____ periods

5. Please estimate the average time you will spend preparing for each of these periods.

_____ hours/period

6. How long (in minutes) is a period at your school? _____ minutes

7. Please check the response that most accurately reflects your feelings about the following statements.

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
I won't spend more time on environmental topics in my classes next year because:					
a. environmental topics are not easily integrated into NC's science curriculum.					
b. I already include enough environmental information in my classes.					
c. I am uncomfortable teaching about environmental topics, due to my lack of knowledge.					
d. I don't think I'm good at teaching about the environment.					
e. I have trouble making environmental information relevant to my classes.					
f. I run out of new ideas for integrating environmental topics into my classes.					
g. there is a lack of administrative support for teaching about the environment.					
h. there is a lack of interest on my own part for teaching about the environment.					
i. there is a lack of interest on my students part for learning about the environment.					
j. there is a lack of parental support for teaching about the environment.					
k. there is a lack of resources or materials for teaching about the environment.					
l. there is not enough time to include more environmental topics in my classes than I have planned because I have too many other topics to cover.					
m. other reasons for not including the environment more often in class (please explain)					

I won't spend more time on environmental topics in my classes next year because:

- a. environmental topics are not easily integrated into NC's science curriculum.
- b. I already include enough environmental information in my classes.
- c. I am uncomfortable teaching about environmental topics, due to my lack of knowledge.
- d. I don't think I'm good at teaching about the environment.
- e. I have trouble making environmental information relevant to my classes.
- f. I run out of new ideas for integrating environmental topics into my classes.
- g. there is a lack of administrative support for teaching about the environment.
- h. there is a lack of interest on my own part for teaching about the environment.
- i. there is a lack of interest on my students part for learning about the environment.
- j. there is a lack of parental support for teaching about the environment.
- k. there is a lack of resources or materials for teaching about the environment.
- l. there is not enough time to include more environmental topics in my classes than I have planned because I have too many other topics to cover.
- m. other reasons for not including the environment more often in class (please explain)

8. What will be the most challenging part of bringing the information gained during the Institute into your classes during the next year?

9. Please indicate how comfortable you would be teaching a lesson on the following topics.

	EXTREMELY UNCOMFORTABLE	NOT VERY COMFORTABLE	COMFORTABLE	VERY COMFORTABLE	EXTREMELY COMFORTABLE
a. Air quality					
b. Biology					
c. Chemistry					
d. Computer use					
e. Developing an environmental report card					
f. Current environmental issues					
g. Ecological health					
h. Ecology					
i. Environmental careers					
j. Environmental ethics and values					
k. Environmental management					
l. Environmental monitoring and assessment					
m. Environmental monitoring technology					
n. Environmental science					
o. Geology					
p. Physics					
q. Soil quality					
r. The relationship between the environment and human health					
s. Water quality					
t. Ways for students to be involved in protecting the environment					
u. Other (please specify)					

10. Please indicate how likely you are to use the following in your classes.

	ENTIRELY UNLIKELY	NOT VERY LIKELY	LIKELY	VERY LIKELY	EXTREMELY LIKELY
a. Computers					
b. Discussions that are not scientifically focused (i.e. public participation, environmental policy, etc.)					
c. Field trips					
d. Geographic Information Systems (GIS) Data					
e. Guest scientists (from outside the school)					
f. Guest speakers other than scientists (from outside the school)					
g. Indoor, hands-on activities					
h. Information accessed by computer					
i. Information obtained from a local industry					
j. Information obtained from a scientific journal					
k. Information obtained from a television program, news article or magazine					
l. Open discussions					
m. Outdoor, hands-on activities					
n. Visual aids (video, movies, filmstrips)					
o. Information obtained from government					
p. Lectures					
q. Teacher demonstrations					
r. A teaching approach that places the lab activity before the related lecture					

11. Please check the response that most accurately reflects your feelings about the following statements regarding the Institute, "Developing an Environmental Report Card".

	STRONGLY DISAGREE	DISAGREE	NEUTRAL	AGREE	STRONGLY AGREE
a. The Institute's objectives were effectively communicated to the participants.					
b. The Institute's objectives were reasonable.					
c. The facilities at EPA were satisfactory.					
d. The educational facilities at UNC-CH were satisfactory.					
e. The accomodations during the field trip were satisfactory.					
f. The food that was provided by the Institute was satisfactory.					
g. There was sufficient access to computers/phones/copiers to accomplish the work that was assigned.					
h. There was sufficient time to accomplish the work that was assigned during the Institute.					
i. There was adequate access to materials and supplies to use throughout the Institute.					
j. The transportation and parking arrangements were satisfactory.					
k. The duration and number of breaks provided between activities was sufficient.					
l. The residential facilities at UNC-CH were satisfactory. (if applicable)					
m. The Institute was similar to what I expected it to be before attending.					
n. The way that the participants were broken down into five small groups by hat color was effective.					
o. The Institute was effectively organized.					
p. Feedback from participants was effectively used by the staff members to improve the Institute.					
q. The "Report Card" Metaphor is a useful tool in thinking about the environment.					

12. Where necessary, please **elaborate** on any of the topics in section 11 (referencing the item letter).

13. Please list the *five* most valuable Institute activities encountered during the past month. (Write the title from the Institute's Agenda or describe the activity.) **Be specific!**

1. _____
2. _____
3. _____
4. _____
5. _____

14. Please list the *five* most valuable Institute presenters encountered during the past month. (Write the title from the Institute's Agenda or describe the topic presented.) **Be specific!**

1. _____
2. _____
3. _____
4. _____
5. _____

15. What was the strongest feature of the Institute, "Developing an Environmental Report Card"?

16. What was the weakest feature of the Institute?

17. What are some suggestions for improving the Institute for future participants?

18. Please check all appropriate responses and circle the correct grade level/s.

I intend to use the information that I have gained during this Institute primarily in my:

a. biology classes for grade/s 6 7 8 9 10 11 12.

b. chemistry classes for grade/s 6 7 8 9 10 11 12.

c. ecology classes for grade/s 6 7 8 9 10 11 12.

d. physics classes for grade/s 6 7 8 9 10 11 12.

e. geology/earth science classes for grade/s 6 7 8 9 10 11 12.

f. other: (please describe) _____

19. In what ways might the information gained from your participation in the Institute be useful to you outside of the classroom?

20. In one phrase, what did you understand the goal of this Institute to be?

21. Was this goal achieved? Yes No

Date: _____

Name: _____ Social Security Number _____

4. Below are five pairs of statements. Each pair represents opposite ends of a continuum in approaches to teaching. After reading a pair of statements, *circle a position on the line* between the statements indicating where you would place your approach (e.g., toward one end, the other, or somewhat in between). Answer for the subject you spend the most time teaching (science, mathematics, technology).

Pair #1

A. My primary goal is to help students learn important facts and formulas and to master key science/mathematics/technology skills.

1 2 3 4 5 6 7

B. My primary goal is to help students achieve a deeper understanding of key science/mathematics/technology concepts and principles.

Pair #2

A. In my science/mathematics/technology course, I aim for *in-depth* study of selected topics and issues even if it means sacrificing coverage.

1 2 3 4 5 6 7

B. In my science/mathematics/technology course, I aim for *comprehensive* coverage even if it means sacrificing in-depth study.

Pair #3

A. My students generally learn basic scientific terms and formulas *before* learning underlying concepts and principles.

1 2 3 4 5 6 7

B. My students generally learn basic scientific terms and formulas *while* learning underlying concepts and principles.

Pair #4

A. In my science/mathematics/technology class, laboratory investigations, and problem solving are used to confirm previously-learned concepts.

1 2 3 4 5 6 7

B. In my science/mathematics/technology class, laboratory investigations, and problem solving are used to introduce and explore concepts.

Pair #5

A. I primarily assess my students' learning based on their ability to apply their knowledge to new situations.

1 2 3 4 5 6 7

B. I primarily assess my students' learning based on their ability to answer questions about specific content and processes.

5. Indicate to what degree you feel each of the following is an important objective in teaching science/mathematics/technology.

(Circle one on each line.)

	<u>Very Important</u>	<u>Important</u>	<u>Somewhat Important</u>	<u>Not Important</u>
a. increase students' interest in science/mathematics/technology	1	2	3	4
b. develop/increase in students a positive attitude about learning	1	2	3	4
c. prepare students for further study in science/mathematics/technology	1	2	3	4
d. increase students' knowledge of important science/mathematics/technology facts	1	2	3	4
e. increase students' awareness and importance of science/mathematics/technology in their daily lives	1	2	3	4
f. increase students' awareness of careers in science/mathematics/technology	1	2	3	4
g. integrate teaching and learning of science/mathematics/technology	1	2	3	4
h. develop students' skills in science mathematics/technology techniques and processes	1	2	3	4
i. develop students' skills in problem-solving and inquiry	1	2	3	4
j. develop students' understanding of science/mathematics/technology principles	1	2	3	4
k. develop students' skills in working together (cooperatively/collaboratively)	1	2	3	4
l. Other important goal (please specify _____)	1	2	3	4

For the items above, select and rank the top five (5) in order of importance. (Write the letter in the space provided):

most important _____

2nd _____

3rd _____

4th _____

5th _____

6. Indicate the degree to which you agree or disagree with each of the following statements.

(Circle one on each line.)

	Strongly Agree	Agree	Disagree	Strongly Disagree
a. I am comfortable with my current level of science/mathematics/technology knowledge	1	2	3	4
b. I feel comfortable teaching science/mathematics/technology	1	2	3	4
c. I feel comfortable managing a class of students who are doing hands-on activities	1	2	3	4
d. I feel comfortable demonstrating science, mathematics/technology principles to my students	1	2	3	4
e. I feel confident in my ability to discuss science/mathematics/technology applications with my students	1	2	3	4
f. I feel confident in my ability to help my students answer their own questions	1	2	3	4
g. I feel confident in my ability to supervise my students' research projects and experiments	1	2	3	4

7. Rate the following aspects of the program.

(Circle one on each line.)

	Excellent	Very Good	Good	Fair	Poor
a. Program administration	1	2	3	4	5
b. Advance communication	1	2	3	4	5
c. Orientation	1	2	3	4	5
d. Availability of resources	1	2	3	4	5
e. Assistance provided by program staff	1	2	3	4	5
f. Workshop leaders	1	2	3	4	5
g. Interactions with other teachers	1	2	3	4	5
h. Interactions with Lab scientists	1	2	3	4	5
i. Receiving advice and support for sharing experience	1	2	3	4	5
j. Receiving support for extending experience to the classroom	1	2	3	4	5

List any specific strengths and weaknesses you would like the program staff to know about:

8. Give your opinion about the program with regard to each of the following statements:

(Circle one on each line.)

		<u>Strongly</u> <u>Agree</u>	<u>Agree</u>	<u>Disagree</u>	<u>Strongly</u> <u>Disagree</u>	<u>Not</u> <u>Applicable</u>
a.	The program staff made me feel welcome	1	2	3	4	N/A
b.	The program staff responded effectively to my questions	1	2	3	4	N/A
c.	The program staff was receptive to my suggestions for program improvement	1	2	3	4	N/A
d.	The materials that were provided will be of use in the classroom	1	2	3	4	N/A
e.	The program provided ideas for ways to present content to my students	1	2	3	4	N/A
f.	Objectives of the program were met	1	2	3	4	N/A
g.	The presentations during the program were well-organized	1	2	3	4	N/A
h.	I had significant opportunity to influence my summer experience to meet my needs	1	2	3	4	N/A
i.	I had significant opportunity to interact with scientists/technicians	1	2	3	4	N/A
j.	I had significant opportunity to interact with other teachers	1	2	3	4	N/A
k.	I gained new perspectives on how science/mathematics/technology should be taught	1	2	3	4	N/A
l.	I learned laboratory skills that I can teach to my students	1	2	3	4	N/A
m.	I increased my knowledge of applications of science/mathematics/technology	1	2	3	4	N/A
n.	I increased my science/mathematics/technology content knowledge	1	2	3	4	N/A

9. For you (personally and/or professionally) what is the most important thing you gained from your program experience?

Post-Institute Concept Mapping

This activity represents the second half of an experiment that we began at the start of the Institute. In order to get an idea of how well we have developed some different ideas during the Institute, this concept map will be compared with the one completed previously by you. In the following exercise, there are no right or wrong answers, only different associations among words. Think of this exercise as a creative word puzzle and have fun with it. All you will need is a piece of paper and a pencil.

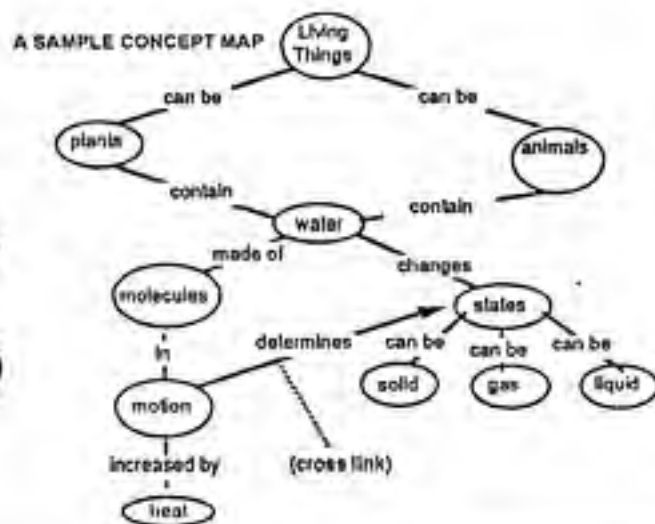
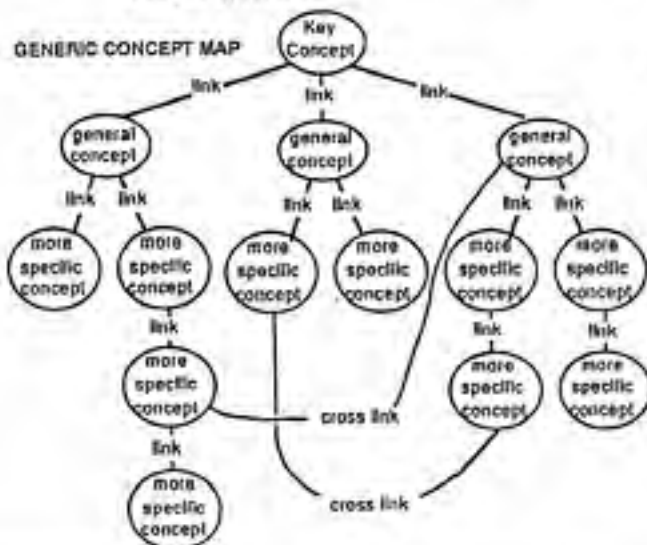
The list below represents some of the concepts that we have attempted to develop and use during the Summer Institute. Check at least 15 words or phrases you know best.

Concept List

air quality	estuary	particulate matter
algae	eutrophication	non-point source pollution
amphibians	fish	environmental policies
benthic macro-invertebrates	flora	rivers
best management practices	habitat	run-off
development	human values	sedimentation
ecosystem health	land use	water quality
environmental report card	nutrients	watershed
erosion	ozone	weather

Refer to the following steps and the samples below to create a concept map using your selected words:

1. From your checked concepts, select a key concept and place it at the top of the sheet of paper to use as the starting point for your map.
2. Below this word/phrase place concept/s that most directly relate to it or describe it, and then do the same for each of these words/phrases, forming columns or clusters until all of your selected words and phrases are written on the page. Be sure to spread the words out on the page.
3. Link the related words/phrases with lines, and on the lines write a verb or simple phrase that describes the relationship between the concepts. All 15 words/phrases should be either directly or indirectly connected to the central concept at the top of the page.
4. Last, you can show the relationship between a word/phrase in one "column" and a word/phrase in another "column". Use a cross-linking line with a verb or simple phrase.



Concept Mapping

Our experience this summer will change some of our ideas about the environment, and we would like to try an experiment to chart some of those changes. Our experiment uses concept mapping, which is a way to illustrate how we relate various parts of a topic. In the following exercise, there are no right or wrong answers, only different associations among words. Think of this exercise as a creative word puzzle and have fun with it. All you will need is a piece of paper and a pencil.

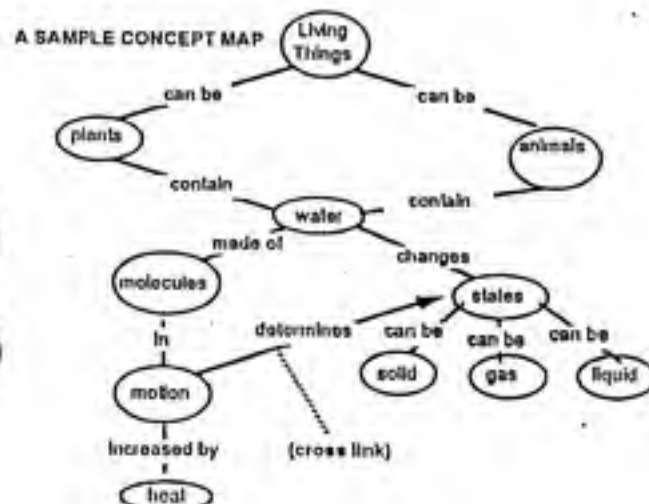
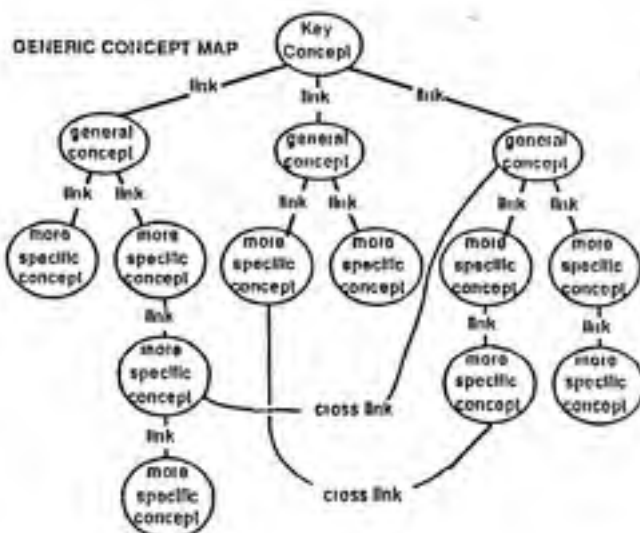
The list below represents some of the concepts we'll develop and use during the Summer Institute. Check at least 15 words or phrases you know best.

Concept List

air quality	estuary	particulate matter
algae	eutrophication	non-point source pollution
amphibians	fish	environmental policies
benthic macro-invertebrates	flora	rivers
best management practices	habitat	run-off
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4. Last, you can show the relationship between a word/phrase in one "column" and a word/phrase in another "column". Use a cross-linking line with a verb or simple phrase.



Debriefing Interview Questions for the Staff Members of Developing an Environmental Report Card

The purpose of these interviews is to debrief the people that were most responsible for the implementation of the Institute, "Developing an Environmental Report Card": Melva Okun, David Smith, Julie Yamamoto, and Lundie Spence. These interviews along with the remarks of the participants will be used in an evaluation of this Institute that will hopefully help to shape similar programs in the future.

This first set of questions address your role in the implementation of the Institute: Developing an Environmental Report Card as well the role of the other members of the Coordinating Committee whom I have identified as having had the most influence on the outcome of the Institute.

- What do you feel was your primary role in the **implementation** of this Institute?
- What were the roles of [Melva, Lundie, Dave, Julie and John]?

This next set of questions addresses your goals and objectives for the Institute and how successful the Institute was at meeting them.

- Briefly, describe what your overall goals and the most important objectives for the Institute participants were at the onset of the Institute?
- Which of your objectives were met by the Institute?
- What were the strongest indicators that these were met?
- What other specific feedback did you receive from the participants and other staff members that helped you come to the conclusion that the Institute was successful at meeting these objectives?
- What are the features of the Institute that made it successful at achieving these objectives?
- Which of your objectives were **not** met by the Institute?
- What were the strongest indicators that these were **not** met?

- What other specific feedback did you receive from the participants and other staff members that helped you come to the conclusion that the Institute was **not** successful at meeting these objectives?
- Was it the result of planning, implementation, or practical constraints that these objectives were **not** met?
- What could have been done differently to ensure that these objectives would have been met?

These next two questions will ask you more generally, about the implementation of the Institute.

- Aside from the achievement of goals and objectives, what were other high points, strong features, and successes of the Institute?
- Aside from the goals and objectives that may not have been achieved, what were some low points, weak features, or failures of the Institute and what went wrong to cause these?
- What went wrong to cause these problems?
- For both yourself in the future, as well as others planning a similar program, what are the most important lessons to be learned from this Institute?

The next set of questions addresses what the teachers gained from the Institute.

- What **new** tools and resources did the teachers leave the Institute with?
- How will they use these new tools and resources?
- What else will the participants take from the Institute and use in the future?

This final question just asks you for an opinion.

- What do you feel was the most important **outcome** of the Institute?

7. How much time have you devoted to environmental topics in your classes so far this year? *(Please estimate hours.)*

8. How much time do you plan to spend on environmental topics between now and your summer vacation, in your classes? *(Please estimate hours.)*

9. List the names and titles or occupations of the local people that you met with during the day provided for this purpose by the Institute. Also indicate next to each name whether or not you or your students have contacted them since that first meeting and whether the contact is ongoing and how it's been useful. *(Please use back)*

**Developing an Environmental Report Card
Institute Evaluation Survey
(results of open-ended questions)**
(as written by repondents)

8. What will be the most challenging part of bringing the information gained during the Institute into your classes during the next year?
- (1) To incorporate it into the other things I teach about the environment without depressing the students.
 - (2) Time / due to NC Curriculum; Money for materials; Being able to take field trips.
 - (3) Time!
 - (4) The most challenging part is teaching my kids how to work effectively in small cooperative groups. Once I conquer this major task, I will be able to use a lot of the activities and ideas I gained.
 - (5) The distraction of being required to incorporate full computerization into the curriculum for the entire department, i.e. choosing appropriate platforms, ordering and setting up the network and lab interface equipment and seeing that the department members gain skill in using the technology in their course work.
 - (6) Getting the students to change their attitudes from indifference to caring.
 - (7) Keeping the interest level high.
 - (8) Getting cooperation from local teachers in my community.
 - (9) Finding an easily accessible place for field work.
 - (10) Having time to prepare without all the interruptions. The movement from [desk?] to class to hither and yon disrupted my own assignments. Guess I'm set in my ways of spreading things out to observe while I work.
 - (11) getting enough time off campus for field work
 - (12)
 - (13) * - Time; * - materials (equipment); *! - both can be overcome (esp. time) as I have learned over the last month!
 - (14) In biology, trying to limit the amount so other objectives will be taught for EOC. In Envir. Sci. - No problem
 - (15) Trying to coordinate all the data my students collect concerning air, water, soil testing (in house and state records) plus info on agriculture, industry, ground water, etc.
 - (16) I will need to make sure that I cover all of the curriculum and don't spend too much time on environmental topics. With all the information I gained, it would be easy to spend the whole year on the environment.
 - (17) Covering everything that I need to and want to during the school year.
 - (18) Finding the resources to use to do some testing
 - (19) Trying to monitor air quality will be the most difficult. I'm hoping to find a place in the western part of the state that reports on air quality.
 - (20) Integrating it (environmental science) with a course with an End-of-course test and still cover the material within the existing curriculum.
 - (21) Preparing them for the EOC test (end of course).
 - (22) Getting my students to be as enthusiastic as I am about making sure our environment is safe.
 - (23) Providing transportation for field trips
 - (24) It will be challenging to work with a wide variety of people in creating an environmental report card, putting what we learn into action, and deciding what things will be done and what things will not be done.
 - (25) Having to get students going out and working on their assignments after school hours and compiling the required data/information. I've on occasion had students who simply copied from their friends. If this happens, the information collected will be rendered useless. The greatest challenge is ensuring that all of them working according to their assignment in order to have a valid report.
 - (26) Getting my principal to allow me the time needed for field trips.

12. Where necessary, please **elaborate** on any of the topics in section 11 (referencing the item letter).

- (1) You can never please us all. Take some input then go with your best judgment.
- (2) n. The groups were good but I think breaking us down by subject area could have been better. e. I would have liked more time in New Bern to enjoy the beautiful accommodations and other participants.
- (3)
- (4)
- (5) My expectation was that more field and lab-work would have been included was not met. From other science workshops that I have attended, "make and take" sessions were particularly valuable. I expected to do much more with computers and GIS activities.
- (6)
- (7) I would be more interested in seeing how things were done at the EPA
- (8) q. We seemed to back away from the Report Card Metaphor during the last week.
- (9)
- (10) n. My group could have been more involved.
simplicity of a report card is good.
- (11) I prefer a more qualitative approach rather than quantitative. Thus, I don't really care to pursue the "report card" metaphor. Open-ended discussion which raise the issues are most important.
- (12) a. it was a little confusing about what was expected of the participants; m. I don't know what I expected; I arrived with no expectations other than I expected to get in touch with environmental interest, education, and people.
- (14) M. The Institute was beyond my expectation!
- (15) The only thing that was NOT effectively communicated before everyone arrived was the matter about payment for meals. Please make that clear in the letter sent before arrival.
- (16)
- (17) Next year you will not have trouble with this, but some days you tried to do too much material or too many areas. There needs to be a break at least every 90 minutes.
- (18)
- (19)
- (20) a,b,d,h,i,n,o,p,q: I truly believe these were the best aspects of this institute. (it's strengths)
- (21)
- (22)
- (23)
- (24) a. the objectives were effectively communicated but never really carried through or completed
- (25) q. The "Report Card" metaphor, though useful, left doubts into my mind as to whether what we want to measure is a trend or an impact of human activities upon the environment. I am still not sure it was a well-placed metaphor.
- (26) Breaks need to be more frequent.

13. Please list the *five* most valuable Institute activities encountered during the past month. (*Write the title from the Institute's Agenda or describe the activity.*) **Be specific!**

- (1) 1. Eno River - Water Testing; 2. ZPG; 3. Alex Hitt - Sustainable Agriculture; 4. Spiny Mussel - Role Play; 5. 1st day - Team Building at Triangle Training Center
- (2) 1. Eno River; 2. Water Plant / WWTP tours; 3. Archdale Bldg. - will be more if you utilize Debra Crane; 4. Soils - Alex Hitt farm; 5. Field Trip - New Bern
- (3) Eno River - all field trips; science (not tech) speakers; teacher interaction; resource materials; contacts made - human resources
- (4) Determining Water Quality Using Physics, Chemistry, and Biology; Estuarine Observations and Characteristics (boat ride); Organic Farm; Rick Dove, The Neuse River Keeper — Boat Ride; Tour of Durham's Wade Brown Water Treatment Plant

- (5) Doing field tests; Gathering data along the Neuse River; Meeting with local environmental agency representatives; Interacting with panel "How Are We Doing Protecting NC's Environment"; Environmental Treasure Hunt
- (6) Eno river water quality sampling etc. activities; Spiny Mussel Role Play Activity; Archdale Bldg. - Envir. Treasure Hunt; Team Building - Triangle Training Center; Soil Sampling at Neuse River Waste Water Treatment Plant
- (7) Organic Farming - Alex Hitt; Water Cycle, Water Quality, and Stream Ecology; How are We Doing Protecting NC's Environment; Estuarine Observations and Characteristics; Fish Kills on the Neuse and the Related Dinoflagellates; Permit Process Simulation
- (8) Joanne Burkholder - Toxic Dinoflagellate; Morehead City Trawler - Identifying dredged organisms; Everything Don Francisco did; The soil scientist who came to Weyerhaeuser - soil history; Team building activities.
- (9) Alex Hitt's Farm Visit; Eno River Activities; Duke Research Vessel; Waste Water Treatment Plant Visit; Archdale Tour/Day in the field in own county.
- (10) Eno River Trip and Alex Hitt Farm; Raleigh Wastewater; Don Francisco participation; Groups Interaction / Ropes Course; Archdale Building; (all of it!)
- (11) Eno River Field Work; Newport River "Cruise"; Alex Hitt's farm; Interviewing local people; interacting with other teachers (not specific but most important).
- (12) Dredging in the sound; water testing; organic farm soil test; sewage plant visit; July 7 panel discussion.
- (13) Field Trip; Fish Kills on the Neuse; Wastewater Treatment Tour; Stress and Salamanders; Connecting Air and Water Quality
- (14) Team Presentations and collaborative work; The sampling of the streams from Eno to Morehead; Treasure Hunt at Archdale; Interviews in Home Area; Interviews
- (15) Internet and Arcview use by MCNC; Joanne Burkholder - dinoflagellates; talking with local officials and others on our "home" day; Presentations by the groups; All of the presenters listed below.
- (16) Fish Kills on the Neuse and Assoc. Dinoflagellates; Tour of Wastewater Treatment Plant; NC Hydrogeology; Determining Water Quality: Using Physics, Chem. and Bio.; Hanes Hall - Internet Info.; Soil Science, Conservation, Land Use - Alex Hitt's part
- (17) Trip down the Neuse; Lecture by Burkholder; Trip to Alex's farm; Panel Discussion; Trip to Archdale Building; Talking with other science teachers
- (18) Water monitoring (DO, Conductivity, etc.); Water Macroinvertebrate Identification (Eno); Duke's Research and Boat Activity; Day at Home Interviewing Comm. People; Visit to Alex Hitt's Farm.
- (19) Local interviews with county officers; Water Quality activities along the Neuse River; The Activities we did on the Duke Research Lab; Sharing of activities among fellow teacher; Visits to the water treatment plants;
- (20) Valuable for Hands-on activities: Water Quality tests (DO, pH, conductivity); Macroinvertebrates in water (Eno river state park); Soil Tests (pH, organic material, infiltration. Valuable for raw knowledge: Alex Hitt's farm visit; Trip to coast; Water Treatment and waste water treatment plant; Time in home county
- (21) The first day of getting to know one another; Environmental Treasure Hunt; Tour NC Museum of Natural Sciences; the video and pizza on the air at Melva's house; going to that organic farm
- (22) Testing of waters pH, Temp, TDS, DO/Research Vessel; field trips - Alex - New Bern; Park Ranger Falls Lake; Water Treatment / waste treatment; Archdale and time at home
- (23) Local Interviews with officials; Duke Marine Lab; Visit to Raleigh Waste Water Treatment; Eno River State Park Study; sharing lesson plans with entire group
- (24) Eno River Activity; Collaboration time among teachers for lesson plans; field day in our own community; water experiments with Don Francisco; Zero Population Growth people
- (25) "Team Building/Get Acquainted"; "Water Cycle, Water Quality and Stream Ecology"; "Threat Analysis for the Swift Creek Population of the Tar River Spiny Mussel"; "Estuarine Observations and Characteristics"; Permit Process Simulation.

(26) Don Francisco's Water Treatment Lecture 06/21; Field Trip to Neuse; Beach Trip (Research Vessel); Weyerhaeuser Trip; Interview Day (At Home)

14. Please list the *five* most valuable Institute presenters encountered during the past month. (Write the title from the Institute's Agenda or describe the topic presented.) **Be specific!**
- (1) 1. Alex Hitt - Sustainable Farm; 2. Dr. Burkholder - Dinoflagellates; 3. Dr. Alvin Braswell - Amphibians and Reptiles; 4. Panel Discussion - Farm Bureau, Pittsboro, Orange County, - protecting NC Env.; 5. Dr. Haans Paerl
 - (2) 1. Joanne Burkholder; 2. Paul Lilly; 3. Alvin Braswell; 4. Alex Hitt; 5. Dave Gardner - Weyerhaeuser; 6. Rick Dove
 - (3) Rangers - Eno and Falls; River Keeper; Farmland History; Burkholder; "salamander man"
 - (4) Dr. Paul Lilly, "History of Swampland..."; "Fish Kills on the Neuse and Associated Dinoflagellates"; Weyerhaeuser speakers; David Cook, Eno River State Park; Allen Hitt, Organic Farm
 - (5) Dr. Burkholder; Don Francisco; Alex Hitt; Michael Rink; Hans Pearl
 - (6) Dr. Joanne Burkholder; Dr. Paul Lilly; Alex Hitt; Jay Zimmerman; Alan Clark; Also Don Francisco and Dave Smith
 - (7) Alex Hitt; Don Francisco; Lundie Spence; Institute Staff; Joann Burkholder
 - (8) Joanne Burkholder; Lundie Spence; Don Francisco; Paul Lilly; Man from Weyerhaeuser.
 - (9) Dr. Joanne Burkholder; How are we doing protecting NC envir. (panel); Population as Envir. Issue - Sheila Jones and Luane Bridle, Don Francisco, Dr. Paul Lilly
 - (10) Don Francisco; Joanne B.; Lundie Spence; Dave Smith; Melva Okun and her Outlook
 - (11) Joanne Burkholder; Paul Lily; Hans Paerl; Alex Hitt; Tom Howard
 - (12) Don Francisco and his various lectures and water testing; Hans Paerl - algae; Jay Zimmerman - Ground Water; Joanne Burkholder - Dinoflagellates; Lundie Spence - dredging activity.
 - (13) Joanne Burkholder; Hans Paerl; Paul Lily; Doug Crawford Brown; Carol Bond
 - (14) Dr. Burkholder - Dinoflagellates; Alvin Braswell - Amphibians and Env. Stress; Alex Hitt - Sustainable Ag.; Dr. Paul Lilly - Changes in Rural Land Use; Dr. Hans Paerl - connecting air-water quality to marine life.
 - (15) Dr. Jim Vickery - "Overview of Air Issues"; Dr. Don Francisco - "Water Cycle, Water Quality, and Stream Ecology"; Dr. John Bachman - "US Policy Plus Indoor Air Issues"; Dr. Alvin Braswell - "Stress and Salamanders"; David Cook - "Land Formations, Water Sheds and Rivers"; Jay Zimmerman - "NC Hydrogeology"; Dr. Hans Paerl - "Connecting Air and Water Quality to Integrity of Marine Life"; Dr. Joanne Burkholder - "Dinoflagellates"
 - (16) Dr. Joann Burkholder; Jay Zimmerman; Dr. Don Francisco; Alex Hitt; Dr. Jim Vickery
 - (17) Joann Burkholder; Alex Hitt; Dr. Paul Lilly; Jim Cummings; Debra Crane
 - (18) Dave Smith - Hormone mimicking chemicals; Dr. Paul Lilly - history of Ag. in NC; Joann Burkholder - Dinoflagellates; Don Francisco - Many Things; Melva Okun - many things; Hans Paerl - Algae Blooms
 - (19) Joann Burkholder - Dinoflagellates; Hans Paerl - Blue/Green; Dave Smith - About De. Report Card; Paul Lilly - History NC (soil); Alex Hitt - Sustainable Farming; Don Francisco - Water Quality
 - (20) Dinoflagellates - NCSU's Burkholder; History of Agriculture in NC - Lily presentation at Weyerhaeuser; Dr. Lundie Spence at Morehead City; Hydrogeology of NC at Falls Lake; Alex Hitt
 - (21) Dr. Francisco; Dr. Alvin Braswell; Dr. Joann Burkholder; Anne Coan; Clara Wiggins
 - (22) Joanne Burkholder - Dinoflagellates; Alex Hitt - organic farm; Debra Crane at Archdale Bldg; Panel NC Environment; Dr. Lilly
 - (23) History of NC Agriculture - Paul Lilly; Dinoflagellates Research - Dr. Burkholder; Panel on NC Environmental Issues - Farm Bureau, etc.; Don Francisco, Melva Okun, Dave Smith, Lundie Spence; Hans Pearl - water Quality, Neuse River Estuary

- (24) Zero Population Growth people; the lady at the Archdale Building who knew everything; Clara Wiggins from DPI with science curric. and internet/nandonet; Don Francisco in the capacity of mentor; Rick Linthurst with EMAP
- (25) Dr. Don Francisco; Dr. Joanne Burkholder; Dr. Doug Crawford Brown; Dr. Hans Paerl; Ken Galluppi
- (26) Jim Vickery, EPA; Dr. John Bachman; Jay Zimmerman; Dr. Joann Burkholder; Ann Taylor, DEHNR

15. What was the strongest feature of the Institute, "Developing an Environmental Report Card"?

- (1) - variety of speakers; - diversity of views from speakers; - variety of activities; - quality of participants
- (2) Lots of great speakers and activities. Lots of resources to use in classroom. Being able to purchase materials for the classroom. Leaders were very easy to work with.
- (3) Field trips
- (4) The study of the Neuse River was the strongest because it helped us with our field experience.
- (5) Resources development and exposure to issues
- (6) Most (actually almost all) of the teacher involved. We learned a lot from each other.
- (7) The ability of the teachers and the staff to communicate and the staff making necessary changes when needed.
- (8) The water quality issues presented were the strongest feature. The presenters Lundie Spence, Don Francisco, Joanne Burkholder, etc. were outstanding.
- (9) The Quality of some of the speakers
- (10) Perseverance.
- (11) Interactions with other teachers
- (12) Variety of speakers, activities.
- (13) Flexibility
- (14) Quality of presenters
- (15) Focusing all the environmental issues (air, water, soil) in such a manner that it gave us a handle as to how to apply it to our local areas. If we bring it closer to home for the students they might want to be more involved in their own future.
- (16) The leaders were willing to adapt to the participants needs.
- (17) All three areas of the environment were covered, and plenty of resource materials and activities were introduced in all three areas. There were excellent speakers.
- (18) It made me more aware of environmental issues and gave me a strong desire to pass this awareness on to my students
- (19) The strongest point for me was the excellent speakers. The sites we visited as well as traveling to the coast were wonderful.
- (20) Ability to provide a comprehensive examination of the environmental quality/management of the air, soil,, and water.
- (21) Hearing about the environment to a point where you are motivated to do something.
- (22) Field Trips; Certain Speakers
- (23) The outstanding Institute Directors and the scientific researchers such as Dr. Joanne Burkholder.
- (24) The strongest feature of the Institute was the opportunities for teacher collaboration.
- (25) Very good organization abilities of the leaders, flexibility and superb patience and understanding characterized the features of this institute.
- (26) The impressive list of world-class scientists used as presenters of cutting edge Info.

16. What was the weakest feature of the Institute?

- (1) Plans changed too often and too quickly. Leaders listened too much to whims of participants.
- (2) Time Constraints - not enough time to do all planned without being rushed. Not utilizing Anne Pope at EPA. Not utilizing Debra Crane at Archdale.

- (3) Long days
 - (4) The Integrated Case Study and Role Play of the Spiny Mussel was a waste of time.
 - (5) Too much was packed into too little time.
 - (6) 1. glitches in technology and unprepared/unfocused presenters
 - (7) Everything that involved computers
 - (8) The air quality section was weakest. The presenters were uninspiring and there was a repetition in their presentations.
 - (9) Time factors that sometimes cut things short.
 - (10) Technology display which is often the case due to so many variables.
 - (11) Computers
 - (12) A little doubt about what was expected from the participants for reports - if we had known exactly what was to be expected from us at the beginning, we might be more prepared? There was doubt about what you really wanted us to do.
 - (13) Technical Aspects
 - (14) Lack of forestry (US Forest Service, ETC) and wildlife management info.
 - (15) Miscommunication of ideas about what was expected as "lesson plans" vs. "activities" vs. "units" different words for different folks!
 - (16) Not enough time allotted for many of the speakers.
 - (17) Most attempts to integrate computers into lessons failed. EPA's part in the workshop.
 - (18) Logistics - we were sent lists of many things to bring, much of which was never needed. I felt the original schedule was better than the changes that were made. This week we had too much time to work independently. Much of this could have been done on our own time.
 - (19) This is not a weakness, but before another time you might want to look for closer parking to save time.
 - (20) Computer/technology applications to high school classrooms
 - (21) Time - too many things [down?] to do in one day
 - (22) Computer Technology; Time Factors - Sometimes needed breaks - other time too much time planning
 - (23) The failure of the computers to function properly.
 - (24) the weakest feature of the Institute is the lack of organization and the deviation from a clear focus to a collection of disjoint activities
 - (25) The main concern, I wouldn't call it a weakness, was in regards to the very tight schedules which characterized it for the first 2 weeks. Few presenters were either out of topic or did not know what was expected out of them.
 - (26) Long Days: some days seem to go on forever
17. What are some **suggestions for improving the Institute** for future participants?
- (1) Distill it - Select the best activities and make the workshop 1 week shorter. Get some tours of more labs at EPA
 - (2) Provide lunch - more interaction time for participants - less out-of-pocket expenses for us. Make a kick net. Have someone from Extension Service share resources that are available.
 - (3) Maybe end at 3
 - (4) I think time needs to be managed better. Most of the time speakers were cut short or had to rush through their presentation. There was too much (activities, speakers, field trips) crammed in our days.
 - (5) Do more lab work; Do make and take; Have experts in soil and air as well as water
 - (6) 1. Select presenters more carefully (some were boring); 2. quadruple confirmations whenever computers are involved; 3. three weeks would be appropriate; 4. The group discussion time was valuable both inter- and intra-level but need to rethink the lesson plans activity.
 - (7) No more cheese
 - (8) Choose presenters both for knowledge and speaking ability. More support from EPA. Dr. Bruck at NCSU is a very interesting presenter on air quality.

- (9) No night speakers - more breaks during sessions
- (10) Parking - I understand the problem. You made the right choice.
- (11) Try out all the technology immediately before it is to be used.
- (12) Weed out some boring speakers and find some more interesting ones and find more visits with other people involved. Keep looking for the new and current issues - be on the cutting edge.
- (13) More emphasis on debrief after in-field interviews; Spreading out presentations of lessons.
- (14) Include Forestry and Wildlife Issues; Leave off Dept. of Public Inst. Part.
- (15) a.) Have a copy of speaker's speech and/or overheads before they present - that way if people want copies of certain things they have ready access to it. b.) State clearly whether lesson plans or activities are to be developed - do this the first several days, NOT 3 weeks into it so they can start "thinking ahead"
- (16) Don't have as many speakers and allow more time for them. Have supplies to make equipment (i.e. kick nets)
- (17) Try not to schedule too much in a day's time.
- (18) Stick closer to planned agenda. Give participants advanced notice of how they need to dress and when. (Don't tell us on Monday we will need to dress up on Friday when some of us are 250 miles from home.)
- (19) You might want to think about changing groups around until it is necessary for them to be together.
- (20) Shorten the Institute to three weeks and reduce the number of speakers
- (21) Be sure time is structured well.
- (22) Selections of participants need to be different. I felt we had some goof-offs and some very negative attitudes. Define roles of groups better for assignments - all should have done group or individual.
- (23) 1 - more time for each field activity; 2 - At least a week for follow-up the next summer to evaluate what did not work well for each participant.
- (24) Conduct the workshop (at least a portion) as a model of what we should be doing in the classroom.
- (25) Moderate Schedules, rotating group members, and informed presenters who are less likely to go off tangent from what is expected.
- (26) More activities and more breaks.

19. In what ways might the information gained from your participation in the Institute be useful to you **outside of the classroom**?

- (1) Our county faces several immediate environmental issues: land application of gasoline contaminated soil, land application of wood processing wastes, decline of agriculture, and four major highway projects, including one new road and bridge through my farm, opening us up to development from Danville, VA. I don't want these things! Right now we have a relatively pristine county - rare in the piedmont. I don't trust our local leaders to be knowledgeable enough nor concerned enough to protect what we have. Most people in our county take for granted what we have. How do I convince them that even surrounding counties don't have clean air, water, and open space any more and that these things should not be traded for "development."
- (2) Outdoor Ed. center development. Understand more about my local environment. How I can keep a better watchful eye on what's going on in my area.
- (3) I am on the town planning board!
- (4) I will become more aware of my local environment. I will also participate more in the management of my environment.
- (5) Development of Environmental Clubs
- (6) I can become more involved in my community action group and environmental activities.
- (7) I have gained a lot of valuable information which I will use for teaching more hands-on activities.
- (8) Help me to be more active in my community on environmental issues.

- (9) I plan to become more involved in environmental issues that affect my community.
- (10) To be a better citizen as well as to inform others and do something about our state of being.
- (11) I'll have a better working knowledge of environmental issues when I read about them or hear about them in the news.
- (12) For writing my texts.
- (13) - Pursuit of personal interest in nature/environment; - Reviewing local policies on environment
- (14) The technical and field work can be better meshed
- (15) By knowing the environment of the county I'll be able to share this Environmental Report Card with various civic groups and hopefully with the local and state government.
- (16) It has made me want to become more aware of environmental issues in my community.
- (17) It has given me the contacts that I need to help me keep watch over the hog farmers in my county. It has also opened my eyes to some of the things that I do that hurt the environment.
- (18) I intend to make myself more knowledgeable of the condition of the environment in my local area and to the management practices in effect, and to everything I can to maintain or improved both the local environment and management practices!
- (19) I think that I , personally, will do more recycling and conserve energy more than I have ever done before.
- (20) It will help me to pursue an advanced degree (MBS) in Soil Science (concentration in Land Use Management)
- (21) Field trips; I'm going to get involved w/ my town hall; participated/get involved with environmental issues
- (22) My own personal attitude towards environmental issues has changed - I'll be more aware and vocal.
- (23) I plan to do more water and soil testing with my students and take field trips to local treatment centers.
- (24) I will be more knowledgeable and active in my local community with regards to the health of the environment.
- (25) Making contacts with local leaders and discussing the state of the environment and also checking on how my students are doing in the fields; (their assigned projects), as they seek solutions to the environmental problems of their locality.
- (26) I can use this knowledge to investigate my hometown and find out what the health of my local environment truly is.

20. In one phrase, what did you understand the goal of this Institute to be?

- (1) To make us more aware of environmental problems in NC and to encourage action in our local are - and to do the same with our students. [y]
- (2) How to help my students develop an Env. Report Card on our local area by what we do in class and carry it into their everyday life. [y]
- (3) The goal of the Institute was to help me do a better job of teaching my kids about the environment and what they can do about it. [y]
- (4) To be able to help our students learn about their local environment. [y]
- (5) "Develop and environmental report card". [y]
- (6) To learn more about the environment so that I can more effectively teach my students to learn the importance of caring and protecting their env. [y]
- (7) To enhance my knowledge of the environment nationally and locally and to be able to use that knowledge to teach my class, and make them aware of environmental issues. [y]
- (8) To enable and empower teachers to teach about their local environment. [y]
- (9) Learning to develop an environmental report card. [y]
- (10) To Spread the Message. [y]
- (11) Learn about how to study and teach about the environment. [y]
- (12) To get teachers (and their students) concerned enough about the environment to do something about it in their communities. [y - to some degree]

- (13) To become more familiar w/ our environmental state. [y]
- (14) To give us skills, information, and activities so the health of the environment can be determined by our students.
- (15) To help me gain a better understanding on the environment so that I, and my students, could assess the "health" of our county that we live in. [y]
- (16) Prepare teachers to help students become aware of the environment. [y]
- (17) To better understand the pressing environmental issues and prepare myself to do a better job of educating our young people about these issues. [y]
- (18) To train teachers across the stat of NC to develop an environmental report card. [y - but maybe something even better was achieved]
- (19) I thought that the institute's goal was for us to be able to assess the quality of our environment. [somewhat]
- (20) To develop a comprehensive way to examine scientifically or "grade" the quality of the environment based on air, soil, and water. [y]
- (21) To learn more about the environment. [y]
- (22) "Let's grade and improve our environment" awareness. [y]
- (23) To increase science teachers interest and knowledge of environmental issues facing our world. [y]
- (24) Develop an Environmental Report Card for use in my community. [n]
- (25) Getting the students involved in solving environmental problems in their community. [y]
- (26) Form a baseline study for determining the health of my local environment. [y]

EPAR

List any specific strengths and weaknesses you would like the program staff to know about:

The program was excellent! This has been a most valuable experience.

Strengths:

1. resources of triangle area
2. participants

Weaknesses:

1. unbalanced groups
2. technological connections
3. failure to inform participants about amount of cash needed -- also a list of local banks is helpful.

Institute could be shortened to three weeks rather than four. There was a lot of unused time the last week.

Very strong water quality presenters. Need more interesting air quality people. Environmental toxicology should be included.

Strengths:

- adaptability, focus of your purpose
- knowledge of water system
- computer gremlins - computer access until late

Weaknesses:

- no staff experts on soil, air, nor ground water
- lack of ability to pursue questions of presenters. We pushed on when it was evident that people were interested in specific topics and were cut off.
- time planning
- no "make-and-take" projects. Could have made Kidsnet, Berlease fungus, etc.

- I question the EPA's fulfilling their commitment to this workshop.
- Excellent job of supplying resource materials and activity suggestions.
- Good job of handling transportation and parking problems.
- Need to work on lunch menu.

- Time was always off, breaks and lunch were always late, some days no break at all.
- Too many papers
- We stay in these classes longer than we would stay in school.

Strength: Interaction with scientists/researchers.

Weakness: Bugs in technological portion which could not be helped!

More details about money, such as food spending, should have been given us in advance; some people didn't have enough for food for the workshop, like the younger people on a beginning salary.

The planning and dedication of everyone involved in the preparation was obvious.

Strength:

- The leaders were willing to adapt to the participants' needs.
- Excellent knowledge of water.

Weaknesses:

- None of the leaders had expertise with soil or air.
- Not enough time given to many of the speakers.
- Should have been given time and supplies to make items for testing (i.e., kick nets).

Strengths:

- Willingness to adjust plans to better meet the objectives of the institute.
- Quite organized
- Work well together
- Supported teachers in their work

Weaknesses:

- None that was within the control of the staff. Honestly, I believe this statement.

Strengths:

- Organization of daily plan;
- patience - caring for individual needs;
- knowledge of subject;
- dedication.

Visits to research areas of EPA would have been appreciated. Overall this was an excellent institute. Thanks so much for permitting me to participate.

1. Be consistent among staff as to directions on assignments.
2. Get presentation from Anne Pope so we could get her resources.

I think time management was a big factor. Too many activities and speakers were crammed into a day. Also, I think there should be a set time schedule (8-3:30).

For you (personally and/or professionally) what is the most important thing you gained from your program experience?

The knowledge that global issues can indeed be local issues. And I owe it to my students to do a better job of teaching them these concepts.

A recharge for my teaching batteries both in a new focus and in the opportunity to interact with other professionals.

The importance and effect that pollution and population have on the environmental quality. The location of a variety of resources (gov., county, etc.)

Contact with programs, people, and environmental issues, plus materials I can use and contacts I can hopefully strengthen.

A strong desire to have my students leave my class with a strong sense of responsibility for our environment.

- A greater understanding and respect for our environmental issues. It has also better prepared me to discuss environmental issues in my classroom.
- I still have one question that may never be answered; where do you draw the line between economics and environmental?

Environmental data in all phases.

Being able to meet and work with research scientists and sharing ideas with other science teachers from around North Carolina.

Interacting with other teachers from all across the state while focussing on a particular issue.

New ideas and interactions from/with fellow teachers and professional scientists.

Background and credibility as a science teacher.

I gained a better understanding of some problems our state has and knowledge of how we are managing these problems.

Awareness of NC's environmental problems.

The most important thing was being able to interact with teachers from around the state regarding a specific topic. It was extremely beneficial to pool our knowledge and organize a new approach toward teaching about the environment in our classroom.

Knowledge and materials needed to do a good environmental program in my class; more insight into our local environment and what our future looks like -- "awareness."

I gained an awareness of things that affect the environment.

- 1) New hands-on lab experiments that can be utilized in the classroom to study the environment directly.
- 2) Allowed me to make connections (networking) with state agencies, county agencies, and other teachers concerning environmental education.

The science overview. Materials which I had none before. The interaction with other teachers and people in the field.

How to put all of the information together and deal with it on a local level.

Being able to learn that some of my fellow teachers have same problems I face and have same commitment to environmental health as I do. It made me feel that I am not an "island unto myself."

- Background knowledge
- Activities to use in the classroom

Contact with experts on the environment.

I created an entire unit which I will use next year to help my students learn about their local environment. I also gained ideas and activities which I can share with my coworkers. Also, I've met a number of new friends.

DAILY EVALUATIONS**Tallys of Activity Ratings from Participant Completed Daily Evaluations****Date: 6/20/94***On a scale of 1-5, please tell us how valuable today's sessions were.*1. This mornings **team building activities** were:

1	2	3 [4]	4 [9]	5 [14]
of no use at all				extremely valuable

2. The presentation on "**Values and the Environmental Movement**" was:

1	2 [3]	3 [8]	4 [11]	5 [4]
of no use at all				extremely valuable

3. The panel discussion on "**Values: Bridging the Gap Between Science and Policy**" was:

1	2	3 [9] *	4 [11]	5 [6]
of no use at all				extremely valuable

Date: 6/21/94*On a scale of 1-5, please tell us how valuable today's sessions were.*1. This mornings **Integrated Case Study and Role Play** activity was:

1	2	3 [1]	4 [13]	5 [13]
of no use at all				extremely valuable

2. The sessions on **Stream Structure and Function** were:

1	2 [1]	3	4 [5]	5 [21]
of no use at all				extremely valuable

3. The session on **The Water Cycle, Water Quality and Stream Ecology** was:

1	2 [1]	3	4 [7]	5 [19]
of no use at all				extremely valuable

Date: 6/22/94*On a scale of 1-5, please tell us how valuable today's sessions were.*1. This morning's session on **Sustainable Agriculture** was:

1	2	3 [2]	4 [5]	5 [18]
of no use at all valuable				extremely

2. The session on **Soil Science** was:

1	2 [3]	3 [9]	4 [10]	5 [2]
of no use at all				extremely
valuable				

3. The session on **"ArcView: Using Technology to Look at the Land and Soils"** was:

1 [2]	2 [13]	3 [6]	4 [2]	5 [2]
of no use at all				extremely

Date: 6/23/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This morning's session, **"Overview of Air Issues"**, was:

1	2	3 [1]	4 [14]	5 [10]
of no use at all				extremely valuable

2. The session on **U.S. Policy and Indoor Air Issues** was:

1	2 [1]	3 [2]	4 [13]	5 [5]
of no use at all				extremely valuable

3. The session, **"How's the Air in North Carolina?"**, was:

1	2	3 [2]	4 [10]	5 [7]
of no use at all				extremely valuable

4. The session, **"The Super Computer and Air Modeling/Visualization"**, was:

1	2 [3]	3 [8]	4 [7]	5 [2]
of no use at all				extremely valuable

Date: 6/24/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. The session, **"Stress and Salamanders: An Integrated Case Study"**, was:

1	2 [1]	3 [3]	4 [10]	5 [11]
of no use at all				extremely valuable

2. This morning's **Time for Working on Lesson Plans** was:

1	2 [3]	3 [4]	4 [7]	5 [11]
of no use at all				extremely valuable

3. The session devoted to **"Developing an Environmental Report Card"** was:

1 [1]	2 [5]	3 [5]	4 [5]	5 [9]
of no use at all				extremely valuable

Date: 6/27/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. The session, "Land Formations, Water Sheds, and Rivers", was:

1	2	3 [1]	4 [6]	5 [16]
of no use at all				extremely valuable

2. This morning's session on **Determining Water Quality: Using Physics, Chemistry, and Biology** was:

1	2	3 [1]	4 [3]	5 [19]
of no use at all				extremely valuable

3. The session, "Botany and Adaptations to Different Systems Along the River", was:

1	2	3 [1]	4 [8]	5 [14]
of no use at all				extremely valuable

4. The **Tour of the Wade Brown Water Treatment Plant** was:

1	2 [1]	3 [4]	4 [10]	5 [8]
of no use at all				extremely valuable

Date: 6/28/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. The session on **Protecting NC's Water Supply Watersheds** was:

1 [1]	2	3 [2]	4 [17]	5 [6]
of no use at all				extremely valuable

2. This morning's session, "Competing Uses for Multiple Use Reservoirs", was:

1 [1]	2	3 [7]	4 [13]	5 [5]
of no use at all				extremely valuable

3. The time scheduled for **Field Work** was:

1	2 [5]	3 [2]	4 [6]	5 [11]
of no use at all				extremely valuable

4. The session, "Air Issues In the Raleigh Durham Area and Monitoring Techniques", was:

1 [1]	2 [3]	3 [10]	4 [9]	5 [3]
of no use at all				extremely valuable

Date: 6/29/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. The session on **North Carolina's Hydrogeology** was:

1	2	3 [4]	4 [8]	5 [12]
of no use at all				extremely valuable

2. This morning's **Tour of the Wastewater Treatment Plant** was:

1	2	3 [3]	4 [4]	5 [17]
of no use at all				extremely valuable

3. The session, "**Vegetative Buffers for Agricultural Operations**", was:

1	2	3 [1]	4	5 [6*]
of no use at all				extremely valuable

* 3/6 marked for soil tests

4. The session, "**Connecting Air and Water Quality to the Integrity of Marine Life**", was:

1	2 [2]	3 [6]	4 [2]	5 [13]
of no use at all				extremely valuable

Date: 6/30/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. The session, "**History of Swampland Development in NC: Changes In Rural Land Use**", was:

1	2 [1]	3 [2]	4 [3]	5 [16]
of no use at all				extremely valuable

2. This morning's session on "**Weyerhaeuser's Operation and Associated Environmental Issues**" was:

1 [1]	2 [2]	3 [3]	4 [7]	5 [9]
of no use at all				extremely valuable

3. The session devoted to "**Issues of the Neuse and Citizen Efforts to Protect the River's Water Quality**" was:

1	2	3 [4]	4 [6]	5 [11]
of no use at all				extremely valuable

Date: 7/01/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. The session, "**Estuarine Observations and Characteristics**", was:

1	2	3	4 [4]	5 [18]
of no use at all				extremely valuable

2. The session devoted to **Debriefing the Weeks Activities and Information Learned** was:

1	2	3	4 [5]	5 [17]
of no use at all				extremely valuable

Date: 7/5/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This mornings session, "**Fish Kills on the Neuse and the Associated Dinoflagelates**" was:

1	2	3 [1]	4 [2]	5 [23]
of no use at all				extremely valuable

2. The presentation on "**Who's In Charge of NC's Environment**" was:

1 [1]	2 [7]	3 [5]	4 [9]	5 [4]
of no use at all				extremely valuable

3. The presentation, "**NC's New Science Curriculum: Environmental Links**" was:

1 [1]	2 [1]	3 [4]	4 [10]	5 [10]
of no use at all				extremely valuable

Date: 7/6/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This mornings session, "**Using Technology to Understand the Environment**" was:

1	2	3 [5]	4 [8]	5 [11]
of no use at all				extremely valuable

2. Today's time at **The North Carolina Museum of Natural Sciences** was:

1	2 [1]	3 [7]	4 [10]	5 [6]
of no use at all				extremely valuable

3. The "**Environmental Treasure Hunt**" at the Archdale Building was:

1	2 [2]	3 [3]	4 [7]	5 [12]
of no use at all				extremely valuable

Date: 7/7/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This mornings session, "**How Are We Doing Protecting North Carolina's Environment**" was:

1	2	3	4 [7]	5 [17]
of no use at all				extremely valuable

2. Today's time to **prepare for your day in the field and work on lesson plans** was:

1	2 [1]	3 [8]	4 [7]	5 [8]
of no use at all				extremely valuable

Date: 7/8/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. The day devoted to **Gathering Information in Your Local Community** was:

1	2	3	4 [3]	5 [20]
of no use at all				extremely valuable

Date: 7/11/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This mornings **small group meeting to debrief the day in the field** was:

1	2 [2]	3	4 [12]	5 [11]
of no use at all				extremely valuable

2. Today's **time to work on lesson plans** was:

1 [1]	2 [3]	3 [6]	4 [8]	5 [7]
of no use at all				extremely valuable

3. The session, "**Population as an Environmental Issue**", was:

1 [2]	2 [3]	3 [5]	4 [8]	5 [7]
of no use at all				extremely valuable

Date: 7/12/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This mornings session on "**Environmental Equity**" was:

1 [2]	2 [5]	3 [10]	4 [5]	5 [2]
of no use at all				extremely valuable

2. Today's **time to work on lesson plans** was:

1	2	3 [3]	4 [7]	5 [14]
of no use at all				extremely valuable

Date: 7/13/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. This mornings session on "**Exploring the Internet**" was:

1 [4]	2 [5]	3 [4]	4 [5]	5 [6]
of no use at all				extremely valuable

2. Today's time to work on lesson plans was:

1	2 [3]	3 [6]	4 [5]	5 [11]
of no use at all				extremely valuable

3. The activity, "Building a Community Water Distribution Model", was:

1	2	3 [2]	4 [11]	5 [12]
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Date: 7/14/94

On a scale of 1-5, please tell us how valuable today's sessions were.

1. Last night's video, "In Search of Clean Air", was: *(complete only if applicable)*

1	2	3 [2]	4 [6]	5 [15]
of no use at all				extremely valuable

2. Today's opportunity to make and listen to presentations was:

1	2	3 [1]	4 [7]	5 [16]
of no use at all				extremely valuable