EDUCATORS' ATTITUDES TOWARD MANAGEMENT OF DEER IN NORTHERN NEW YORK

BY

G.A. POMERANTZ, D. BOGAN AND R.A. SMOLKA, JR.

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Human Dimensions Research Unit
Department of Natural Resources
New York State College of Agriculture and Life Sciences
A Statutory College of the State University
Cornell University, Ithaca, N. Y.

PROGRESS REPORT

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Gerri A. Pomerantz
Research Associate

and

Douglas Bogan
Consultant

and

Robert A. Smolka, Jr.
Research Support Specialist

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PROGRESS REPORT

STATE: NEW YORK
PROJECT NO: W-146-R:10

PROJECT TITLE:	Public Attitudes Toward Wildlife and Its Accessibility
STUDY NUMBER AND TITLE:	VIII - Identifying Attitudes and Values Toward Species and Their Management
STUDY OBJECTIVE:	To discern, specific to key public segregation, the attitudes held toward species traditionally associated with selected values or costs, the compatibility and effectiveness of management of those species and the public's satisfaction with the Bureau of Wildlife's efforts to manage those species.
JOB NUMBER AND TITLE:	VIII-9 - Educator's Attitudes Toward Management of Deer in Northern New York
JOB OBJECTIVE:	To determine educator's attitudes toward management of white-tailed deer in Northern New York and their likelihood of teaching deer management concepts.
JOB DURATION:	1 April 1984 - 31 October 1985

PURPOSE OF REPORT

This progress report provides a situational analysis of the current status of environmental education in New York public schools and outlines the means by which the New York State Department of Environmental Conservation can provide leadership in the implementation of wildlife education programs. We see this report as a communications piece with Bureau of Wildlife staff, providing preliminary information that will serve as an initial basis and impetus for decision-making to enhance further planning for this (for Job VIII-9) job. It is important that a decision be made very soon regarding the future of this study in order to take greatest advantage of the changes currently being made in the New York State science curriculum for public schools.

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EXECUTIVE SUMMARY

One of the goals of the New York State Department of Environmental Conservation (DEC) is to generate public support for sound deer management programs by establishing two-way communication between the public and DEC. Northern New York (NNY) has been a region of longstanding problems for managers of white-tailed deer (Odocoilius virginianus).

DEC believes part of the problem in NNY may be teachers' attitudes toward deer management. If teachers have a negative attitude toward wildlife management, particularly deer management practices DEC sees as necessary to manage deer effectively in the area, they may be transmitting or reinforcing this attitude to their students, or may simply be excluding discussion of resource management practices from the classroom.

A number of studies have addressed the influence that teachers and schools have had on children's attitudes toward wildlife, and the importance of formal schooling relative to other influences on wildlife interest (i.e., books, magazines, television, activity participation and demographic factors). School has traditionally ranked behind various media forms such as television, books, and magazines, as a wildlife information source (Pomerantz 1977, 1985). However, children might perceive a much greater school influence on their wildlife knowledge and attitudes if school curricula gave greater emphasis to wildlife education.

The time in a person's life when education has its greatest influence is in childhood and the most important and effective instrument in political socialization in the United States is the public school (Hess and Torney 1967). Not only is there evidence indicating the importance of the early years for the formation of environmental attitudes, but there is evidence that this is a crucial time in the development of cognitive abilities for environmental knowledge (Kellert 1983). It is up to environmental educators

to recognize the underlying structures of cognitive growth and structure curricula that take into account a child's readiness for, and interest in learning (Rejeski 1982).

Environmental education, nationwide, has not been treated as a basic component of the school curriculum (Childress 1978). Traditionally, elementary school teachers are ill-prepared to teach science and lack the confidence to implement science-related materials in the classroom. In New York, however, the elementary science curriculum has recently been completely revamped to provide students in grades K-six with a strong science background. The three goals of the New Elementary Science Syllabus (NESS) are to have children: (1) increase their understanding of scientific principles, i.e., knowledge of ecosystems and their constituent properties; (2) develop positive science attitudes, i.e., appreciation of the natural world, valuing it for present and future generations; and (3) apply skills systematically and with ease to solve problems, i.e., utilize the scientific method to analyze and synthesize data, generalize from data, and make decisions.

The New York State Education Department (SED) has developed a three-pronged approach to implement the NESS. The first task is to make teachers and administrators at the local level aware of the new curriculum and outline SED expectations for students and teachers. The second step is to provide intensive training for teachers to give them the tools to implement the NESS in the classroom. Lastly, SED is developing prototype material kits to demonstrate hands-on teaching of elementary science.

The NESS is clearly an SED program and one may logically ask, "Why should DEC be involved in an SED program at all?" The answer lies in the fact that both agencies want to achieve the same goal; an educated citizenry capable of making and recognizing rational decisions about the natural environment. DEC's stated concern is that teacher attitudes about wildlife management are

affecting what and how they are teaching youngsters. Up until now, teachers did not have to deal with resource issues in the classroom unless they so desired. The NESS changes the state's directives considerably. Although no law mandates adherence, teachers and administrators will have to develop curricula that correspond to the NESS guidelines by virtue of the fact that students will be tested on the material and must show minimum competency to fulfill the science requirements for graduation.

This current statewide effort by SED to train its teachers to implement an ecologically oriented science curriculum has direct implications for DEC. There is the possibility that:

(1) teachers' attitudes toward adoption of environmental education in their science curriculum may change;

(2) teachers' knowledge of how to implement environmental education in the classroom may change; and

(3) teachers' actual incorporation of environmental education in the science curriculum may change, regardless of any attitudinal change.

impl. of curric change

Given the current state of flux, it is recommended that DEC:

(1) evaluate teacher attitudes, knowledge, and behavior regarding wildlife issues prior to the in-service training and again after the training has been completed to see where teachers orginally stand on wildlife issues and determine the effectiveness of the in-service teacher training;

(2) participate in the in-service training of the elementary teachers so that wildlife education techniques are incorporated into the teachers' science training;

(3) participate in the provision and evaluation of resource materials to implement the NESS in order to introduce wildlife curriculum guides such as

DEC

Project Wild, to a broad spectrum of school teachers and determine their effectiveness in communicating wildlife information; and

(4) coordinate environmental/wildlife education efforts within DEC and between DEC and SED so that the greatest possible use will be made of educational endeavors and the greatest number of people will benefit from them.

DEC's interest in the evaluation of teachers' influence on children's wildlife knowledge and attitudes could not be more timely. The implementation of the NESS provides the opportunity to incorporate wildlife education into the public school system. Coordination of efforts by DEC and SED should facilitate achievement of this goal.

INTRODUCTION

This report provides a situational analysis of the current status of environmental education in New York public schools and outlines the means by which the New York State Department of Environmental Conservation (DEC) can involve itself in the implementation of wildlife education programs. An overview is provided of the factors that influence children's knowledge, attitudes, and behavior regarding wildlife. The role of environmental education, specifically wildlife education, is described, outlining existing and potential programs. Most important is the description of the possible role that DEC can take in providing assistance, coordination, and leadership in wildlife education in the New York public schools.

BACKGROUND

Northern New York (NNY) has been a region of longstanding problems for managers of white-tailed deer (Odocoilius virginianus). This region contains about one third of the state's total deer habitat, but the deer are not being managed effectively here. Harvest is limited by law to bucks only[1], a policy that DEC biologists consider inappropriate in much of the region.

The deer management situation in NNY has been the focus of much sociological research. Several studies have dealt with public attitudes toward illegal deer kill in the Agricultural and Transitional deer ranges of the state (Amidon 1968, Jackson 1969a, b, 1974, Shafer et al. 1972, Decker et al. 1980, 1981), where the occurrence of illegal deer killing has long been considered a widespread activity (Darrow 1948, Severinghaus and Brown 1956, Severinghaus and Free 1963). Based upon these studies and other information, DEC took a new approach to the NNY deer problem. A team of deer managers

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[1] See Decker et al. (1983) for a discussion of the events leading up to this restriction.

developed the NNY Strategic Plan for Deer Management, a blueprint for the long-term direction DEC will take to manage deer. Although potentially effective deer management programs are identified in the plan, history has shown that public acceptance and support are essential prerequisites for program implementation. This is particularly true in NNY where socio-political constraints have severely limited DEC's ability to manage deer.

One of the subgoals of the plan is to generate continued public support for sound deer management programs in NNY, and it initially holds the highest priority. This will be accomplished through a two-way communication program that seeks and uses input from key publics and, in turn, provides them with program information and rationales. A series of four studies, to be conducted by Cornell University, was called for in the plan to carry out these objectives.

The purpose of the first study (Decker et al. 1983, Smolka et al. 1983) was to determine the degree of support among NNY deer hunters for DEC's suggested deer management alternatives in the region. The second study (Smolka et al. 1985, Smolka and Decker in press) was to provide information on the attitudes toward deer and deer management held by leaders or official representatives of organizations representing a broad spectrum of interest in NNY deer management. The purpose of the third study was to determine the importance of the deer resource to nonconsumptive recreationists in NNY. Two surveys were conducted, one of nonresident recreationists and one of resident (landowner) recreationists. The surveys have been completed and the data are now being analyzed.

The fourth and final study in the NNY plan concerns the role of teachers in integrating wildlife management principles and concepts into curricula of NNY public schools. DEC believes that teachers may have negative attitudes toward wildlife management, particularly toward deer management practices DEC

sees as necessary to manage deer effectively in the area. Teachers may possibily be reinforcing or transmitting these attitudes to their students, or may simply be excluding discussion of resource management practices from the classroom. If this scenario is true for much of NNY, then existing negative attitudes toward DEC management policies are not likely to change with the next generation of adult recreationists. DEC therefore wants to determine: (1) the attitudes of teachers in NNY toward wildlife management policies, and (2) how their attitudes affect what and how they teach information about wildlife and ecological principles.

IMPORTANCE OF ENVIRONMENTAL EDUCATION IN CHILDHOOD

One of the ways to increase public support for wildlife management policies is through education. The goals of environmental education have been described by many educators to consist of essentially three elements: (1) the transmission of knowledge of the biophysical environment; (2) the development of positive environmental attitudes; and (3) the stimulation of environmentally sound behavior (Stapp et al. 1969).

Environmental education is similar to the teaching of other scientific subjects in trying to help people understand scientific concepts (i.e., ecological principles and the consequences of environmental actions). However, it differs from most academic subjects by emphasizing the incorporation of this environmental knowledge in the development of positive attitudes toward environmental quality. The ultimate goal is then to transform these enlightened environmental attitudes into socially responsible actions (Doran 1977 and references therein, LaHart and Barnes 1978-79).

Given that environmental educators are left with the job of informing, in the hope that educated people will make rational decisions, educators need to (1) reach people when formal education will have the greatest influence on

behavior, and (2) use the most effective kinds of educational tools. The time in a person's life when education has its greatest influence is in childhood (Chemers and Altman 1977, Cohen and Hollingworth 1973, Doran et al. 1974, Hess and Torney 1967, Miller 1975, Moore 1977, More 1977). After studying 17,000 elementary school students throughout the United States, Hess and Torney (1967) concluded that the most pronounced changes in a child's political attitudes occurs between the fourth and fifth grades, and the most important and effective instrument of political socialization in the United States is the public school. Regarding the formation of environmental attitudes, Miller (1975) states that the basis of pre-adult attitudes toward ecology and pollution are formed during the early years of childhood, and that by the eighth grade the attitudes of young people differ little from those of adults. However, McTeer (1977-1978) found that high school students had a much greater concern for environmental problems than adults. Pettus (1976) also maintains that there is a level of education where environmental education ceases to be effective in influencing environmental attitudes. More (1977) claims that the attitudes, preferences, beliefs, and values formed in childhood will govern people's behavior for the rest of their adult lives.

The importance of environmental education in these early years is emphasized by Doran et al. (1974) because it is during this time when young people evaluate their values. The development of an individual's value system is outlined in Kohlberg's Theory of Moral Development (Kauchak et al. 1978). In the first level, preconventional, children have a hedonistic attitude where they want to avoid punishment and maximize pleasure. In level two, conventional, they follow others' expectations. It is not until they reach level three, post conventional, that they become autonomous or principled. Kellert and Westervelt's (1983) study of children indicated that younger

children, in grades two through eight, did not have a sense of moral conviction where animals were concerned. It was not until the transition from the eighth to eleventh grades that children increased their ethical and ecological concern for animals and the natural environment.

In addition to evidence indicating the importance of the early years in the formation of environmental attitudes, there is evidence that this is a crucial time in the development of cognitive abilities for environmental knowledge. Rejeski (1982) used a Piagetian approach to understand the development of children's perceptions of the environment. Based on an analysis of children's drawings of "nature," Rejeski outlined three stages of cognitive development. In the first stage, Literalism, centered around ages six-seven, the child was interested in his immediate environment and had little ability to see himself removed from his physical surroundings. The tree, along with its inhabitants, their homes, and behavior, was an especially important symbol of nature during this stage. Ages nine-ten brought the second stage, Organization, where children classified and systematically reduced the complexity of the world through natural laws. Nature was seen as an enclosed space, i.e., a pond, forest, or mountain, and children became aware that human intervention may produce deleterious effects on the environment. This is the stage that begins to provide a basis for the land ethic. At ages thirteen-fourteen children began to understand basic ecosystem concepts and explored the link between humans and their natural environment. A sense of moralism is established at this time.

The findings of Kellert and Westervelt (1983) corroborate Rejeski's stages of development. They found that young children, in grades two through five, were the least informed about animals and the most exploitive. From grades five to eight there was a major increase in factual knowledge of animals. Children from grade eight to eleven became more interested in

animals for ecological, moral, and naturalistic reasons. Chemers and Altman (1977) found that "certain cognitive tendencies...predispose the child toward early and effective environmental perception." Their research indicates that children form utilitarian perceptions of the environment at an early age. Moore (1977) says that it is during the middle years, from about eight to twelve years of age, when "children have their deepest and most extensive relationships with the outdoors" and "when nature on a large scale reaches its highest level of behavioral significance." Both Rejeski (1982) and Kellert (1983) conclude that environmental educators must recognize that the underlying structures of cognitive growth also structure a child's acquisition of knowledge about the environment. Rejeski (1982) suggests that curricula be developed that take into account the sequence of cognitive development and that tasks for children should consider a child's readiness for, and interest in learning. An application would be to use the tree, for young children, as a microcosm reflecting the concept of larger, more complex ecosystems.

VALUE OF WILDLIFE EDUCATION

A major concern of environmentalists, and according to Schoenfeld (1978) what "may well be the most universal symbol for the concept of the environment" is wildlife. He says,

> "Whatever the total complement of environmental education, wildlife conservation is a key element - a valuble point of entry, a rich source of illustration, a stimulus to action, and an aspect of the ultimate reason for environmentalism."

The area of wildlife conservation is particularly meaningful for children, as children tend to identify with wildlife (Schoenfeld 1978). Studies of adult attitudes toward animals have shown that a person's childhood experiences with animals are important factors in the determination of adult attitudes

toward wildlife (Kellert 1976, Shaw 1974). Many researchers and resource managers feel that understanding the underlying reasons for people's attitudes and behavior toward wildlife is a way to reduce the conflicts and misunderstandings that exist today among the various users of natural resources (Hendee and Potter 1971, Kellert 1980, Shaw and Zube 1980). In an effort to explain some of the conflicts involving people and animals, Kellert (1980) conducted a national survey of adult attitudes toward animals. He found the four most popular attitudes held by adults centered around two themes: human exploitation of animals, and human affection for animals. The conflicts in these areas, Kellert suggests, is due to the fact that the population is split on the right to use animals and that some people have strong positive feelings toward animals while others have either neutral or negative feelings.

A number of studies have tried to determine the relationships between knowledge, attitudes, and behavior of young people regarding wildlife and natural resources (Kellert and Westervelt 1983, Langenau and Mellon-Coyle 1977, Pomerantz 1977, 1985, inter alia). Pomerantz (1977) conducted a statewide study of seventh through twelfth graders in Michigan, comparing the knowledge, attitudes, and behavior of young hunters, nonhunters, and antihunters. Langenau and Mellon-Coyle studied young Michigan hunters and used a combination of the questionnarie used by Pomerantz with additional questions designed specifically for the hunting population. Both studies of the general population of young people and the young hunting population revealed that young people value wildlife for existential (because wildlife is there) and educational reasons. According to Kellert and Westervelt (1983) these values become evident between the eighth and eleventh grades.

THE INFLUENCE OF SOCIO-DEMOGRAPHIC FACTORS ON WILDLIFE-RELATED ATTITUDES, KNOWLEDGE, AND ACTIVITIES

Geographic Location

Much of the research on young people has tried to identify the major independent variables that influence environmental knowledge, attitudes, and behavior. Because the population of NNY is primarily small town and rural, data pertaining to rural populations and differences between these areas and the more prevalent urban and suburban populations will be useful. Most educational programs are geared toward the latter two groups, so such information would be worth considering in adjusting program content and methods to a more rural situation. Both Pomerantz (1977) and Kellert (1983) found that rural children tended to be more knowledgeable about wildlife and the environment than their urban counterparts. However, after reading the children's nature magazine "Ranger Rick", city and suburban children increased their wildlife knowledge levels significantly more than rural children (Pomerantz 1985). Kellert found that rural children expressed greater interest and affection for wildlife and the outdoors and had less avoidance of animals due to indifference, dislike or fear than other groups. Pomerantz (1977) reported that rural children felt that their interest in wildlife was influenced more by relatives than by formal education or the media. Dyar (1975) found that rural children in California were more concerned about and active in issues of animal welfare than were other groups, although Sanders (1974) found that rural children in Oklahoma were less concerned than suburban children, though more concerned than urban children. Pomerantz (1977) also found that more rural children participated in wildlife related activities than their nonrural counterparts.

Gender

To the extent that teachers will have to deal with differing responses by boys and girls to their wildlife teaching, it is worth examining some gender-related differences in attitudes toward wildlife. Pomerantz's (1977) study of Michigan children and Kellert and Westervelt's (1983) study of Connecticut children found that males scored significantly higher on wildlife knowledge scales than females. However, Pomerantz's (1985) study of children who read "Ranger Rick" magazine showed no significant knowledge differences between males and females. Both Pomerantz (1977, 1985) and Kellert and Westervelt (1983) found that females were more often opposed to hunting. In Kellert and Westervelt's study (1983) and Pomerantz's Michigan study (1977) females had more anthropomorphic feelings toward animals. However, there were no significant differences in anthropomorphic feelings of males and females in Pomerantz's (1985) study of children exposed to "Ranger Rick." Kellert and Westervelt (1983) also found that males were more utilitarian, preferring "useful animals" twice as often as females, while females expressed more affection for large, attractive animals and were less willing to support the domination of animals. Similarly, Sanders (1974) found that females were more concerned about animal welfare. Pomerantz (1977) also found that females outnumbered males in supporting the aesthetic and educational value of wildlife and that females felt there was greater influence on their attitudes by teachers and classwork, while males were more influenced by relatives or club leaders.

INFLUENCE ON WILDLIFE INTEREST

Books and Magazines

Previous research on the importance of the media in environmental education supports the hypothesis that the media is an important influence on environmental knowledge and attitudes (Cauley, Jr. and Groves 1974, Fortner

and Teates 1980, Murch 1971, Pomerantz 1977, Schoenfeld 1977, 1979, inter alia). Eyers' survey (1975) of Australian secondary students found that the best environmental knowledge scores and most positive environmental attitudes were held by the students who claimed the media was their primary source of environmental information. Richmond and Morgan (1977) obtained similar results when they surveyed secondary school students in England. Students were asked what they perceived to be their primary source of environmental knowledge. Those students who said private reading was their main information source had the highest environmental knowledge scores and most positive environmental attitudes. Richmond and Morgan (1977) conclude that these results "tend to reaffirm the importance of the media as an educational tool. In addition to improving the quality and quantity of special environmental courses, it would seem wise to intensify environmental education efforts in those areas that the majority of pupils already perceive to be the prime source of their knowledge."

In a study of the factors that influence seventh through twelfth graders' environmental values, Alaimo and Doran (1980) found that children gather an increasing amount of environmental information from magazines as they get older. Pomerantz's (1985) study of the influence of the children's nature magazine "Ranger Rick" confirmed that the magazine increased children's knowledge of wildlife and the natural world.

Both Pomerantz (1977) and Kellert and Westervelt (1983) found that about 60% of children read books about wildlife, and LaHart (1978) reported that 73% of 8th graders in his study read such books, but Kellert and Westervelt reported that rural children were less likely to have read about animals in school than other groups. Additionally, the largest proportion of children (94%) learned about animals by looking at pictures, and more younger children read books about animals. Second graders were most interested in books about

pets, fifth graders were most interested in adventure and wild animal stories, and eighth graders were most interested in adventure stories and showed more interest in books about the outdoors. Pomerantz's (1985) study of children exposed to "Ranger Rick" magazine found similar trends. More younger children mainly looked at the pictures, liked to read about domestic animals and pets, and did not like seeing photos of scary or strange animals. As children got older, increasing numbers liked stories about people who work with animals, did not object to stories about predation, read other nature and science magazines, and indicated that "Ranger Rick" helped them with their school work.

Ramsey and Rickson (1976) showed that the manner in which ecological material is presented makes a difference in learning. Robinson (1963) compared the use of science articles versus textbooks in a freshman college course in physical science to determine if one approach was superior in promoting better science reasoning and understanding. Science reasoning essentially referred to comprehension of the scientific method. Science understanding referred to the ability to comprehend what the material stated or implied about the general nature of science and its impact on society. No difference was observed in science reasoning between the two groups. However, the group that read the science articles from magazines had significantly better science understanding.

The principle of popularized but accurate environmental education can be applied to children's literature as well. Currently, animal books comprise a major portion of children's literature (More 1979). More suggests that the anthropomorphization of animals in children's books may be related to later wildlife preferences. Marcus (1977) describes a number of books about nature in the city that are designed for children and present interesting and accurate information. The problem, he says, is that there are far too few of these kinds of books available.

One example of a popularized medium that portrays animals and environmental information to children is "Ranger Rick" magazine, published by the National Wildlife Federation. Pomerantz (1985) compared the popular magazine style used in "Ranger Rick" with a standard science text book. The comparison of the magazine styles of presentation showed that children learned from both sources. However, the magazine had a greater impact when it used a detailed, colorful presentation of scientific information.

Further support of the influence of the media on environmental attitudes and knowledge was found by Langenau and Mellon-Coyle (1977). Young hunters who were more influenced by books, newspapers, and magazines used more internal controls in their hunting behavior and were therefore at a higher stage of moral development. These children were also more knowledgeable about the environment. They present a discouraging argument that the children influenced most by printed material are unfortunately those that need it the least, because they already are more knowledgeable. However, if the same popular reading material that interests and motivates students at home were used in the more formal environmental education programs, it might prove to be effective for the less knowledgeable student as well.

Television

Tenth grade students claimed that marine-related TV programs and movies had the greatest influence on their knowledge of the marine environment, and there was a correlation between knowledge scores and the number of Cousteau specials seen (Fortner and Teates 1980). Pomerantz (1977) reported that television was mentioned by the greatest proportion of Michigan seventh-twelfth graders (87%) as having had an effect on their wildlife interest. Television ranked fourth, however, as an information source for a fifth grade sample from North Carolina (Pomerantz 1985). Kellert found that Wild Kingdom,

National Geographic, and Jacques Cousteau specials were the most popular programs among older children.

People

Pomerantz's (1977) study of Michigan seventh-twelfth graders found that males were more likely to be influenced by a relative or club member while females were more likely to be influenced by a teacher, and that rural children were more often influenced by relatives than other groups. The greatest influences, as reported by children, were their parents (84%), friends and teachers (74%), relatives (64%) and scout or club leaders (40%). When fifth graders from North Carolina rated nine wildlife information sources, parents ranked number five while friends and relatives ranked last.

School

Kellert and Westervelt (1983) reported that there were no significant differences in knowledge scale scores between those children who had versus had not learned about animals in school within a two year period, though those who had exposure to animals did score higher on the naturalistic and the scientistic attitude scales. Rural children were less likely to have read or watched movies about wildlife and participated less frequently in wildlife related experiments or fieldtrips than suburban or small city residents.

Pomerantz (1977) found that the wildlife interest of 63% of the children in her Michigan sample had been influenced by school classes, and that about one-third were not influenced by either a teacher or a school class. School was ranked number three, after magazines and books, as a wildlife information source by a sample of North Carolina fifth graders (Pomerantz 1985).

Children might perceive a much greater school influence on their wildlife knowledge and attitudes if school curricula gave greater emphasis to wildlife

education. It is therefore not fair to assume that school wildlife programs lack an impact on interest and learning. What is much more likely is that there is no school-sponsored wildlife program and, therefore, children do not necessarily see the connection between school and wildlife education.

Activity Participation

Participation in wildlife activities does seem to have a positive relationship with knowledge of and interest in wildlife. Both Kellert and Westervelt (1983) and Pomerantz (1977) found that those who had hunted had higher knowledge scores than nonhunters and Kellert and Westervelt also found that hunters and fishers were more ecologically oriented and less negative in their attitudes toward animals than were other children. Pomerantz (1977) also reported that hunters participated more often in wildlife observation than did nonhunters. In contradiction to these findings, LaHart (1978) found nonhunting children in Florida to be more knowledgeable about wildlife. Kellert and Westervelt (1983) reported that membership in animal clubs and ownership of pets were also related to higher knowledge scores as well as to more ecological and naturalistic attitudes. In addition, birdwatching was associated with more naturalistic and scientific attitudes. Pomerantz (1977) found that 65% of her Michigan sample drove to observe wildlife, 59% hiked to observe wildlife, 33% had hunted, and 22% had taken wildlife classes.

Integration of Wildlife Programs

Significantly, two-thirds or more of Pomerantz's (1977) Michigan respondents said that they would like to participate in wildlife and environmental education classes and that there should be more opportunities for such study. More than three-quarters thought there should be more areas to watch wildlife, and nearly as many wanted more nature centers and guided nature walks. More females than males wanted increases in opportunity, except

for more hunting areas. One-half of the students thought there should be more booklets about wildlife available, and significatntly more anti-hunters than hunters desired such booklets.

A number of researchers (George 1967, LaHart 1978, Baird 1982, Kellert 1983) conclude that the outcomes of children's activities and direct experiences with wildlife are as conducive to attitude change as the attainment of knowledge about wildlife, and they suggest that experiential education be an integral part of any wildlife education program. Integration of innovative resource materials by the teacher into the school curriculum, alongside direct wildlife experiences, will help educate youngsters about the environment and give them an appreciation of the natural world.

FACTORS RELATED TO ADOPTION OF ENVIRONMENTAL EDUCATION PROGRAMS IN PUBLIC SCHOOLS

Hooper (1981) researched teachers' attitudes toward environmental education (EE)and interests in developing EE programs. The study was conducted among California K-12 teachers and involved a broad range of concerns related to teacher adoption of EE themes. Of the teachers surveyed, 60% had adopted EE at some time, with 46% actually teaching EE at the time of the study.

A multiple regression analysis was performed to estimate the effects of selected variables on teachers' adoption of EE. The model accounted for 22% of the variation in adoption. Hooper found that teachers who had adopted some sort of EE theme in their teaching were more likely to have been personally involved in various wildlife activities. More participated in exclusively nonconsumptive (21%) than consumptive (1%) activities, but 77% participated in both. Sport hunting and trapping received the least involvement (9% and 2%, respectively) and a majority (56% and 75%, respectively) actually disapproved

of them. More than one-third belonged to wildlife or sportsmen's organizations such as the National Wildlife Federation, Sierra Club, Audubon Society or National Rifle Association. Hooper recommends that teacher participation in EE be stimulated by creating opportunities for teachers to become involved in wildlife related activites.

There was a positive relationship between adoption of EE programs with previous participation in in-service training and with wildlife knowledge. Hooper suggests that efforts to improve teachers' wildlife knowledge will have a spinoff benefit of increasing teacher adoption of EE. The association between teacher exposure to in-service training and EE adoption indicates the value of such programs, especially considering the overwhelming willingness of teachers to attend training sessions.

Dr. Larry Shaffer (pers. comm.) reported similar findings after conducting in-service training of NY teachers. Teachers came to the workshop feeling inadequately prepared to handle science education due to a personal lack of science knowledge and paucity of hands-on materials to demonstrate principles in the classroom. After the teachers completed the training and saw that it was not necessary for them to go back to school for a degree in biology to teach science, they wanted more information and classroom materials.

A factor in teacher attitudes toward and interest in EE is the teacher's subject area. Hooper found that social science teachers were most likely to adopt EE themes, followed closely by natural science teachers, though Pettus et al. (1978) found that science teachers tended to have more positive attitudes toward environmental issues, especially those concerning restriction of individual rights and preparing for a sustainable future. They did report that the attitude differences between science and social studies teachers were not all that clearcut, and concluded that both subject areas deserve

curricular attention and that other criteria be used to predict teacher interest and proficiency in EE material.

Hooper also found higher levels of adoption by older teachers and by females. His possible explanations for the trend in older teachers were that: (1) older teachers had more time to develop a curriculum and found it easier to incorporate EE into it; (2) older teachers may be better able to deal with constraints on teaching EE; and (3) older, experienced teachers may have more institutional freedom to teach as they wish.

While department or school district administrators are often officially in charge of EE program planning, the task is for the most part left in the hands of individual teachers. Nationwide, Childress (1978) found that teachers had primary involvement in selecting program content in 81% of the cases. EE program directors and students were ranked a distant second and third in involvement, respectively, and other administrators, state education personnel, parents and community representatives had no involvement at all in most of the cases. Hooper (1981) found that 91% of the teachers in California made their own decisions to incorporate EE into their teaching. He also found that EE planning was a special case; most other curriculum decisions were made by some sort of collective action (staff meeting, etc.). In NNY, administrators were involved in EE planning 27% of the time, and collective actions by teachers were responsible for planning 23% of the time (Tewksbury and Harris 1982).

Teacher Training

Studies have substantiated the need for teacher training in EE at both the pre- and in-service levels (Hungerford and Volk 1984). A recent national survey (Volk et al. 1984) found that environmental educators perceived middle school and high school teachers to have a greater need for in-service training

than elementary teachers, that there is a greater need for such training than for new curricula. T one study done in the NNY region (Tewksbury and Harris 1982) found that only 41% of NNY schools provided for in-service EE workshops, 44% provided no in-service training opportunities at all, and 89% did not require any such training. Similarly, 89% of the responding schools did not require any pre-service training, though 80% of the principals felt that such training was important.

There are some positive signs for increasing participation in teacher training. A statewide committee dealing with the Regents Action Plan will be making new recommendations for increased pre-service EE training (Contact: Dr. Charles Yaple, SUNY-Cortland, 607/753-4968), and Cornell University is planning to institute a new, exemplary science teacher training program in 1986 that requires EE training (Contact: Dr. Joseph Novak, 607/256-2267). SUNY-Potsdam, which together with SUNY-Plattsburg trains many of the teachers in the NNY region, requires all of its secondary teacher-trainees to take "Ecology for Teachers" along with their major coursework. It also encourages its elementary teacher-trainees to take this or other environmentally-related courses as one of their two required science courses, though very few are actually able to do so (Contact: Dr. Mary Rutley, SUNY-Potsdam, 315/267-2263). Elementary school teachers receive little pre-service science training as a rule.

The amount of in-service teacher training in elementary science will be dramatically increased beginning in the fall of 1985 (see the section "Current Status of Science Education in New York Public Schools" for details).

Needs Assessment and Administration of Programs

A number of recent surveys have, at least in part, attempted to assess the needs of teachers for EE curricula and training. Nationwide, Volk et al. (1984) found a perceived need for new curricula "to a considerable extent" for

the secondary level, and to a more "moderate extent" for elementary schools. Curriculum needs were especially pronounced concerning awareness of the interdisciplinary nature of human-environment relations for all educational levels, along with problem-solving skills and action-orientation at the secondary level. The respondents anticipated a greater use of curricula dealing with the knowledge and awareness levels of environmental concerns at the elementary and middle school level, while they anticipated greater use of curricula dealing with evaluation of issues and solutions or with citizen action at the secondary level.

The primary constraints on EE program development are lack of time to produce materials, insufficient space in the school curriculum, and lack of funding for all levels of development, along with the aforementioned lack of support for teacher training (Childress 1978, Leach 1978, Hooper 1981, Tewksbury and Harris 1982). Hooper also reported that these problems played an important role in the discontinuation of existing EE programs. Tewksbury and Harris found that, at least from the perspective of NNY school principals, lack of teacher acceptance of programs was not a problem, with less than one in ten reporting it as a constraint.

ENVIRONMENTAL EDUCATION IN NORTHERN NEW YORK SCHOOLS PRIOR TO 1985

A 1980 survey of public elementary and secondary schools in Franklin, Jefferson, Lewis, and St. Lawrence Counties by Tewksbury and Harris (1982) found that 73% of responding schools -- or at least 66 schools in the region -- had some sort of EE program. One-fifth of the schools (including 29% of the high schools) had no EE programs and no plans for them in the future. Nearly all of the persons teaching these programs were regular school teachers, and of that figure, 60% were science teachers and 31% were social studies teachers. Community people or EE specialists only accountd for 10%

of the direct teaching load. The teachers primarily used class discussions and audio/visual aids to get across EE content, and they used outdoor activities, field trips, and group projects to a lesser but still substantial extent. Guest lecturers were used by less than one-half of the teachers while computer assisted instruction was almost non-existant.

Teachers seemed to rely on workshops and conferences for most of their organizational support. However, only 41% of the schools with EE programs provided workshops, 31% provided conferences, and 44% of the schools provided no in-service opportunities at all. Individual teachers were relied upon most often to plan EE programs, with administrators being involved in only 27% of the cases. Two-thirds of the instructional materials used were a combination of teacher-prepared and commercially available materials, and one-half came from public agencies such as the Adirondack Park Agency (APA) and DEC. Overall, three-fourths of the schools in the survey spent less than one hour per week of class time on EE. EE programs have been suffering from lack of administrative and curricular support, with EE teachers fending for themselves to maintain such programs. The need for more institutional support in developing curriculum materials and in-service teacher training is currently being addressed. (See section "Current Status of Science Education in NY Public Schools.)

EXISTING SCHOOL-ORIENTED ENVIRONMENTAL EDUCATION PROGRAMS IN NORTHERN NEW YORK

Teacher Workshops

There are a number of variously sponsored EE teacher workshops in the NNY region. They are for the most part presented annually, either in the late summer or early fall. While it is unclear what percentage of teachers make use of them or whether participation in them always leads to more and better EE programs in area schools, there are certainly a number of opportunities

available for such teacher training.

One substantial program is based at the Raquette Lake Outdoor Education Center and is sponsored by the DEC Educational Services Bureau, the New York State Conservation Council, the New York State Outdoor Education Association (NYSOEA), and SUNY-Cortland. It consists of two week-long sessions in which teachers from around the state participate. Teachers are financially sponsored by county sportsmen's federations; this sponsorship appears crucial to continued teacher involvement. The sessions are billed as conservation education workshops and feature a significant amount of wildlife and wildlife management content through use of the Project Wild curriculum guide and other material developed by the organizers. (Contacts: George Fuge, Raquette Lake Outdoor Education Center, 315/354-4784 and Robert Budliger, DEC Educational Services, 518/457-3720).

Another workshop is sponsored by the Hudson Falls BOCES, APA, and the Adirondack Council. It has been functioning for almost a decade and it is well attended, though the organizers would like to be able to attract more new people to the workshop. One-half of the leaders in the workshops are teachers and one-half are outside resource people; participants come mostly from the eastern half of NNY. (Contacts: Ted Huntington, BOCES, 518/793-7721 and Mike Storey, APA, 518/891-4050).

A third series of EE workshops are sponsored by the New York State Office of Parks, Recreation, and Historic Preservation (OPRHP) at the Menah Anthony Nature Center at Wellesley Island State Park. The staff there has gone to considerable lengths gathering teacher mailing lists from the regional BOCES and school district administrators, as well as parochial and "alternative" schools. They expressed interest in using any new curriculum materials that are produced. The Center also provides on-site day programs for area schools and has extension services for substantial numbers of schools within a 50 mile

radius. (Contact: Bob Wakefield, Menah Anthony Nature Center 315/482-2479).

Other workshops are offered for area educators by NYSOEA and the Association of Interpretive Naturalists-Northeast region (AIN). (Contacts: Kathy McGee, NYSOEA-region 5, 518/6239 and George Steele, AIN (DEC), 518/457-3720).

Other Programs

Raquette Lake Outdoor Education Center also provides programs for a few schools in the region, though these are mainly activity oriented. Indian Creek Nature Center, in Canton, provides seasonal extension programs to schools in St. Lawrence County. The Adirondack Council provides speakers and slideshows to schools throughout the area and has produced a text on the natural history of the region, The Adirondack Wild Guide, that would be useful for teachers. (Contact: Gary Randorff, Adirondack Council, 518/873-2240).

There are summer EE programs for NNY junior high school students at DEC's Camp Colby, at Saranac Lake. This is an intensive, one-week program emphasizing basic ecological principles, ecosystem components, and hunter education. Similar programs for older high school students are offered at Rogers EE Center in Sherburne and at Debruce in Sullivan County. (Contact: George Steele, DEC - Educational Services, 518/457-3720).

Anticipated Programs

SUNY-CESF Adirondack Ecosystems Center in Newcomb is planning a new educational program this fall for schools around the state entitled "Wildlife in the Adirondack Ecosystem." It will include both on-site and outreach programs and displays for high schools and the general public. (Contact: Rainer Brocke, SUNY-CESF, 325/470-6807 or 848-3444).

The Adirondack Visitors Center, to be maintained by the APA, is expected to be operational by the fall of 1986, though its exact location has not been

decided. It will serve as an EE center for the region and will no doubt provide programs for area schools. (Contact: Mike Storey, APA, 518/891-4050).

RELEVANT OUT-OF-STATE PROGRAMS

The New Jersey Division of Fish, Game, and Wildlife has had an extensive wildlife management education program, presented through biannual in-service teacher workshops, for the past ten years. They have produced their own curriculum guides (see curriculum review section in appendix), as well as made use of Project Wild. The programs have been well attended by teachers and the Division has increased its effectiveness by having teachers and staff biologists teach the workshops. (Contact: Bob McDowell, NJ Division of Fish, Game, and Wildlife, Wildlife Education Unit, 201/637-4125).

CURRENT STATUS OF SCIENCE EDUCATION IN NEW YORK PUBLIC SCHOOLS

Important new opportunities for integrating wildlife education into the schools in New York are on the horizon. DEC problably has never had as much potential to make an impact on wildlife education in the school as it will have during the next few years. This opportunity relates to the implementation of the revised New York State Elementary Science Syllabus. The science syllabus has been rewritten to take a problem-solving approach to building understandings of life science and physical science. The syllabus is built upon three components: content, skills, and attitudes.

The intended content goal is to produce some understanding of ecosystems and their constituent properties by the sixth grade. With regard to life science, the syllabus builds on the concepts of needs and dependence introduced in Level One (K-second grade), to reproduction and community in Level Two (second-fourth grade), and then to environmental interactions and the ecosystem concept in Level Three (fourth-sixth grade).

The goal of the skills component is to have students apply skills systematically and with ease to solve problems. A student should be able to obtain data through scientific investigation, organize the data into a useful form, analyze it, generalize and/or synthsize from the data, and make decisions.

The overall goal of the attitudinal component is to develop positive science attitudes that will foster appreciation of the natural world, valuing it for present and future generations. The student is expected to acquire specific problem-solving skills that will help him/her evaluate problem situations and come to rational decisions about the use of the natural environment.

The State Education Department (SED) is committed to the implementation of the New Elementary Science Syllabus (NESS). SED is spending this academic year, 1985-1986, informing school administrators and teachers of the syllabus contents and objectives. It is being called a "Year of Awareness" during which teacher and student expectations will be defined. SED has developed a three-pronged approach to implement the new syllabus.

The first prong is SED's awareness program. Fifteen people from across the state, who are currently involved in science education as either teachers or administrators, received intensive training in the NESS during the summer of 1985 and are being referred to as Elementary Science Mentors (ESMs). In addition, each of the 48 BOCES is being asked to identify one or more representatives to serve as an ESM. By mid-fall, there should be 57 BOCES representatives in addition to the 15 ESMs already identified. An appeal will then be made to the Chief School Officers to identify their own mentors to represent the local school district. The third step in selecting representatives will result in over 1,000 local mentors by early winter.

The job of the ESM will be to provide information about the NESS. The information will be filtered through this three-tier system. The original 15 mentors will conduct workshops across the state with the 57 BOCES-level

representatives. There will be three different workshops which will address (1) syllabus awareness, (2) awareness of local program development, and (3) problem-solving. These 72 mentors (57 BOCES and original 15 ESMs) will then go to the local districts to train the 1000 or more local district representatives. By the end of the 1985-86 school year at least one person per district should be up to the "Awareness Level" regarding the NESS.

The second prong of the syllabus implementation strategy is to provide an intensive training program for the 72 ESMs in the summer of 1986. Dr. Larry Shaffer of the School of Science Teaching at Syracuse University was awarded a Higher Education Grant to develop training materials for the ESMs. The overall goal of the two-three week summer training session is to give the mentors specific tools to use in training the local school district representatives in actual syllabus implementation in the classroom. The training session will include three different workshops. The first is a syllabus update which will help explain the characteristics of the NESS, SED's plan to evaluate the NESS in 1989, the expectations for students, teachers, and administrators, and the sequence of steps necessary to accomplish the NESS objectives.

The second workshop will address curriculum development. This workshop will demonstrate how to assess the needs of a local curriculum by determining where the present program is relative to where it should be for the NESS. Lists of relevant resource material will be provided including evaluations of textbook correlations (textbook and syllabus contents that are provided by the textbook publishers). Sessions will include information on hands-on approaches to science education and how to acquire and manage these materials.

The third workshop will be devoted to problem-solving. As previously mentioned, problem-solving skills are an important element in the NESS. This training session will provide techniques on how to transform the existing

curriculum into a problem-solving approach.

Following the intensive summer training session at Syracuse, money is anticipated to be available to support these 72 ESMs to go back to their home areas to provide more intensive technical assistance to the local school district representatives.

The third prong of the NESS implementation program is the development of prototype material kits to demonstrate hands-on teaching of elementary science. The first of three volumes will be available in September, with the second and third volumes expected out in late fall. These kits will be distributed to the 72 mentors to serve as models of hands-on approaches for teachers to use at the local level.

The NESS should be implemented in the classroom after the EMSs have provided in-service technical training to the elementary school teachers. Some syllabus implementation should take place during the 1986-87 school year, with the majority of schools participating by the 1987-88 school year. In May, 1989 a Program Evaluation Test in science will be administered to determine if the NESS objectives are being achieved.

Unlike the science syllabus designed for elementary schools, which is meant to be taught in its entirety, the middle schools have a series of ten syllabus blocks that are addressed individually. Three syllabus blocks relate to the life sciences, three to the physical sciences, three to earth science, and one block is about science technology and society. When the current (1985) seventh graders complete the ninth grade they will take a Regents Competency Test (RCT) in science. Any students who fail will receive remediation. A passing grade on the RCT will be the minimum requirement in science to receive a high school diploma.

Summer 1985	1985-86 School Year	Summer 1986	1986-87 School Year	1987-88 1988-89	May 1989
Original 15 EMSs Trained	"Year of Awareness"	Intensive Training at Syracuse for 72 ESMs	Technical Training for Implementation of Syllabus at Local Level (some syllabus implementation)	Implementation of Syllabus in Classrooms	Program Evaluation Test in Science (by end of sixth grade)

POSSIBLE POINTS OF PROGRAM INFUSION INTO NEW YORK STATE SCIENCE SYLLABI

A major problem which teachers interested in developing an environmental education program face is how to fit it into their existing curriculum. Likewise, administrators will be less inclined to support such material if they feel that it does not contribute to their curriculum requirements. However, the NESS, middle school syllabus blocks, and secondary biology syllabi now have specific EE requirements which are to be implemented in the classroom over the next few years. Thus, a review of the current New York State syllabi for elementary and secondary science courses was undertaken to identify possible infusion points for material on wildlife and wildlife management.

There are a number of points within the NESS in which wildlife and wildlife management concepts could be introduced. Level One principles in life science deal with the properties or adaptations of animals that allow them to meet their needs. The attributes of deer and other local wildlife species could be focused on to illustrate these concepts. Level One also introduces the principle of dependence of animals on other animals and on plants. There are possibilities here for dealing with the nutritional requirements of deer and wildlife. Level Two introduces the concepts of reproduction of species and interdependence in communities. Population maintenance among wildlife species and predator/prey interactions could be dealt with here. The life science section of Level Three deals with the effects of environmental changes on plants and animals. Factors in the life cycles of wildlife species, such as winter conditions on deer, could be presented here to teach the importance of environmental factors. This level also introduces the principles related to changing or maintaining the carrying capacity of a given environment, very relevant to an understanding of wildlife management

requirements. All in all, the NESS contains many possibilities for coordinating and justifying wildlife curriculum infusions.

The middle school and junior high school life science syllabus consists of three blocks that are usually presented in the seventh grade, the first of which deals with organisms and living systems. The last third of this block deals with ecology, and it essentially picks up where the elementary syllabus left off. This section is strongly oriented toward the need for conservation of resources, including a brief section on wildlife resources and management, though there is a paucity of ideas or suggestions for activities and discussion of this topic.

At the high school level, life science is usually taught in tenth grade, either as General Biology for non-science oriented students, or as Regents Biology for science major/college-bound students. In the General Biology syllabus, there is a brief section on the economic uses of animals at the end of Unit 2, while ecological relationships are dealt with in Unit 7. This Unit includes a number of concepts, such as community, populations and conservation, in which wildlife management material could be introduced by way of example and activity. The Regents Biology syllabus has a similarly structured Unit 7 on ecology, though it is more technically oriented in content. It includes relevant sections on successional change, negative aspects of human/environment relations such as poor land-use management, and positive aspects such as species preservation and management. There is also a science/social studies elective syllabus for tenth-twelfth grades in environmental studies, though it is not clear how often this syllabus is actually used in high school curricula. It includes units on natural environments, population dynamics, and environmental careers, including a brief section on wildlife management that could also benefit from illustrative material that is well-designed and easily implemented.

PROGRAM EVALUATION NEEDS

The NY SED plans to evaluate the success of the NESS in 1989 with the Program Evaluation Test (PET) in science. However, there are no plans to evaluate students and teachers in 1985 prior to the implementation of the NESS. Failure to perform a pre-test now will severely limit the ability of the 1989 PET to evaluate the progress, or lack thereof, of students and teachers in science. A complete program evaluation should be performed to determine: (1) if the in-service teacher training is effective in communicating the NESS content and objectives; (2) the extent of school implementation of the NESS; and (3) the success of the NESS. Such an evaluation would include the following:

(1) Pre-treatment evaluation of:

  (a) the three-tiers of elementary science mentors

    (1) 15 original ESMs

    (2) 57 BOCES-level ESMs

    (3) 1000 + local district ESMs

  (b) classroom teachers

  (c) students

regarding their:

  (a) knowledge of general science, ecology, and wildlife management

  (b) attitudes toward teaching science, ecology, and wildlife management

  (c) behavior in science- and wildlife-related activities

(2) Evaluation of the summer 1986 intensive training session for the 72 ESMs

(3) Evaluation of in-service teacher workshops at local school districts

(4) Evaluation of the extent of the NESS implementation statewide

(5) Evaluation of curriculum material used in the NESS implementation

(6) 1989 Program Evaluation Test to determine overall program success

ROLE OF THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

What now needs to be addressed is DEC's role in the implementation and evaluation of EE in NY schools. One may logically ask, "Why should DEC be involved in an SED program at all?" The answer lies in the fact that both agencies want to achieve the same goal; an educated citizenry capable of making rational decisions about the natural environment. DEC's stated concern is that teacher attitudes about wildlife management are affecting what and how they are teaching youngsters. Up until now, teachers did not have to deal with resource issues in the classroom unless they so desired. The NESS changes the state's directives considerably. Although no law mandates adherence, teachers and administrators will have to develop curricula that correspond to the NESS guidelines by virtue of the fact that students will be tested on the material and must show minimum competency to fulfill the science requirements for graduation.

This current statewide effort by SED to train its teachers to implement an ecologically oriented science curriculum has direct implications for DEC. There is the possibility that:

(1) teachers' attitudes toward adoption of EE in their science curriculum may change,

(2) teachers' knowledge of how to implement EE in the classroom may change, and

(3) teachers' actual incorporation of EE in the science curriculum may change, regardless of any attitudinal change.

Given the current state of flux, it is recommended that DEC evaluate teacher attitudes, knowledge, and behavior regarding wildlife issues prior to the in-service training and again after the training has been completed. It is expected that the original 15 ESMs will have strongly positive EE attitudes

as these are people who are already involved in science education. It would be valuable to assess where the three-tiers of ESMs stand on their attitudes, knowledge, and behavior regarding wildlife issues. The ESMs will be the transmittal agents for EE adoption in the public schools and there may be a trickle-down effect of their attitudes on classroom teachers. It will be interesting to see if the NESS will have a mediating effect on teacher attitudes, bringing the "negativistic" and "naturalistic" types closer together.

A second recommendation is that DEC participate in the in-service training of the elementary teachers. The DEC Division of Environmental Education is currently conducting training sessions for use of Project Wild. An example of the way DEC and SED could coordinate their efforts would be to include Project Wild and/or other curriculum guide training in the technical training of the ESMs. This may be an efficient way to incorporate wildlife education into the public school system, particularly considering the in-service teacher training already planned by SED.

Thirdly, DEC should participate in the provision and evaluation of resource materials to implement the NESS. There is an opportunity to determine the effectiveness of a range of curriculum guides including: Project Wild, Project Learning Tree, state natural resource agency curriculum packets, and SED materials. Wildlife education materials could be introduced to a broad spectrum of school teachers by tying into the teacher training.

Independent conversations with SED (Jack Higham), DEC (George Steele), and the Syracuse School of Science Teaching (Larry Shaffer who will conduct the technical training of the ESMs) have confirmed that all parties are interested in seeing more cooperation in EE efforts. It is recommended that environmental/wildlife education efforts within DEC and between DEC and SED be

coordinated so that the greatest possible use is made of educational endeavors to benefit the greatest number of people. Coordination of efforts by DEC and SED should facilitate the incorporation of wildlife education into the public school system.

LITERATURE CITED

Alaimo, S.J., and R.L. Doran. 1980. Students' perceptions of environmental problems and sources of environmental information. Journal of Environmental Education 12(1):17-21.

The American Forest Institute, Inc. 1977. Project Learning Tree. 1619 Massachusetts Ave., N.W., Washington, D.C. 20036.

Amidon, P.H. 1968. New York hunters; a comparison of deer law violators and nonviolators. M.S. thesis, N.Y.S. Univ. Coll. Forestry, Syracuse.

Baird, D.D. and R.R. Tolman. 1982. Attitudes of high school students and biology teachers towards animals. Unpublished Manuscript, Field Museum of Natural History, Division of Mammals. Chicago, Ill.

Byrne, R. 1980. Population dynamics: A curriculum guide for elementary and secondary teachers. New Jersey State Department of Environmental Protection, Trenton. ERIC #199 085.

Cauley, V.B., and D.L. Groves. 1974. Variables related to conservation. American Biology Teacher 36:500-501.

Chemers, M., and I. Altman. 1977. Use and perception of the environment: Cultural and developmental processes. Pages 43-54 in Children, Nature, and the Urban Environment: Proceedings of a Symposium-Fair. U.S.D.A. Forest Service General Technical Report NE-30.

Childress, R.B. 1978. Public school environmental education curricula: A national profile. Journal of Environmental Education 9(3):2-11

Cohen, M.R. and D.K. Hollingsworth. 1973. Environmental beliefs and educational ability. Journal of Environmental Education 5(2):9-12.

Darrow, R.W. 1948. The whitetail in New York. N.Y.S. Conservationist 2(3):10-13.

Decker, D.J., T.L. Brown, and C.P. Dawson. 1980. Deer hunting violations and law enforcement in New York. Trans. Northeast Section Wildlife Society 36:113-128.

Decker, D.J., T.L. Brown and W. Sarbello. 1981. Attitudes of residents in the peripheral Adirondacks toward illegally killing deer. N.Y. Fish and Game Journal. 28:73-80.

Decker, D.J., R.A. Smolka, Jr., N. Sanyal, and T.L. Brown. 1983. Hunter reaction to a proposed deer management intitative in Northern New York: Antecedents to support or opposition. Trans. NE Sec. Wildl.Soc. 40:76-93.

Doran, R.L. 1977. State of the art for measurement and evaluation of environmental objectives. Journal of Environmental Education 9(1):50-63.

Doran, R.L., R.O. Guerin, and A.A. Sarnowski, Jr. 1974. Assessing students awareness of environmental problems. Journal of Environmental Education 5(4):14-18.

Dyar, N.A. 1975. Assessing environmental attitudes and behaviors of a seventh grade school population. Unpublished Ph.D. Dissertation, Univ. of California at Berkeley.

Eyers, V.G. 1975. Environmental knowledge and beliefs among grade 10 students in Australia. Unpublished Ph.D Dissertation. Oregon State University.

Fortner, R.W., and T.G. Teates. 1980. Baseline studies for marine education: Experiences related to marine knowledge and attitudes. Journal of Environmental Education 11(4):11-19.

George, R.W. 1967. A comparative analysis of conservation attitudes where conservation education is a part of the educational experience. Trans. of the 32nd N.A. Wildlife and Natural Resources Conference 199-210.

Hendee, J.C., and D.R. Potter. 1971. Human behavior and wildlife management: Needed research. Trans. N. Am. Wildlife Nat. Resour. Conf. 36:38modity Natural Resource Values, Institutional Series Report No. 1.

Hess, R.D., and J.V. Torney. 1967. The development of political attitudes in children. Anchor Books, Doubleday and Co., New York. 331 pp.

Hoffman, L. and L. Ritrovato. 1978. Kids, wildlife and their environment: An elementary teachers guide to wildlife activities. Bureau of State Parks, Program Services and Operations Div., P.O. Box 1467, Harrisburg, PA 17120

Hooper, J. 1981. Influence of wildlife-related variables on teacher adoption of environmental education. California-Nevada Wildlife Trans. 122-131.

Hungerford, H.R. and T.L. Volk. 1984. The challenges of K-12 environmental education. Monographs in environmental education and environmental studies. Vol. 1. Arthur B. Sacks, ed. Columbus, Ohio: ERIC

Jackson, L.W. 1969a. The white-tailed deer in Malone. New York Federal Aid in Fish and Wildlife Restoration Project W-89-R-14 (special report for Job IV-3). N.Y.S. Cons. Dept. (mimeo.).

_____. 1969b. Results of the feasibility portion of the Malone deer study. New York Federal Aid in Fish and Wildlife Restoration Project W-89-R-14 (separate report for Job IV-3). N.Y.S. Cons. Dept. (mimeo.)

_____. 1974. A public opinion survey in the town of Malone with Potsdam as the control town. New York Federal Aid in Fish and Wildlife Restoration Project W-89-R-18. N.Y.S. Dept. Envir. Cons. (mimeo)

Jamason, B. 1975. Environmental education curriculum infusion units. General Education and Curricular Services, The State Education Department, Albany, New York 12234.

Kauchak, D., F. Krall, and K. Heimsath. 1978. The need for education, not indoctrination. Journal of Environmental Education 10(1):19-22.

Kellert, S.R. 1976. Perceptions of animals in American society. N. Am. Wildl. Nat. Resource Conf. 41:533-546.

_____. 1980. American attitudes toward and knowledge of animals: An update. Int. J. of Stud. of Anim. Prog. 1(2):87-119.

_____. 1983. Attitudes toward animals: Age-related development among children. Paper reporting on Kellert, S.R., and M.O. Westervelt study, "Children's attitudes, knowledge, and behaviors toward animals." Government Printing Office report no. 024-010-00641-2, 202 pp.

Kellert, S.R., and M.O. Westervelt. 1983. Children's attitudes, knowledge, and behaviors toward animals. Government Printing Office report no. 024-010-00641-2, 202 pp.

Knapp, C. 1975. Priority one: Environment, open lands and wildlife. Union Township Board of Education, New Jersey Dept. of Education. Pollution Control Education Center, Township of Union Public Schools, Union, New Jersey. ERIC #133 230.

LaHart, D.E. 1978. The influence of knowledge on young people's perceptions about wildlife. Final Report to National Wildlife Federation. College of Education, Florida State University.

LaHart, D.E., and L.W. Barnes. 1978-79. A holistic scheme for environmental education research. Journal of Environmental Education 10(2):24-29.

Langenau, Jr., E.E., and P.M. Mellon-Coyle. 1977. Michigan's young hunter. Wildlife Division Report No. 2800, Michigan Department of Natural Resources. 78 pp.

Leach, B.H. 1978. Establishment of wildlife educational programs in the public school system. Proc. Annual Conference Western Assoc. Fish and Wildlife Agencies. 58:272-275.

Marcus. L.S. 1977. Within city limits: Nature and children's books about nature in the city. Pages 83-88 in Children, Nature, and the Urban Environment: Proceedings of a Symposium-Fair. U.S.D.A. Forest Service General Technical Report NE-30.

McTeer, J.H. 1977-78. Teenage-adult differences in concern for environmental problems. Journal of Environmental Education 9(2):20-23.

Miller, J.D. 1975. The development of pre-adult attitudes toward environmental conservation and pollution. School Science and Math. 75:729-737.

Moore, R.C. 1977. The environmental design of children-nature relations: Some strands of applicative theory. Pages 207-214 in Children, Nature, and the Urban Environment: Proceedings of a Symposium-Fair. U.S.D.A. Forest Service General Technical Report NE-30.

More, T.A. 1977. An analysis of wildlife in children's stories. Pages 89-94 in Children, Nature, and the Urban Environment: Proceedings of a Symposium-Fair. U.S.D.A. Forest Service General Technical Report NE-30.

_____. 1979. Wildlife preferences and children's books. Wildlife Society Bulletin. 7(4):274-278.

Murch. A.W. 1971. Public concern for environmental pollution. Public Opinion Quarterly 35:100-106.

Pettus, A. 1976. Environmental education and environmental attitudes. Journal of Environmental Education 8(1):48-51.

Pettus, A., R.B. Frary and T.G. Teates. 1978. Attitudes of science and social studies teachers toward environmental issues. Journal of Research in Science Teaching 15(3):367-72.

Pomerantz, G.A. 1977. Young people's atitudes toward wildlife. Wildlife Division Report No. 2781, Michigan Dept. of Nat. Resour. 79 pp.

_____. 1985. The influence of "Ranger Rick" magazine on children's perceptions of natural resource issues. Unpublished Ph.D. Dissertation. North Caroline State University. 261 pp.

Ramsey, C.E., and R.E. Rickson. 1976. Environmental knowledge and attitudes. Journal of Environmental Education 8(1):10-18.

Rejeski, D.W. 1982. Children look at nature: Environmental perception and education. Journal of Environmental Education 13(4):27-40.

Richmond, J.M., and R.F. Morgan. 1977. A national survey of the environmental knowledge and attitudes of 5th year pupils in England. 201 pp. ERIC ED #134 478.

Robinson, J.H. 1963. Effects of teaching with science articles. Sci. Ed. 47(1):73-83.

Sanders, G.O. 1974. A study of stated concerns of secondary students on selected animal welfare problems. Unpublished Ph.D. Dissertation, University of Tulsa.

Schoenfeld, C. 1977. The changing role of mass communication in environmental education. Journal of Environmental Education 8(3):60-64.

_____. 1978. Environmental education and wildlife conservation. Pages 471-484 in H.P. Brokaw, ed., Wildlife and America. Council on Environmental Quality, Washington, D.C.

_____. 1979. Environmental communications today. Journal of Environmental Education 10(3):43-48.

Severinghaus, C.W. and C.P. Brown. 1956. History of white-tailed deer in New York. N.Y. Fish and Game Journal 3(2):129-167.

Severinghaus, C.W. and S. Free. 1963. Management implications of the trend and distribution of the legal deer kill in the Adirondack region. N.Y. Fish and Game Journal 10(2):201-214.

Shafer, E.L., Jr., P.H. Amidon, and C.W. Severinghaus. 1972. A comparison of violators and nonviolators of New York's deer hunting laws. J. Wildlife Management 26:933-939.

Shaw, W.W. 1974. Sociological and psychological determinants of attitudes toward hunting. Ph.D. Dissertation. University of Michigan, Ann Arbor.

Shaw, W.W., and E.H. Zube. 1980. Wildlife values: A workshop on assessment methodologies and information needs. Pages 4-10 in Shaw, W.W., and E.H. Zube, eds., Wildlife Values. Center for Assessment of Noncommodity Natural Resource Values, Institutional Series Report No. 1.

Smolka, R.A., Jr. and D.J. Decker. 1985. Identifying interest groups' issue positions and designing communication strategies for deer management in Northern New York. Paper presented at the NE Fish and Wildlife Conf.

Smolka, R.A., Jr., D.J. Decker and T.L. Brown. 1985. Implementation of a survey of attitudes of key public leadership toward deer management alternatives for Northern New York. New York Federal Aid in Wildlife Restoration Project W-146-R-10, Study VIII-6. (in press)

Smolka, R.A., Jr., D.J. Decker, N. Sanyal and T.L. Brown. 1983. Northern New York deer management: Hunters' opinions and preferences. Federal Aid in Wildlife Restoration Project W-146-R-8, Study VIII-3. 278 pp.

Stapp, W.B., et al. 1969. The concept of environmental education. Journal of Environmental Education 1(1):30-31.

Storey, M. 1981. An environmental education resource manual for Adirondack schools. Adirondack Park Agency, Box 99, Raybrook, New York 12977.

Tewksbury, S. and G.R. Harris. 1982. The status of environmental education in Northern New York. Journal of Environmental Education 13(3):30-38.

U.S. Fish and Wildlife Service. 1984. Hunting and wildlife management: Issues. Pac. Nat. Inst. for Urban Wildlife, 10921 Trotting Ridge Way, Columbia, Maryland 21044.

Volk, T., H. Hungerford and A. Tomera. 1984. A national survey of curriculum needs as perceived by professional environmental educators, Journal of Environmental Education 16(1):10-19.

Western Regional Environmental Education Council. 1983. Project WILD. Salina Star Route, Boulder, Colorado 80302.

APPENDIX

REVIEW OF PUBLISHED CURRICULUM GUIDES DEALING WITH WILDLIFE MANAGEMENT

The following annotated list of published curriculum guides was gathered from a review of the past 15 years of Resources in Education and from regional contacts. It is not a comprehensive listing, but it represents some of the curricula currently available. There seem to be relatively few environmental education curricula that focus specifically on wildlife management, owing perhaps, to the broad and multifaceted nature of environmental education content and to school administrators' distaste for potentially politically-complicated topics. Those curricula that do exist have been produced mainly by agencies and organizations that are specifically concerned with wildlife management issues, either on the national or state level. Full citiations and publication information are listed by principal author in the Literature Cited section.

Population Dynamics: A Curriculum Guide for Elementary and Secondary Teachers (Bryne, 1980). This is the most relevant guide uncovered in this search, having been developed specifically to teach wildlife management principles. It is geared toward the most common misunderstandings about population dynamics, and includes listings of important concepts, behavioral objectives, and support activities, including games. It also contains a good listing of relevant films, references, and a glossary of wildlife terms. This unit is part of a series of wildlife education guides produced by the Wildlife Education Unit of the New Jersey Department of Environmental Protection for their public schools.

Hunting and Wildlife Management (U.S. Fish and Wildlife Service, 1985). This is also a management-focused curriculum package targeted at the fourth-seventh grade student. It includes an overview of hunting and wildlife materials, procedures, student evaluation forms, and other relevant information for making the activity successful. Some of the activities are the best organized of their kind, while others do not seem feasible or appropriate for their intended purpose. (acquired)

Project Wild (Western Regional Environmental Education Council 1985). The goal of Project Wild is to assist learners in developing awareness, knowledge, skills, and commitment to result in informed decisions, responsible behavior, and constructive actions concerning wildlife and the environment. Instructional activities, organized by topic area, are provided for integration into the general school curriculum. There are separate activity guides for the elementary and secondary levels.

Kids, Wildlife and Their Environment: An Elementary Teacher's Guide to Wildlife Activities (Hoffman and Ritrovato, 1977). Similar in many respects to Project Wild, this guide is a smaller collection of activities dealing with various wildlife concepts. The activities are not as well organized, nor are they categorized or put into a conceptual framework. The kinds of activities are similar to those in Project Wild, though they are only aimed at the elementary level.

Priority One: Environment, Open Lands and Wildlife (Knapp, 1975). This curriculum is much broader than others discussed so far, but it does have some sections on hunting and wildlife management. It also includes suggestions for related activities, discussion questions, a glossary, and worksheets.

Environmental Education Curriculum Infusion Units, Grades 7-12 (Jamason, 1975). While again broader in scope than other curriculum guides, this collection of activities is useful in that it contains a "process manual" for designing one's own units, along with lists of concepts and sample units. It has units on wildlife habitats and wildlife management, including suggestions for student involvement, field trips and guest speakers. (acquired)

An Environmental Resource Manual for Adirondack Schools (Storey, 1981). This curriculum guide, while being broader and less sophisticated in content than others, has the distinction of being the only one uncovered that was written expressly for the region in question. It includes hands-on information and suggestions on developing and programming outdoor learning sites, preparing and conducting outdoor lessons, dealing with values, follow-up activities, and evaluation of programs. The activities are mostly aimed at the elementary level and are generic in nature. Besides the usual components, the activitiy sections include values questions to stimulate discussion. It also includes a comprehensive but easy-to-read summary of the natural history of the Adirondacks and lists of resources and relevant agency contacts. (acquired)

SUGGESTED COMPONENTS OF A CURRICULUM PACKAGE

In consideration of the existing curricula dealing with wildlife management, it is instructive to list the componets of a curriculum package that reflect the best features of these guides. No attempt is made to specify the particular content for such a unit, but any package that is produced should to include the following components:

(1) Overview of the subject and the principles to be taught.

(2) A list of intended learning outcomes, including behavioral, cognitive, and affective goals.

(3) An outline of the concepts to be taught and the information to be presented.

(4) A set of visual aids, either in handout or transparency form, that illustrate the more complex patterns within the content to be presented.

(5) A set of feasible, complementary activities that relate to each of the major principles presented that include procedures, materials data and worksheets, and questions that deal with attitudes and factual knowledge.

(6) Suggestions regarding possible field trips (as specific as possible) and guest speakers to bring life to the material.

(7) Lists of recommended films, relevant texts and other source materials, institutional contacts in the area, and glossary terms.

The material for some of these components could be taken "as is" from the best of the exisitng curricula, while other components should be tailor-made for the particular situations of the region and of the schools.

The Bureau of General Education Curriculum Development of the New York State Education Department has been acquiring a "talent bank" of available EE curriculum consultants that could be drawn upon for such a project (contact: Barry Jamason, (518/474-5890).