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A unit in conservation for the slow learner in a high school biology course

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A UNIT IN CONSERVATION FOR THE SLOW LEARNER IN A HIGH SCHOOL BIOLOGY COURSE

by

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CONSERVATION PLEDGE

I GIVE MY PLEDGE AS AN AMERICAN TO SAVE AND FAITHFULLY DEFEND FROM WASTE THE NATURAL RESOURCES OF MY COUNTRY -- ITS SOIL AND MINERALS, ITS FORESTS, WATERS, AND WILDLIFE.*

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*Soil Conservation Service. U.S.D.A. Region 5. Lincoln, Nebraska.

TABLE OF CONTENTS

CHAPTER PAGE

LIST OF TABLES

LIST OF FIGURES

FIGURE PAGE

CHAPTER I

INTRODUCTION AND DEFINITION OF TERMS USED

There seems to be some confusion about what conservation means to the average citizen, and this could partially account for the lack of interest and understanding of conservation problems.

I. DEFINITIONS OF CONSERVATION

Some of this confusion is the result of terminology. The following definitions bring out the complexity and importance of the field of conservation.

1. Conservation is the kind of resource use which results in the greatest good for the largest number of people, for the longest time.[1]

2. Conservation means preservation of our forests, and all those natural resources which are useful to us in our complex way of living.[2]

3. Conservation is the preservation and wise use of natural resources.[3]

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[1] Concepts of Conservation, The Conservation Foundation. (New York: n. d.)

[2] P. E. McNall, Our Natural Resources. (Danville, Ill.: Interstate Printers and Publishers, 1954), p. 124.

[3] Truman J. Moon, Paul B. Mann, James H. Otto, Modern Biology. (New York: Henry Holt and Company, Inc., 1956), p. 724.

4. Conservation is the opportunity to use, build up, and distribute equitably, in terms of public benefit, what we call the natural resources of the country.[4]

5. Conservation means management, wise use, and protection from exploitation of our resources, our forests, our soil, our water, our animals, fish, and birds. It means the maintenance in sanctuary of wilderness areas.[5]

6. Conservation is the use of natural resources to provide the highest quality of living for mankind.[6]

7. Conservation consists of balancing the use of natural resources and the varying demands of population in such a manner that existing resource supplies will not become exhausted before adequate substitute supplies have been discovered or invented and made available for use.[7]

8. Conservation is a state of harmony between men and land.[8]

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[4]Shirley W. Allen, Conserving Natural Resources (New York: McGraw Hill Book Company, Inc., 1955), p. 1.

[5]Dorothy Childs Hogner, Conservation in America. (Philadelphia and New York: J. B. Lippincott Company, 1958), p. 3.

[6]Raymond F. Dasmann, Environmental Conservation. (New York: John Wiley and Sons, Inc., 1959), p. 7.

[7]Charles E. Lively and Jack J. Preiss, Conservation Education in American Colleges. (New York: The Ronald Press Company, 1957), p. 5.

[8]Aldo Leopold, as quoted in Conservation Education in American Schools: Twenty-ninth Yearbook. (Washington: American Association of School Administrators. National Education Association, 1951), p. 6.

9. Conservation means development, with wise use or management in the best public interest, of our natural resources of soil, water, vegetation, wildlife, and minerals.[9]

10. Conservation of natural resources - means the fullest possible use of them without abusing the ones exploited, without destroying any needlessly, and without neglecting any that can be used.[10]

11. Natural resources - are the basic earth materials -- water, soil, plants, animals, and minerals -- that we employ or convert to sustain our material culture.[11]

12. Non-renewable resources - some metal, most minerals, coal, gas, petroleum.

13. Renewable resources - soil, water, vegetation, animal life.

14. Inexhaustible resources - sunlight, air, water, clay, sand, and gravel.

Since this study is concerned with conservation as taught to slow learners, a definition of pupils in this category is necessary. The writer assumes that slow learners are, in general, those pupils with intelligence quotient falling roughly between 75 and 90. It should be understood that the I. Q. was the only determining factor in the placement of the pupils in the slow learner group. Slow learners should be interpreted to mean slow in intellectual achievement.

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[9] The Annals of the American Academy of Political and Social Science. Vol. 281, May 1952 p. 869.

[10] Rueben L. Parson, Conserving American Resources. (Englewood Cliffs, New Jersey: Prentice Hall Inc., 1956), pp. 5,6.

[11] Ibid., p. 4

II. THE PROBLEM

Statement of the Problem. It is the purpose of this study to develop a functional unit in conservation of natural resources for the slow learner in a high school biology course. The unit is adjusted to the location of the school, which is in a surburban area of densely populated northern New Jersey. Even though community conservation resource needs such as soil, water, and forests are the nucleus of the unit, conservation problems of the whole country, and the world, are brought into the unit.

Importance of Conservation. The increased activities of the vacation-minded American public such as camping, hiking, gardening, hunting, and fishing have made apparent to us the vital importance of more knowledge of the out-of-doors. The masses are returning to the great out-of-doors. Recognizing this, educators — and especially science teachers who are broadly trained in conservation — should meet this challenge. Teachers are in the best position to emphasize effectively the complexity and importance of man's dependence on natural resources.

> The United States is now using up natural resources faster than man, science, and nature together are creating them. In the last fifty years alone, while our population has doubled, our consumption of power has increased eleven times, of fuel thirteen times, and of paper (from wood pulp) fourteen times. Already shortages of certain raw materials are in sight. We are importing

> more and more industrial raw materials from abroad - generally from nations much poorer and often more crowded than we. Today, with less than a tenth of the world's land and population, we consume more than half the world's steel; more than 50 per cent of the world's oil; 90 per cent of the world's natural gas; and 54 per cent of its commercially produced energy.[12]

Conservation should become a way of life. More people should accept the concepts of conservation and govern their lives accordingly. Ignorance and indifference by the American public are probably the two main problems of conservation. Parson states:

> Ignorance and apathy are the greatest obstacles to conservation. Much waste and abuse of resources stems from inadequate understanding of their nature and importance -- from the innocent behavior of well-meaning fools. Many a present-day voter sees no connection between last year's forest fire and this year's flood. Too few New Yorkers appreciate fully how dust storms in Texas can raise the price of steaks in Manhattan, or how the draining of marshes can ruin their duck-shooting. This situation can become intolerable in a democracy where voters are the policy makers.[13]

The everyday needs of humanity can be supplied only by drawing upon our resources. Over fifty million people annually visit our national parks and monuments because they have increased prosperity, more leisure time, and faster means of transportation. Some of the natural resources used are renewable; others can not be replaced. The social and

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[12] Concepts of Conservation. The Conservation Foundation. (New York: n.d.)

[13] Ruben L. Parson, Conserving American Resources. (Englewood Cliffs, New Jersey: Prentice Hall Inc., 1956), p. 8.

economic well-being of our civilization depends upon the quality and quantity of natural resources.

Since the young people of today are the taxpayers of the next generation, their interest needs to be aroused in problems of conservation and they should bring about more intelligent resource use. Conservation education under good leadership should eventually result in an informed public who, in turn, would strive for better conservation legislation.

Effective conservation requires an understanding of natural resources and an awareness that man is absolutely dependent upon them. The everyday needs of his life can be supplied only by drawing upon these resources.

Some groups are aware of the pressing need of conservation education. The American Association of School Administrators adopted the following resolution on March 1, 1950.

> Wastage of human and natural resources either by neglect or destruction robs society of its rightful potentialities for better living. In order to develop and conserve our human and natural resources, it is recommended that renewed emphasis be given in school curricula to the wise use of natural resources, the development of the fundamental principles of moral character and responsible citizenship, and the preparation needed for everyday living as set forth in Education for All American Youth and Life Adjustment Education for Every Youth.[14]

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[14] Conservation Education in American Schools: Twenty-ninth Yearbook. (Washington: American Association of School Administrators. National Education Association, 1951), p. 62.

History has shown that the downfall of powerful civilizations may be attributed to the exhaustion of their natural resources. Lowdermilk states: "If a civilization is to avoid a long decline, like the one that has blighted North Africa and the Near East for thirteen centuries, society must be born again out of an economy of exploitation into an economy of Conservation."[15]

The welfare of the individual and the nation is dependent on a sound program of natural resource utilization. Conservation is everybody's business - the individual's, the community's, the nation's, and the world's.

The Place of Conservation in the Curriculum. There are several ways in which conservation can be incorporated into the school curriculum. For example, it can be introduced as a separate course on a senior high school level. Assuming that conservation experiences are important, such a course could be listed as a required subject.

Portions of the conservation unit could be integrated into the existing high school courses (mathematics, social studies, English, etc.)

A third way is to teach a separate unit on Conservation in the high school biology course. The Author chose this latter method for the study.

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[15] W. C. Lowdermilk, Conquest of the Land Through Seven Thousand Years. (Washington: U. S. D. A., 1944), p. 2.

Whatever plan is adopted -- to offer a separate course, to integrate parts into the whole curriculum, or to offer a unit as part of a biology course -- much cooperative planning by teachers, administrators, and other resource personnel is necessary to insure development of proper attitudes, skills, and appreciations. All school personnel must constantly remember the vast inter-relationships that exist in this field.

Lively and Preiss state: "Without effective conservation teaching in general education, the public tends to lose sight of the value of the conservation practices it already enjoys, and the battle for retention of them must be refought in every generation."[16]

Biology and Conservation. If it is feasible to incorporate conservation in a given subject, biology should rate a high priority, with one of the other sciences such as general science or life science as a second choice. Conservation concepts and practices should be part of every well-organized biology or science course. If this were done, every pupil would be reached with some conservation learning. Our future citizens should learn the fundamental relationships between soil, vegetation, water, minerals, and animals,

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16 Charles E. Lively and Jack J. Preiss, Conservation Education in American Colleges. (New York: Ronald Press Co. 1957), p. 256.

including the most important resource — man and his role in civilization.

The Need for Conservation Education for the Slow Learner. In organizing this unit of conservation for the slow learner, one must recognize that all of the natural resources are interdependent and all must be conserved with equal vigor. One resource is as essential as another and should be treated accordingly by the teacher in coordinating a unit of study. In this age of specialization, there is a greater need for teachers who have had training in several fields and who can thus fully understand this vast subject, conservation of natural resources.

Since we can assume that America's standard of living and per capita requirements will rise considerably, our natural resources will be imposed upon more severely in the future. Too often resource problems are recognized only when they are of a spectacular nature — e.g. a tragic fire, or flood — and, as a result, the remedial educational program carried on is temporary and soon forgotten.

An organized conservation unit should provide for the needs of all students — the gifted and the retarded. "The dullard may be a greater menace to resources than a more intelligent person.[17]

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17 Ruben L. Parson, Conserving American Resources (Englewood Cliffs, New Jersey: Prentice Hall Inc., 1956), p. 476

Thus, there would seem to be a need for a unit in conservation for the slow learner in a high school biology course. A constructive group project (plus individual projects) involving all the pupils in the biology classes can help combine practice with theory and thus make the course more meaningful. Careful guidance by the instructor is needed to insure the selection of worthwhile projects which encompass practical as well as abstract values.

III. PROCEDURES

In addition to teaching three biology classes of average, or above average pupils, the Author taught two classes in biology where all pupils were slow learners. Of the latter group, one class was chosen as the control group utilizing the conventional textbook and lecture method of teaching with the average amount of audio-visual aids. The second class of slow learners became the experimental group where diversified methods including short field trips, more than average amount of audio-visual aids, panel discussions, numerous demonstrations, and resource experiments were utilized. This experimental group learned chiefly by seeing and by doing things with and for conservation. On the basis of their I.Q. (average about 85) the pupils were assigned to the slow learner classes in biology. These pupils might have been normal, or above normal, in things such as social

adaptability, mechanical ability, or artistic potential. One should be careful not to assume a pupil's potential solely by his I.Q.

No effort was made to equate scientifically the control and experimental group. Whatever homogenity was present in the pupils in the two groups was due merely to the fact that their I.Q.'s fell between 75 and 90. The researcher was cognizant of this limitation when he sought to determine the achievements in the conservation unit by the two groups.

A standardized pre-test, "A Test of Reasoning in Conservation," (Form A) was administered to both groups before the conservation unit was initiated. After the completion of the unit, a post-test (Form B) was administered to each group to determine if any noticeable differences were evident.

The main audio-visual aids used for the experimental group included the following: an introductory film entitled, "Yours is the Land"[18]; (two weeks later) the filmstrip, "The Demand, The Supply, Balancing the Supply and Demand"[19]; and (during the fourth week) the three films in the "Web of Life"[20] series. After each of these films was shown, the

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18 "Yours is the Land," Encyclopedia Britannica Films, Inc., (New York, New York, 1950).

19 Ibid.

20 Ibid.

class had discussions and field trips, following which each pupil brought in an item relating to the film in some way; and, each pupil had an opportunity to discuss his item and how it related to conservation.

CHAPTER II

THE CONSERVATION UNIT FOR SLOW LEARNERS AT RAMAPO REGIONAL HIGH SCHOOL

After teaching conservation as a unit in tenth grade biology, with homogeneous and heterogeneous groups, and after exploring conservation education philosophy, it was felt that the following basic concepts listed in Conservation Education in American Schools are the most meaningful of any of the concepts used today.

I. CONSERVATION CONCEPTS AND OBJECTIVES

Conservation of natural resources means the wise use of natural resources for the greatest good of the largest number of people for the longest time.[1]

The broad categories of natural resources commonly used include (a) renewable resources such as water, soil, animals, forests, grasses, and other vegetation, and (b) non-renewable resources such as minerals. Each of these terms, however, carries numerous shades of meaning, and for the various resources there are varying degrees of renewability or non-renewability.[2]

The most serious problem related to natural resources is how to conserve the remaining good natural soils that exist on the earth, together with the complementary resources of forests and other plants, water, and the myriads of beneficial forms of animal life.[3]

Natural resources must be thought of as having an essential unity rather than as separate categories. They are inter-related and inter-dependent. This unity, the closely linked inter-dependence of soil, water, minerals, plants, animals, and man, constitutes the seamless web of life and matter.[4]

In planning for the wise use of natural resources one cannot think of man apart from either his social environment, or culture, or his natural environments. Each culture develops its own ways of using natural resources.[5]

In its broadest sense conservation is a way of life, involving processes that are social and ethical as well as material. It is not alone something to do; it is something to feel, to live.[6]

No conservation program can succeed unless those who control natural resources accept the obligations of trusteeship for the general good. Posterity is entitled to a share of the resource heritage to which we have become heir.[7]

The tide of the earth's population is rising and that of the earth's natural resource base is falling. No one yet knows the ultimate efficiency of man's resource use or, therefore, the eventual population-supporting capacity of the earth or any of its parts. Nevertheless, unless ways can be found to provide subsistence for rapidly increasing populations, we face a dark future.[8]

At the present rate of resource use, neither the United States nor most other nations can support even their present populations indefinitely on a high plan of civilized living.[9]

Conservation applies to all people, rural and urban, and to be most effective must be practiced universally.[10]

The wealth of a nation depends upon both its available natural resources and upon the courage and resourcefulness of its people.[11]

A given civilization, with its institutions and order, rests upon certain natural resources. Destroy those resources, in any case, and you destroy that civilization.[12]

The seeds of resource destruction are present in every manner of resource use.[13]

Our existence depends basically upon the living matter, whether plant or animal, that is produced by the earth's fertility, including the products of inland waters and the oceans.[14]

> Our energy and well-being, physical and mental, are dependent in the main upon the composition and quality of the diet. All of it, except fish and other food taken from the ocean and inland waters, is derived from the soil, whether in the form of grains, fruits, or vegetables, or in the form of meat and milk of animals which, in turn, live upon plant life.[15]

> Man must know and respect nature.[16]

> Science can aid and abet natural processes, but it cannot replace them. However, dependence upon the processes of nature does not, in any sense, exclude science and its vast benefits.[17]

> An important objective in all conservation efforts should be to bring about the maximum integration among such pursuits as farming, ranching, fishing, mining, manufacturing, and lumbering. Until the efforts to integrate these activities become more extensive and more effective, there will be dust bowls, silted reservoirs, polluted streams, and other consequences of exploitation and waste.[18]

Although these general basic concepts are important and necessary to know, it is essential to reach more specific goals, when organizing a unit for a biology class. The following major goals were selected as most meaningful in a biology unit for slow learners.

Major Objectives in Unit. The pupil will be given the opportunity to learn that

1. Soil is one of our most vital resources.

2. Wise land use and human welfare are correlated.

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[18] Conservation Education in American Schools: Twenty-ninth Yearbook. (Washington: American Association of School Administrators. National Education Association, 1951).

3. Man is dependent on all natural resources and must adapt in order to survive.

4. All living things are dependent on water.

5. Minerals can and must be conserved.

6. All natural resources are closely interdependent.

7. The balance of life is delicate and involved.

8. Scientific attitudes and methods should be used in the study and evaluation of our resources.

II. INTRODUCTION OF A CONSERVATION UNIT

During the first week, the unit was introduced by using the following procedures:

1. Show film, Yours Is The Land (22 min., sound) followed by a brief discussion.

2. Take survey trip around the school grounds to look for problem areas and future project possibilities; also, note what had been done the previous years by former pupils.

3. Give brief objective pre-test on conservation facts.

4. Give the pupils printed sheet with conservation facts that apply to the local environment, in order to arouse interest.

5. Invite local leader in conservation to speak to the school classes.

6. Form committees on:
   a) soil
   b) water
   c) minerals
   d) wildlife (including fish)
   e) forests
   f) other plant life

7. Circulate study guide questions, prepared in advance, to interest groups for an orderly beginning and a better background.

8. Early in the unit, take a survey of all related community agencies that could serve as resources in a cooperative approach between the school and the community.

9. Use available teaching aids to help in the indirect and direct learning.
   a) Conservation Foundation film strips
   b) Film strips and charts on supply and demand

III. DEVELOPING THE CONSERVATION UNIT

Even though all the resources were woven together, conservation was divided into five areas for a more practical approach. Following is an outline of the content covered.

I. Outline of Soil Resources

A. Basic information needed

1. Soil, the basic resource
2. Soil building processes
3. Weathering
4. Parent materials
5. Time involved
6. Soil horizons
7. Biological, physical, chemical forces
8. Humus and mineral content
9. Movement of soil and soil water
10. Climatic effects

B. Soil Problems

1. Poor agricultural methods
2. Natural losses (wind, water)

C. Solving Problems

1. Land plan
2. Importance of soil fertility
3. Restoring natural cover

D. Possible Activities

1. Collect soil samples for analysis in lab
2. Make a land history study of area

3. Visit farms and fertilizer factories
4. Set up erosion experiments (sample plots)
5. Panel discussion on soil and its constituents
6. Plant experiments, using control

II. Outline of Water Resources

A. Source of water

1. Springs
2. Lakes
3. Wells (dug, artesian)
4. Streams
5. Oceans

B. Hydrologic Cycle

1. Atmospheric moisture
2. Precipitation

C. Water Usage

1. All organisms
2. Domestic needs
3. Generation of power
4. Transportation and recreation
5. Industrial use

D. Water Problems

1. Floods and their control
2. Water pollution, causes and effects

E. Water Conservation Program

1. Legislation
2. Vegetation and its relation

F. Possible Activities

1. Water resource study
2. Visit area where irrigation is used
3. Study flood damage in area
4. Panel discussion on which is more valuable - soil or water

III. Outline of Mineral Resources

A. Types of minerals (renewable and non-renewable)

1. Metallic
2. Non-metallic
3. Mineral fuels

B. Formation of Minerals and Their Values

1. Those found in area
2. Those needed

C. Mineral Research

1. Synthetic (plastics, nylon, etc.)
2. By-products

D. Possible Activities

1. Figure cost of heating a home
2. Survey the types of fuels used in area
3. Make collection of metals
4. Get samples of fertilizers and literature
5. Plan a field trip to a mine or quarry
6. Collect scrap metal -- compare prices with new metals
7. Panel discussion on minerals contributing to community life (food, shelter, clothing, etc.)

IV. Outline of Forest Resources

A. Identification of Common Trees

B. Uses of Forests

1. Products
2. Wildlife
3. Watershed
4. Recreation
5. School and community forests

C. Forests Problems

1. Fires, disease, insects
2. Poor lumbering
3. Uninformed woodlot owners
4. Poor management

D. Possible Activities

1. Survey types of trees
2. Visit a tree nursery, fire tower, and farm woodlot

3. Visit a burned-over area and comparable area that is not burned over
4. Visit a nearby park
5. Visit a sawmill or lumber yard
6. Start a school forest
7. Draw up a landscape plan, using trees where needed
8. Propagate trees from seed collected in wild
9. Make an exhibit of insect enemies
10. Discuss careers in forestry

V. Outline of Wildlife Resources

A. Wildlife Values

1. Economic (food, employment)
2. Recreation (hunting, fishing)
3. Aesthetic (intangible)

B. Wildlife Population

1. Mammals (big and small game, furbearers)
2. Birds (song, game, migratory)
3. Fish (game, non-game, commercial)
4. Reptiles and salamanders (and other amphibians)
5. Invertebrates

C. Balance in Nature Affected by Man

1. Reduction in natural habitats
   a) Agriculture: crop production
   b) Clearing native vegetation
   c) Competition of livestock (over-grazing)
   d) Drainage of wetlands (marshes, swamps)
   e) Water pollution
   f) Urbanization
   g) Fires
2. Exploitation of Wildlife
   a) Commercialization (over-hunting, fishing, etc.)
3. Wildlife Regulations
   a) More law enforcement personnel needed
   b) Cooperative public through education

D. Possible Activities

1. Wildlife survey or census of area
2. Make game bird and song bird feeders
3. Plant food and cover plants
4. Visit a fish hatchery

5. Contact a local game warden for visit to school for interpretation and need of laws
6. Contact representative of local sportsmens group for information
7. Set up and maintain nature trails and displays
8. Set up and maintain a wildlife sanctuary
9. Make a survey of reptiles and amphibians of the area
10. Have a panel discussion on "Predator control is poor conservation"
11. Make bird houses and help keep record of migratory birds
12. Develop and uphold a conservation code
13. Have a panel discussion on "A good conservation program for our community"

IV. SOME OF THE ACTIVITIES USED WITH THE UNIT ON CONSERVATION

Recent literature indicates that educators are becoming cognizant of the value of school grounds as functional outdoor laboratories requisite to a complete and meaningful school program -- both curricular and co-curricular. Also, an awareness on the part of the pupils should result in an appreciation, an understanding, and a wiser utilization of natural resourses.[19]

The following activities were developed at Ramapo Regional High School while carrying on the experimental unit. These suggestions, of proven worth, may serve as a guide to any interested teacher who may modify them to his individual program.

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[19] Richard L. Weaver, Handbook for Teaching of Conservation and Resource-Use. (Danville, Illinois: Interstate Printers and Publishers, Inc., 1955), p. 290.

Wildlife Sanctuary. In 1956, soon after the opening of the new Ramapo Regional High School in Franklin Lakes, New Jersey, a Conservation Club, open to all biology and life science pupils, was formed by the investigator. Permission was obtained from the Board of Education for the use of part of the fifty-acre school site for development into a wildlife sanctuary and outdoor classroom area.

This long range project included a series of educational nature trails, complete with eye-catching signs. For example, one read, "Touch me today; I'll itch you tomorrow," -- obviously a reference to the nearby poison ivy plants. Another sign placed in an open area was illustrated with a bluebird over the following caption: "Bluebird, a Harbinger of Spring". These signs, which were of a durable nature, were the result of the interest by the art, shop, and science departments in the project. The same departments mentioned above co-operated in the building of many nesting boxes and bird feeders which were placed in appropriate locations in this particular area. Included among these were bluebird, tree swallow, and wren nesting boxes; some of these showed signs of immediate occupancy. During the critical winter season, varied types of bird feeders were kept plentifully supplied with food. Over two hundred pounds of bird seed, suet,

and peanut butter, purchased with Conservation Club funds, were consumed annually by the avian fauna. (See Appendix C, Illustration 1).

Tree Planting. (See Appendix D). In the spring of 1959, one thousand three-year-old evergreen trees (e.g., white pine, Norway spruce, Austrian pine) were planted; 1200 were planted in the spring of 1960; and 1500 were planted in the spring of 1961. All of this was done by the biology and life science classes as part of the school erosion control program.

Some trees were planted as the beginning of a school forest. Trees were purchased at a nominal cost from the New Jersey State Department of Conservation, Trenton, New Jersey. The funds were obtained by conducting numerous money-raising activities including cake sales, candy sales, and guest lecture programs for which admission was charged.

The tree planting was first demonstrated by the investigator during class time and most of the actual tree planting took place after school (during club meeting time) and on Saturdays. Shovels, buckets, etc. were supplied by the pupils.

Observance of Special Days. The annual observance of Arbor Day usually included a tree planting (See Appendix C)

and some other related activities. An appropriate program ordinarily accompanied this work. National Wildlife Week was recognized through the use of a large showcase display of the native forms of wildlife.[20]

Field Trips. The field trip was an integral part of each course in biology. One or two class sessions in the field were used as a summary of the entire year's work. In this particular unit, the investigator spent one class period in discussing the specific school area, a wet deciduous woodland, in which the study was made. A general description of the area was given describing the various types of habitats, the types of plant cover, and the existent animal forms.

Since most mammals are nocturnal, the pupils are alerted for the presence of animal signs (e. g., track or trail signs, dens, droppings, food remains, etc.). The class was divided into teams of five pupils, with each group assigned a specific collecting area. The field collections were then brought into the laboratory and examined carefully over a period of one week. Reports were made on the types of animals and plants found. The

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[20] Obtained from the New Jersey Audubon Society, Franklin Lakes, New Jersey.

The relationship and interdependence of these various life forms supplied ample material for informative and exploratory discussions in the classroom.

To broaden their experience, the pupils accompanied adult conservation organizations, such as the New Jersey Audubon Society and the Fyke Nature Association, on week-end field trips. On these trips the flora and fauna of various sections of New Jersey were observed. The ecological approach, the relationship of organisms to each other and to their environment, was stressed.

Garden Club Exhibits. Annual conservation exhibits of the pupils' projects were displayed in co-operation with the nearby Oakland and Wyckoff, New Jersey, garden club flower shows. In this way the high school conservation activities were made known locally; this resulted in the awarding of several small annual conservation scholarships by the garden clubs. The recipients were, by rule, those graduating seniors who had shown the most interest in the cause of conservation.

Growing Flowers and Shrubs. A portable classroom rooting bed (on wheels) was built by the pupils for the propagation of evergreen shrubs from cuttings.

An outdoor cold frame was built adjacent to the

school greenhouse for plant propagation, with twelve hundred flowering bulbs having been planted to date.

Outdoor Classroom. An outdoor classroom area was designated: rustic log seats were made from a large oak tree and arranged in a semicircle under a large beech tree in the sanctuary. This provided opportunities for educational and scientific investigations.

School Greenhouse. A greenhouse was added to the biology classroom. This was fully utilized in the growing of flowers, vegetables, evergreens, and other plants. Properly supervised contests in the growing of plants were found to create a greater interest in school work. Much of the material grown is now utilized by the school, especially by the science department, in such ways as plant physiology experiments in general science, life science, and biology classes, and the decoration of the school through the use of flowers planted in large plant containers located throughout the school building.

The greenhouse also serves as a research and work area for various individual and group experiments with plant life by the biology and life science pupils.

School Landscaping. Many of the plants propagated in the cold frame, the portable rooting bed, and the

greenhouse were utilized in improving the appearance of a portion of the fifty acres of school grounds. Information on planting, fertilizing, and pruning was given the pupils through actual demonstrations.

Conservation Legislation. Legislation which affected natural resources was discussed as the need arose, especially on the local and state level. A law was passed protecting all hawks and owls (see Appendix C, Illustration No. 3) in New Jersey. Many of the pupils wrote cards and letters to the legislators urging the passage of this bill which was endorsed by the majority of the conservation organizations in the state.

Public Relations. (See Appendix D). Newspaper articles, accompanied by photographs showing the results of this unit approach, have made the conservation program at Ramapo Regional High School more evident, not only to the school population, but also to the immediate public. Public relations were used to show desirable school activities and thus keep the citizens informed.

CHAPTER III

EVALUATION OF THE CONSERVATION UNIT FOR SLOW LEARNERS

I. TESTS USED IN EXPERIMENTAL STUDY

Test of Reasoning in Conservation. A forty-minute standardized test containing 45 questions had been prepared by the Educational Testing Service in Princeton, New Jersey and the Education Division of the Conservation Foundation, New York, New York. (See Appendix B).

The pre-test (Form A) was given on January 3, 1961, and the post-test (Form B) was given on February 3, 1961. Between these two testings the classes met for forty-minute periods, five days per week. The lecture type of instruction was given to the control group of slow learners while the "learn by doing" instruction was given to the experimental group of slow learners.

Control Group Results. The tests were administered, scored, and tabulated for the control group (see Table I, page 30). The range varied slightly from 18 in the initial test to 19 in the post-test with an average raw score gain of 2 points per pupil. The individual scores ranged from a gain of 10 points to a loss of 4 points, with four pupils remaining the same as compared to the initial test.

Experimental Group Results. In the experimental group, the range decreased from 19 on the initial test to 13 on the final test (see Table II, page 31). No pupil lost any points or stayed the same. The pupils in the experimental group gained from 3 to 11 points with an average raw score gain of nearly 7 points.

Graphic Comparison of Means. A comparison of the pre-test raw scores between the experimental and control groups is presented in Figure 1, page 32. The mean of the control group is seen to be 18.5 while the mean of the experimental group was 23.8 - a difference of about 5 points.

In the post-test scores presented in Figure 2, page 33, the mean of the experimental group is seen to have risen 7 points while the mean of the control group rose only 2.2 points.

Data for both the pre-tests and post-tests administered during the study is shown in Table III, page 34.

While this data cannot be considered to be conclusive evidence of any marked differences in achievement of the two groups, they do suggest that slow learners may gain by the type of approach used to teach the conservation unit. The Author is of the opinion that the experimental group was more receptive, more eager to learn, and more likely to apply what they learned in conservation than was the control group.

TABLE I

SCORES OF CONTROL GROUP IN STUDY OF CONSERVATION UNIT

Student	Initial Score*	Final Score**	Gain or Loss***
1	27	24	Loss 3
2	27	24	Loss 3
3	26	30	Gain 4
4	25	31	Gain 6
5	25	23	Loss 2
6	23	22	Loss 1
7	23	28	Gain 5
8	23	27	Gain 4
9	21	17	Loss 4
10	21	27	Gain 6
11	20	21	Gain 1
12	19	25	Gain 6
13	19	19	Same
14	19	19	Same
15	19	21	Gain 2
16	19	26	Gain 7
17	18	22	Gain 4
18	18	18	Same
19	18	28	Gain 10
20	17	21	Gain 4
21	17	14	Loss 3
22	17	14	Loss 3
23	15	13	Loss 2
24	15	15	Same
25	14	12	Loss 2
26	14	22	Gain 8
27	13	15	Gain 2
28	13	18	Gain 5
29	11	17	Gain 6
30	9	12	Gain 3

* Initial Score Range: 9-27 = 18
** Final Score Range: 12-31 = 19
*** Average Gain = 2 points per student

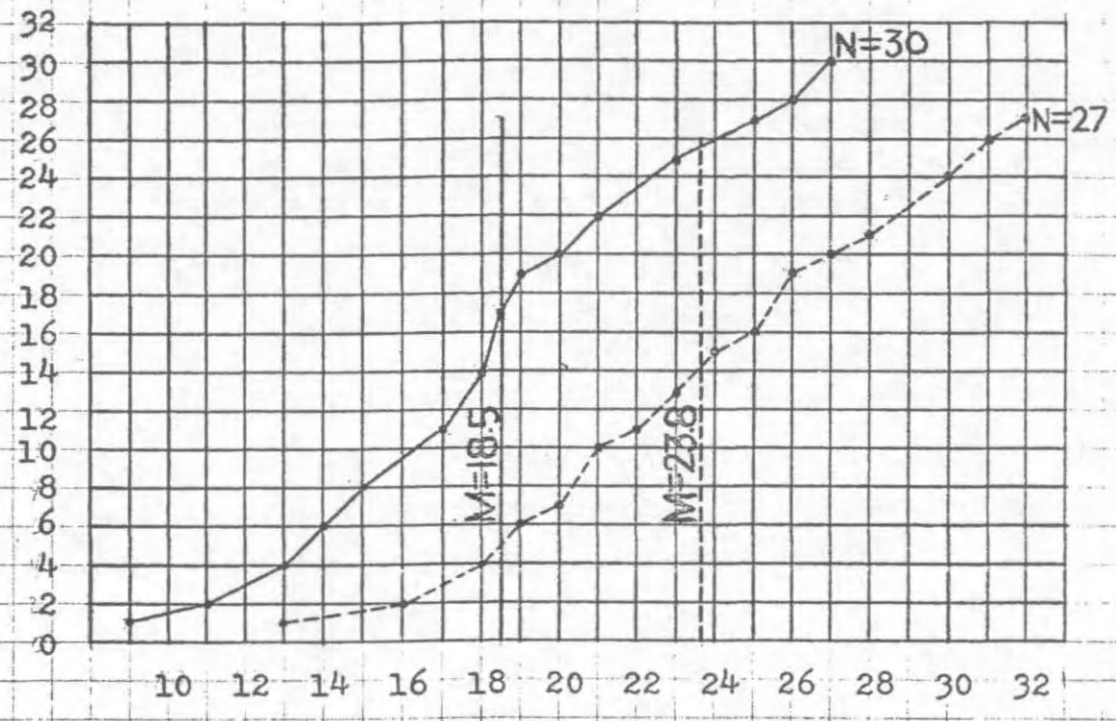
TABLE II

SCORES OF EXPERIMENTAL GROUP IN STUDY OF CONSERVATION UNIT

Student	Initial Score*	Final Score**	Gain or Loss***
1	32	36	Gain 4
2	31	35	Gain 4
3	31	34	Gain 3
4	30	37	Gain 7
5	30	35	Gain 5
6	30	33	Gain 3
7	28	34	Gain 6
8	27	36	Gain 9
9	26	33	Gain 7
10	26	33	Gain 7
11	26	31	Gain 5
12	25	31	Gain 6
13	24	32	Gain 8
14	24	32	Gain 8
15	23	29	Gain 6
16	23	28	Gain 5
17	22	29	Gain 7
18	21	29	Gain 8
19	21	29	Gain 8
20	21	30	Gain 9
21	20	26	Gain 6
22	19	25	Gain 6
23	19	30	Gain 11
24	18	27	Gain 9
25	18	26	Gain 8
26	16	25	Gain 9
27	13	24	Gain 11

* Initial Score Range: 13-32 = 19
** Final Score Range: 24-37 = 13
*** Average Gain = 6.85 points per student

FIGURE 1



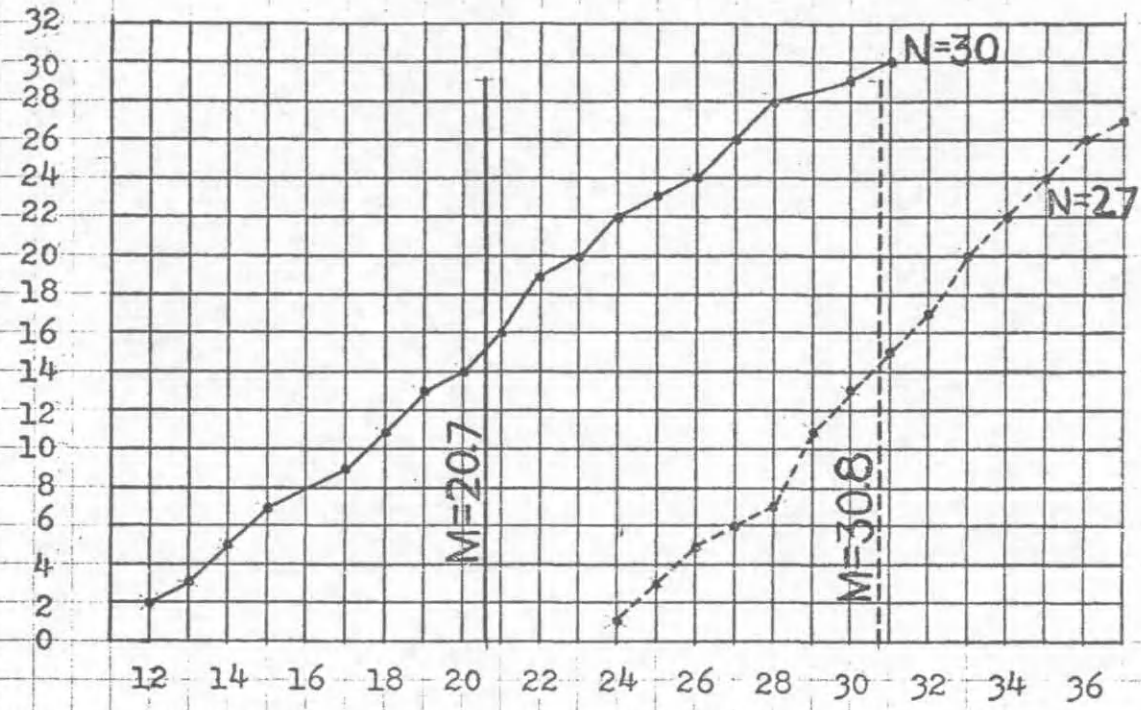
RAW SCORES ON TESTS OF REASONG IN CONSERVATION
(Pre-Test)

——— Pre-test for control group

– – – – Pre-test for experimental group

Cumulative Frequency Comparing the Control and Experiment Groups (January 3, 1961)

FIGURE 2



RAW SCORES ON TESTS OF REASONING IN CONSERVATION
(Post-Test)

—— Post-test for control group

—— Post-test for experimental group

Cumulative Frequency Comparing The Control and Experiment Groups (February 3, 1961)

TABLE III

STATISTICAL TEST DATA FOR EXPERIMENTAL AND CONTROL GROUPS

Groups	No. Students	Mean	S.D.	Mdn.	Q1	Q3
Exper. Test 1, F.A.*	27	23.8	±5.2	24	20.0	28.1
Exper. Test 2, F.B.	27	30.8	±3.7	31	28.3	33.8
Control Test 1, F.B.**	30	18.5	±5.7	19	14.1	22.8
Control Test 2, F.A.	30	20.7	±5.2	21	16.8	25.1

1. In the experimental group the mean score rose 7 points from 23.8 to 30.8 while the standard deviation decreased from ±5.2 to ±3.7 from pre-test to post-test. In the control group the mean score rose only 2.2 points from 18.5 to 20.7 and there was little change in the standard deviation.

2. The median score for the experimental group rose 7 points from 24 to 31, while the median score of the control group rose only 2 points from 19 to 21. The interquartile range for the experimental group decreased from 8.1 points on the pre-test, to 5.5 points on the post-test. The interquartile range for the control group remained about the same changing from 8.7 on the pre-test to 8.3 on the post-test.

3. The raw scores on the pre-test for the experimental group ranged from 13 to 32, and on the post-test from 24 to 37. The raw scores of the control group on the pre-test ranged from 9 to 27, and on the post test from 12 to 31.

* Form A
** Form B

CHAPTER IV

SUMMARY, CONCLUSION, COMMENTS, AND RECOMMENDATION

I. SUMMARY

It was the purpose of this study to develop a functional conservation unit for the slow learner in high school biology (I.Q. 75-90). It was found that present high school biology textbooks were too difficult for the slow learner to comprehend. With this in mind, the writer consulted numerous resouce personnel and examined a great amount of literature on conservation in order to gather ideas in evolving this unit.

It was felt that a more funotional unit could be developed utilizing diversified teaching methods including short field trips, laboratory work, and other "learn by doing" activities, as compared to the usual lecture method of teaching conservation.

It was decided to utilize two classes (homogenous only in I.Q.) in this experiment. One class served as the control (lecture method) while the second class served as the experimental group ("learn by doing" approach). A standardized test was given to both groups before initiating the conservation unit.

After one month of teaching these classes, a different form of the same standardized test was administered to both groups.

II. CONCLUSIONS

It should be noted that the experimental group made a more noticeable gain (7 points per pupil) as compared to the control group (2 points per pupil).

Since the samples in this study were small (twenty seven in one class and thirty in the second) one must avoid general conclusions. Perhaps the only safe claim is that the slow learners in the control group did as well as those in the experimental group, though the differences seem to suggest that the experimental group profited by the approach used.

Even though the experimental and control classes were homogeneously grouped (slow-learner level), it was found that each class had some pupils who were more attentive, energetic and ambitious. This appeared to be increasingly true, especially in the experimental group, as the unit in conservation gained momentum utilizing the "learn by doing" approach.

One month (January 3, 1961 to February 3, 1961) had been spent on this experimental study. It is felt that conservation concepts could have been more fully developed if the time of study had been increased to a minimum of six weeks.

Clearly, a more dynamic approach to the study of conservation is possible if resource problems in the immediate

area are investigated. This should also prove to be more meaningful to the learner. It would seem that conservation concepts can be more readily developed using this approach.

III. COMMENTS

Having concluded this brief and not too conclusive study, the Author wishes to comment briefly on certain aspects of the conservation program at his school.

The future holds the prospect of promise as well as peril — depending upon how well we adapt ourselves to the changing world. As compared to fifty years ago, we are now living in a golden age of technology where less land is needed to produce essential food and materials necessary for existence.

Almost too late, we have learned to conserve our natural resources for the common good. We should try to improve conservation education in the community, at home, and in the schools. Progress results only as humans improve their relationship to their surroundings of soil, water, minerals, plants, animals, and most of all, people.

We should instill in the public an understanding of man's dependence upon his resources and stimulate the public by pointing out good conservation work already started in nearby areas where it will be more meaningful

than in distant areas.

Conservation in schools could be taught as a subject in itself, but for better over-all results, should be integrated into or correlated with every grade -- primary through high school. Until this can be accomplished, the most logical place to incorporate a unit in conservation (in order to reach a great number of pupils) would be in a high school biology course.

Opportunities for self-discovery and activities of short duration should be substituted for lecturing because of the shorter interest span of the slow learner. The schools should do the following:

1. Provide opportunities for exploration and group demonstration of simple but meaningful experiments.

2. Concentrate on developing desirable attitudes and appreciations.

3. Use outdoor resources whenever feasible.

4. Avoid a strong technical approach.

Schools may appropriately start with the curriculum they now have as they set about the task of making adequate provision for conservation education. Fragmentation of knowledge and experience thru the development of special courses on conservation would mean the limitation of such offerings to a relatively small part of the school population. Furthermore, the natural and social sciences are logical subject fields in which to infuse such natural and social materials or experiences as are found in a comprehensive study of conservation. The close relationship of conservation to both the natural and social sciences is apparent.

> One practice that is relatively common is to incorporate units of study on conservation into existing natural or social science courses.[1]

The youth of America, especially organized groups like the Future Farmers of America, 4-H Clubs, Boy Scouts, and Girl Scouts, have already made progress in recognizing the importance of natural resources by their participation in conservation activities.

Much of this progress, especially with the Future Farmers of America and 4-H Clubs, has been made under the direction of good teacher leadership. In order to promote groups such as conservation clubs, a teacher needs as qualifications a diversified background, a deep interest, and contagious enthusiasm to handle this complex field of work known as conservation of natural resources. Willing and dedicated teachers and conscientious pupils can carry the message of good conservation practices by their deeds.

Teachers who do have a background of natural science and functional training in resource use (or conservation education) find that conservation on the school grounds can often motivate the slow learner to turn to books or studies with new interest.

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1 Conservation Education in American Schools: Twenty-Ninth Yearbook. (Washington: American Association of School Administrators. National Education Association. 1951), p. 66

Latent scientific tendencies can be aroused through the use of problem-solving skills instead of the memorization of facts in apparently unrelated subjects. Conservation studies and projects under a qualified teacher can make school work less of a chore and more of a challenge for the pupils.

Since the subject matter includes the study of the natural environment in which the pupils live, it would be ironical if the pupils were not made to see the close relationship of the natural and social environments. Both the individual and the group must be brought into a closer relationship resulting in an intelligent or informed citizenry and nation.

Teachers should set a good example for the students and practice what they preach to demonstrate the meaning of conservation.

If the conservation activities are closely related to the area in which the pupils live, it will be less difficult to stimulate them in interpreting their immediate environment. The teacher should help the student associate his or her daily experiences with the concepts mentioned. Thus, the individual will be able to see each experience as part of a total pattern resulting in the formation of sound attitudes.

The cooperation of enthusiastic teachers, local, state, and federal organizations, and community groups should result in a more dynamic approach to understanding that conservation is a way of life.

IV. RECOMMENDATIONS

A similar study could be better developed utilizing two biology teachers in the same school with one using the conventional methods on his classes of slow learners with the second following the experimental methods. This approach should avoid any possibility of withholding information from the control group thus resulting in unfair advantage for the experimental group.

Also, a similar study could be conducted for average, or above average, biology students and a comparison made of the results.

The incorporation of more standardized test material, or correlating the I. Q. test with the conservation test, should provide more information on the evaluation of the experimental method used in this study.

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APPENDIX

APPENDIX A -- LETTERS

November 22, 1960

Mrs. Martha Munzer
3656 Waldo Avenue
New York 63, New York

Dear Mrs. Munzer:

I received your three forms of the "Tests in Reasoning" and wish to thank you for your help and cooperation in my experimental study.

I will keep you posted on this study.

Is there a possibility of renting your series of filmstrips for this experiment? Also do you have any suggestions for other teaching aids that could be used by me in my experimental class in contrast to the formal lecture method to be used in my control class.

Thank you again.

Respectfully,

Frank Chrapliwy
Life Science - Biology
Teacher

FC:rs

THE CONSERVATION FOUNDATION

RESEARCH EDUCATION

30 East 40th Street
New York 16, N. Y.

Telephone • LExington 2-6110
Cable Address • CONSERVIT

[illegible], N.Y.

October 31, 1960

Mr. Frank Chrapliwy
Ramapo Regional High School
Franklin Lakes, New Jersey

Dear Mr. Chrapliwy,

Under separate cover I am sending you the three forms of the "Tests in Reasoning" you have requested.

I am very much interested in your experiment and will appreciate having a copy of the results of the study in the spring.

When you are grading the tests you will need to add 2½ points to the B grades and 5 points to the C grades in order to have them equivalent to the grades in the A tests.

Cordially yours,

MEM/jt

Martha E. Munzer

THE CONSERVATION FOUNDATION
RESEARCH · EDUCATION

30 East 40th Street
New York 16, N. Y.
Telephone • LExington 2-6120
Cable Address • CONSERVFT

May 20, 1951

Dear Colleague:

"A Test of Reasoning in Conservation" has been standardized by Educational Testing Service at Princeton. We knew you would be interested because you so generously helped us in the experimental period and took part in this important development.

Extensive testing in Oregon and by fifty of our friends in schools and colleges throughout the country have indicated the test is valid and reliable. Forms A and B are now being made ready for general use.

Enclosed you will find a table of norms (part of the teachers' manual that is to accompany test booklets in the future).

We should be happy to have you communicate with us if you or your colleagues are interested in further use of this testing instrument.

Thank you again.

Always cordially

Phyllis L. Wagner
Research Assistant

MPW/jt

NATIONAL WILDLIFE FEDERATION
1412 SIXTEENTH STREET, NORTHWEST
WASHINGTON 6, D. C.
ADAMS 2-8004

March 10, 1961

Mr. Frank Floyd Chrapliwy
49 Oneida Avenue
Oakland, New Jersey

Dear Mr. Chrapliwy:

We are happy to notify you your application for a conservation education grant from the National Wildlife Federation was approved by the Board of Directors, meeting in Washington, D.C. last week.

We felt you should be advised prior to our releasing the information to the newspapers.

A letter containing full details of your award will be forthcoming. We should like to extend our congratulations to you as a successful recipient of a National Wildlife Federation award.

Sincerely,

THOMAS L. KIMBALL
Executive Director

cc: Dr. Paul A. Herbert
Head of Department, James Gebhart, Ph.D., Education Dept. Montana
File University, Missoula, Montana

NATIONAL WILDLIFE FEDERATION

1412 SIXTEENTH STREET, NORTHWEST
WASHINGTON 6, D. C.

ADAMS 2-5004

April 4, 1961

Mr. Frank F. Chrapliwy
[illegible] Oneida Avenue
Oakland, New Jersey

Dear Mr. Chrapliwy:

Early in March you were advised the Board of Directors of the National Wildlife Federation had approved your application for a conservation education grant in the amount of $[illegible].

In line with Federation policy, half of the award will be mailed during the first part of September. The balance will be forwarded sometime during the latter part of January of next year, on condition we receive a report showing satisfactory progress in your work at mid year. We request your department head submit a report at the close of the fall semester.

Sometime before the first of September please let us know if you wish to have your check made payable to you personally or to the school you are attending. Also give us a good and complete address for mailing of the check.

The Conservation Education Committee and the Board feel you are representing the Federation's interests, and we hope you will feel free to call on us if we can be of any help to you.

Best wishes for your success.

Sincerely yours,

THOMAS L. KIMALL
Executive Director

cc: Dr. Paul A. Herbert
Department Head James Gilbert
File

APPENDIX B — TEST

TEST OF REASONING IN CONSERVATION

FORM A

Read the directions on the back cover

The Conservation Foundation
New York

Prepared in cooperation with Educational Testing Service
Princeton, N. J. Los Angeles, Calif.

Time—40 minutes

Directions: The group of questions below consists of four lettered headings followed by a list of numbered sentences. For each numbered sentence select the one heading which is most closely related to it and blacken the corresponding space on the answer sheet. One heading may be used once, more than once, or not at all.

Questions 1-5:

(A) Renewable resources (those of which continuous use can be made when properly managed)
(B) Nonrenewable resources (those whose use results in permanent loss)
(C) Inexhaustible resources (those which are at present so abundant that they seem limitless)
(D) Resources yet to be discovered (those depending on the intelligence and skill of specially trained people)

1. The sun will continue to supply us with light and heat for at least another billion years.
2. Millions of years are necessary to develop a piece of coal through natural processes.
3. In well-managed forests some trees are cut and some are planted at regular intervals.
4. Nitrogen is added to the soil when crops such as peas, beans, or clover are planted.
5. At present the earth contains a number of substances which are not widely used by man.

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one which is best in each case and then blacken the corresponding space on the answer sheet.

6. Occasionally on certain game refuges a limited amount of hunting is permitted. Such hunting is justified for all of the following reasons EXCEPT:
   (A) It provides recreation for hunters.
   (B) Unfit young animals may be eliminated.
   (C) It prevents some animals from starving.
   (D) It supplies our country with much-needed food.

7. A recreation area was supplied with tables, fireplaces, trash cans, and other needed facilities. Soon after the area went into use it was found that there was a litter of paper, garbage, and tin cans scattered around. Which of the following probably contributed most to this condition?
   (A) Not enough trash cans to take care of litter
   (B) Not enough attendants to keep the place clean
   (C) Not enough thoughtfulness on the part of the visitors
   (D) Not enough space for all the visitors

8. Squirrels, beavers, raccoons, and other small mammals can live near cities if
   (A) hunting laws are strictly enforced
   (B) dogs are kept leashed
   (C) their natural enemies are controlled
   (D) cover and food supply are available

9. Which of the following would be the most successful procedure for preventing forest fires?
   (A) Requiring licenses of all who enter forests
   (B) Constructing extensive firebreaks in forests
   (C) Educating the public about the loss resulting from forest fires
   (D) Increasing the amount of research being done on the seeding of rain clouds

10. Which of the following causes the greatest damage to the country's fertile soil?
    (A) Leaching
    (B) Erosion
    (C) Failure to fertilize
    (D) Failure to rotate crops

GO ON TO THE NEXT PAGE

11. For the past few years, the new reserves of petroleum discovered each year have exceeded the total amount used for that year. It seems, therefore, that

(A) man will never use up the earth's oil reserves
(B) the oil reserves will probably last longer than was predicted 20 years ago
(C) new underground supplies of crude oil are being created rapidly each year
(D) the annual consumption of petroleum has not been increasing

12. Man now obtains from the sea nearly 100 per cent of the magnesium he uses, 80 per cent of the bromine, and 7 per cent of the table salt. But he is greatly limited in obtaining other minerals from the sea by the

(A) absence in the sea of the really important minerals
(B) limited need for the other minerals present in sea water
(C) lack of economical methods of extracting them
(D) overabundance of common salt, which greatly increases the difficulty of separating the other minerals

13. Wildlife is most wisely conserved if

(A) all hunting is outlawed and the law is strictly enforced
(B) the hunting restrictions are based on a yearly survey of conditions
(C) only the males of the species are allowed to be hunted
(D) hunting is permitted only in the late fall

14. "The known coal supply is equal in volume to a 15-mile cube and what we have used to date is only a nick in the corner of the cube." This statement implies that

(A) man has found few uses for coal
(B) it would be best for many industries now using natural gas to convert to coal
(C) energy sources of the future will rely almost completely on coal
(D) there is a huge amount of the mineral which is called coal in the earth's crust

15. Which of the following developments could produce an almost unlimited supply of usable fresh water?

(A) An economical method of desalting sea water
(B) A sure method of seeding clouds
(C) A more efficient method of purifying sewage
(D) A more efficient method of locating underground water

16. Which of the following is the most essential resource?

(A) Iron deposits
(B) The intelligence of man
(C) Oil deposits
(D) Unspoiled wilderness regions

17. To which of the following sources of energy has least attention been given by American scientists?

(A) Oil extracted from shale
(B) Heat from the center of the earth
(C) The sun
(D) Atomic fusion using heavy hydrogen

Questions 18-19:

18. Which of the following essential mineral resources does the United States NOT need to import?

(A) Tungsten and tin
(B) Platinum and chromium
(C) Molybdenum and magnesium
(D) Nickel and diamonds

19. The United States is self-sufficient in only one of the above mentioned pairs of minerals. Which of the following points of view concerning world-wide conservation of minerals would be most acceptable?

(A) We should build up our reserve of minerals by making special treaties with countries which produce them.
(B) We should cooperate in international efforts to develop mineral resources.
(C) We should pay little attention to the problem since efforts to discover substitutes are sure to be successful.
(D) We should immediately buy minerals wherever they may be found.

GO ON TO THE NEXT PAGE

Questions 20-22:

The United States has large surpluses of food. Many believe that with such surpluses it is foolish to worry about the conservation of soil and water.

20. Of the following, the chief reason for the activities of the many agencies working to increase conservation of soil and water is to

(A) have soil available to produce farm and forest products for a much larger population
(B) reduce the cost of living by providing a large supply of inexpensive food
(C) be sure of an adequate supply of farm and forest products in case of greatly increased prices
(D) be able to trade food surpluses with foreign countries for manufactured goods

21. Of the following, the best reason for conserving soil is that it

(A) reduces federal income taxes
(B) increases annual rainfall
(C) prevents drought
(D) protects the nation's water supply

22. It is possible for the United States to produce large surpluses of food, for all the following reasons EXCEPT:

(A) Agricultural technology is very advanced in the United States.
(B) There is a large amount of good farm land in the United States in proportion to the population.
(C) Farmers receive much help and information on farming from the federal government.
(D) A higher percentage of the population of the United States is engaged in agriculture than in most other countries.

Questions 23-25:

People live where there is a supply of usable water. Some areas have great amounts of water while others must protect a limited supply. There is a drought somewhere on earth almost every year; other areas are temporarily troubled with too much water. Man depends upon rainfall for this life-sustaining substance, whether he obtains it from wells, lakes, or rivers.

23. Of the following characteristics of rainfall, those which most determine its usefulness to man are

(A) time, place, and amount
(B) form, quality, and rate of fall
(C) taste, temperature, and clearness
(D) pressure, rate, and taste

24. In applying conservation practices to his water supply, man is mainly concerned with

(A) increasing the amount of precipitation
(B) increasing evaporation from oceans and large lakes
(C) increasing and improving swampland drainage
(D) delaying the return of precipitation to the oceans

25. To determine whether water is "usable" we must first

(A) check it for clearness and purity
(B) make a bacteriological count
(C) know how it is going to be used
(D) test the water for germs

Questions 26-28:

A decision was made to build a dam on a certain river in the High Plains area of the United States. The reservoir behind it would supply water for irrigation and for the neighboring city, and would be used for fishing and swimming. The dam would serve to protect property downstream from floods, and a hydroelectric power plant would be built below the dam. For all these reasons the money was appropriated and the dam, reservoir, and power plant were built. The reservoir was stocked with fish. Cabins were built along the shoreline.

26. A major problem in this type of water development is that the

(A) cost of purchasing the necessary land is very high
(B) purposes served are so different that it is difficult to serve them all equally well
(C) water held by the dam endangers downstream areas in case of failure of the dam
(D) operation costs are too high for the benefits obtained

27. Which of the following purposes would NOT be well served by a full reservoir?

(A) Public water supply
(B) Boating and fishing
(C) Power generation
(D) Flood control

28. Which of the following would generally make the most water available for a variety of uses?

(A) Building higher dams
(B) Better regulation of stream flow
(C) More efficient water softeners
(D) Building larger reservoirs

GO ON TO THE NEXT PAGE

Questions 29-32:

In 1872 Congress established the first national park, Yellowstone National Park, to be "dedicated and set apart . . . as public pleasuring grounds" and to be retained in a "natural condition." Today there are 29 national parks, embracing a total of 13,136,239 acres, similarly dedicated and set apart. In the early days only a small proportion of the population of the United States was able to visit Yellowstone, because transportation was slow. In 1957 over 50,000,000 Americans visited the national parks.

29. In establishing Yellowstone National Park, Congress was making use of its powers to

(A) convert private lands to government ownership
(B) provide for the general welfare
(C) promote the progress of science
(D) regulate the Indian territories

30. The main purpose of the national parks is to

(A) save valuable timber resources for future logging operations
(B) reserve unspoiled areas of natural beauty for recreation
(C) protect wildlife
(D) ensure that the government will always own a minimum amount of land

31. The number of Americans visiting the national parks will probably increase in the future, for all of the following reasons EXCEPT:

(A) Americans will have more leisure time.
(B) Transportation will continue to improve.
(C) There will be a large increase in population.
(D) Fees for facilities in the parks will be cut.

32. Certain national parks contain magnificent stands of trees. Some people think that these trees should be used for lumber. Which of the following is the best reason for opposing this?

(A) The "natural condition" of a national park would be destroyed if the trees were to be cut.
(B) Timber use in the United States has been decreasing with the development of new building materials.
(C) The United States can import all the timber it needs.
(D) The trees provide windbreaks.

Questions 33-36:

The Joint Committee of Chemistry and Agriculture attempts to find industrial uses for farm products. It strongly recommends the use of alcohol, produced from the fermentation of certain farm products, for motor fuel.

33. In considering whether to use alcohol for motor fuel, the least important of the following questions is:

(A) Will it help to conserve natural resources?
(B) What will it cost?
(C) Is it practical from a technical viewpoint?
(D) How will the new fuel be distributed to motorists?

34. If this recommendation were widely carried out, which of the following would be most likely to take place?

(A) The production of farm products would increase.
(B) The drilling of oil wells would be stopped.
(C) Diesel-powered automobiles would be developed.
(D) Smaller automobile engines would be built.

35. If this plan were put into effect, the most troublesome economic problem that might arise would be due to the

(A) increased demand for surplus grain now stored at public expense
(B) decreased demand for gasoline
(C) increased income for farmers and consequent reduction in government support of other farm goods
(D) decreased demand for alcoholic beverages

36. Should this recommendation of the Joint Committee be ignored?

(A) Yes, because it comes from a group that would profit by its adoption.
(B) Yes, because alcohol cannot be used as a fuel in automobile engines.
(C) No, because it would divert alcohol from alcoholic beverages to more useful purposes.
(D) No, because automobile engines could be converted to use alcohol.

GO ON TO THE NEXT PAGE

Questions 37-41:

The number of species of insects exceeds that of all other animals taken together. In the United States there are about ten thousand injurious insect species causing losses of about four billion dollars annually to crops, trees, stored foodstuffs, etc. In undisturbed natural environments, the populations of insects are generally kept in check by their natural enemies. Artificial control of insect populations in order to prevent disease, economic loss, or nuisance (as in mosquito control) is accomplished by the use of chemical pesticides (such as DDT) and biological methods, and by specific farming and forestry practices. There are more than two hundred basic chemical pesticides which are sold under six thousand different brand names.

37. Of the following, which factor is least important in ensuring that a chemical pesticide is used safely?

(A) Prior testing of the chemical under actual field conditions
(B) Use of the pesticide in the minimum effective amount for the particular pest
(C) Choice of a pesticide that is highly selective in its effect
(D) Application of the pesticide when the land is dry

38. Which of the following best defines an "insect pest"?

(A) Any kind of spider, mite, or beetle
(B) An insect judged harmful to man's interests
(C) An insect for which natural enemies do not exist
(D) An insect whose population growth is temporarily unchecked by natural enemies

39. Biological control of the population levels of insect pests means

(A) control through the action of other living organisms
(B) use of chemicals that attack the biological "weak points" of insects
(C) pesticide programs based on surveys of pests in their natural surroundings
(D) a return to the undisturbed "balance of nature"

40. The development of a strain of insect resistant to a particular pesticide at a given dosage is due to

(A) carrying on pest control operations over too long a period
(B) the survival and the reproduction of resistant individuals
(C) the gradual accumulation of pesticide residues in the insect habitat
(D) the choice of the wrong pesticide in the first place

41. A chemical pesticide should satisfy all of the following essential requirements EXCEPT:

(A) It should in general be harmless to wildlife, vegetation, soil, and water resources.
(B) It should provide an effective check of the insect pest at low unit-cost.
(C) It should not create any hazard to public health.
(D) It should eradicate the particular pest once and for all.

GO ON TO THE NEXT PAGE

Questions 42-45:

The following letter appeared in a local Colorado newspaper.

Dear Editor:

In last Tuesday's editorial you showed how much control the government had by telling the businessman how to run his business. Well they sure stick their nose in my husband's business. My husband is a cattle rancher and he grazes several hundred head of sheep and cattle on a nearby national forest range. For this "privilege" he pays the government a monthly fee for each head. Not only that, but he has to keep his herds on the move. The government tells my husband every year how many head of cattle he will be allowed to graze on the national forest range that year. What I want to know is, what right has the government to tell my husband how many cattle we can have, especially when we pay for each head? And besides, what right has the government to charge us for using nearby land that is not being used for anything else?

Yours truly,

A rancher's wife

42. Why should the number of sheep and cattle permitted on the national forest range be limited?

(A) To prevent unfair competition with ranchers who own their own range land
(B) To ensure that each rancher will get a fair price for his cattle
(C) To prevent overgrazing
(D) Because there is not enough private range land for all ranchers

43. Should the government have the right to charge ranchers for using the national forest range?

(A) Yes, because the national forest range belongs to all the people.
(B) Yes, because the government had to buy the land originally from private owners.
(C) No, because the national forest range should be free to all.
(D) No, because the national forest ranges have been established for the people living in the vicinity.

44. Why is the rancher required to keep his cattle on the move?

(A) To insure that all the ranchers will have an equal share of the range
(B) To prevent the spread of cattle disease
(C) To prevent the grass from being eaten too close to the ground
(D) To improve the quality of the meat

45. Which of the following factors is most important in deciding how many animals should be allowed to graze each year on a certain national forest range?

(A) The amount of livestock disease in the area
(B) The present price of livestock and grain
(C) The present availability of skilled help and the cost of transportation
(D) The condition of the range forage plants

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

TEST OF REASONING IN CONSERVATION

General Instructions

You will be given forty minutes to work on this test.

You will find special directions inside the test book. Be sure you understand the directions before trying to answer any questions. You may ask questions about any part of the directions you do not understand.

You will make your best score by answering every question because your score is the number of correct answers you mark. Work carefully, but do not spend too much time on any one question. If a question seems to be too difficult, make the most careful choice you can, but do not waste time puzzling over it.

Mark all of your answers on the separate answer sheet enclosed in this test book; you will not receive credit for anything you write in the book itself. Mark your answer sheet by blackening the space between the dotted lines under the letter of your choice for each question.

Example:

The most important material carried away by erosion is

(A) rock
(B) soil
(C) water
(D) seed

Sample Answer

Use a pencil to record your answers, and make your answer marks heavy and black. Mark only one answer for each question. If you change your mind about an answer, be sure to erase the first mark completely.

TEST OF REASONING IN CONSERVATION

FORM B

Read the directions on the back cover

The Conservation Foundation
New York

Prepared in cooperation with Educational Testing Service
Princeton, N. J. Los Angeles, Calif.

Time—40 minutes

Directions: The group of questions below consists of four lettered headings followed by a list of numbered phrases. For each numbered phrase select the one heading which is most closely related to it and blacken the corresponding space on the answer sheet. One heading may be used once, more than once, or not at all.

Questions 1-5:

(A) Federal government
(B) State government
(C) Private organizations (such as scouts, Audubon clubs, etc.)
(D) Either private industry or private citizens

1. Determining the length of hunting seasons and the number of game (except for migratory water fowl) to be taken
2. Practicing strip cropping to prevent soil erosion
3. Provides training for boys and girls in nature study and good camping practices
4. Promoting research on atomic fusion as a source of energy
5. Recovery and re-use of iron from scrap

Directions: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one which is best in each case and then blacken the corresponding space on the answer sheet.

6. Some plant seeds, when treated with the chemical giberellin, will germinate faster, produce taller seedlings, and grow more rapidly. Giberellin, therefore, will be a likely help in conservation because
   (A) it will reduce the need for fertilizers
   (B) farm land can be made more productive
   (C) treated plants will require less attention
   (D) giberellin is inexpensive to manufacture
7. In order to practice soil conservation wisely it is most important to
   (A) know the best way each piece of land can be watered
   (B) know how each piece of land can be put to best long-term use
   (C) know what kind of fertilizer each piece of land needs most
   (D) enforce legislation regulating the use to which different kinds of land may be put
8. Experts say that certain metals are rapidly becoming scarce. "Scarce" here means that
   (A) certain widely used metals are being replaced by newly discovered ones which are superior
   (B) the metal is eventually washed into the sea and is lost
   (C) our growing population places an increasing demand on natural ores which are not plentiful
   (D) unusable products from the rusting of the metal are about all that remain of the earth's supply
9. The "litterbug" drive is considered to be part of conservation because it
   (A) is an important health measure
   (B) contributes to the beauty of our surroundings
   (C) emphasizes the importance of cooperation among citizens
   (D) prevents an unnecessary waste of paper
10. For which of the following would it be most difficult to develop a suitable substitute?
   (A) Lumber
   (B) Nitrate deposits for fertilizer
   (C) Wilderness areas
   (D) Water power

GO ON TO THE NEXT PAGE

11. A managed forest may be more valuable for timber than a virgin (undisturbed) forest mainly because

(A) the trees in a virgin forest are generally younger and smaller than those in a managed forest
(B) the cost of transportation of timber out of a virgin forest is greater because of the dense growth
(C) a managed forest generally contains a higher proportion of hardwood trees
(D) a virgin forest may contain older trees which grow slowly and are often partly decayed

12. Which of the following statements concerning ranges and grasslands is FALSE?

(A) The productivity of a range can be maintained by proper adjustment of numbers of livestock to available forage.
(B) Sheep grazing is the most productive use for grass ranges on flat or rolling ground with plenty of water.
(C) If a range is grazed as soon as plant growth begins in the spring, the forage is weakened.
(D) Reseeding may increase the productivity of some ranges.

13. Why is good science education important to resource conservation?

(A) Because science will soon solve most resource shortages.
(B) Because science provides the factual basis for laws restricting resource use.
(C) Because science is the best guide to good living, for which ample resources are necessary.
(D) Because science provides some understanding of the natural world of which resources are a part.

14. Attempts have been made to purify ocean water for purposes of drinking and irrigation. In addition to chemical separation of the salts, other methods have been proposed to distill ocean water. Distillation is not yet widely used because

(A) ocean water boils at an excessively high temperature
(B) the fuel costs are too high
(C) no use has been found for the residue salts
(D) distilled sea water has a salty taste

15. Which of the following is the best reason for the development of water power?

(A) It is always less expensive than other energy sources.
(B) Coal, petroleum, and natural gas resources are almost exhausted.
(C) It is an energy source which is renewable.
(D) Distribution of water power sites is more uniform than distribution of the mineral fuels.

16. The principal way in which the numbers of harmful insects in the forests of the United States are kept down is by

(A) extensive spraying
(B) their natural enemies
(C) selective cutting of infected trees
(D) spraying of certain areas

17. Which of the following causes the smallest number of forest fires in the United States?

(A) People who deliberately set forest fires
(B) Motorists who carelessly throw lighted cigars and cigarettes from their cars
(C) Uncontrolled burning of debris and brush
(D) Lightning

18. Of the following, the chief reason solar energy has failed to replace the present major sources of energy is that

(A) the sun's heat cannot be stored overnight or during cloudy periods
(B) the installations occupy too much area per horsepower produced
(C) the cost of capturing large amounts of the sun's energy is still too great
(D) heat energy is rarely useful unless it is converted to other forms of energy

19. Of the following, the LEAST efficient procedure to ensure a new crop of trees in an area where timber is being cut is to

(A) adopt a rotation plan, growing trees for twenty years and alternating with grass, corn, and wheat
(B) cut selectively, leaving a number of seed-producing trees
(C) cut blocks of trees, allowing for natural reseeding from surrounding uncut areas
(D) cut all timber, clean the area, and reseed

GO ON TO THE NEXT PAGE

20. Which of the following has NOT contributed to water supply problems throughout the United States?

(A) Steady decline in annual rainfall
(B) Steady change in the need for water by industry
(C) Change in population
(D) Change in the demand for water for home use

Questions 21-23:

The sewage of city A is dumped directly into streams, where it is disposed of by bacterial action and by slow oxidation due to oxygen dissolved in the water. City B disposes of its sewage by running it into closed sludge tanks, allowing bacteria to decompose it, and treating it with chemicals.

21. The most important of the following advantages of disposing of sewage by running it into closed sludge tanks is that

(A) the waste from sludge tanks can be used for fertilizer
(B) important minerals can be saved
(C) the open streams are kept safe for recreation
(D) the sewage disposal plant provides gainful employment for a number of people

22. The main advantage of disposing of sewage by dumping it directly into streams is that

(A) it takes less time than using sludge tanks
(B) it costs less than using sludge tanks
(C) wastes are quickly removed from the vicinity of the city
(D) harmful bacteria are quickly destroyed by sunlight and running water

23. In comparing the methods used by cities A and B in disposing of their sewage, one should realize that

(A) both methods are equally good
(B) both methods are equally bad
(C) the method used by city A is better
(D) the method used by city B is better

Questions 24-27:

During the 1930's and the 1950's, certain sections of the country had very severe dust storms. Dust at ground level caused zero visibility at times, and aircraft pilots reported dust as high as 30,000 feet. Winter wheat and spring crops were blown out. Highways were closed for hours at a time. Cars were damaged and fences were buried.

24. The most serious effect of bad dust storms is the

(A) closing of highways
(B) damage to automobiles
(C) loss of topsoil
(D) loss of an entire year's crops

25. The experiences with dust storms since the 1930's indicate that

(A) a period of dust storms must be expected every other decade
(B) the recording of variations in climate in the region has been inadequate
(C) no permanent solution to the dust storm problem has been generally adopted
(D) conservation practices have made no headway in this country since the 1930's

26. To reduce these destructive dust storms the most effective of the following practices would be to

(A) reseed the land to grass
(B) seed clouds to produce rain
(C) grow corn and beans instead of wheat
(D) apply large amounts of inorganic fertilizer to the soil

27. Which of the following probably accounts for the fact that there were no major dust storms in the 1940's but that there were such storms in the 1950's?

(A) There was more rainfall in the 1940's than in the 1950's.
(B) The soil was more fertile in the 1940's than in the 1950's.
(C) Winds were stronger in the 1950's than in the 1940's.
(D) The direction of the prevailing winds shifted in the early 1950's.

GO ON TO THE NEXT PAGE

Questions 28-31:

Suppose that the United States House of Representatives has set up a committee to study uses of atomic energy for power.

28. Which of the following topics would be most important for the committee to consider?

(A) How to increase rapidly the production of atomic power in the United States
(B) How to discover better and more economical methods of producing atomic energy
(C) How to keep uranium imports from flooding the United States market
(D) How to make reactors small enough for home use

29. Suppose that the committee called upon people to come before it and give their opinions regarding the problem. Which of these would be giving the LEAST useful opinion?

(A) A scientist who explains why it is necessary to be very careful about safety when constructing atomic energy reactors
(B) A businessman who explains why it will be necessary for the government to supply some of the money
(C) A labor leader who tells the committee why unemployment would not result from the use of atomic energy
(D) A taxpayers' representative who explains that the government should stop building power dams now that atomic energy is available

30. From the point of view of conservation, the work of the committee would be most important for which of the following reasons?

(A) Uncontrolled atomic fallout can do serious damage to food crops.
(B) Commercial uses for atomic wastes should be found.
(C) Of all our nonrenewable resources, fossil fuels are in shortest supply.
(D) An abundant supply of energy can be helpful in solving many conservation problems.

31. Suppose that the committee makes a study of our need for energy in the immediate future. Which conclusion is most likely?

(A) Atomic energy will not eliminate our need for oil in the next 30 years.
(B) We may need a substitute for coal within 30 years.
(C) We will not be using hydroelectric power 50 years from now.
(D) All our energy requirements will be satisfied by solar energy by the year 2000.

Questions 32-34:

One of the major problems of the coal industry in the United States has been the waste of coal at all stages of production, preparation for market, and utilization.

32. Much waste occurs in coal extraction because

(A) the removal of waste such as slate is largely a hand process
(B) strip mining is technically impossible in coal deposits
(C) practices which would remove all the coal in a mine are too costly to be used
(D) the mining industry does not employ scientifically trained personnel to develop means of eliminating waste

33. There has been little incentive for operators to reduce waste in production because

(A) the industry has had little competition from other fuel sources
(B) the industry has been able to weather competition from other fuel sources by expanding production of chemical by-products
(C) the industry is marked by much cooperation among producers
(D) coal resources have been relatively plentiful

34. When coal is mined, large pillars of coal are often left standing to prevent cave-ins. Is this procedure a waste of coal?

(A) No, because the use of coal to prevent cave-ins is important.
(B) No, because these pillars will be a good source of coal for future generations.
(C) Yes, because compressed air can be used to prevent cave-ins during mining operations.
(D) Yes, because strip mining makes large pillars unnecessary.

GO ON TO THE NEXT PAGE

Questions 35-37:

In 1957, 6000 permits to take one deer each were offered to hunters in the Kaibab National Forest in northern Arizona. Only 4500 permits were purchased and 3700 deer taken. Only one permit was allowed per hunter. In 1958, 8000 permits were offered, and each hunter could buy a second permit after taking his first deer, as long as the permits lasted.

35. This information most probably indicates that

(A) someone wants to rid the Kaibab Forest of all deer
(B) a great many hunters are poor shots
(C) sportsmen are pressuring the state Game and Fish Commission into permitting destructive hunting
(D) the annual increase of deer is more than the area can support

36. "What the hunters don't take, the winter will" is a common saying among the sportsmen of the state. This statement is based on the fact that

(A) the heavy snows of winter reduce the available food supply
(B) the storms of winter freeze many deer
(C) approximately 10% of the deer will die during the winter no matter how many deer there are in the forest
(D) hunters are most likely to kill the weak deer which are least able to survive the winter

37. Certain groups would like the Kaibab closed completely to all hunting. Which of the following would be the most probable result of following their ideas?

(A) There would be more and more deer with a corresponding increase in the enjoyment of visitors to the forest each year.
(B) There would be fewer deer with a corresponding decrease in the enjoyment of visitors to the forest each year.
(C) After a few years the number of deer would remain constant, but there would be a definite decrease in the enjoyment of visitors who hunt.
(D) After a few years there would be no deer.

Questions 38-39:

The iron ore reserves of the United States are being used up at a rapid rate. Any plan to ensure an adequate supply of iron for future use will affect the following groups in different ways.

Group 1: The producer of iron and steel
Group 2: The consumer
Group 3: The taxpayer
Group 4: The future population

38. Increasing the effective life of iron and steel products by treating them to reduce corrosion will benefit which two groups the most?

(A) The producer and the consumer
(B) The consumer and the taxpayer
(C) The consumer and the future population
(D) The taxpayer and the future population

39. Assume that a suitable substitute for iron and steel becomes available. For which group will this present the most serious problem?

(A) The producer of iron and steel
(B) The consumer
(C) The taxpayer
(D) The future population

GO ON TO THE NEXT PAGE

Questions 40-42:

In 1925 the population of the earth was somewhat less than 2 billion. In 1959 it was about $2\frac{3}{4}$ billion, and experts predict that by the end of this century it will be about 6 billion. Though a few nations produce food surpluses, in many parts of the world a semi-starvation diet is the rule rather than the exception. People simply are not able to get enough to eat. Thus, the nourishment of human populations remains an unsolved problem. Along with the improvement of agriculture in many areas we must look to scientific and technical advances for help in getting enough food.

40. The major reason for the staggering increase in world population in the twentieth century is

(A) the improvement in transportation
(B) advancement in government and finance
(C) advancement in medicine and sanitation
(D) the discovery and exploration of new territories

41. Certain committees of the United Nations concern themselves with practical methods of dealing with the imbalance between population and food resources. To which of the following projects would they be LEAST likely to give their serious attention?

(A) An efficient method of mass production of marine algae suitable for human and animal food
(B) Encouraging the cultivation of crops having greater protein content
(C) The increased use of terracing in mountain areas
(D) Improved methods of whaling in international waters

42. Which of the following would contribute LEAST toward solving the food shortage problem?

(A) An inexpensive method of desalting sea water
(B) Artificial photosynthesis
(C) Spaceships to settle people on other planets
(D) Safe and peaceful uses of atomic energy

Questions 43-45:

Certain domestic oil producers complain that the petroleum production of the United States is being threatened by importation of cheaper crude oil from abroad. Four senators are discussing this problem.

Senator A: "The government should provide support for domestic producers so that they can compete with imports from foreign countries."
Senator B: "The military forces stationed within the continental limits of the United States should be required to use only domestically produced petroleum products."
Senator C: "The government should prohibit the importation of petroleum."
Senator D: "The government should take no action at all in this matter, thus allowing supply and demand to regulate the flow of oil from other countries."

43. Which senator's suggestion would probably protect the domestic petroleum resources of the United States for the longest time?

(A) Senator A
(B) Senator B
(C) Senator C
(D) Senator D

44. Which senator's suggestion would provide more jobs for United States oil workers?

(A) Senator A
(B) Senator B
(C) Senator C
(D) Senator D

45. The suggestion of which senator would tend to keep down the cost of petroleum products without requiring additional taxes?

(A) Senator A
(B) Senator B
(C) Senator C
(D) Senator D

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

TEST OF REASONING IN CONSERVATION

General Instructions

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Mark all of your answers on the separate answer sheet enclosed in this test book; you will not receive credit for anything you write in the book itself. Mark your answer sheet by blackening the space between the dotted lines under the letter of your choice for each question.

Example:

The most important material carried away by erosion is

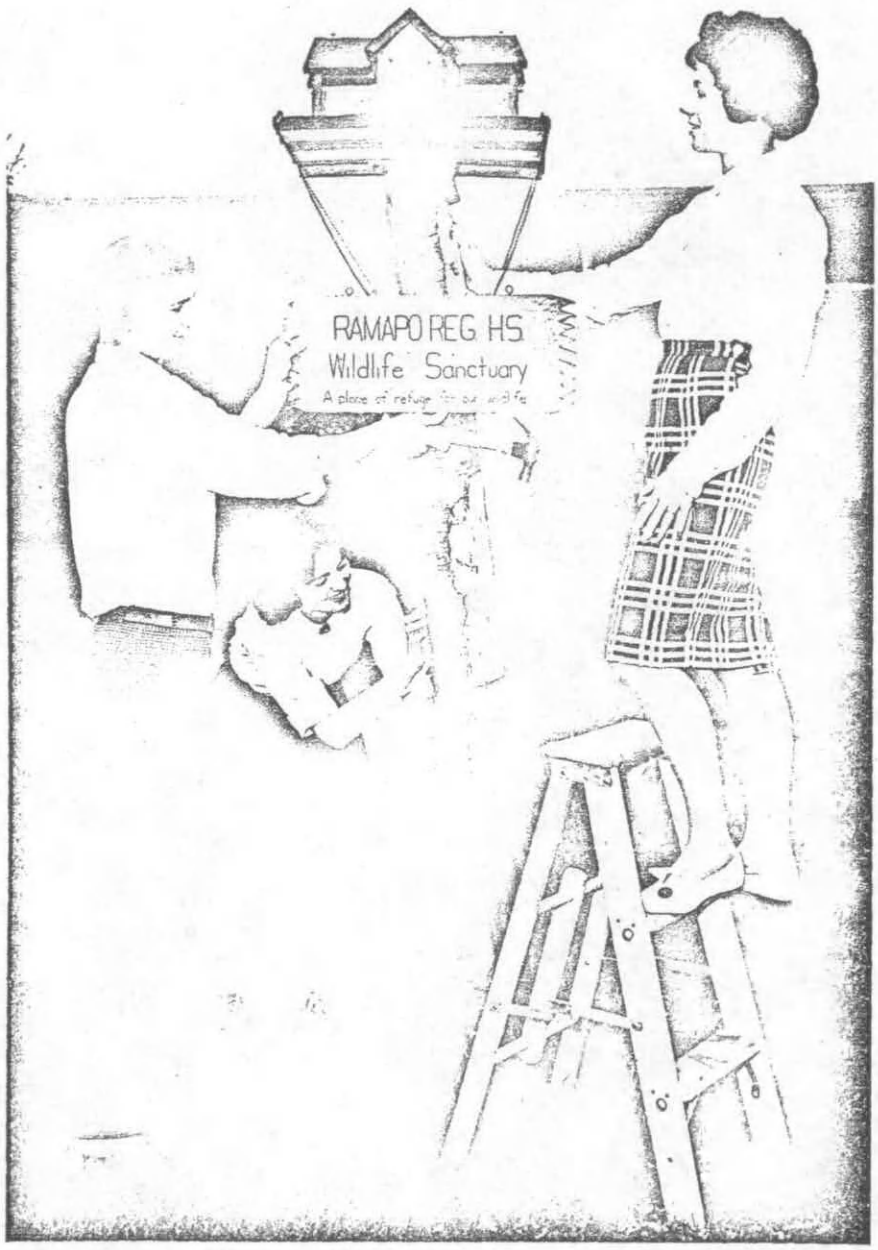
(A) rock
(B) soil
(C) water
(D) seed

Sample Answer

Use a pencil to record your answers, and make your answer marks heavy and black. Mark only one answer for each question. If you change your mind about an answer, be sure to erase the first mark completely.

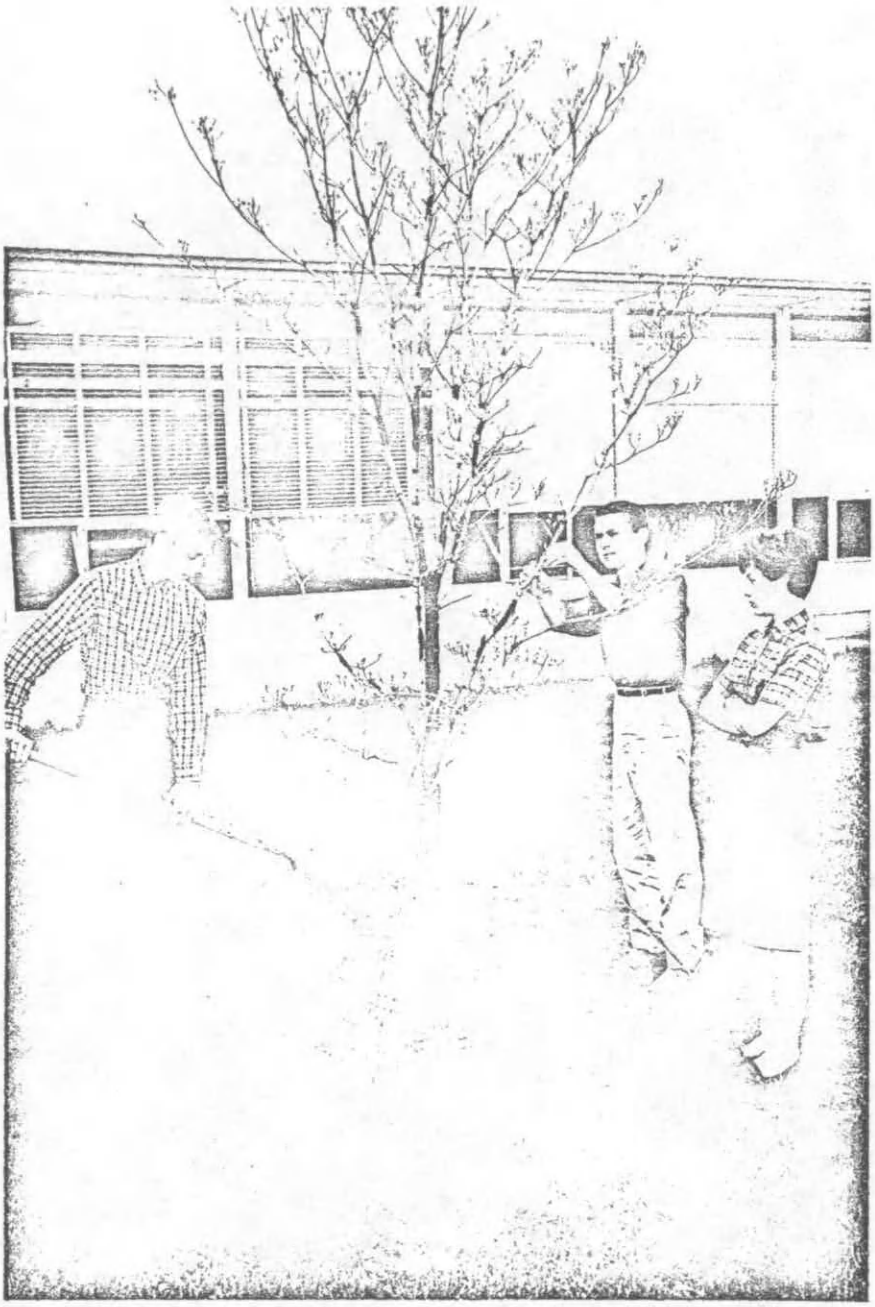
APPENDIX C — ILLUSTRATIONS

The following photographs illustrate some of the activities incorporated into the conservation unit of the experimental group.



ONE OF THE MANY BIRD FEEDERS FOUND

AT RAMAPO REGIONAL HIGH SCHOOL

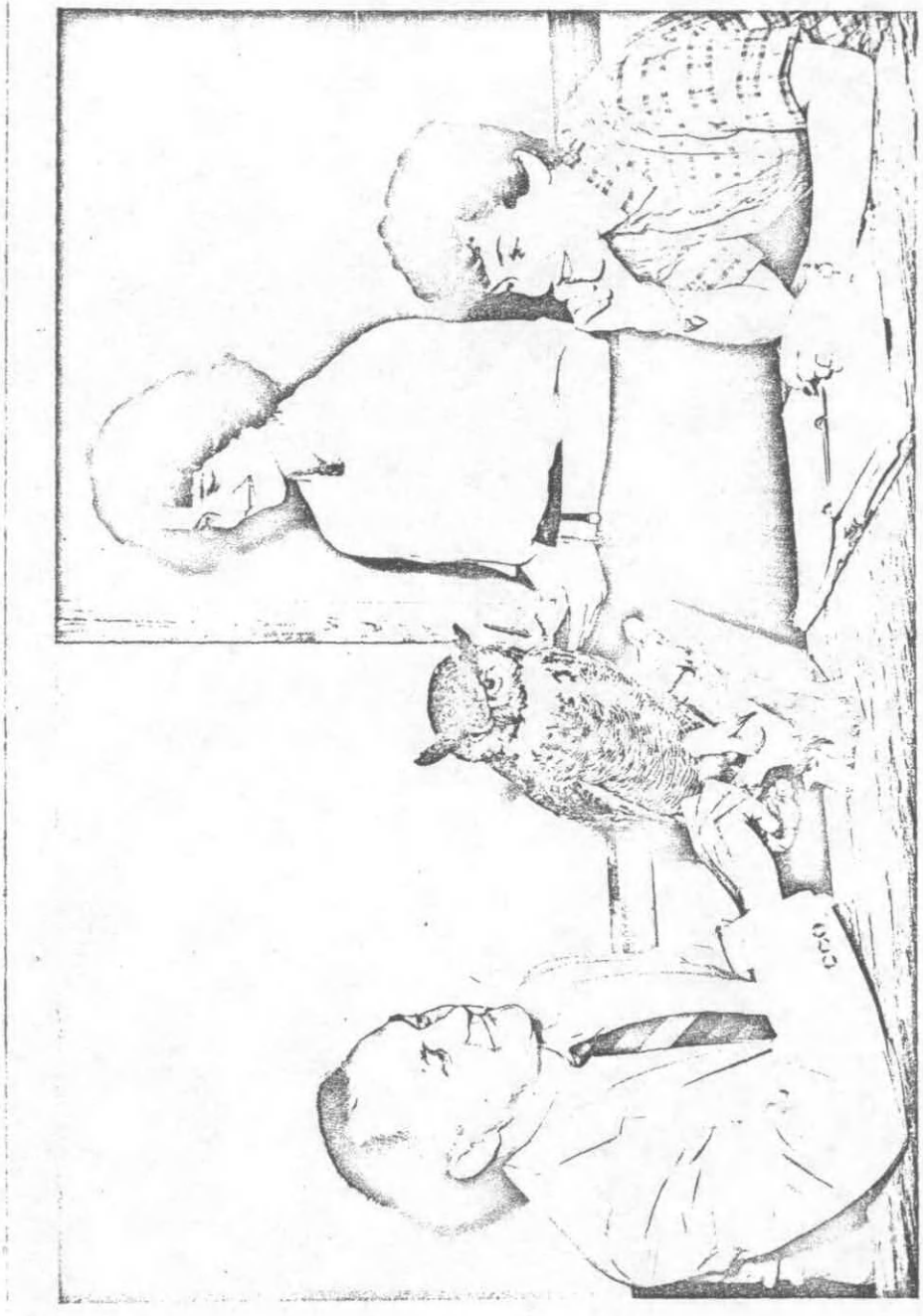


TRANSPLANTING A FLOWERING DOGWOOD TREE

(Cornus florida)

FLICKER, A COMMON WOODPECKER IN NEW JERSEY

NOWY EGRET, FOUND ALONG NEW JERSEY COAST



GREAT HORNED OWL, LIKE OTHER BIRDS OF PREY,

NOW PROTECTED BY LAW IN NEW JERSEY

APPENDIX D: NEWSPAPER ARTICLES

When biology students at the Ramapo Regional High School in Franklin Lakes take up the study of the genus reptilia, they can obtain first-hand information. The class mascot is a 6½-foot boa constrictor named Pedro. Shown here holding Pedro are Miss Barbara Comstock, 17, and Rev. Di Grazia, 15. (Bergen Evening Record photograph.)

Live Boa Constrictor Is Used In Ramapo H.S. Biology Study

Pedro The Reptile Enlivens Course, But Students Are Safe

Franklin Lakes — The study of biology at Ramapo Regional High School is quite a lively course thanks to Pedro, a 6½-foot boa constrictor.

ARRIVED 2 YEARS AGO

The reptile is under study by members of Frank Chrathwy's biology course. It was brought to the school by Chrathwy 2 years ago when he joined the faculty.

The boa, which eats rats alive, was given to Chrathwy by the students at a Connecticut high school while he was teaching there.

Pedro got his name because its natural habitat is South America. A 150-watt light bulb is kept burning in the snake's cage to simulate a South American climate. Chrathwy said Pedro seems to like a temperature of 80 degrees.

"He has been handled by more than 1,000 students since I have had him and he has never bitten any one," Chrathwy maintains.

Chrathwy said he expects Pedro, now 10 years old, to grow to a normal boa length of 12 feet.

Biology studies at the school are also augmented by a wildlife sanctuary, covering several acres.

A student Conservation club maintains several feeders in the sanctuary, [illegible] a nature program to the school auditorium [illegible]. Naturalist Rich will show a wildlife film

HERALD-NEWS

Rescott 7-6000 PASSAIC CITY ON N. J., SATURDAY, SEPTEMBER 22 1956 20 PAGES

A SNAKE AND SOME CHARMERS—Members of Frank Chrapliwy's biology class at Ramapo Regional High School have a boa constrictor to hold their interest. Miss Willie Ozias, left, Betsy Ross and Chrapliwy already have a good grasp of the subject. (Herald-News Photo)

Boa Adds Zest To Class Work

By Arthur F. Lenehan
Herald-News Staff Writer

There's a snake in the class at Ramapo Regional High School.

It's in the biology class. And it has already succeeded in charming all the students.

The six-foot long Boa constrictor was introduced to the class this week by Frank Chrapliwy, the teacher.

A pretty blonde girl named Willie Ozias exclaimed "Oooh!"

A lovely brunette lassie whose monicker is Betsy Ross began thinking of running up the white flag of surrender.

"It's for real," whispered an awed male.

[illegible] Snake [illegible]
[illegible] biology [illegible]
[illegible] at New [illegible]
Served in Connec[illegible]
[illegible] to new-born [illegible]
[illegible] this year.

"Pedro" [illegible]
[illegible] up [illegible]
[illegible] got [illegible]
chipped in and sent away to the zoo for teacher. The Spanish class at the New Milford school dubbed it "Senor Pedro."

At his modern, Chrapliwy keeps Pedro in a cage in the cellar of his new home on Oneida Avenue in Oakland.

He lives there with his wife, Louise, and their three children, Marlene, Irene, Jr., and Bill. The kiddies love the snake, too. Chrapliwy hopes he succeeds—in spite of the boa.

Also harbored in the cellar is a small lab space. That will be introduced to the biology class when the high school classes move from its present temporary quarters at Eastern Christian School in North Haledon to the [illegible] school now [illegible] on Franklin [illegible]. That will probably be in December.

A dog and a cat and a collection of 20 or 25 shells of various mammals also fill the Chrapliwy home.

The students in Chrapliwy's class took only 15 minutes to lose their shyness and begin handling the boa. They found Senor Pedro to be a pretty docile fellow.

"He likes children," said Chrapliwy. "And not to eat either."

The students like Senor Pedro, too. He certainly has quickened interest in biology at the [illegible].

When he's around you can say the students are all wrapped up in the subject.

PASSAIC · BERGEN
SECTION TWO

SUNDAY NEWS
NEW YORK'S PICTURE NEWSPAPER

New York 17, N.Y., Sunday, May 21, 1961

Pupils Having a Wing-ding

Give Birds All the Comforts of Home

Jack Muehleisen of Wyckoff nails a Ramapo Refuge shingle under a Swiss chalet-type bird feeder. Lou Ann Benecchi (below) and Lynda Ellen Hoff peel bark off the post.

By PAUL ZUMBO

When we say that Ramapo Regional High School in Franklin Lakes is for the birds, stay with us. What we are saying is that Ramapo Regional is flying high thanks to its Conservation Club which can well serve as a model for other schools in the state.

Founded in 1956 under the guidance of biology teacher Frank Chrapliwy, the wildlife sanctuary developed by the school club is now sprucing up for its spring activities on the 50-acre school site.

"We have 60 active members in the club who do all of the work on the nature trails, duck houses, and game bird feeders," Chrapliwy said. "Of course, one of the main reasons of the club is to acquaint students with the need for better utilization of the natural resources in our country [illegible] greater appreciation of the spacious areas surrounding the school, the teacher said. More than 1,000 evergreens have been planted by the students in the last three years. The evergreens were purchased from the State Conservation Department.

Also, more than 1,000 flowering bulbs and half a dozen dogwood trees were planted through the assistance of the Oakland and Wyckoff Garden clubs. Club members built bird feeders which dot the campus. Some 200 pounds of bird seed, suet and peanut butter has already been consumed this year, Chrapliwy said.

The New Jersey Audubon Society, which has its headquarters and sanctuary in Franklin Lakes, lends expert advice to the high school club, he added.

Duck Houses Built

"We built eight wood duck houses and placed them in the Franklin Lakes area," the teacher said. "We left one on the small fire pond adjacent to the school sanctuary.

"On our trails we have placed nail-keg corn feeders for game birds and many brush-pile shelters. A number of bluebird, tree swallow and wren homes can be found on our campus and we are pleased to see that some are already occupied," he added.

Some day, and he hopes soon, the teacher said, an outdoor classroom area will be set up complete with rustic benches, etc. "Such an area will provide educational, scientific and inspirational values for the students," [illegible] added.

"Besides the regular [illegible] ings and activities [illegible] divided into dairy [illegible] boy and girl members, the [illegible] servation Club also takes [illegible] sponsored field trips to [illegible] increase their knowledge of [illegible] biology," Chrapliwy said.

THE SUNDAY NEWS

COVERS NORTHWEST BERGEN COUNTY

No. 18 Gilbert 5-6400 RIDGEWOOD, N. J., APRIL 30, 1961 (112 Pages)

Club Has 60 Active Members

Sanctuary Being Developed

FRANKLIN LAKES — An active Ramapo Regional High School Conservation Club, formed soon after the school was opened in 1956 under the supervision of Frank P. Chraplitwy, biology teacher, is now in the process of its spring activities.

The Ramapo Regional Board of Education gave permission for part of the 50-acre school site to be developed into a wildlife sanctuary. The sanctuary now has a series of nature trails, labeled with trail signs with catch phrases, not name tags. For example, one reads, "Touch me today; I'll itch you tomorrow." Another attractive sign placed near an open wet area is illustrated with a yellow-throat warbler with the following caption: "Yellow-throat warbler; listen for its call — witchity, witchity, witchity, witch." A number of these signs have been given to the New Jersey Audubon Society for their trails.

Several brush-pile shelters for wildlife and nail-keg corn feeders (for game birds) are also found along the trails. A number of bluebird, tree swallow and wren homes have been placed around the campus and have already shown signs of occupancy. A total of eight wood duck houses have been built and set up in the Franklin Lakes area, including one on the small fire pond adjacent to the Ramapo High sanctuary.

Lends Advice

The New Jersey Audubon Society which has its headquarters and sanctuary in Franklin Lakes lends expert advice to the 60 active club members at the school.

A great number of varied bird feeders, built by the members, dot the campus. More than 200 pounds of bird seed, suet and peanut butter already have been consumed this year.

To help with the landscaping around the spacious outdoor areas of the school, more than 1,000 flowering bulb and six dogwood trees have been planted with assistance from the Oakland and Wyckoff Garden Clubs.

For three years, annual planting of 1,000 evergreens, purchased from the State Conservation Department, was done by the students on the school property.

One purpose of this club is to acquaint more students with the need for better utilization of our natural resources in our rapidly growing world and to instill in everyone a greater appreciation for the out-of-doors.

Members of the club, under the guidance of their adviser, participate in some of the many N. J. Audubon sponsored field trips which include journeys to Cape May and Camp Bernie and weekends to further increase their knowledge of field biology with emphasis on the ecological approach.

Other future activities will include further landscaping, establishing a school tree nursery, conducting an anti-litter campaign (in cooperation with "Keep America Beautiful, Inc.") and further development of the wildlife sanctuary. Several wind breaks around the school boundary is another project anticipated by the members.

An attempt will be made to keep a small area completely natural and untouched in order to cooperate with the Nature Conservancy in their long-range study of natural areas.

An outdoor classroom area, with rustic benches, is another long-range project contemplated. The outdoor classroom area will provide educational, scientific and inspirational value for the students

Members of th[illegible] the newly [illegible] attac[illegible]

uilding [illegible] serves as a search a[illegible] area for vari ant experiments undertaken by ology and life science students

BULLETIN

OAKLAND, N. J., THURSDAY, MAY 4, 1961

[illegible] Conservation Club Active

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The Regional Board of Education gave permission for part of the 50 acre school site to be developed into a wild-life sanctuary. The sanctuary now has a series of nature trails, labeled with trail signs with catch-phrases, not name tags. For example, one reads, "Touch me today; I'll itch you tomorrow."

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The New Jersey Audubon Society which has its headquarters and sanctuary in Franklin Lakes, lends expert advice to the 60 active club members at the school.

Build Bird Feeders

A great number of varied bird feeders, built by the members, dot the campus. Over 200 pounds of bird seed, suet, and peanut butter has already been consumed this year.

To help with the landscaping around the spacious outdoor areas of the school, over 1,000 flowering bulbs and six dogwood trees have been planted with assistance from the Oakland and Wyckoff Garden Clubs.

For three years, annual planting of 1,000 evergreens, purchased from the State Conservation Department, was done by the students on the school property.

One purpose of the club is to acquaint more students with the need for better utilization of our natural resources in our rapidly growing world and to instill in everyone a greater appreciation for the out-of-doors.

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Other future activities will include further landscaping, establishing a school tree nursery, conducting an anti-litter campaign in cooperation with "Keep America Beautiful, Inc." and further development of the wildlife sanctuary. Several wind breaks around the school boundary is another project anticipated by the members.

An attempt will be made to keep a small area completely natural and untouched in order to cooperate with the Nature Conservancy in their long range study of natural areas.

Outdoor Classroom

An outdoor classroom area, with rustic benches, is another long range project contemplated. The outdoor classroom area will provide educational, scientific and inspirational value for the students.

The members of the club are proud of the newly built greenhouse which is attached to the science wing of the building proper. It serves as a research and work area for various plant experiments undertaken by the biology and life science students.

Nature Trails Labeled

Conservation Club Beautifies Grounds Of Ramapo Regional High School

FRANKLIN LAKES — An active Ramapo Regional High School Conservation Club, formed soon after the school was opened in 1956 under the supervision of Mr. Frank F. Chrapliwy, biology teacher is now in the process of its spring activities.

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An attempt will be made to

Do-It-Yourself Nature-ally

In this age of do-it-yourself, a small group at Ramapo Regional High School in Franklin Lakes is doing just that. The immediate, or almost immediate, results will be some homemade landscaping around the new school, bird sanctuaries and nature trails.

The doers in this do-it-yourself program are members of the school's Conservation Club, sponsored by biology teacher Frank Chrapliwy and practice teacher William Steadaert and made up of members of the biology classes.

It is mere coincidence that the headquarters of the New Jersey Audubon Society, which has proved very helpful, is in Franklin Lakes but it was not by mere chance that this program got underway.

Believes in Philosophy

"I believe in the philosophy," says Chrapliwy, "that subjects better taught indoors be taught indoors and subjects better taught outdoors be taught outdoors."

There is no doubt that Chrapliwy, an ardent conservationist, believes biology is best taught outdoors.

When Chrapliwy checked with the Board of Education and found no objection to using part of the school's 50 acre campus for a wildlife sanctuary, he organized the club—as a service club with emphasis on natural resources, not as a social group.

There already is evidence of the club's activity on the campus. There are bird houses and bird feeders, built by the members, and put in place by the members. Almost 1,000 bulbs have also been planted by the group.

There also are the beginnings of nature trails and there are two dogwood trees, donated and planted by the group. The money to buy the trees was earned by selling bird houses made by the members.

And this is also part of Chrapliwy's method of integrating different school subjects into the program. The boys who also take shop, build the bird houses and also make sign boards for nature trails. The girls in art classes paint the houses and letter the signs.

The nature-trail signs, by the way, are catch-phrases, not name tags. One, for example, reads "Touch me today—I'll itch you tomorrow." Poison Ivy, for sure.

The organization has aroused an active interest in the student members. Even on rainy days pupils like president James David, secretary Peggy Kelly, treasurer Barbara Horvath, Emil Ippolito, Doug Tandberg, Ellen Van Lenten and Virginia Cooper show up at the biology classroom after school lets out to see if they can do some planting.

They are all also looking forward to one of the big projects. As Ed Frydendahl puts it, "One of the things we plan to do, is plant flowers in the big circle out front spelling out Ramapo Re-Ramapo Regional High School." gional High School."

"We're helping to landscape the campus and getting the personal satisfaction out of doing it ourselves," Chrapliwy says, "but more important we're instilling an interest in nature in these youngsters and someday they will be the taxpayers who can help give us a good conservation program."

(NEWS fotos by Ray Waters)

Instructor Frank Chrapliwy watches student plant bulbs.

Ear To The Ground

Students At Work In The Schoolyard

Young Gardeners Give Campuses A New Look

By JEAN KELLY

Bergen teen-agers don't sit around twiddling their green thumbs; they dig the good earth as well as rock and roll. Because of their labors, the old alma mater will have a lovelier campus.

Actually, the old alma mater may be brand new — or in the case of Bergenfield High, still under construction. Student organizations in Bergenfield will provide the basic background shrubbery for the new campus and take care of the evergreens until the school's grand opening next September. Y groups are earning money for the plants by selling programs at athletic events.

Tenafly High students moved into their new building last year and promptly constructed a patio. The Senior Class gave $50 toward the project; work was done by volunteers from the class under direction of ornamental horticulture students from Bergen County Vocational and Technical High School. Sophomore Louise Levy won the patio-design prize.

BIG RAMAPO PROJECT

The full-grown High School building — not quite 40 years old — is enhanced by sloping, shaded lawns but even here students find there is some room for improvement. Flower beds and trees have been planted by participants in Operation Green Thumb. They call the wherewithal [illegible] through candy sales.

[illegible] of the old [illegible] campus is at Ramapo Regional High School, which is on a 50-acre site in Franklin Lakes. Among projects: initial landscaping, wildlife sanctuary with nature trail, and a windbreak of several hundred hemlocks.

Everybody gets into the act here. Industrial arts students make trail signs, bluebird houses, and bird feeders. Science and conservation students are coordinated with the program. The New Jersey Audubon Society, which has its headquarters and sanctuary in Franklin Lakes, lends its expert advice. Also, the Society lets students share in sponsorship of natural history films, with the school share of proceeds going toward the purchase of plants and bird seed. Technical assistance is given by the Wyckoff and Oakland Garden Clubs.

Students have just bought 50 pounds of seed for the bird feeders. Keeping the feeders stocked is a winter project of interested pupils, who work under the direction of Frank Shrapliwy of the faculty.

Considerable work has been done on the grounds since the school's opening in January of 1977, but there's plenty of opportunity for further development. In fact, students for generations to come will be able to have a share in making this unusual campus a joy to behold and a haven for wild life.

Interest in campus gardening extends to the junior high set. Thomas Jefferson Junior High in Fair Lawn has its Green Thumb Club, which recently planted flower bulbs near the school's main entrance. A group of boys meets once a week with Interior Arnold Pressma to work on landscaping. They [illegible] fence for the entrance [illegible] and have taken on responsibility for weeding, cultivating, and trimming the grass of this area. Next step is landscaping of other areas around the school.

Blessed with a 50-acre school site, Ramapo Regional High School students are preparing a wildlife sanctuary on part of the campus. A labeled nature trail will be one of the features. Edward Frydendahl is shown hanging the sanctuary sign. Raymond Di Gracia holds it in place, and Janice Swain checks to see that it is even.

What may appear to be knotholes on this log are actually larders for birds. Holes have been drilled and filled with food. Winter feeding of birds is one of the student projects at Ramapo Regional High School in Franklin Lakes. John Hamilton holds the log as John Brinkema steadies it and Barbara Comstock looks on. (Bergen Evening Record photographs.)

Li[illegible] Boa Provides Lively Lessons

NORTH HALLIDON -- "Land snake's alive!" If it isn't a live boa constrictor in the biology class at the Rockdale Regional High School[illegible] at Eastern Christian [illegible]

Biology teacher [illegible] Chrapliwy, caused a [illegible] last week when he introduced the six foot boa to his class. He explained that the snake was given to him by former students at New Milford High School in Connecticut, where he taught last year. It seems that while at that school Chrapliwy had a [illegible] snake that died. Students felt sorry, and chipped in for this boa. The Spanish class at New Milford called it "Senor Pedro".

Chrapliwy keeps the boa in a cage in the cellar of his home on Oneida Ave., in Oakland. He also has a tarantula spider, but he'll wait till students move from their temporary quarters in Eastern Christian High School, to their new Eastern Regional High School in Franklin Lakes, before he introduces that.

Senor Pedro like to get around, which is natural since constrictors usually wrap themselves about objects. However the class soon got over their fear and began handling the boa. "He likes children", said Chrapliwy, not referring to the snake's appetite of course.

Interest has certainly livened in the biology class, but it might be a good idea if teacher checked the class role from time to time, just to make sure.

[illegible] TUTORS' [illegible] STUDENTS

Ramapo High School Body Watches and Works at Campus Sanctuary

By JOHN W. SLOCUM

Special to The New York Times.

[illegible] LAKES, N. J. [illegible] today—I'll [illegible] you tomorrow." This catch [illegible] on a small wooden sign [illegible] attention to poison ivy on a [illegible] trail at the Ramapo [illegible] High School here. [illegible] scores of trails through [illegible] part of the fifty acres [illegible] that is a wildlife sanctuary [illegible] ly birds, trees and shrubs. [illegible] confusing Latin adorns the markers, but sometimes there is a painting by an art student who is a member of the Conservation Club.

Membership in the club is a popular activity, but it is restricted to sixty of the 1,000 students — twenty each drawn by lot from the sophomore, junior and senior classes—all of whom are present or former biology students. Frank F. Chrapliwy, biology teacher, tennis coach and ornithologist, is the faculty adviser.

Field Notes Taken

Under Mr. Chrapliwy's direction, the students are taught to observe natural phenomena. To make sure they do not walk through the woods blindly, the instructor has them take field notes, which he checks.

The New Jersey Audubon Society, which has its headquarters next to the school, lends expert advice and is co-sponsor with the club of lectures by wildlife experts. To show their appreciation, the students planted 100 three-year-old evergreens on the society's grounds when they planted 1,000 trees on their campus. A cake sale sponsored by the seniors brought in the funds for the trees.

Dotting the campus is the club members' work, much of it done on Saturdays. Bird feeders and houses all built by the students, abound. One is a three-story purple marten house, and in the "fire pond"—a source of water to fight fires—is a wooden duckhouse on a piece of angle iron driven deep into the mud.

Game Birds Are Tenants

As the students clean up the sanctuary, they pile brush to attract thrushes and put out game-bird feeders made from nail kegs and filled with corn. Mr. Chrapliwy reports that grouse, pheasant and woodcock make their homes on the campus. Now and then deer visit; Mr. Chrapliwy saw ten from his classroom one day.

Among the club's plans is the conversion of a glade into a classroom. Hewn logs will be the seats. From that vantage the members will have close observation of the forty to fifty species of birds at hand and the twenty to twenty-five varieties of trees.

For those who care for the exotic, a trip to Mr. Chrapliwy's room is rewarding. There Señor Pedro, mascot of the club, lives in solitary comfort in a large cage. He is not likely to be mishandled, for Pedro is a six-and-a-half-foot boa constrictor.

Ramapo Club Puts Green Thumbs To Work to Beautify H.S. Grounds

FRANKLIN LAKES The Student Conservation Club at Ramapo Regional High School is spearheading a drive to transform the 50-acre campus into a natural showplace for this area.

On Tuesday the club expects to complete planting narcissus, grape hyacinth and crocus bulbs around the main buildings, the current project is a long-range program that includes plans for the development of a wildlife sanctuary and outdoor science and biology classroom.

Initiative for the campus development and beautification program belongs to the club, which is composed of 50 members of the sophomore and junior classes under the direction of Frank Chrapliwy, biology teacher, and William Standeart, practice teacher from Montclair State Teachers College.

Materials Were Donated

The bulbs, peat moss and bone meal were donated to the Conservation Club by the Ramapo Association of Parents and Teachers through a committee headed by Mrs. William Simonds and Mrs. Herman Menes.

Members of the Wyckoff, Oakland and Franklin Lakes Garden Clubs supervised the plantings. Assisting were Mrs. Peter Ossi and Mrs. Menes from Wyckoff; Mrs. Claude Northrop, Mrs. Raymond Nagle, Mrs. Howard Payne and Mrs. William Hibbert from Franklin Lakes; and Mrs. Adolph Winter and Mrs. William Freeman from Oakland.

The Conservation Club was organized with the objective of beautifying the school grounds in as many ways as possible.

Work began last year when members sold bird houses made from crates and with the proceeds bought, planted and cared for two flowering dogwood trees in front of the administrative offices.

Provided Bird Feeders

The students have built and placed numerous bird feeders of different types on the school grounds. A donation of wild bird seed from the parents association was put in the feeders recently.

In cooperation with the New Jersey Audubon Society the club has made nature trail signs for the Lorrimer Sanctuary in Franklin Lakes and through the courtesy of Frank McLaughlin, executive director, uses the grounds of the sanctuary for field trips.

Future plans include making nature trails on part of Ramapo's 50 acres patterned after those of the Audubon Society and the development of a wildlife sanctuary on low areas to be used eventually as an outdoor science and biology classroom.

To bring back the bluebird to this area the club will build nesting boxes in cooperation with the Audubon Society.

Climax of the project will be the planting of flowers and other vegetation in the school's front circle to spell out the initials, RRHS.