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### Attempt to measure the quantity and intensity of conservation education in Missoula County High School

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AN ATTEMPT TO MEASURE THE QUANTITY AND INTENSITY  
OF CONSERVATION EDUCATION  
IN MISSOULA COUNTY HIGH SCHOOL

by

Harley B. Lorange

B. A. Montana State University, 1929

Presented in partial fulfillment  
of the requirements for the degree of

Master of Education

MONTANA STATE UNIVERSITY

1955

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Date

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## TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION . . . . .	1
Problem . . . . .	1
Limitation . . . . .	2
Limits of coverage . . . . .	2
Delimitation of the problem . . . . .	3
Variations in answers . . . . .	3
Terminology . . . . .	3
Related Literature . . . . .	4
Testing programs . . . . .	4
Methods of teaching conservation . . . . .	4
As a subject . . . . .	5
As a unit . . . . .	5
Material for teachers . . . . .	6
II. RESEARCH PROCEDURE . . . . .	7
Developing the questionnaire . . . . .	7
Organizing the subject matter . . . . .	7
Selection of the type of question . . . . .	7
Selection of the questions . . . . .	8
Getting complete responses . . . . .	8
Information regarding rank and size of class . . . . .	9
Allocating time . . . . .	10
Source of Data . . . . .	10
Place . . . . .	10

CHAPTER	PAGE
Methods of procedure . . . . .	12
Distributing the questionnaire . . . . .	12
Returns . . . . .	12
Treatment of data . . . . .	13
Division of replies . . . . .	13
III. RESULTS OF THE RESEARCH . . . . .	15
Introduction . . . . .	15
Measuring the intensity . . . . .	15
Intensity of conservation education	
ranked by departments . . . . .	15
Intensity ranked by areas . . . . .	18
Measuring quantity . . . . .	18
Quantity of conservation education as	
ranked by departments . . . . .	18
Grouping of similar activities . . . . .	22
Grouping within departments . . . . .	22
IV. OPINIONS AND SUGGESTIONS . . . . .	27
Introduction . . . . .	27
Teaching conservation . . . . .	27
Teaching by subject . . . . .	27
Teaching by units . . . . .	27
Measuring conservation-incidence . . . . .	28
Primary objective of the study . . . . .	28
Secondary objective of the study . . . . .	28
Suggestions for future . . . . .	28
Study groups . . . . .	28
Use of the measuring device . . . . .	28

CHAPTER	PAGE
Variations in attitudes . . . . .	30
BIBLIOGRAPHY . . . . .	34
APPENDIX, INSTRUMENT USED . . . . .	36

## LIST OF TABLES

TABLE	PAGE
I. Hours devoted to conservation education by department and area . . . . .	16
II. Pupil hours resulting from number hours acting on number pupils by department and area . . . . .	19
III. Number of pupils affected by departments and area ranked by total pupils . . . . .	20

## CHAPTER I

### INTRODUCTION

The study which is reported in this paper is the result of two interests.

Conservation has been a hobby of the writer since the subject was introduced during his elementary education. The second interest arose during a study of curriculum revision in graduate school. The question of how to measure what is being taught in a given field not covered by a course of study offered a challenge to see what could be accomplished. This problem is started only to investigate the possibilities of measuring objectively a field of material taught in parallel with several courses of study.

#### I. PROBLEM

Statement of the Problem. This study is an attempt to measure the intensity and quantity of conservation education being offered to the students of Missoula County High School and to evaluate the results of that measurement in terms of an administrative policy to provide adequate instruction in the field of conservation.

Importance of the Study. The Montana Conservation Council prints a news letter on which this slogan appears,



"Conservation is Everybody's Business."<sup>1</sup> Too many times everybody's business becomes no one's business.

Somewhat the same situation has developed in the teaching of conservation. The task of developing a course of study and the responsibility of deciding where in the school curriculum, as it exists, should the course be entered has not been definitely assigned. It is the opinion of conservation minded individuals that because of this indecision there is very little being done in the field of conservation education.

If this field is to be freed from judgments of opinion, devices that can reduce ideas to objective data must be developed. Measuring objective data provides a basis for judgment and decision.

Only through such devices can the quantity of conservation offered students be measured.

## II. LIMITATIONS

Limits of coverage. This study was limited to a coverage of the activities in conservation in Missoula County High School. The teachers constituted the universe for this high school, but the results do not necessarily have implications for other school systems.

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<sup>1</sup>Montana Conservation Council, Montana Conservationist (Billings, Montana, Eastern Montana College of Education, 1955) p. 1.

There was no attempt made to measure the learning which the student had acquired, as separating the information acquired in high school from that which was acquired in grade school or through experience in the field is almost impossible.

Delimitation of the problem. Studies of this nature have either never been made, or they have not received state or national attention. Consequently there are no available tests with which to measure the quantity of conservation education being taught. Since there is no agreement among the agencies which deal in conservation and in education on what should be taught, those items found most commonly mentioned will constitute the basis for testing.

Little work has been done in developing testing programs for conservation education. Therefore, there was no opportunity to compare the results of this test with existing norms or with that which might be considered ideal.

Variations in answers. There were some variations in the answers on the questionnaires because of the different concepts of the teachers questioned. Without a try-out of the instrument, some of the questions were misinterpreted.

### III. TERMINOLOGY

Terms used in this study will not be sufficiently technical to require definition.

For many years, the word "Conservation" was used in so many ways that its meaning was either vague or highly specialized. Continued use of the term and a wider concept of the problems connected with it have brought about a more unified understanding of the meaning of the term and the word no longer rates a special definition.

#### IV. RELATED LITERATURE

The efforts that have been expended on conservation education have been put into the specific fields that each specialist represented. The soil conservation engineer writes booklets on soil conservation; the forester writes books on timber conservation; the psychologist writes on conservation of human resources. A unification of these efforts will eventually be made. Before that time comes, more definite information on what is actually being taught will be needed.

Testing programs. So far there are no tests available that measure the quantity of conservation education being offered.

Since there are no goals set as to the amount of conservation education that is desirable in various subjects, measuring the teacher's work will be used as a means of determining how much time is spent in each class on conservation education.

Methods of teaching conservation. There are numerous outlines, workbooks, and pamphlets available that serve

as guides to the teaching of conservation.<sup>2</sup> The methods and techniques of teaching are inherent in the manner in which the work is presented. Generally they fall into three classifications: (1) to teach conservation as a subject; (2) to teach conservation as a unit within a subject; (3) integration throughout a subject.

As a subject. The United States Government, through the Soil Conservation booklets designed to serve as outlines to be followed in teaching conservation as a subject. Two such booklets do not have bulletin numbers, but are available upon request under the titles, "An Outline for Teaching Conservation in Junior High Schools" and "An Outline for Teaching Conservation in High Schools."<sup>3</sup>

As a Unit. A later edition from the same source follows the second plan mentioned above and suggests the teaching of units in English, science, mathematics, agri-

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<sup>2</sup>W. C. Allee, Principles of Animal Ecology (Philadelphia; Saunders Co., 1950); D. L. Allen, Our Wildlife Legacy (New York, Funk & Wagnalls, 1954); V. G. Carter, Man on the Landscape: The Fundamentals of Plant Conservation (Washington, D. C.: National Wildlife Federation, 1949 i.e. 1950); H. H. Bennett, Elements of Soil Conservation (New York; McGraw-Hill Company 1947); A. H. Carhart, Water - Or Your Life (Philadelphia: Lippincott, 1951); W. P. Beard, Teaching Conservation, A Guide in Natural Resources Education, (Washington: American Forestry Assn., 1948); E. P. Odum, Fundamentals of Ecology (Philadelphia: Saunders, 1953); Wm. Vogt, Road to Survival (New York: W. Sloan Association, 1948)

<sup>3</sup>United States Department of Agriculture, An Outline for Teaching Conservation in Junior High Schools (Washington, D. C., United States Bureau of Printing); United States Department of Agriculture, An Outline for Teaching Conservation in High Schools (Washington, D. C., United States Bureau of Printing)

culture, history, economics, and sociology. It can be secured by requesting "An Outline for Teaching Conservation in High School", Soil Conservation bulletin, PA-201.<sup>4</sup>

A series of outlines have been published by the local Soil Conservation Service. While they were on the elementary level, some suggestions were added to the information already available on the most common areas of conservation being studied by the experts. They are titled "Outlines for Teaching Conservation, Grades One Through Eight."<sup>5</sup> They are edited by the National Association of Soil Conservationists and published by the J. R. Watkins Company.

Material for the Teachers. Facts and information useful to the teachers are not so well organized, which is to be expected since it is source material. Because college courses give more basic information, teachers can draw their own illustrations and ideas into the discussions and fit the teaching to the age-grade level of the students. Two main fields supplying basic information are ecology and conservation. In the bibliography of this study, there will be found a number of texts that will give an idea of the material available.

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<sup>4</sup>United States Department of Agriculture, An Outline For Teaching Conservation in High School, Soil Conservation Bulletin, PA-201 (Washington, D. C., United States Bureau of Printing)

<sup>5</sup>National Association of Soil Conservationists; Outlines for Teaching Conservation, Grades One Through Eight (The J. R. Watkins Company, 1954)

## CHAPTER II

### RESEARCH PROCEDURE

#### I. DEVELOPING THE QUESTIONNAIRE

Organizing the subject matter. After a survey of the field of conservation, the material was sorted into groups by subjects. The subjects were those of the usual curricula divisions. Many of these subjects were allied to a central theme. For example, history, geography, contemporary problems, sociology, and economics raise the same questions in conservation. It was logical to classify these together. When the material was rearranged following the collection of data, the resemblance to departments was apparent. The logical solution to this problem appeared to be the acceptance of the classification according to departments. A large sheet was divided into columns with each column representing a department. The following headings appeared on the sheet: science, English, social studies, mathematics, commercial, music, arts and crafts, physical education, and health.

Selection of the type of questions. In attempting to get the teachers to report all of their activities, the open end question was chosen to permit greater ranges of answers on fewer samples. Since all of the teaching

experiences would give a more accurate knowledge of the situation as it existed, the questions were phrased in such a manner that additional activities were suggested.

This brought certain problems in the tabulation of replies, since some activities were reported in a different classification than the one in which they were expected. Correction of these differences was attempted by the tabulation of the answer in the correct category wherever possible.

Selection of the questions. There appeared to be about one hundred fifty questions pertinent to the high school level which could be devised from the material in the numerous outlines<sup>1</sup> and the material presented in the course on conservation education at Montana State University. Many of these overlapped and some were irrelevant. By careful selection the number was reduced to seventy-one. One questionnaire offered an addition--"What about smoking in the forest as a fire hazard?"

Getting complete responses. The question arose, "Would teachers answer only those questions listed under their department?" It was a valid question. Also, the question arose, "Are we teaching in all the areas of conservation?" Western Montanans are especially conscious of

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<sup>1</sup>W. C. Allee, Principles of Animal Ecology (Philadelphia: Saunders Co., 1950); D. L. Allen, Our Wildlife Legacy (New York: Funk & Wagnalls, 1954); V. G. Carter, Man on the Landscape: The Fundamentals of Plant Conservation (Washington: National Wildlife Federation, 1949 i.e. 1950)

conservation as it applies to forests and watersheds. Are they equally aware of the conservation of agricultural since they are not extensive cultivators of land? Have they been made conscious of the conservation of human energy and life?

To encourage all teachers to answer all questions the seventy-one questions were rearranged under headings suggested by the areas of conservation. These headings were soils, plants, minerals, animals, water, and society. In this manner, all questions under the division of English under the first arrangement would be distributed through all the categories of the second arrangement. Thus any teacher could not be sure that he had answered all questions pertaining to his field without going through the entire questionnaire.

This dual arrangement had the advantage over a single classification in that it was possible to rank the replies by departments and areas, thus giving a more accurate picture of the offerings to the students.

Information regarding rank and size of class. Each teacher was asked to record, on the front page, a few facts regarding the number of students in each class and, for convenience, to number their classes from one through five, and then to number any additional club or other activity. By writing the number of the class on the following pages, the scorer could determine the number of students affected and the learning level of the students for any response listed by the teacher.



Allocating time. Teachers expressed concern over the problem of time allotted to various activities. Sometimes an activity would be discussed in a regular assignment. This might consume only a portion of a period or it might consume a period and part of another. Other problems were made as one, two, three, or more period assignments and the time element could easily be determined. To arrive at a tangible answer to this problem, a decision was made that a major discussion would be allocated one period (one hour) of time. If the assignment was for a stated number of class periods, then that number of hours would be assigned to that activity.

## II. SOURCE OF DATA

Place. Missoula County High School was selected for several reasons. The administration had indicated an interest in conservation by engaging in several activities to increase faculty interest in conservation.

Each year the administration has attempted to encourage some new teacher to take advantage of the opportunity to become a member of the Montana Conservation Caravan.<sup>3</sup> Another teacher has been encourage to take advantage of the scholarship awarded by the Soil Conservation District<sup>4</sup> to the teacher

<sup>3</sup>Montana Conservation Council, George H. Gloege, Executive Secretary, Eastern Montana College of Education, Billings, Montana

<sup>4</sup>Missoula County Soil Conservation District, John Schroeder, President.

Taking the Conservation Education course at Montana State University.

In April 1954, the entire teaching staff was taken on a well-planned and well-executed trip around the Missoula vicinity to points where conservation practices and theories could be stressed. Personnel from the Forest Service and the Soil Conservation Service acted as consultants for the education information.

Within the faculty, a committee had been appointed to head up conservation activities. These activities included a panel discussion on conservation education as it could apply to Missoula County High School, and during National Conservation Week the faculty meeting was given over to the showing of the conservation film "The Web of Life."<sup>5</sup>

In addition, Missoula County High School was an area where cooperation would be given to such a study because of the proximity of the school to the investigator doing the study. Teachers found it convenient to drop in and ask questions about topics on which some doubt had arisen, and it was equally as convenient to ask the teachers if they had taken time to fill in the form.

The school employs over sixty teachers in the various departments. Moreover, the departments were sufficiently defined so as to permit comparisons.

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<sup>5</sup>The Web of Life, (Film, United States Forest Service.)

### III. METHODS OF PROCEDURE

Distributing the questionnaire. Since all of the faculty were within an area comprised of two buildings, handing the questionnaire to each teacher personally was possible. This had a decided advantage in securing cooperation. As there already existed personal acquaintance and respect, there was a feeling of acceptance of the study by almost every teacher in the system. Certain errors on the questionnaire were pointed out and explained. One of the errors was the lack of headings on the columns for the report of the teacher on the hours spent on each activity and the registering of the number of the class. However, as the teachers understood what was wanted, many of the teachers filled in the number of students affected, and this turned out to be a saving on the time of the scorer. Another error that was apparent and would be pertinent in later studies was the lack of a signature; however, this was not a serious blunder at the particular time, as all of the teachers were aware of the origin of the questionnaire.

Several teachers have asked for copies of the questionnaire for their own personal use in the class room as a source of suggested ways for improving their teaching.

Returns. At the time that the questionnaires were handed out, a check list was made out that provided for a record of the teachers to whom the instrument had been

given, and a place was provided for the recording of the questionnaires that were returned.

Of the sixty questionnaires issued, forty-two were returned. This is exactly seventy percent. The number returned may have been influenced a great deal by the fact that the questionnaires were issued the last few days of the school year.

#### IV. TREATMENT OF DATA

Division of replies. Returned questionnaires were separated into eight divisions, corresponding to the departments of the faculty.

Questionnaires returned by the teachers of art, handicraft, manual training, agriculture, mechanical drawing, and home economics were tabulated under arts and crafts.

Questionnaires returned by the teachers of general science, biology, chemistry, and physics were tabulated under science.

Physical education and health were taught by the same instructors. Those reports were combined.

English and languages were grouped together.

Music was tabulated alone because of the nature of the classes.

All of the commercial classes were treated as one unit.

Mathematics had little in common with any other subject and was treated as a department.

History, geography, contemporary problems, and social studies were combined into one department.

Large sheets of paper were divided into sections both horizontally and vertically. Down the left margin the names of the instructors in a department were written. Across the top of the sheet, horizontally, the divisions were inserted. Spaces were provided at both the right side and the bottom for totals by hours, by pupil hours, and by number of pupils affected. This arrangement permitted totals to be made on each teacher and each department. From this sheet, a master sheet was designed to make possible the acquisition of totals by departments and by areas of conservation.

From this master sheet, three charts were made to cover the hours taught by department and area, the pupil hours of activity by department and area, and the number of pupils affected by departments and area.

### CHAPTER III

## RESULTS OF THE RESEARCH

### INTRODUCTION

The intensity of conservation education taking place was measured by the hours which a teacher devoted to it. The amount of time used for discussion or other activities indicates the extent of the interest and desire of the teacher to teach the values of conservation.

The quantity of conservation offered was measured by the number of hours of student activity multiplied by the number of pupils present in the class. Therefore the number of pupils and the pupil hours were charted to make possible the ranking of departments from the one which offered the most conservation education to the one which offered the least.

#### I. MEASURING THE INTENSITY

Intensity of conservation education ranked by departments. Data used to rank the departments according to intensity are found in Table I. Arts and crafts which included reports from classes in agriculture and home economics, stood at the top of the list. If this department was ranked by total number of hours (338), or by average

TABLE I  
HOURS DEVOTED TO CONSERVATION  
EDUCATION BY DEPARTMENT  
AND AREA

Department	Area						Total Hours	Teachers Reporting	Aver. Hours Per Teacher
	Soil	Plant	Mineral	Water	Animal	Society			
Arts and Crafts	134	23	4	11	18	148	338	8	42.25
Science	50	17	2	22	8	25	124	4	31
Social Studies	27	6	6	18	1	49	107	5	21.4
Health and P. E.	11	2	0	4	1	7	25	2	12.5
English	5	3	0	4	0	7	19	8	2.375
Mathematics	1	0	0	0	0	0	1	6	.166
Commercial	0	0	0	0	0	0	0	7	0
Music	0	0	0	0	0	0	0	1	0
Total	228	51	12	59	28	2 36	614		

hours per teacher (42.25), it was first. As some of the teachers in this department had not given any time to conservation activities, the incidence of conservation education in other classes in the department would be much great than the average for the department.

The science department ranked second in both the number of hours taught (124) and the average per teacher (31). The total hours reported for the department were evenly distributed among the four teachers reporting.

The third ranking department in terms of hours taught (107) and the average hours per teacher (21.4) was the social sciences. Not only were the hours quite evenly divided among the five teachers reporting, but the hours were also fairly evenly divided over the areas of conservation education.

Health and physical education ranked fourth in hours taught (25) and in average hours per teacher (13.5). The sharp decline between the third and fourth rank cannot fail to be noticed and must draw some consideration from administrators studying this problem.

English and mathematics ranked fifth (19) and sixth (1) in that order. These results are significant in that the question might arise as to whether or not they are doing all they could do.

The commercial and music departments were represented by returned but no conservation education activities were reported by any teacher.



Intensity ranked by areas. When the total hours devoted to conservation were tabulated, activities dealing with the social aspects of conservation (236 hours) outranked activities dealing with the conservation of soil (228 hours) by only a small margin. These two areas accounted for seventy-five and one-half per cent of the total hours devoted to conservation. The areas of water conservation, plant conservation, animal conservation, and mineral conservation ranked from third to sixth in that order. The two outstanding pieces of information in this field are: the almost equal rate of incidence in humanities and soil conservation, and the comparatively low rate of incidence in the other fields.

## II. MEASURING QUANTITY

Quantity of conservation education as ranked by departments. Table II and Table III are the result of the tabulation of data chosen to measure the quantity of conservation education. Pupil hours are the product of the number of hours taught and the number of students affected (Table II). This should picture the size of the classes, which is an important factor in the quantity of conservation education being offered. The total number of pupils affected (Table III) was chosen to picture another phase of the quantity idea. The total by departments is a measure of students that can be reached by each department. However the totals beyond the departments have little significance

TABLE II

PUPIL HOURS RESULTING FROM NUMBER HOURS  
ACTING ON NUMBER PUPILS BY  
DEPARTMENT AND AREA

Department	Area						Total pupil hours
	Soil	Plant	Mineral	Water	Animal	Society	
Arts and Crafts	5369	761	56	349	861	8342	15,737
Social Studies	3771	780	692	2439	151	6799	14,632
Science	4718	2031	192	2113	884	3178	13,116
English	466	376	0	266	0	763	1,871
Health and P. E.	660	120	0	255	60	465	1,560
Mathematics	28	0	0	0	0	0	28
Commercial	0	0	0	0	0	0	0
Music	0	0	0	0	0	0	0
Total	15011	4068	940	5422	1956	19547	46,944

TABLE III  
NUMBER OF PUPILS AFFECTED BY  
DEPARTMENTS AND AREA  
RANKED BY TOTAL PUPILS

Department	Area						Total Number of pupils
	Soil	Plant	Mineral	Water	Animal	Society	
Social Studies	397	390	484	390	151	635	635
Arts and Crafts	436	227	14	200	183	552	552
English	166	228	142	142	0	424	456
Science	352	160	96	256	160	256	352
Health and P. E.	60	60	0	135	60	135	135
Mathematics	28	0	0	0	0	0	28
Commercial	0	0	0	0	0	0	0
Music	0	0	0	0	0	0	0

because of the overlapping that occurs as students take several courses in high school.

Arts and crafts affected the second largest number of pupils (552) but reported the greatest number of pupil-hours (15,737). This was accomplished by the greater incidence of conservation activities.

Social studies, which ranked third in incidence of conservation, enrolled the greatest number of students (635) and this caused the department to rank second in pupil-hours (14,632).

Ranking third in pupil-hours (13,116), the science department ranked fourth in the number of pupils (352). This represents a larger incidence of conservation education but teachers had smaller classes.

The ranking in the English department indicates the reversal of the situation in the science department. Teachers in the English department had a lower rate of incidence in conservation education (ranking fifth) but English classes were evidently larger. English department ranked fourth in pupil-hours (1871) and third in enrollment (456). The sharp decline in pupil-hours at this point was particularly noticeable.

Fifth and sixth ranks in both pupil-hours and numbers of students were held by the departments of health and physical education, and mathematics.

The commercial and music departments reported no conservation activities.

### III. GROUPING OF SIMILAR ACTIVITIES

Grouping within departments. While many of the teachers in a department carried out a few activities that were peculiar to their own classes, there were many activities of a very similar nature.

In the science department the activities dealing with capillary action in various types of soils were quite similar. All of the teachers reporting from the science department reported demonstrations and experiments that illustrated absorptive qualities of various materials. One teacher used towels and blotters, another used loose and packed earth, another used raw earth and humus, but the results could be identified by the students. One of the teachers reported a novel manner of seeing the action in capillary attraction by using two glass lamp chimneys or globes so that the action was visible.

Under the activities showing man's dependency on water, all of the teachers reporting listed some activity on the use of water in the body of man. Since man's dependency on water extends beyond this limitation, there were many other activities listed that dealt with the hydraulic machines, relative and absolute humidity, hydrologic cycle, source of minerals, evaporation, dew, rain, frost, and the effect of boiling water, especially in the development of steam. The effect of hard water on steam engines was mentioned.

To show the differences that existed in department work, the activity listed under the question, "What activities do you carry out to show the value of changing areas where disease is apt to reproduce into areas where the product is useful," only one teacher reported any activity. This teacher listed two activities: raising bacteria in the laboratory for study and a study of the history of public health.

One-half of the teachers in the science department listed some activity relative to the study of conservation of animals. However, only one teacher reported activity on the particular subject. This report included discussions and motion pictures on the fields of comparative anatomy studies and "balance of life studies." The other activities listed did not fall within the scope of conservation of animals since the activities dealt with the waste products from wood, oil, and coal, and the study of sewage problems.

Seventy-five percent of the teachers reporting from the science department, reported some activity on conservation of resources by more efficient use. The activities varied from a study of waste wood products to farming methods to soil usage. The fact that the activities varied is not as important as the fact that they presented some challenge to the students under their care and tutelage.

In conserving human life by planning community health program, three-fourths of the science teachers reported

activities. The activities were not co-incidental. Study of public health techniques, decline of diseases through vaccinations, and the purity and low cost of an adequate water supply, were among those listed.

In the arts and crafts department, there was a much wider range of activities than in any other department. In the conservation of human energy, thirty-seven and one-half per cent of the teachers reporting used some related activity to time-motion studies. Such items as the proper arrangement of buildings on a farm or the arrangement of a kitchen to provide for the greatest amount of work accomplished for the expenditure of the least amount of effort were mentioned.

Arts and crafts department made greater use of movies and films, outside speakers, and government reports than did any other department. It should be kept in mind that these teachers are somewhat directly responsible to government agencies and must report to their superiors. Films and movies were mentioned the greatest number of times (26), outside speakers followed (11), and government reports ranked third (5).

One of the aspects of conservation about which a high school could do a great deal to transform the thinking of students is the utilization of waste projects and the development of synthetics. Four teachers from a list of eight introduced this subject only four times.

In contrast to the problem of waste products and synthetic manufacture, the question of family earnings and finance received the attention of six teachers. The relation of these two questions to a third question, developing students to their highest potential, should receive priority of time in the conservation movement.

Conservation was mentioned seven times in connection with recreational and avocational problems in the arts and crafts department.

One interesting feature of the study of the responses from the social studies department was the variations of the answers from those expected. Instead of limiting their activities to the end result of conservation the teachers devoted considerable effort to the development of background material. On the problem of the development of nations as world powers, four teachers introduced this question seven times. Some of the phrases used were "resources in world trade," "have-not nations," "reasons for colonization," and the "need for food."

All of the teachers reporting from the social studies department, reported some activity dealing with the use of minerals in connection with conservation. This was a greater rate of incidence than existed in either the arts and crafts department (12.5%) or the science department (25%).

Only forty percent of the teachers reporting from the social studies department reported any activity on the question concerning the dependence of man on water.



Sixty percent of the teachers returning questionnaires from the social studies department used class activities to relate conservation to the controlling of floods and watersheds. The activity most frequently mentioned was a comprehensive study of T. V. A.

The relatively important problem of the conservation of resources by more efficient use was introduced in the classes of only one teacher in the social studies department.

Sixty percent of the reports from the same department had introduced studies relative to the effect of natural resources on the stability of population.

The same sixty percent of the teachers reported sponsoring activities bearing on the reliance of certain manufacturers on natural resources. The common experience was to take the students to the local abattoir where two factors could be studied together, the utilization of waste products and the products of the farms.

On the question of the development of new uses for replacable resources, only forty percent of the teachers from the department reported any activity. One teacher used the biographies of noted scientists.

The low rate of incidence of conservation education in the departments other than the top three ranking departments made grouping of responses impossible. Many of the activities were listed only once and some of the others were listed with such variances that there was no surety that the same activity was under consideration.

## CHAPTER IV

### OPINIONS AND SUGGESTIONS

#### INTRODUCTION

As this was only a very elementary study in a field not yet fully organized, the value of the data is unknown.

#### I. TEACHING CONSERVATION

Teaching by subject. Plans have been advanced suggesting the teaching of conservation by subject field. In looking over the tables in this study, the writer feels that this should be limited to some subjects. Evidence points to the idea that conservation is a factor in the study in some departments but not in all. Some of the departments with low incidence in conservation education might be improved, especially those with larger enrollments.

Teaching by units. If the plan to teach conservation by units were to be followed, and the units were to be cooperatively worked out in certain major fields, many of the weaknesses might be overcome. At least, a majority of the students would be given some training in the major areas of conservation.

## II. MEASURING CONSERVATION-INCIDENCE

Primary objective of the study. The original purpose of the writer was to measure the number of times that conservation education occurred in various classes and the duration of these incidences. The assumption was that no one knew how many times the subject of conservation became a part of subject matter.

Secondary objective of the study. The selection of material taught as conservation education could be better made if subject fields were to be considered during the process of selection. This study might help to limit the number of fields in which selection and teaching would best take place.

## III. SUGGESTIONS FOR FUTURE

Study groups. Selling conservation to the American public has been a major objective of several organizations. If many small groups would band together and conduct studies on "how much" and "where" rather than on "what," the amount of conservation education would be materially increased and teachers as well as other groups would find the answer on what to teach.

Use of the Measuring device. This study, to the writer's knowledge, was the first time that such a questionnaire had been used to measure this particular type of

learning. For the purpose of clarity should this device be used again, it might be well to place certain suggestions in writing.

As was pointed out earlier, the questionnaire was handed out to the faculty during the last few days of the school year. Some of the teachers filled it out rather hurriedly because of the rush of finishing school. Some teachers did not fill it out until school had been dismissed. Others either failed to fill it out or to return it.

In the process of filling out the questionnaire, more complete results would have been received had the teachers been able to devote more time to the work.

If the questionnaire had been handed out earlier in the school year, it could have been filled out a little at a time as the teacher came across the activities during class time. In this way, a more accurate allocation of time could have been made.

If a greater length of time had been available, the conductor of the study could clarify the problem to those answering the questionnaire. The teachers, in turn could clarify their answers so that the study could include what is being taught in conservation at the same time that information regarding "where" and "how many times" is conservation being taught was sought.

This more definite picture of the offerings of conservation would permit an administrator to point out

with a greater deal of definiteness what should be added to or deleted from the offerings.

To start this study sometime during the first semester and to continue to take information for the balance of the year would make this study much more complete and accurate.

Were it possible to do so, some better method of defining the area of an activity would improve the quality of the responses and increase the ease with which the questionnaire could be tabulated. The response to a question asking for the activities to show the value in conserving human energy by educating each person to fulfill his highest capabilities was answered by

Farmstead planning  
Feeding operations  
Farming operations  
Planning saves time and money

Obviously the answer was relative to the problem of conserving time and energy and should be listed as a conservation activity. Whether or not this answer precluded the answer as to whether this individual should be a farmer or follow some other occupation was not clear.

#### V. VARIATIONS IN ATTITUDES

The attitude of the personnel of the staff is always an important factor in attempting to make any change. While certain attitudes may be resident within an individual when no answers are given, this cannot be

accepted since there may be no opportunity for expression. However, unsolicited statements would give an administrator some insight into the attitude of the staff.

The following are taken from the notes on the questionnaires:

1. "I'd like to have a blank questionnaire if you can spare it."
2. "My whole subject is a study of conservation as well as a study of composition, characteristic properties, manufacture or uses of the various substances."
3. "My subject is not adaptable to conservation beyond encouraging students to continue this study if they are especially apt in it."
4. "Possibility for development."
5. "I don't feel that my department makes any specific contribution to the teaching of conservation. Anything of this sort would be purely incidental."
6. "The \_\_\_\_\_ Club, through speakers and visual aids learns the various activities of the Forest Service and other agencies of the Government connected directly with conservation."
7. "We discuss 'spectatoritis' in connection with sports as avocations."
8. "Very Thorough."
9. "Any conservation I have taught in mathematics has been quite indirect - no planned activities. Your questionnaire suggests a few possibilities."

10. "This is a good questionnaire - but I find my mathematics classes do not seem to get into conservation topics."

11. "I'm afraid this won't be much help. There is little opportunity in a crowded English curriculum as it is now planned for emphasis on conservation as such."

12. "Afraid this isn't what you wanted, but English is so general!"

13. "Interesting questionnaire. In French we discuss their intensive farming and intensive forestry. In English, as the stories indicate, we discuss the conservation of natural resources."

14. "I find no place to discuss no smoking as a measure to reduce forest fires."

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**APPENDIX**  
**INSTRUMENT USED**

Pursuant to the Montana law requiring conservation to be taught in the Public Schools of Montana, it becomes evident that some means of measuring the amount of conservation education should be devised. Since conservation affects every facet of men's lives, it is in every subject and activity of our schools. This makes it difficult to measure and increases the need for measuring.

I am attempting to devise some means of measuring and interpreting this education in the hope that my efforts might add a little to the field of knowledge of the "how" and the "why" of conservation.

#### YOUR HELP SOLICITED

I shall be sincerely grateful for the time spent in filling out this questionnaire. I hope that each of you will receive some benefits from reading the questionnaire and that you may find some method or technique that shall lighten your work and make it more pleasant.

A copy of the completed study will be deposited with the high school for your future use.

#### DIRECTIONS

Please read all questions as each question may refer to several departments. The examples are given only to assist in recalling types of things done. Be sure to list all activities even though some are the same as the example. Time spent viewing motion pictures, listening to outside speakers, etc., is to be included.

\_\_\_\_\_ Department \_\_\_\_\_ Teacher

Class or club

Name of course

Rank by grade

Number of students

1	2	3	4	5	6

## GROUP ON SOILS

1. What activities do you use to show the interdependence of plants, animals, soil, water, and climate?

Ex. Make a cross-reference chart showing the dependence of an animal on soil, water, climate, and plants, in sequence.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

2. What activities do you carry out that show the change in chemical composition of soil caused by growing legumes.

Ex. Have several samples of soils tested in the laboratory and tabulate the results.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

3. What activities do you carry out that show the effects of adding fertilizers to soils?

Ex. Application of acid soil to litmus paper to record the change in color.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

4. What activities do you carry out that show the effect of acids in the top soil?

Ex. Bring samples into the school room of duff in various stages of decay.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

5. Through what projects do you attempt to show the relationship of growth of nations to economic practices?

Ex. Have a panel discussion on the development of cloth manufacturing in the U. S. as dependent on the number of slaves in the South.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

6. What activities do you carry out that show the relationship of world power dominance by nations which have a supply of natural resources?

Ex. Discuss the effect on Great Britain of obtaining colonies with natural resources.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

7. Do you find opportunity to show the excessive use of natural resources during war years?

Ex. Collect data and graph the number of board feet of lumber used from 1935 to 1945.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

8. In what experiences does your teaching point out the conservation practices espoused by the government?

Ex. Have one-half the class list reasons for establishing the "Shelter Belt;" the other one-half of the class list the results.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

9. What activities do you carry out to show that an abundance of natural resources gives humans time for leisure and cultural development?

Ex. Get a book review on "Man and the Sail" from the International Harvester Company, Chicago, Illinois.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

10. What activities do you carry out to show that society must be interested in conservation for preservation?

Ex. Have the class give speeches showing ultimate source of income of doctor, lawyer, and others.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

11. What activities do you carry out to show effects of loss of income in one area upon gain in population in another?

Ex. View news films on disaster areas.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

- |     |   |  |  |
|-----|---|--|--|
| 12. | What activities do you carry out that show the effect of leaching on soils heavily irrigated?                         |  |  |
|     | Ex. Fill one glass container with coarse soil; cover the top with food coloring; and flood the top with water.        |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 13. | What activities do you sponsor to show the amount of available plant food in a soil?                                  |  |  |
|     | Ex. Fill one container with rich soil--one with very poor soil--plant corn or beans. Notice the difference in growth. |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 14. | What activities do you carry out to show the artistry of nature as compared to ugliness of man's waste?               |  |  |
|     | Ex. A study of the effects of excessive logging practices.  |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 15. | What activities do you carry out to show annual loss of land by flood?  |  |  |
|     | Ex. Gather news items from papers to post on the bulletin board.  |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |

16. What activities do you carry out to show the relation of steepness of a slope to the volume of run-off?

Ex. Use a box filled with dirt placed at various angles and sprinkled with water.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

17. What activities do you carry out that show the relationship between contour farming and color design?

Ex. Paint farm scenes in water colors for art class.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

18. What activities do you carry out that show the relationship between contour farming and geometric design?

Ex. Make a picture story-book showing various designs made by water.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_

19. What activities do you carry out that show the relationship between absorptive qualities of soil containing much humus and those containing little humus?

Ex. Fill one box with mineral earth and another with leaf mold. Tilt both boxes and sprinkle with water.

- A. \_\_\_\_\_  
B. \_\_\_\_\_  
C. \_\_\_\_\_



- |     |  |  |  |
|-----|--|--|--|
| 20. | <p>What activities do you carry out that show the relation between soil texture and structure to porosity and capillarity of soils?</p> <p>Ex. Punch holes in the bottom of two tin cans. Fill one with clay--the other with loam. Notice the rise of water in the cans.</p> <p>A. _____</p> <p>B. _____</p> <p>C. _____</p> |  |  |
| 21. | <p>What activities do you carry out that show the use that can be made of gravity and friction to reduce erosion?</p> <p>Ex. Take the class on a field trip to observe the eroding effects on plowed ground or grass land.</p> <p>A. _____</p> <p>B. _____</p> <p>C. _____</p>   |  |  |
| 22. | <p>What opportunity do you have to illustrate the effects of mineral deficiency on plant and animal life in quantity produced per acre?</p> <p>Ex. Plant beans in cans filled with identical soil except add phosphate to one can.</p> <p>A. _____</p> <p>B. _____</p> <p>C. _____</p>                                       |  |  |
| 23. | <p>What opportunity do you have to show the effects of humus in the soil on its production per acre?</p> <p>Ex. Show a film on the fertility of soils.</p> <p>A. _____</p> <p>B. _____</p> <p>C. _____</p>   |  |  |

24. What activities do you carry out to show the effect of changing minerals into soluble form?

Ex. Plant two containers of carrots-water and one with plain water; the other with minerals dissolved in water.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

25. What activities do you carry out to show that growing grass or forests build soil fertility?

Ex. Study U. S. Government bulletins on soil management.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

26. Through what experiences do you show the struggle for food produced on marginal land before the days of modern transportation?

Ex. Conduct class discussions on Colonial home life.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

27. What activities do you carry out that indicate that plants and animals deficient in minerals cannot nourish healthy people.

Ex. Written themes on the comparison of health standards of new and old civilizations.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

28. What activities do you carry out that show the relative value of foods grown on soil poor in minerals as compared to foods grown on rich soil?

Ex. Ask the county agent or home demonstration agent to speak on this subject.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

29. What opportunity do you find to teach mechanics of soil structure?

Ex. Take a field trip to an area showing rock slides above fertile soil--note the stages between.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

30. Do you classify land as to its capabilities to produce food for man?

Ex. Ask the Soil Conservation Service to explain their classification.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

31. Have you any Projects that show the relationship between climate and strip, or contour farming?

Ex. The government has films on this subject.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

32. Have you any projects that show the value of humus in upper soil to prevent erosion and conserve the moisture?

Ex. Mark out two small areas on the school ground. Cover one with grass cuttings. Examine for moisture content two days later.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

33. Do any of your activities show how great the cost of erosion really is?

Ex. Write to the ~~harbor~~ authorities in New York or Seattle to request information on the cost of dredging the harbor.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

## GROUP ON PLANTS

- |     |   |  |  |
|-----|---|--|--|
| 34. | <p>What activities do you carry out to illustrate the losses incurred from insects and diseases?</p> <p style="margin-left: 40px;">Ex. Compile statistics from the U. S. Forest Service on the losses incurred from fires, diseases, and insects.</p> <p style="margin-left: 40px;">A. _____</p> <p style="margin-left: 40px;">B. _____</p> <p style="margin-left: 40px;">C. _____</p>  |  |  |
| 35. | <p>What activities do you carry out that suggest new scientific developments might use renewable resources to replace the items manufactured out of non-renewable resources?</p> <p style="margin-left: 40px;">Ex. Have a committee report on the latest development in car bodies made of plastics.</p> <p style="margin-left: 40px;">A. _____</p> <p style="margin-left: 40px;">B. _____</p> <p style="margin-left: 40px;">C. _____</p> |  |  |
| 36. | <p>What activities do you carry out to show the deletion of natural resources in the U. S.?</p> <p style="margin-left: 40px;">Ex. Let the class gather statistics on timber growth and use. Make contrasting charts.</p> <p style="margin-left: 40px;">A. _____</p> <p style="margin-left: 40px;">B. _____</p> <p style="margin-left: 40px;">C. _____</p>   |  |  |
| 37. | <p>Have you any projects that show the necessity of selection and improvement of plants to control upper soil strata formation?</p> <p style="margin-left: 40px;">Ex. Plan for a lecture by the U. S. Forest Service Grazing Supervisor.</p> <p style="margin-left: 40px;">A. _____</p> <p style="margin-left: 40px;">B. _____</p>  |  |  |

38. What activities do you carry out to show the effects of over-grazing of pasture land?

Ex. Take a field trip to Mount Sentinal to study first hand information on over-grazing.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

39. What activities do you carry out to show the relation of "feed" and "cover" to the abundance of wild game?

Ex. Make an oil painting of a deer in a browse thicket.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

GROUP ON MINERAL

40. Through what activities do you show the amount of iron ore, aluminum, timber, etc. in the manufacture of an airplane; a train.

Ex. Write letters to a railroad car manufacturer and get statistics.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

41. What activities do you carry out to show the relationship of civilization to man's use of bronze, iron, steel, etc.?

Ex. Have the class compare the simultaneous growth of mathematics and the ore industries.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

# GROUP ON WATER

42. What activities do you use to illustrate Man's dependence on water?

Ex. Make a chart showing the purpose of each part of a tree.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

43. What activities do you carry out to show the hydrologic cycle and its impact on life?

Ex. Have different students prepare talks on rainfall, evaporation, effect of mountains on the climate, etc.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

44. What activities do you carry out that show the possibility of man producing food by Hydroponics?

Ex. Grow carrots in chemically fed water.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

45. What activities do you carry out to show that the oceans are a source of renewable resources now unused?

Ex. Have a committee report on products of the oceans.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_



- |     |   |  |  |
|-----|---|--|--|
| 46. | What activities do you carry out that show the necessity for adequate supplies of uncontaminated water?   |  |  |
|     | Ex. Let the students discuss the health of citizens in Missoula with that of citizens in Turkey.  |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 47. | What activities do you carry out that show the value in changing areas where disease is apt to reproduce, into an area where the product is useful?           |  |  |
|     | Ex. Have one student report on the reduction of Malaria in the South.   |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 48. | What activities do you carry out that would help students appreciate the waste of energy in river floods rather than storage and use through electric plants? |  |  |
|     | Ex. In a mathematics class have the class compute how much electricity is developed by one acre foot of water falling 100 feet.                               |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 49. | What activities do you carry out that illustrate the necessity for controlling the water flow?  |  |  |
|     | Ex. Gather news items for class discussion on the damage done by floods.  |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |

GROUP ON ANIMALS

50. What activities do you use to show the necessity of the existence of predators in the food chain?

Ex. Class discussion on the loss of deer in a herd unless man hunts the animals and uses the meat.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

51. What activities do you carry out to show that resources may be conserved by using "waste" products to manufacture a different product?

Ex. Take a field trip to the local slaughter house to see what happens to the "waste" products.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

# GROUP ON SOCIETY

52. What activities do you carry out to show that resources may be conserved by more efficient use?

Ex. Study reports from petroleum companies about extracting gasoline from crude oil.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

53. What activities do you carry out that indicate some resources may be used for multiple purposes?

Ex. Send for a booklet from U. S. Dept. of Agriculture entitled Wood Lots on American Farms.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

54. What activities do you carry out to show the effects of natural resources on national boundaries?

Ex. Have the class make a series of maps showing the different occupations of the Saar Basin.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

55. What projects do you sponsor to show the relation of natural resources to "ghost" towns?

Ex. Read and discuss The Deserted Village by Oliver Goldsmith.

- A. \_\_\_\_\_
- B. \_\_\_\_\_
- C. \_\_\_\_\_

56. Through what activities do you show how such industries as the meat packers, paper manufacturers, etc., rely on the natural resources?

Ex. Have members of the class give speeches on the wood pulp industry.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

57. What activities do you carry out to show the wise use, or replacement, of resources?

Ex. Let the class discuss the life of Dr. George Carver and the results of his experiments on the wealth of the South.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

58. What activities do you carry out to show the amount of land lost to cultivation by wasteful methods?

Ex. Take a field trip to areas where gullies have been washed in cultivated land.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

59. What activities do you carry out to show the increased prosperity caused by conservation methods?

Ex. Let a student report on the experiments of agriculture colleges on scientific pork production.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

60. What activities do you carry out that show a relationship between natural resources and kinds of government?

Ex. Have a panel discussion on the effects of natural resources on culture in the democracies.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

61. What activities do you carry out that show the need for Federal participation in conservation?

Ex. Arrange to have a member of the staff of the Bureau of Reclamation talk on problems of the Bureau.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

62. What activities do you carry out to show the value of organization of Soil Conservation districts?

Ex. Show a film on soil conservation activities.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

63. What activities do you carry out to call attention to the services of the county agent, home demonstration agent?

Ex. Let a 4-H club member report to the class on a recent visit to the home demonstration agent.

A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

- |     |   |  |  |
|-----|---|--|--|
| 64. | Do any of your activities point out that unwise use of natural resources aided the changes in ancient civilizations?                          |  |  |
|     | Ex. Encourage members of the class to illustrate what happened to Rome when land in Phonccia became worn out.                                 |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 65. | What activities do you carry out to show the relationship between natural resources and man's well-being in the same region?                  |  |  |
|     | Ex. Encourage some student to gather and record the number of families in Missoula who live on incomes from timber work.                      |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 66. | What activities do you carry out that show the value in conservation of human life by communities planning health programs?                   |  |  |
|     | Ex. Keep a note book on small pox vaccination and study the decline in cases over the last twenty-five years.                                 |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |
| 67. | What activities do you carry out that show the value of conserving human energy by educating each person to fulfill his highest capabilities? |  |  |
|     | Ex. Let the students compare the financial earnings of all types of workers and professional people.  |  |  |
|     | A. _____  |  |  |
|     | B. _____  |  |  |
|     | C. _____  |  |  |

68.	What activities do you carry out that show the value in conservation of human energy by recreation supplied within a community?		
	Ex. Have a doctor talk to the class on the need of proper recreation.		
	A. _____		
	B. _____		
	C. _____		
69.	What activities do you carry out that show the desirable effects of recreation areas?		
	Ex. Make a chart showing the continual rise in the number of people entering Yellowstone National Park.		
	A. _____		
	B. _____		
	C. _____		
70.	What activities do you carry out that show the value of conserving human energy by avocational interests?		
	Ex. Make a chart showing the number of people who participate in sports in the U. S.		
	A. _____		
	B. _____		
	C. _____		
71.	What activities do you carry out to show the value of planned harvesting?		
	Ex. Arrange to have a lecturer in from "Tree Farmers" or from the Forest Service on continuous harvesting.		
	A. _____		
	B. _____		
	C. _____		