

A STUDY OF NATURAL RESOURCE CONSERVATION  
INTEGRATED IN A HIGH SCHOOL PROGRAM

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by  
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## PREFACE

Any technique, procedure, or method of teaching that aids the student in more fully understanding his environment will contribute to his development. The integration of conservation into a subject is one method by which the student can partially obtain self-realization. This is the subject considered in this paper under the title "A Study of Natural Resources as Integrated in a High School Program".

The first chapter was written to familiarize the reader with procedure followed in arriving at an outline. The final chapter was devoted entirely to an outline of conservation education. It is not the aim of this paper to present a subject or unit in conservation education but rather to present an outline that would show how any teacher may integrate conservation education as a part of the subject being taught.

The content fully satisfies the provisions of state requirements and at the same time it is designed to satisfy the interests and needs of the student. Because of its practical aspect, the student will experience little difficulty in adjusting himself to the different grade levels.

The writer wishes to acknowledge indebtedness for the valuable criticisms and suggestions from Dr. M. Franks, Dr. N. Helburn, Mr. E. Fellbaum, Mr. M. J. Edie, Mrs. E. A. Wright, of Montana State College and Mr. H. E. Anderson, of Gallatin County High School.

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## CHAPTER I

### INTRODUCTION

#### Statement of Problem

The problem that is to be considered in this paper is deeply rooted in the local conditions under which the educational program operates. Conservation Education will vary as to curriculum content, due to the facilities available for integration of subject matter, such as industrial, agricultural, and governmental. With this thought in mind and the title of the problem,

(What are the desirable activities to be followed in the integration of Conservation Education in the 9th, 10th, 11th, and 12th grades?)<sup>1</sup> the writer will endeavor to present a program of general nature from which any school may integrate the subject.

#### Procedure

The normative-survey method was the approach used in solving this problem.<sup>2</sup> Specifically the steps were as follows:

The writer formulated an overall picture of how he was going to approach and solve the problem. It was decided to show how man had wastefully utilized the natural resources of his environment. The purpose of this and the following chapter, which deals with beneficial uses of natural resources through conservation, was to obtain enough evidence to show the

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<sup>1</sup> The writer felt that Conservation Education could be taught successfully as an integrated subject in the senior high school.

<sup>2</sup> Good, Carter V., Douglas E. Skates, The Methodology of Educational Research, (New York: D. Appleton-Century Company, 1941), p.345.

tremendous area that is included in conservation. It also would be written so as to show conservation in action.

The objective of Chapter IV was to correlate conservation and education, then to show how, when and why Conservation Education should be taught.

Finally, the most important part of the paper--an outline for the integration of Conservation Education in the 9th, 10th, 11th and 12th grades. The outline was constructed so as to literally grow with the student--the growth being similar to a rock dropped into a placid lake. The rings caused by the rock may be likened to the integration of conservation, encompassing everything and growing as the student grows.

Having decided upon the method, the writer proceeded to make an outline of the problem, and to set up the outline form with the overall thought in mind to tie together the natural resources and conservation education which was to result in a program suitable for use in high school as an integrated subject. To the outline a basic fundamental structure was added. By this procedure, it became evident to the author that Natural Resources, Natural Resources and Conservation, Conservation Education and Integration of Conservation Education were key phrases from which the whole text of the paper could be constructed.

A review of literature of Conservation Education was made. This continued throughout the study in order that any newly published material concerning Conservation Education in secondary schools could be analyzed.

Man the world over has been fortunate enough to have had almost a limitless quantity of natural resources. However, with the ever increasing population, these once bountiful resources have declined until it was a necessity to employ conservation practices.

How has civilization over-utilized his resources, and how has man wastefully depleted the living and nonliving resources of his environment? How is man attempting to conserve his natural resources and how is he utilizing the natural resources beneficially? These questions will be answered in Chapters II and III.

In Chapters II and III, natural resources are treated respectively from the viewpoints of wasteful and beneficial practices employed by man. Natural resources are divided into four large categories; solar energy, air, water and land.

## CHAPTER II

### NATURAL RESOURCES

There are many good definitions of natural resources. The general consensus has been to divide natural resources into five major fields; (1) soils, (2) water, (3) forests, grasses and other vegetation, (4) wildlife, including bird and aquatic, (5) minerals.

The writer was unable to find any definition that identified his purpose. Therefore, he has decided to use his own definition. Natural resources include solar energy along with all of the elements and combination of elements of either organic or inorganic materials that are necessary for life's processes.

#### Solar Energy

Of all the natural resources available to man, pending future discoveries, this is the only one of which he has the greatest abundance, yet has utilized the least. However, solar energy has destroyed many of man's other natural resources because of a lack of scientific knowledge in understanding this source of energy. Though not purposeful, man's use of solar energy in the destruction of soil becomes evident wherever he tries to plant areas that are not suited to the crop being produced. The plow destroys the climax vegetation exposing the top soil to the Sun which, under drought conditions, gradually or quickly parches the earth causing deep cracks and a consequent loss of practically all the water in the soil profile to a depth that may include the C horizon. Consequently the soil is subject to severe erosion by wind.

We have but to talk to a few dealers that handle meat, vegetables and fruit to find out what a serious loss there is in those departments because of improper handling resulting in extreme exposure to solar energy.<sup>3</sup>

The sportsmen<sup>4</sup> are often times negligent in the handling of wild game resulting in severe losses of meat every year.

It must be noted that, although the various agencies are not deliberately trying to diminish the resources by exposing them to solar energy, it is nevertheless being done.

On August 6 of 1945,<sup>5</sup> an airplane called the Enola Gay dropped an atomic bomb on the city of Hiroshima, Japan. The next day a bomb of the same calibre was exploded over Nagasaki, Japan. We all realize how many American soldiers were saved by these epic-making events and are thankful that it shortened the war by many months; but regardless of these factors, millions of dollars in resources were destroyed. The bombs in their actual explosion only accounted for a portion of the destruction of natural resources; all of the materials that were required to develop the atom age severely drained the non-renewable resources of this great nation. In the next chapter the atomic and hydrogen age will be treated as an asset with potentialities greater than man has ever dreamed.

#### Air

Industrial pollution of the air has been very severe in the past and is becoming more extreme as the ever-increasing population demands greater industrialization.

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<sup>3</sup> Interview with Joe Hansford, Owner Joes Finer Food Grocery Store, Bozeman, Montana.

<sup>4</sup> The writer is referring to hunters, trappers, trophy hunters and fishermen.

<sup>5</sup> Churchill, Winston S., Triumph and Tragedy (Boston: Houghtlin Mifflin Company, 1953), p.545.

In December of 1952, occurred what has become universally known as the London smog. In its way, the most disastrous, most lethal occurrence of air pollution that has yet been recorded. We have always had heavily polluted fogs in London and in some of our other industrial cities. But between December 5 and 9, 1952, there was a smog in London which caused some 4,000 deaths.<sup>6</sup>

Unfortunately, in the depletion of the natural resources, man only becomes aware of his destruction when his physical environment begins to close in on him resulting in an effect similar to claustrophobia.<sup>7</sup> The large cities such as London, Los Angeles, and Chicago are prime examples. Thousands of dollars are being expended every year to combat smog.<sup>8</sup> Smog is the accumulation of waste gases from industries, transportation, and residential dwellings, combined with air and moisture which settles upon cities with inhibitory and sometimes lethal effects.

#### Water

Water in a pure or semi-pure state is abundant but not limitless. You may immediately be concerned with the phrase 'not limitless'. When White man first came to the Americas he could be confident that the streams and rivers were filled with good water. To the Pilgrim, the lakes were jewels of glistening blue aqua and bounded in the wealth of a million years accumulation. How different the expression on the Pilgrim's face would have been if the picture before his eyes would have changed to show him

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<sup>6</sup> Mallette, Frederick S., Air Pollution (Reinhold Publishing Company, 1955), p. 6.

<sup>7</sup> Claustrophobia, Fear of closed places.

<sup>8</sup> Smog, Frost or fog combining with still air and smoke.

the waters of today! Economy and a growing population automatically demand the development of large industries. Whether the industry be stationary or mobile, it has to be large to provide a balanced economy. Many conservationists such as Raushenbush are aware of the shortage of water and have studied it in great detail.

The shortage of water is producing several major changes in our way of living. Many cities have now grown to the place where they can no longer guarantee new industries an adequate supply.<sup>9</sup>

The modern industry, though it will change with time and discoveries, utilized the natural resources very wastefully. In 1949 the state of Ohio supplemented its existing public health laws by enacting section 1240-4 of the general code which prohibits the discharge of untreated sewage and industrial waste unless works, satisfactory to the director of health, have been installed.<sup>10</sup> These waste or by-products sooner or later find their way to the once pure streams that may already be polluted with silt from improperly farmed areas.

It takes many people to operate a large industry, and consequently we have a convergence of people with their waste products. The effects are far reaching from the industrial site to the ocean. Along the banks of the river where it enters the ocean, we find docks and warehouses from which huge steamers, tankers, and other vessels propel themselves to

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<sup>9</sup> Raushenbush, H. S., Our Conservation Job (Washington, D. C., The Public Affairs Institute, 1949), p. 14.

<sup>10</sup> Weiss, Marvin D., Industrial Water Pollution (New York: Chemnomics, Inc., 1951), p. 142.

deliver their goods. These facilities of trade are also contributing to the pollution of water.<sup>11</sup>

The railroads, another type of industry, are aiding in the depletion of this natural resource. Evidence that they cause pollution may be actually observed if you take a trip to Seattle, Washington. Before you enter any of the large city watersheds, all conveniences are locked--a result of laws passed by those states to prevent contamination of water being utilized by those cities. What about the area between watersheds?

The outdoorsmen are often negligent in some manner when it comes to the contamination of water; and, with the interest of outdoor living becoming more and more prominent, this type of natural resource destruction will or may become acute.

#### Land

A statement by Raushenbush reads as follows: "Our main national aim is to get the maximum continuous production from the land".<sup>12</sup> This attitude almost completely analyzes the present day attitude toward the renewable<sup>13</sup> and non-renewable<sup>14</sup> resources found in soil or as a result of good soil. However, the same statement would have been true in the past had the word continuous been excluded. The miner, farmer, or hunter looked at the land with a very limited attitude in that they assumed ownership<sup>15</sup> rather than

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<sup>11</sup> Hyde, G. S., John Oliver, A. M. Rawm, Sewage and Drainage of the Greater Vancouver Area, British Columbia (Vancouver: A Report to the Chairman and members Vancouver and Districts Joint Sewage and Drainage Board, 1953), p. 47.

<sup>12</sup> Raushenbush, op. cit., p. 55.

<sup>13</sup> Re-newable: To replace; also to restore to fullness.

<sup>14</sup> Non-renewable: Unable to replace; also unable to restore to fullness.

<sup>15</sup> Ownership: Fact of being an owner; lawful claim or title, property.

lessee<sup>16</sup> obligations until the next generation took his place. To the miner, whether it be of gold, silver, copper, or oil, the thought in his mind was how many dollar's worth of minerals can be extracted in as short a time as possible. The fact that they were destroying the surface area of the land by washing all the topsoil away or flooding it with oil was greedily ignored. The farmer was nomadic; when the land he was planting failed to produce the desired crop he moved on. Upon finding a desirable location, timber was burned to allow grasses to grow for his grazing animals, trees were cut down and uprooted to give him land enough to grow the crops he wanted. This movement might be related to a huge flood as it inundates the land mass of a continent. Each pioneer was as insignificant as a drop of water in the ocean, but the cumulative effects were deplorable. To add to the tide of human movement the hunter and trapper were forever reaping a rich harvest from the gigantic world of wildlife. A glowing example of the frontier movement is vividly explained by the epoch of the bison. As the settlers moved westward, farms sprang up and areas were mercilessly fenced with a result of greatly reduced range for the bison. Along with the settlers came cattle that roamed the range at will, cutting the flowing fields of grass down more and more as they moved toward the Pacific coast. All of the time, the practices of soil conservation were being neglected and drastic dust bowl centers<sup>17</sup> took form along with a great toll of lives both in people and animals. Finally, and by far not least, the ruthless fun-loving hunters killed<sup>18</sup>, and killed just for hides.

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<sup>16</sup> Lessee: A tenant under a lease.

<sup>17</sup> Whitaker, R. J., E. A. Akerman, American Resources (New York: Harcourt, Brace and Company, 1951), p. 33.

<sup>18</sup> Sanders, Helen F., A History of Montana (Chicago: Lewis Publishing Co.), p. 117.

Even when they were slaughtered for food, only the choicest parts of the carcasses were utilized--so abundant were the wild animals. As we know, at one time the Great Plains of the United States was covered with some 30,000,000 bison. Gradual migration diminished this number until there were some 5,500,000 left and finally the herd was reduced to a mere 6 animals.<sup>19</sup>

The day has come when we can no longer expand the frontiers by simply moving to a greener pasture. Only areas with the severest climatic conditions remain to be developed. This means that the philosophy of ownership must be changed and consideration be given to the future generations.<sup>20</sup>

#### Summary

This chapter by the use of descriptive material, portrayed the waste of the renewable and non-renewable resources. There have been many interpretations of this waste of natural resources and what will happen in the future. Ordway discussed it a great deal and referred to the pessimist and optimists as the prophets of doom.

Natural scientists tell us that the earth's supply of renewable resources is steadily and rapidly diminishing while the earth's population, as well as per capita demand for organic products, continues to increase. Unless we learn to work with nature instead of against her, the human race is doomed to physical and spiritual failure within foreseeable time. Aligned against these so-called "Prophets of Doom" is another group of scientists who insist that man has already discovered sufficient ways to increase production and to synthesize food so that there need be no fear of the future. To these "Cornucopians" science seems to be an inexhaustible horn of plenty.<sup>21</sup>

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<sup>19</sup> Came out of a conference with a Masters Degree candidate, Montana State University, Missoula, Montana.

<sup>20</sup> Whitaker, op. cit., p. 35.

<sup>21</sup> Ordway, S. H., Our Conservation Job, (New York: The Conservation Foundation, 1949), Forward.

Neither of the foregoing attitudes are to be considered the answer to conservation of Natural Resources. Collectively they may present to us the conditions which should be met to bring forth the desired results. The next chapter will deal with the beneficial uses of natural resources as related to conservation. Natural Resources will be divided into the four large categories, solar energy, air, water, and land.

### CHAPTER III

#### NATURAL RESOURCES AND CONSERVATION

In this chapter the writer will refer to two great movements in conservation. The first one beginning in 1872 and ending in 1910. The second movement beginning in 1930 and still in progress.

We are a proud nation and we are even prouder of the fact that, as a united people, we have a record that is possibly the most complete natural resource survey of any country in the world. The beginning of this realization started in 1872 with the withdrawal of the Yellowstone National Park area. In 1891, the first forest reserves were set aside by President Harrison.<sup>22</sup> This was followed by a serious effort in 1908 when Theodore Roosevelt and the White House Conference of Governors started the various state departments of conservation.<sup>23</sup> The first general survey made in the United States was made public through reports from the National Conservation Commission.<sup>24</sup> The groundwork for this movement was aided by such men as John Muir, naturalist, conservationist, and gifted writer; Gifford Pinchot, chairman of the National Conservation Commission and pioneer in forest conservation in the United States. He was the nation's foremost forester and his autobiography is a major

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<sup>22</sup> Stoddart, Lawrence A., A. D. Smith, Range Management (New York: McGraw Hill Book Co., 1943), p. 40.

<sup>23</sup> Whitaker, op. cit., p. 33.

<sup>24</sup> Ibid., p. 34.

contribution to the history of the whole conservation movement.<sup>25</sup> There were many others equally as important but none of them as important to the field of education as Charles R. Van Hise. As president of the University of Wisconsin, he introduced to the students the findings<sup>26</sup> of the conference and of the National Conservation Commission. His lectures were published<sup>27</sup> in 1910. A direct quotation from a report by the United States President's Materials Policy Commission completes the overall program to the present time.

Technology, that complex accumulation of knowledge, techniques, processes, and skills whereby we maintain a working control over our physical world, has had so enormous a growth during the twentieth century as to dwarf all previous accomplishments of its history. The growth, pervading every level of human activity, has had two opposite effects on materials: it has greatly increased the efficiency of their use, and it has also greatly increased the total drain upon the resources from which they came.<sup>28</sup>

The preceding quotation was made in 1952 and justifies technology as the reason for the second great movement that started with the New Deal Policy under the administration of President Franklin D. Roosevelt. During this period we had the development of the CCC, the BRC, SCS, TVA and many other conservation agencies.<sup>29</sup> With this thought and background of information, we are now ready to treat the four great natural resources from the viewpoint of conservation.

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<sup>25</sup> Pinchot, Gifford, Breaking New Ground (New York: Harecourt Brace, 1947).

<sup>26</sup> Whitaker, op. cit., p. 34.

<sup>27</sup> Hise, Van R., The Conservation of Natural Resources (New York: The McMillan Co., 1910).

<sup>28</sup> Paley, William S. and others, Resources For Freedom (United States Policy Commission, Vol. 4, Washington, United States Government Printing Office, 1952), p. 1.

<sup>29</sup> Korstein, C. F., Seeding and Planting in the Practice of Forestry (New York: John Wiley and Sons, 1942), pp. 11-15.

### Solar Energy

This is the most abundant natural source of energy available to mankind and he has utilized it directly the least of all. However, we are beginning to hear more and more about its use through newspapers and radio programs. The following article appeared in the Great Falls Tribune.

PHOENIX, Ariz. (UP)--The world symposium on applied solar energy studied Russian plans for a sun-powered solar plant that could heat thousands of people and turn deserts into "flourishing gardens."

Scientist V. A. Baum, head of the Heliotechnical Laboratory in Moscow, notified the symposium by paper of the plant and several other Russian solar experiments. Baum had been invited to the symposium, but was unable to make the trip.

Baum said in his paper that the plant could possibly produce 1,000 kilowatts of power which, during cold weather, could heat a settlement having a population of between 17,000 and 20,000 inhabitants.

He also said the energy could be fed to power stations, which supply water for irrigation purposes. By doing so, he said, desert lands could be made more productive.

"Many of the tropical and subtropical areas have become sterile deserts as a result of the pernicious influence of the sun...(but) the self-same mighty forces can be used by mankind to return those deserts to life and turn them into flourishing gardens," Baum said.<sup>30</sup>

The Saturday Evening Post has an article entitled the "Big Power Plant In The Sky." Already scientists are using the sun's energy to heat houses, pump water and cook meals. Important people are saying that the sun may be chance to raise the world living standards.<sup>31</sup> These articles further substantiate the theory that solar energy will play an important

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<sup>30</sup> News item in the Great Falls Tribune, November 7, 1955.

<sup>31</sup> Neil M. Clark, "Big Power Plant in the Sky", The Saturday Evening Post, November 5, 1954, p. 54.

role in the future. The U. S. President's Materials Policy Commission made the following report in 1952:

The area of the United States is about 2 billion acres, on which there falls, in an average year, sunlight with an energy content equal to that of about 1,900 billion tons of bituminous coal. About a third of the energy system of the United States is devoted to comfort heating. Solar energy holds great promise in this field.<sup>32</sup>

### Air

How does air have any importance to us as a natural resource?

Where would we be without it? These are two simple questions but they take on an importance beyond the imagination of the mortal human when we try to imagine air as a declining resource. How much oxygen would be available to us if all the plants on earth were destroyed? Possibly these questions and statements sound absurd but let's take a look at how we can prevent wasting this natural resource even on a small scale.

Chapter II pointed out, our big cities have become a place where air is gradually attaining more importance to the individual because of the lack of its purity. There is already a trend in the United States of either dispersal of the industrial plants or a movement of the city populations to rural areas.<sup>33</sup> Conservation is the only real answer and it will come as a purifier of industrial waste products. The conservationist will be challenged in all of the fields of physical and chemical science until he has mastered the control of gases from industrial plants, automobiles, and any other mechanical devices which add to the pollution of air.

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<sup>32</sup> Materials Policy Commission, op. cit., p. 213.

<sup>33</sup> Whitaker, op. cit. p. 442.

Diversion of atomic energy from radio-active war clouds of dust particles floating around in the air to peaceful uses is eminent to the salvation of mankind. This field of nuclear study, similar to all other fields of science, is in its infancy. We will witness in our lifetime some of the greatest discoveries in all history. Already we have witnessed the atomic powered submarine whose power plant, put to peaceful uses, could conserve the non-renewable resources of this nation.

### Water

With crystal clear water as our objective, how are we starting to achieve it? The U. S. President's Materials Policy Commission, in its study of the natural resources, very aptly clarified the importance of water in the following paragraph:

With the exception of the air he breathes, water is the most essential single factor which man uses. Indispensable in directly sustaining all plant and animal life, it is hardly less important in its myriad uses. Water is the master solvent and cleanser and the most efficient medium for transfer of heat and energy, both solar and man-controlled. It is the vehicle which affords the cheapest transportation of heavy and massive produce and the disposition and dilution of most man-made wastes.<sup>34</sup>

Here we have a challenge that is being met by the knowhow of chemistry, physics, mechanical engineering, bacteriology, and many other divisions of science.<sup>35</sup> Together they are all working toward a common goal "Water Purification". At the present time, many methods are in operation and the results have been gratifying. In the purification of drinking water

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<sup>34</sup> Paley, William S. and others, Resources For Freedom (United States Materials Policy Commission, Vol. 5, Washington, United States Government Printing Office, 1952), p. 83.

<sup>35</sup> Documented by: Walter, William G., Botany and Bacteriology Dept., Montana State College.

there are several choices<sup>36</sup> as to the system that will be used: water from mountain streams and lakes may not require any treatment depending on the locality; however, if it is necessary, the system of coagulation and sedimentation basins, is very good. Where filtration is necessary we may find the following methods; Slow Sand, Rapid Sand, and Pressure. Water purification is handled by a different process where sewage is concerned. The facilities used here vary from Outdoor Privies, Septic Tanks to Activated Sludge Systems.

An approach to the problem of purifying water for human consumption and of human waste products is being dealt with by standards set up by the U. S. Public Health Service.<sup>37</sup> This in itself is encouraging and does take into account the waste products from industry and agriculture. In some cases, where industry is concerned, it may take many years<sup>38</sup> before efficient control measures can be developed. Conservationists realize this and are approaching the whole problem with a long term policy and a patient attitude. Through good sound educational policies, in agriculture we find the individual employing practices that are giving him the maximum use of water without removing the soil which is imperative to his very livelihood.

Good water means a healthier, economically more stable nation, rich in the power it will produce. It will result in the growth of biological

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<sup>36</sup> Walter, William G., McBee, Richard H., General Bacteriology (New York: Van Nostrand Company, Inc., 1955), p. 202.

<sup>37</sup> Ibid., p. 201.

<sup>38</sup> Ibid., p. 214.

organisms and plant life necessary for a fruitful harvest of fish and wildlife. It is also the life-blood of a nation.

The future conservationist and scientist will be interested in the following excerpt taken from a report by the U. S. President's Materials Policy Commission:

Man has tapped very little of the ocean resources so far, chiefly for the reason that exploitation of land resources has been more economic. As the needs for materials become more urgent in years ahead, and as the technology of exploration and development of ocean resources improves, man may turn increasingly to the sea.<sup>39</sup>

The population of the United States is growing all the time and as a result the demand for more and more agricultural crops and animals will also increase. Stephen Hilmar Raushenbush, in his book *Our Conservation Job*, gave one possible solution which may be a partial answer to the greater demand for agricultural products.

The possibilities for control of the processes which plants use for producing energy came with atomic fission. They led some of the workers in the field to believe that they are only a few years away from the time when either marine or fresh water algae in miles of shallow tanks, exposed in our sunnier areas to heavy sunlight and multiplying at great speed, will be producing under control either proteins, or fats or sugars in the ratio our economy needs.<sup>40</sup>

#### Land

Any and all land is our heritage and the beneficial uses man has made of it are practically limitless. In the book *"My Country 'Tis of Thee"*, we are impressed by the following quotation:

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<sup>39</sup> Materials Policy Commission, op. cit., p. 23.

<sup>40</sup> Raushenbush, op. cit., p. 30

The agronomist thinks of soil as a truly living thing. More than that he thinks of soil and its care as basic in civilization.<sup>41</sup>

Land has been used for building dams to produce hydro-electric power, to save cities and for irrigation. It has been used for transportation of water, vehicles, airplanes and trains. Good soil is responsible for the economy of a nation in producing grain crops, cereal crops, vegetable crops, forest crops, and others.

Where its forests are concerned, the history of the United States shows by the following report from the Joint Committee on Basis of Sound Land Policy that man severely drained this renewable resource.

The original forests of the United States covered 822,238,000 acres, located mainly in the eastern part of the United States. Approximately 5/6 (five-sixths) of this area has been cut over. Only 138,000,000 acres of virgin timber remain. About 352,000,000 acres have been permanently cleared and transferred to other uses, so that only 470,000,000 acres can now be classified as forest land.<sup>42</sup>

Severe as this is, through sound forest management policies, the United States can now state that the yearly growth of its timber is equal to the harvest. The importance of the foregoing development was made possible through educating the public. Education of the public in wise use of land is not restricted to forestry alone but includes any and all phases of sound land management.

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<sup>41</sup> Mitchell, Mrs. Lucy (Sprague), My Country 'Tis of Thee, (New York: The McMillan Co., 1940), p. 107.

<sup>42</sup> Joint Committee on Basis of Sound Land Management, What About The Year 2000, 1929, p. 88.

### Summary

The primary purpose of this chapter was to:

Give a little of the historical background of Conservation of Natural Resources.

Give beneficial uses man has made of solar energy, air, water, and land.

Give proposed and possible future scientific uses of natural resources.

The next chapter will bring conservation and education together as a unit. Chapter IV will also reveal when, how and why conservation education should be taught as an integrated subject.

## CHAPTER IV

### CONSERVATION EDUCATION

Each and every one of us is familiar with the individual terms Conservation and Education. However, when we speak of conservation education a person has a tendency to restrict his thinking, narrow the field down and as a result lose sight of the overall picture. We must magnify our realization, just as one does when looking through a microscope, then pick out the minutest details to find the essence and vastness of conservation. One can only understand these minute problems in all the various fields or in only one if he has a basic understanding of Natural Resources Conservation; and he can secure that knowledge through education.

Why is it important? The industrial age has shown us what mechanization can do to speed up the declining sources of materials necessary for the modern world. Now we are entering the atomic and hydrogen age, a type of power when utilized properly that can increase many times the speed of mechanization of a nation. It is for us to prepare the younger generation so that it may be literally keyed up to face the fast moving world into which it will go to seek its future. That future depends on a thorough understanding of the basic philosophy behind all educational programs of today.

When should the teaching of conservation education begin? There is no definite point at which conservation education should begin, but rather a period of time which occurs between the parent and the time the child is born. During this element of time the parent is consistently thinking

about the baby. Will it be a boy or girl? How much we can do for our baby as she or he grows up. So many many things are ever present in the parents' minds about their baby and the future of the baby. Wouldn't it be wise and healthy for the parent and child if the adults were confident in the security of the future? Therefore, the health of a baby may be considered essential to learning capabilities, and consequently his education begins prior to birth.

How should conservation be taught? At the present time the Law for Montana reads as follows:

75-2015. Type of Conservation Courses of Instruction. The state board of education shall determine the type of conservation education to be taught in the public schools of the state and shall also determine the type of services in this general conservation program to be given by the above named agencies at the various units at the greater university of Montana; provided, that conservation education shall not be taught as a specific subject in the elementary and secondary schools but rather shall be taught as a part of and integrated with all other related subjects and courses. (In. Ch. 125, L. 1951).<sup>43</sup>

The men that passed this law represented the people of Montana and as such it can be considered an opinion of its citizens. The writer felt that this in itself was evidence enough that conservation education should be integrated into practically all high school subjects. Three instructors at Montana State College, and the Supervisor of Gallatin High School were consulted. Their combined opinions were in complete accordance with the law. It was also felt that in order to make the

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<sup>43</sup> School Laws of Montana (Great Falls, Tribune Printing and Supply Co., 1953), p. 88.

program effective all teachers, that may possibly integrate conservation education, should have some education in that field.<sup>44</sup>

#### Summary

The preceding chapter dealt with the correlation of Conservation and Education in that it answered the fundamental questions concerning the topic and gave a factual reason for integrating it with other subjects. It also gave the combined opinion of educators that are at the present time active in the education of students that will be future teachers and prominent personalities in other fields.

The next chapter will outline a suggested application of conservation education for the ninth, tenth, eleventh, and twelfth grades.

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<sup>44</sup> Opinions were secured with respect to the question: Do you feel Conservation should be taught as an integrated subject in the high school program?

## CHAPTER V

### INTEGRATING CONSERVATION EDUCATION

This, the final chapter, will be devoted to the employment of conservation education of natural resources in senior high school. The idea of the writer was to lay out a plan which would grow with the student both in active participation and depth of reasoning. The content of the outline is written to show that there is literally no subject that cannot integrate conservation education.

#### Outline for 9th Grade

Objectives--The aim in the 9th grade is to familiarize the student thoroughly with his community.

1. Where and how conservation is found in his community.
2. How we can improve conditions that we encounter.
3. Who the local leaders are and what is their job.
4. Learn its history.
5. Develop a popular understanding of natural resources.
6. Cultivate a new community ambition.

#### Motivations--

1. Community encouragement by local organizations sponsoring activities.
2. Construction of wooden models depicting:
  - a. Architectural uses of wood.
  - b. Conservation models to mathematical accuracy.
3. Start a school forest or nursery or secure support from a local nursery or greenhouse.

Grade 9 continued

4. Use of audio-visual education material.
5. Write a theme on pioneer days of community or make a scrapbook showing a growing community.

Procedure--

1. Visitations by students to community industrial areas, stores, water purification plants and sewage disposal units.
2. Local business discussions with various classes regarding possible future developments of community.
3. Obtain local support for acquiring a plot of land as nursery site or use of local nursery or greenhouse.
4. Planting of seeds and seedlings in nursery as class project.
5. Field trips to various areas adjacent to community.
6. Visit local city hall, library, museum, and other places that are directly connected with the community.
7. Talks to students by:
  - a. Mayor
  - b. City Engineer
  - c. Firechief
  - d. Chief of Police
  - e. Others

Evaluation--

1. Tests
2. Individual interest while on field trips.
3. Grading of themes and scrapbooks.

Correlation--

Conservation education of natural resources will be only as successful as the teachers that integrate it. In Corvallis, Montana, the 8th grade

has successfully integrated this subject. The following is a portion of an interesting article taken from the Montana Education, April 1954.

A conservation project, a spirit duplicator and a school paper wedded in pollygamic pedagogy (yet to be investigated by Dr. Betts, et al), have served admireably in securing edifying results as an integral educational experiment, or better experience, here in Corvallis 8th grade. We have been seeking a way to integrate the subject of conservation into the curriculum for some time. Like many of you, we are not interested in teaching conservation as a separate subject; but rather, as a part of everyday living. If you have read this far, do not throw your hands up in despair. You do not have to be a polished conservationist, a journalist, and a mechanic rolled into one to try something like this.<sup>45</sup>

A school district that has an ambitious, interested administration that can familiarize teachers to the conditions surrounding them, can create the motivation necessary for proper integration.

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<sup>45</sup> Bay, R., Classrooms Unlimited, Montana Education 30: Apr. 54, p. 12.

## Outline for 10th Grade

## Objectives--

1. In the 10th grade we will correlate the community and county.
2. Sensitize the individual to evidences of resource waste.
3. Develop new customs and practices.
4. Become acquainted with all the processes at work in the county..
5. Establish relationships between community, county, and adjoining areas.
6. Become personally acquainted with the men responsible for conservation.

## Motivations--

1. Complete familiarization of students with county through use of maps and history.
2. Teach students the land area of the county in detail.
3. Use of audio-visual aids.
4. Writing themes and taking pictures.
5. County encouragement by local organizations sponsoring activities.

## Procedure--

1. Field trips to places within the county that are of historical, commercial and future interest.
2. Field trips within the county that are of conservational interest.
  - a. Forested areas.
  - b. Strip and contour farms.
  - c. Areas used for grazing.
3. Visit to county courthouse, extension agents office and others that are directly connected with the county.

4. Talks and visits to the school by:
  - a. County Agent
  - b. County Commissioner
  - c. Local Game Warden
  - d. District Forest Ranger
  - e. Historians within the county.
5. Work in nursery acquired in grade 9 or whatever facilities that were made available. Students will figure out seedling germination, survival, causes and effects of environmental factors and other practical information.
6. Make up a pamphlet on Our County 195-.

#### Evaluation--

1. Tests
2. Student Behavior
3. Themes, picture scrapbooks, and yearly pamphlet to be returned to student.

#### Correlations--

The objective here is to give the students detailed facts to show how the community and county are related through taxes, watershed, farming, industry, and history. Also, to produce, through possible correlation, possible improvements for the future. Any student is interested and motivated if he is shown where he fits or can fit into county-community relationship either as a family of the past, present or future.

### Outline for Grade 11

The student having been thoroughly prepared, to the smallest detail in county and community relationship, is now ready to learn about natural resources of a greater extent.

#### Objectives--

The philosophy for the 11th grade should be to give the student sufficient education on functions within the state that he feels;

- a. Competent to talk about it.
  - b. Proud to live in it.
  - c. He is a citizen of it.
1. Understand and appreciate all the industries and their relationship to the community.
  2. Study the pattern of state government and its proceedings in the many related fields.
  3. Make an intimate study of the history of the state with relation to industry, agriculture and wildlife.
  4. Correlate and understand the laws of the state with respect to conservation.

#### Motivations--

1. Familiarization with state by use of maps, history, routes of transportation, rivers, industry and cities.
2. Familiarize students with the political state.
3. Audio-visual aids concerning state.
4. Reading and reporting on books about state.

#### Procedure--

1. Field trips of great enough extent to cover, as well as possible, any and all historical, conservational, industrial and political functions of the state.

2. Visits to school by state personal or individuals interested in the state:
  - a. State Fish and Game Department.
  - b. State Historical Society.
  - c. Montana Conservation Council.
  - d. State Highway Department.
3. Nursery operations are at the transplant stage. Students through proper guidance will follow the procedure for transplanting and work out a complete report.
4. Students build or work with a school aquarium. Every year the junior class will supply one of two aquariums with marine life.

#### Evaluation--

1. Tests.
2. Reports on field trips either written or photographic. To be returned to student.
3. Reports by students regarding their own experiences with state.
4. Theme and book reports.

#### Correlation--

If he has properly learned the functions of the county, the student will have no trouble correlating conservation in the counties with conservation practices of the state. He will be able to integrate historical, industrial, political and conservational aspects of the state much easier. The nursery work may be of great value in that the student can figure out mathematical problems of practical application. For example:

- a. Taxes on property. How are these taxes used?
- b. Seeds planted and survival for transplanting.
- c. Number of transplants the forest service would need to adequately plant areas devastated by fire the previous summer.
- d. Cost of operating the small nursery as compared to a large nursery.

Up to this point the student has been thoroughly educated in all the functions of the state. He has witnessed the application of his learning from a theoretical and practical viewpoint.

## Outline for Grade 12

The senior in high school is now in the final preparatory year. He is ready to bring together all his previous learning activities into a united understanding.

## Objectives--

1. In public speaking the student will report on his experiences in travel if it was nationwide or other topics that are either nationwide or worldwide in content.
2. Chemistry will integrate conservation of natural resources by lecture and practical experiments.
3. English and natural resources can be related by themes. For example:
  - a. Individual papers on specific types of big game animals of North America.
  - b. Individual papers on future America as related to science.
  - c. Individual papers on why he thinks laws and natural resources are necessary and related.
4. In trigonometry the students may solve problems that are related to conservation of natural resources.
5. To integrate material concerning natural resources on a national scale.
6. To explode the idea that foreign trade can compensate for exhausted resources.
7. To instigate geographical habits of thinking.
8. To dispel the notion that science is a substitute for resources.
9. To create practical student interest in conservation education of natural resources.

## Motivation--

1. Familiarize the student with the states as related to natural resources.
2. Familiarize the student, step by step, with transportation, industry, government, natural resources, scientific discoveries, law, history and future of America.
3. Student experiences concerning travel.
4. Class prepared and edited booklet regarding their four years in high school.
5. School nursery pamphlet and assisting freshmen in their nursery work.
6. Individual planting of several seedlings that they themselves developed over the four year period. Making a plaque to commemorate the event.
7. Audio-visual Education.
8. Reading and reporting on books concerning history of the nation and world.
9. Senior sponsored dance to be composed of decorations and costumes that depict conservation of natural resources.

## Procedure--

1. Active participation of students in national contests.
2. Visitations to school by representatives of the United States government, industry and others.
3. Nursery report a complete, detailed, business like tabulation.
4. School aquarium report which will be complete in showing the development of marine life.
5. Find particular fields which interest the students and supply them with information that is related to conservation education.

### Correlation--

In the senior year worldwide conditions necessitate a complete correlation of conservation education of natural resources and the subjects he takes. This is the last chance the educators will have to teach many of the students. It is also the last chance the teachers of the first twelve grades will have to prepare the students for further education.

### Summary

The object of the outline for high school is not that it be looked at or thought of as a set pattern to follow. The suggested steps, in presentation, are what are important otherwise we may have the student getting ahead of himself in content and as a result there will be a loss of interest through lack of understanding. Upon graduation, he will be prepared for college, on the job training as an apprentice or other employment. Through thorough and proper schooling he will be loved and respected by his home, proudly thought of by the community, and be enthusiastically watched by his teachers and supervisors.

Conservation education of natural resources that is integrated throughout his entire twelve years of learning activities will be one of the stepping stones to achieving that future which the student desires. It must be realized that the term Conservation Education as a direct reference should be referred to in only the minutest detail. It is more important to realize that it is basic to almost every learning activity.

The writer is confident that if a program were followed that included the basic methods prescribed it would achieve the following:

1. Create interest and motivation.
2. Add to retention of students throughout the four years of high school.
3. Develop an understanding between boy and girl and improve future relations among them.
4. Give the students a sense of value regarding their community, county, state and nation.
5. Be beneficial to future development of state and nation.
6. Aid community in understanding and solving its problems.

7. Make healthier minds and bodies through a sound education policy.
8. Give the administration and teachers a feeling of a job well done.

In conclusion the writer suggests the following books which will be helpful in integrating Conservation Education.

1. Allan, Durward, "Our Wildlife Legacy", New York, Funk and Wagnalls Company, 1954. 422 pp.
2. Baker, A. C., and Lewis H. Mills, "Dynamic Biology". New York, Rand McNally and Co., 1938. 733 pp.
3. Brinser, A., and W. Shepard, "Our Use of the Land". New York, Harper, 1939, 303 pp.
4. Emery, Lewis Will, A Study of Conservation Education in the Secondary Schools of the United States, Cornell University, 1949. 521 pp.
5. Fales, D. B. and others, "Conserve Our Soil, Forest and Wildlife". Cornell 4-H Club Bulletin 77. 52 pp.
6. Flynn, H. E., and F. E. Perkins, "Conservation of the Nation's Resources", New York, Macmillan, 1941. 385 pp.
7. Laton, Anita D., and Samuel R. Powers, "New Directions in Science Teaching", New York, McGraw Hill Book Company, 1949. p. 220, 93-94.
8. Renner, G. T., and W. H. Hartley, "Conservation and Citizenship". Boston, Heath, 1940. 367 pp.
9. Sears, Paul B., "Deserts on the March", Norman; University of Oklahoma Press, 1935. 231 pp.
10. Sears, Paul B., "This is Our World", Norman; University of Oklahoma Press, 1937. 202 pp.
11. Smith, Ella T., "Exploring Biology", New York, Harcourt and Brace, 1938. 696 pp.

## BIBLIOGRAPHY

## A. BOOKS

- Churchill, Winston S., Triumph and Tragedy. Boston: Houghton Mifflin Company, 1953. 800 pp.
- Korstein, C. F., James W. Toumey, Seeding and Planting in the Practice of Forestry. New York: John Wiley and Sons, Inc., 1942. 520 pp.
- Mallette, Frederick S., Air Pollution. New York: Reinhold Publishing Corporation, 1955. 272 pp. Problems and control of air pollution; proceedings of the 1st Congress held in New York City, March 1-2, 1955, under the sponsorship of the committee of air-pollution controls of the American society of mechanical engineers.
- Mitchell, Mrs. Lucy (Sprague), My Country 'Tis of Thee. New York: The MacMillan Company, 1940. 335 pp. Use and abuse of natural resources.
- Sanders, Helen F., A History of Montana. Chicago and New York: Lewis Publishing Company Vol. I, 1913. 547 pp.
- Walter, William G., Richard H. McBee, General Bacteriology. New York: Van Nostrand Company, Inc., 1955. 345 pp.
- Weiss, Marvin D., Industrial Water Pollution. New York: Chemonomics Inc., 1951. 142 pp. Survey of legislation and regulations.
- Whitaker, Russell J., Edward A. Ackerman, American Resources. New York: Harcourt, Brace and Company, 1951. 497 pp. This book deals primarily with the management and conservation of natural resources.
- School Laws of the State of Montana, Great Falls: Tribune Printing and Supply Company, 1953. 250 pp.

## B. PERIODICAL ARTICLES

- Bay, R., "Classrooms Unlimited", Montana Education 30: April, 54. p.12.
- Clark, Neil M., "Big Power Plant in the Sky", Saturday Evening Post. Vol. 228, No. 19, November 5, 1955.

## C. PARTS OF SERIES

- Paley, William S., and others, Resources For Freedom. United States Materials Policy Commission, 5 vols.; Washington: United States Government Printing Office, 1952.

## D. PUBLICATIONS OF LEARNED ORGANIZATIONS

Gilman, Charles H., John Oliver, A. M. Rawn, Sewage and Drainage of the Greater Vancouver Area, "Vancouver and Districts Joint Sewage and Drainage Board," Vancouver, British Columbia, 1953. 278 pp. A report to the chairman and members of the Vancouver and Districts Joint Sewage and Drainage Board.

"Joint Committee on Basis of Sound Land Management Policy", What About The Year 2000? Harrisburg: Mount Pleasant Press, 1929. 168 pp.

Ordway, Samuel Hanson, A Conservation Handbook. New York: The Conservation Foundation, 1949. 76 pp.

Raushenbaugh, Hilmar Stephan, Our Conservation Job. Washington D. C., 1949. 68 pp. A new way to obtain soil and range, forest, fuel and energy conservation.