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An Experiment in Teaching Conversation: The Terra Verde Conservation Project

Russell James Bay

The University of Montana

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AN EXPERIMENT IN TEACHING CONSERVATION:

THE TERRA VERDE CONSERVATION PROJECT

by

RUSSELL BAY

B. E. Montana State Normal College, 1938

Presented in partial fulfillment of the requirements for the degree of Master of Education

MONTANA STATE UNIVERSITY

1954

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Date: Aug 13, 1954
PREFACE

The Egoist. Relative to geologic time, man's whole existence upon earth has been but an instant; yet, his influence thereon has been no less than catastrophic. Along with his accumulation of knowledge and technical skills, he has developed an ego to the point of infamy. He has assumed for himself an omnipotence over the fundamental laws of nature, which to break instills no trembling, nor fear of the unfortunate consequences that historically have always followed such vanity. Man has yet to realize fully the fact that he is only an infinitesimal part of nature's community. Until he accepts and respects his responsibility as a minor cog in the machinery of nature's community, that he is not the machine, nor its product, much less its motivating power, his very existence is in danger.

The Community. Ecologically, the community is an aggregation of organisms, bound together in an exceedingly complex web of inter-relationships, within whose structure, man's role of dependence upon the "lesser" constituents far exceeds his admitted station. True, the community tolerates dominates, as well as subordinates therein; however, the condition is seldom static. The tree, because of its size dominates the immediate locale structurally as well as ecologically. But, that dominance is static only as long as that organism is found to be in harmony with the community
in its entirety. Whereas, man fallaciously presupposes his dominancy is an inalienable, God-given "right," philosophically reasonable, justifiable in the light of conscious intelligence. Unique as he certainly is, his welfare in the community depends entirely, in the final analysis, upon his ability to live harmoniously with the lesser constituents.

The record of his past, written upon the face of the good earth, is not one of harmony, but rather, one of dictatorial abuse, of destruction, of desecration. With the gathering speed of an avalanche, he has obliterated the tender leaf, laid waste the warm, rich soil and destroyed the once refreshing, pure water. We need only to review the "record" to verify these shameful facts.
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CHAPTER ONE

THE RECORD

I. INTRODUCTION

Unfortunate indeed, is the fact that the term conservation has been defined as "preserving, guarding, or protecting; a keeping in a safe or entire state." In the language of a dictionary, this may be the accepted definition; however, it does not in any way represent the full meaning as implied herein.

Conservation is more than preserving. It not only implies use, but "wise use" of our renewable natural resources, so that the maximum benefit is obtained for the general welfare of the entire nation and each individual therein, and at the same time, that use being consistent with the ideal of permanent maintenance.

Although this ideal and the philosophy as stated in the preface, may, on the surface, appear to be more rhetoric, rather than that of sensible reasoning, we need only to view the panorama of the past in tachistoscopic glimpses to ascertain its veracity. The necessity of this approach is even more imperative in the light of our ever increasing complacency.

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1 Webster's New International Dictionary, second edition, unabridged (Springfield: Meriam Company, 1951)
We Americans have never worried greatly over the consistency, clarity or sufficiency of our pattern of belief. We have not done so for the excellent reason that, until recently, we have seldom needed to do otherwise. We have been too wrapped up in the conviction of our own invincibility, too sure of our inevitable progress. The fact that we have hitherto emerged into uneasy interludes of prosperity and peace has actually encouraged our complacency.2

This somewhat mild indictment of the attitude of America is in no way a development new to world society. We need only to read the record of the past to witness this fact.

Let us consider briefly a few historical situations that exemplify the incident of like complacency in the now extinct, or nearly so, nations of Mesopotamia, Egypt, Israel, Roman North Africa, Italy, and finally, in our own nation, the United States.

II. RETROSPECT: THE RECORD

The written history of the world, as most of us know it, is a vain compilation of dramatic events, the rise and fall of great empires, dates, and wars. The consideration and interpretation of causes which produced events of historical importance are too often neglected. Investigating thoroughly the actual cause of specific instances of conquest or mass migrations, a few historical researchers have found a similar sequence of similar facts prevailing in many situations which follow a definite pattern; namely, (1) an

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abundance of natural resources provided excellent living conditions, (2) which in turn accelerated population increases, (3) placing heavier demands upon those resources, (4) until their depletion was as sure as the passing of time, (5) as was the degeneration of that particular civilization.

Archaeologists tell us that some 7,000 years ago, agriculture had its beginning either upon the fertile plains of Mesopotamia or in the Valley of the Nile. With the coming of this vocation, came the birth of civilization. With the aid of irrigation, more food could be raised than could be consumed by the producer and his family, so that a division of labor was effected, releasing many laborers to pursue many other specialized occupations.

Mesopotamia. In Mesopotamia, the foundations of the city of Babylon rested upon the rich alluvium deposited, some believe, by the great flood described in biblical records. Upon this rich soil, Nebuchadnezzar's people grew bountiful, lush crops, making possible the development of a culture of the highest degree. Originally, the watersheds of the Tigris and Euphrates Rivers were clothed with the huge Lebanon cedar. These Nebuchadnezzar boasted cutting down and adorning with gold and jewels. Actually, he was effecting the suicide of his very empire. Had he listened to the Hebrew prophets who were saying Babylon would become "A desolation, a dry land, and a wilderness, a land wherein no man dwelleth..." his empire may have remained intact.

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3 The Holy Bible, King James version, Jeremiah 51:43
But no, the trees were removed, the succulent grass cover was obliterated, and the unprotected soils of the watersheds were, as a result, eroded and washed into the irrigating canals that were the arteries of this civilization. Harder and harder they labored to remove the silt, but it was a losing battle. A great empire crumbled finally, when internal revolutions and foreign invaders necessitated the removal of the many, many laborers whose task it was to remove the silt. Once filled, it was humanly impossible for them to remove the silt by their slow, crude methods.

Yet today, we look upon the ruins of this great civilization, the sifting, dry sand and desert shrub, lamenting the destructive forces of a military defeat.

**Egypt.** Possibly at the same time, another great civilization was in the process of development. In Egypt too, man learned to irrigate his land. His lands were then, even as now, flooded each spring by the muddy waters of the Nile, depositing alluvium over the surface of the land, forming a rich, new soil each spring. This was kept moist throughout the dry growing season with water from the River Nile. The division of labor was again effected and the whole north-eastern portion of the continent of Africa was populated. But again, thoughtless abuse of the tender leaf was the prime destroyer. Population increased rapidly, more foodstuffs were needed, which in turn required increases in herds of cattle, sheep and goats, until the last blade of grass on the
now barren foothills was consumed. The slow starvation of a great civilization was unknowingly, but deliberately launched and pursued.

But why did a remnant of that civilization manage to exist? The headwaters of the Nile were at such a great distance from Egypt that it was in no way practical to utilize much of the resources available there. Swamps, jungles, and disease also curtailed the possibility of utilization.

The Promised Land. "Ol' Pharaoh, let my people go." Had the people of Israel been capable of serving the Pharaoh further, this plea would probably have gone unheard. However, when the tide of Egyptian cultural and economic expansion had begun to ebb, he allowed this tremendous migration to take place, possibly as a solution to increasing food shortages and labor surpluses. Moses led his people, estimated to have numbered some 2,400,000 souls, through the wilderness surrounding Sinai for a period of forty years.

Today that same wilderness is a desert, bleak and desolate, eroded and arid. Yet, during the era of Israel's wanderings, the wilderness provided adequate grazing to feed their countless flocks, and provided the necessary food constituents for that amazing migrating flock of humanity.

Looking across the Jordan River, finally, Moses described to his followers their promised homestead in these

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words:

For the Lord thy God bringeth thee into a good land, a land of brooks of water, of fountains and depths that spring out of valleys and hills; a land of wheat and barley and vines and fig trees and pomegranates, a land of olive oil and honey; a land wherein thou shalt eat bread without scarceness; thou shalt not lack anything in it; a land whose stones are iron and out of whose hills thou mayest dig brass.\(^5\)

Recently (1938-1939), Mr. W. C. Lowdermilk of the U. S. Soil Conservation Service retraced the steps of the Israelites and described the same scene as follows:

We crossed the Jordan Valley as did Hoshua and found the Jordan River a muddy and disappointing stream. We stopped at the ruins of Jericho and dug out kernels of charred grain which the archaeologists tell us undoubtedly belonged to an ancient household of this ill-fated city. We look at the Promised Land as it is today, 3,000 years after Moses described it to the Israelites as a "land flowing with milk and honey."

We found the soils of red earth washed off the slopes to bedrock over more than half the upland area. These soils had lodged to the valleys where they are still being cultivated and are still being eroded by great gullies that cut through the alluvium with every heavy rain. Evidence of rocks washed off the hills were found in piles of stone where tillers of soil had heaped them together to make cultivation about them easier. From the air we read with startling vividness the graphic story as written on the land. Soils had been washed off to bedrock in the vicinity of Hebron and only dregs of the land were left behind to narrow valley floors, still cultivated to meager crops.\(^6\)

What more need be said?

Roman North Africa. No word symbolizes desolation or waste as does "Sahara." Few are aware of the fact that great cities once thrived there.

\(^5\) The Holy Bible, King James version, Deuteronomy 8:7-9

Timbuktu, a ghost town of pre-historic origin isolated by miles of arid waste in the middle of the Sahara Desert, was once surrounded by fertile fields and olive groves. Buried beneath its desert sands is complete evidence that Africa's great dust bowl once was as rich as the Mississippi valley. Giant primitive forests, lakes and rivers once spread across the vast wastes of the Sahara.

It was here in the rural areas of this and other Roman cities of splendor that much grain and similar agricultural products were raised. The level of culture and comfort, as we judge it now, is suggested by the fact that many of these cities boasted public libraries, forums, theaters, and more surprising still, marble flush toilets for the public. And yet, this rich land and the evidence of civilization has been lost to knowledge for a period of nearly 1,200 years, buried by the dust of wind erosion.

But why, we ask again, is this area, along with that of the major portion of North Africa, the epitome of all deserts?

The simple suggestion of a decided change of climatic conditions hardly explains the decadence of North Africa. This fact is completely born out in the light of recent studies and experiments.

On the plains about Sfax, ruins of olive presses were found, but no olive trees. Forty years ago an experiment to plant olive trees there was decided upon. Now more than 150,000 acres are planted to olive trees; their products support thriving industries in the modern city.

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of Sfax. These plantings indicate that the climate of today has not become significantly drier since Roman times.\(^8\)

Unable to justify the decadence of this civilization in terms of the vagaries of nature, we must assume, then, that the disappearance of man, beast, and plant from the face of this land must have been a result of man's own doing, a result of his own vanity. Sadly enough, the first evidence of a similar environmental change may be seen upon our own continent, critical water shortages, abandoned ranges, slashed forests, dust bowls, to mention only a few.

**Greece.** Little needs be added to Plato's quotation of Timaeus in his conversation with Socrates:

Consequently, since many great convulsions took place during the 9,000 years—for such was the number of years from that time to this—the soil which has kept breaking away from the high lands during these ages and these disasters, forms no pile of sediment worth mentioning. . . But at that epoch the country was unimpaired, and for its mountains it had high arable hills, and in place of the "moorlands," as they are now called, it contained plains full of rich soil; and are visible signs even to this day; for there are some mountains which now have nothing but food for bees, but they had trees not so very long time ago, and the rafters from those felled there to roof the largest buildings are still sound. And besides, here were many lofty trees of cultivated species; and it produced boundless pasturage for flocks. Moreover, it was enriched by the yearly rains from Zeus, which were not lost to it, as now, by flowing from the fare land into the sea; but the soil it had was deep, and therein it received the water, storing it up in retentive loamy soil; and by drawing off into the hollows from the heights the water that was there absorbed, it provided all the various districts with abundant supplies of spring-waters and streams, whereof the shrines which still remain even now, at the spots where the fountains formerly existed, are signs which testify that our present description of the

\(^8\) Lowdermilk, op. cit., p. 18.
land is true.9

Italy. Under the very inappropriate title of Genious of Italy, Leonardo Olschki states:

With little exaggeration, it can be said that man, more than nature is responsible for the fallow and uncultivated land and thinly settled region of ... continental and insular Italy. The naval development of Rome from the destruction of Carthage to the era of imperial expansion led to the deforestation of the Apennine heights.

The process was completed in the course of the Middle Ages by the shipbuilders of Venice, Pise, Genora, and Amalfi. Since then the erosion of the unprotected soil has made a stony waste of the mountainous region once covered ... by luxuriant forests. Large flocks of goats and sheep have completed the age-old process of deforestation by gnawing away the fresh shoots of deciduous plants tenaciously rebiergeoing under a merciful sun.

The proponents of agrarian reform ... have never been able to find in a poor country, the huge capital needed for the regeneration of the vast regions neglected by man and ravaged by nature ... . The wish that moves mountains is helpless where man and soil have become equally torpid and recalcitrant.10

As early as 1600 A. D., proponents of conservation were appearing upon the Italian scene. Because of their love of the city of Venice, the Paulini brothers began an intensive study of the watersheds of that city.11 They described the disastrous effects of the clear cutting methods of the ancient logging industries and continued to their day. It was


11 The information concerning the Paulini Brothers was taken from a lecture of Dean Ross Williams of the Montana State University Forestry School, given at the Conservation Workshop, July __, 1953.
their contention that a part of the trees be left standing for soil holding purposes. They were not so much concerned with the fact that the soil was being removed after the forests were stripped from the watersheds, but were intensely interested in retarding the siltation of the canals in Venice. Without the benefit of dredging machinery, the filling of the upper reaches of Venice's canals by erosional debris meant simply the necessity of evacuation of the people and businesses of that particular area, being no other means of transportation other than by way of canal boat. But, the removal of entire forests continued (what little did remain), as did the displacement of people from their canal-side homes.

Venice became, as a result, a city of tremendous density of population, giving rise to social disorders of great magnitude. Once again, the immediate economic importance of the products of the good earth was the criteria of the justification of misuse, rather than the consideration of the inevitable remuneration collected at a future date.

Historical parallels all: Mesopotamia, Egypt, Israel, Roman North Africa, and Italy, each of which represents only a few of the many more instances of man's flagrant dissipation of God-given natural resources, resulting in nearly every case, the social and political retrogression of that society. The consideration, then, of the United States and her record of resource-use follows logically, serving,
possibly, as a basis of prognostication concerning the record yet to be written in the future.

III. THE UNITED STATES

The Age of Plenty. The basic philosophy in the establishment of society upon the continent of North America, collectively and individually, was one fraught with freedom. This ideal became a driving force, almost to the point of intoxication, evident in every phase of the growing social structure, in the formulation of governing bodies, social attitudes, religious precepts, economic practices, and individual relationships. Freedom without limiting bounds, however, has a way of becoming destructive, unless tempered by cool, rational reasoning. No better example can be cited than that of the Constitution of the United States. This historic document was not only a statement implementing the continuance of freedom, but was a noble effort to limit those "rights" within due bounds, in order to prevent the self destruction of the newly born nation.

However, little political attention was paid to the physiography of the nation, other than the acquisition of further territory and problems of economic intercourse.

The fathers of the Constitutional Assembly had discovered and laid claim to a land of apparently inexhaustible natural resources. They found vast areas of heavily forested lands whose magnificence was looked upon in wonder, but at the same time, the removal of the same from the land seemed
imperative for the ultimate use, agriculture. If, after removing the obstinate tree, they found the soil unsuitable for cropping, they moved on. When on the other hand, the last accessible, merchantable tree was cut for purposes of naval utilization, lumber, or fuel, they again moved on. Shortly, however, a few men of insight realized that the depletion of those bountiful resources could become total if this exploitation were to continue, but not until great inroads toward that depletion had been accomplished.

Conservation, like health and justice, takes on meaning only through defect. The idea would have no point in human society which maintained a favorable and well-balanced relation to its environment. The idea of curing a specific disease or eliminating a particular injustice always seems more practical than an inquiry into the conditions necessary for general health or for justice.\(^{12}\)

William Penn was probably the first to realize the importance of "eliminating the particular injustice" of planless exploitation through his ordinance, known as the William Penn Ordinance of 1681, which provided "that in clearing land, one acre be left in trees for every five cleared."\(^{13}\) Shortly thereafter (1691), came the well-known edict, the Broad Arrow Proclamation from the English government, ruling that "white pine trees, 24 inches and larger in


diameter, were to be reserved for the Royal Navy."14

Among others were:

George Washington who established a crop rotation in order that he might preserve the soil on his farm, and Thomas Jefferson in 1813 advocated contour plowing to prevent the soil from running into the rivers.15

These and a pitifully small number of other men of political stature made similar attempts toward conservation, giving evidence of early concern and interest in the perpetuation of the forests and soil.

The Western Movement. The ever growing snowball of exploitation of natural resources reached alarming proportions during the so-called Western Movement. Ever increasing requirements of growing industries, the expansion of railroads, clearing for new farms exacted a catastrophic toll upon the forests. Likewise, the rich lands of the Great Plains were broken in preparation for the tragic dust storms to come later; while the less accessible grass land of the Midwest were grazed to the limit. Here too, the geologic record of the same area indicates that the "buffalo roamed the prairies for 400,000 years. The white man came and liquidated that species in one generation."16


The Contemporary Period. Today, there are left remaining large bodies of coniferous forests in the Northwest, but these are rapidly disappearing. The pine forest of the Northeast are practically extinct, while those of the Southeast, though badly mutilated, are capable of restoration. The tall-grass prairie is gone. The vegetation in the high plains and mountainous areas of the West has been modified in character in some areas, while it has been completely destroyed in others. The shrublands of the arid and semiarid regions of the West remain practically unchanged, simply because of its unsuitability to man and animal needs.

The philosophy of "cut and move" has run its course, since there is little left to cut, much less a new frontier on which to move. Here, as in no other phase of human existence, is more appropriate the old adage, "history repeats itself." Without much extravagance of imagination, a historical parallel can be seen in the muddied waters of the Mississippi with that of the Tigris, the Euphrates, and the Nile. The dust over the Midwest may be a type of juvenile Sahara. The cancerous gullies of the entire nation may appear as a "re-take" of the Promised Land.

If we do neglect conservation as history has ignored it in the past, and any considerable portion of our population does search in vain for existence, we shall have increasing poverty, social upheavals and, in spite of our high ideals and worship of peace, we shall have more wars instead of fewer, for wars are the spawn of empty stomachs, and empty stomachs follow—as day the
night—the excess of demand for natural resources over the supply.

But since we, with ten percent of the world population, have, in the brief period of two hundred years, used up eighty percent of our forests, thirty-three percent of our soil, and abused our aquatic resources even more than our land and forests, we can roughly guess about how long America could feed the world.17

IV. THE PROBLEM

An Overview.18 If we were to cross the River Jordan today as did the children of Israel centuries ago, we would, without doubt, fail to find an individual bunch of grapes so large that it would require two men to carry it home. As we have already noted, that land is now a veritable desert—but not by chance. Our study of the story written upon the face of that land revealed a sordid story of wanton abuse, abuse of clod, grass, and tree. But that, we say, was planless exploitation by unenlightened people. Yet we read in their own Book, "And it was commanded them that they should not hurt the grass of the earth, neither any green thing, neither any tree. . . ."19

More recently, another race of man, more enlightened and more practiced in the use of special tools, inhabited a new land of "milk and honey," not to find huge bunches of

17 Darling, loc. cit. p. 38.

18 A portion of the following was taken from the "Overview" of the Conservation Workshop Manual (Missoula: Montana State University, 1953), written by this author.

grapes, but to find great oceans of forests and grasslands. But this he considered a temporary situation, only to be disposed of for the ultimate use, agriculture. He, like the man of Israel, with his infinite ego and self-assumed omnipotence, broke practically every fundamental law of nature without a thought given to the unfortunate consequences that had befallen his "old-world" predecessor.

Sadly enough, the wanton destruction has not yet been halted. True, man, because of great social and economic pressures, has found it necessary to meet his immediate problems with immediate action. Nevertheless, the community of nature, God's own plan of things, must be considered. If we continue to use self-assumed dictatorial powers upon nature's community, our technical efficiency will indeed continue to work wonders for a time; but, we know too well from the experience of the past that a dictatorship inevitably ends in disaster.

We must seek out a working philosophy, then, in the light of historical experience, that will assure proper treatment and wise use of our God-given resources for the general welfare of every mortal, following a course of enlightened selfishness.

The Problem. The problem, then, simply stated is: How are we to bring our way of life into harmony with the dictates of Nature? The solution, without doubt, cannot be achieved through the employment of a single approach, due to
its tremendous complexity. Education, however, seems to be the most promising, possibly the only hope.

James H. Case, Jr., President of Jefferson College at Washington, Pennsylvania, wrote:

Fortunately there is a growing awareness that no single approach to the problem of conservation offers a cure. Forestry, soil conservation, water supply, flood control, urban practices, indirect process and many other kindred activities are inextricably related. It is our contention that liberally educated men, acquainted with basic scientific concepts and laws, familiar with social, economic, and political practices and objectives, and possessed of the insight afforded by literature and philosophy, can best achieve and organize the properly integrated approach to the problem.20

Although the educator, too, may fall short of the goal of mass conviction, the ensuing enlightenment and conscious awareness of the necessity of practicing the basic principles of conservation will be an important step forward.

It is more apparent than ever that in the youth of America a comprehensive understanding of the problem must be edified, rather than in the adult populace. Conservationists have been failing to scratch the surface of public opinion in spite of their arduous endeavors for the last half century. Heretofore, that appeal has been beamed solely for the consumption of adults, adults who are too busy with the affairs of day-to-day living to give much serious thought to the problem.

The problem of conservation is an individual responsibility first, thence one of governmental concern. As he sees fit, the landowner may conserve or abuse his land, so the general trend of thought goes.

Our neighbors may persuade, public institutions may educate or induce by financial grants, but the individual uses his resources according to the dictates of his own judgments and decisions. Those decisions are influenced by state and federal policies, fluctuations in industrial activity, international trade and prices, tradition and cultural patterns, the closing of a long-receding frontier, population trends.21

This idea of individual responsibility is certainly in keeping with our democratic ideals of freedom of enterprise; however, with the mean, there is ever present the extreme.

Chief Justice Shaw of the Massachusetts Supreme Court stated:

Every holder of property, however absolute and unqualified may be his title, holds it under the implied liability that his use of it shall be so regulated that it shall not be ... injurious to the rights of the community. 22

We have taken considerable comfort in the fact that many, many individuals and organizations have long been shouting conservation from the house tops. However, this has been a philosophy much like that of the Golden Rule—even the sinner affirms its soundness, but few saints actually practice it. The results of this shouting has done


little to defeat the confirmed American habit of mass exploitation, a philosophy of ignorance.

Here lies the croix of the situation. Education is the only effective combatant of ignorance.

V. AN APPROACH THROUGH EDUCATION

We are well aware of the fact that any given school system can hardly be called typical of the whole American educational picture; likewise, there can be no one conservation program that could be followed successfully in every community. Thus, to assure good results, the program must be adapted to the local community and to that community's inherent needs.

One community may be suffering from insufficient and inadequate annual supply of range grass due to past abuse; whereas, another, whose economy is based upon row crops, is concerned mainly with problems of soil improvement. The problems at hand must first be recognized. The plan of action to be followed after that recognition is not only the responsibility but the duty of teachers and administrators throughout the land.

Scientists have long since interpreted and correlated the laws of nature and are continuing to do so in such a manner that the educator need only to make them clear to the youth. Yet, too often, the average teacher will drill his class upon textbook details of, say, mechanics of identification without giving thought to the ecological
aspects of the study at hand. Hard facts of scientific knowledge become cold and sterile unless exposed to the warmth of everyday living.

Thus, the local problems must be singled out, appraised in the light of scientific knowledge, and related to the welfare of the community and the individual.

In addition to the tremendous service done for the welfare of the nation, is the fact that conservation studies based upon local situations tend to render the teacher, himself, more sensitive to the local environment, of which teachers too often have little or no knowledge or respect. Cooperative resource units, both large and small, or extensive conservation projects on the local physical, economic, and cultural environment will greatly enrich the lives of the future citizen.

Finally, this approach to conservation enlightenment through education cannot only become an achievement in itself, but in addition, conservation education successfully pursued can become a method of the expression of basic desires of the child himself, thereby achieving, in part, the edification of the child physically and psychologically. Mr. R. Will Burnett expressed this idea in these words:

Tendencies to explore, to investigate, and to experiment seem to be characteristic and primary aspects of the child's ways of carrying on many of his activities. An imperative of childhood—in fact, it is an aspect of mature personality required for satisfying personal and positive social life in a democratic society—is for the insights, skills, and attitudes necessary to bring the world of real things and events increasingly into an
orderly pattern that can be understood, accepted, and controlled.  

VI. OBJECTIVES OF THE EDUCATIONAL APPROACH

The ultimate goal of conservation education is to stimulate individual consideration and thought concerning the whole subject, which in turn will logically inspire, or better, impel action by every person to conserve our natural resources through their wise use. The thesis herein implied is that the implementation of this goal can be achieved through: 1) Understanding what natural resources actually are;

2) Understanding the basic implication and relationships inherent in nature's community;

3) Knowledge of how those resources can be made to serve us and our posterity;

4) Understanding of their current conditions, locally and nationally;

5) Understanding of the importance of resources upon the welfare of the individual and the nation; and

6) Understanding of how "wise use" can be achieved.

VII. DEFINITION OF TERMS

Climax Organism. The climax organism in any given situation of nature is found to be an individual plant, or possibly a whole community of living organisms, one of which

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has usually assumed the role of dominancy, remaining so only as long as it exists in complete harmony with other constituent organisms. In one situation, the tree may be found to be the climax organism; whereas, on the surface of bare rock, fungi may be found to be the climax organism. Through his complacent ignorance, man has assumed a role of dictatorship, producing, in many instances, objectionable climax organisms which serve no practical use. The application of knowledge gained in scientific study already completed will assure the existence of climax organisms that are compatible to their natural environment and valuable in their service to man.

**Hipsometer.** A hipsometer is a simple device commonly used to measure the gradient quotient of the rise of the topographical features of a given area. In practice, a survey of a given area describes land surfaces in terms of planal measurements; thus, any topographical rises in elevation from the plane must be adjusted through the use of triangulation. Through the use of the hipsometer and the application of the Rule of Prothagorus, that adjustment can be easily computed.

**Horizons.** This term, as used in the science of forestry, may be defined to mean simply the "future"; however, much more is implied. Soil horizons, for instance, not only means "soil futures," but also implies the ecological aspects of attainment of that element. Merchantable
tree horizons, then, would suggest not only the tree in a merchantable condition, but also suggest the consideration of, say, precipitation, soil, weather, et cetera, in the production of the finished product.

National Resources. We must first understand national resources, or if preferred--natural resources, in their total state of existence; thence, expanding our knowledge through the consideration of the individual items, the tree, the soil, the stream. Ridiculous is the idea that one's fingers could function without the arm; likewise, ridiculous is the idea that the lack of fish in a given stream can be attributed to the failure of fisheries to re-stock those waters.

Land, water, and vegetation (and man's very existence) are equally dependent upon one another. With the drying of springs and streams goes vegetation. When vegetation departs, soil too goes--and with it goes man. It was Benjamin Franklin who said, "Forever taking out and never putting anything in soon exposes the bottom of the meal barrel."

Parshall Flume. This is a device used to measure the actual amount of water flowing in a creek or irrigation canal. The total amount of water is directed through the contrivance, and is measured in terms of second feet (one cubic foot of water per second). This figure of measurement is then converted to the more commonly used water scale of acre feet.

Plant Succession. Plant succession is a term applied
to the orderly progression of one plant succeeding another, beginning with the lowly fungi, proceeding to, say, the tree as a climax organism. The fungi, with its unique ability to sustain itself from the nutrients taken from the air, slowly creates a tiny bit of soil, which in turn gives footing and food to support mosses, the successor plant. Likewise, mosses contribute further to the creation of soil, until sufficient amounts are present to sustain its successor, grasses. Succession continues so long as other favorable circumstances are present. The climax organism is found at any of the many stages of progression.

Man's primary interest in plant succession has been directed toward organisms which produce conditions or products which are immediately expendable; whereas, the natural optimum organism in the community, and it existing in harmonic relationship to the whole, has been considered but little.

Witness Tree. At the point of intersecting survey lines, particularly the section line, a stone is usually buried by the surveyor, marking that point. In the forest, this stone can be extremely difficult to find. For this reason, several trees in the immediate vicinity of the "stone" are marked in such a way as to enable the surveyor to relocate his point of line intersection. Since the tree marked "witnesses" the location of that point, it is called the witness tree.
CHAPTER TWO

A REVIEW OF CONTEMPORARY WORK RELATIVE TO CONSERVATION EDUCATION

The growing national interest in conservation education is reflected in the increasing number of school activities centered around that subject. These activities consist of studies ranging from simple, but effective units of work integrated in one particular school subject, to that of extensive state-wide projects. The use of projects as a teaching method can hardly be called a new departure in the field of education, particularly in conservation education. This fact can well be illustrated by the work of the Two Rivers (Wisconsin) High School as described by Frank Chapman Sharp in his book Education for Character, written in 1917.

The Two Rivers High School Conservation Project. Tiring of their work in the classroom upon the subject of social problems, the youngsters of this school asked, "Isn't there something that we could do?" Following the discussion of this question in the form of a debate, the reformation of the local cemetery was undertaken, a project which received considerable public support and interest. Following the successful completion of this task, other forms of civic improvement were undertaken and finished. Mr. Sharp

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appropriately called this "education for character," which is undoubtedly one of the primary objectives of conservation education.

More recent examples of conservation education are seen to take form in an extremely wide variety of approaches, using equally varied methods of employment. Let us consider several of these examples, beginning with the consideration of specific work being done in rural areas, thence urban, and finally, an individual example of a state program.

I. RURAL CONSERVATION PROGRAMS

The Nambe Project. For more than two centuries, the small village of Nambe, New Mexico has gone practically unnoticed. The Spanish-speaking inhabitants lived simply in their silent, arid expanse of desert, clinging tenaciously to their age-old customs and beliefs of Spanish origin. However, the now familiar pattern in the development of a society, following the same lines as cited in the foregoing discussion, became one of digression. As the population increased, the requirements of the grasslands were increasingly overtaxed, resulting in the near depletion of that vital resource. With the removal of the natural ground cover of the neighboring foothills, came destructive flash floods and the excessive siltation of irrigating ditches, giving rise to rapidly mounting social problems that threatened the very existence of these people.

More bewildering still, was the impact of the introduc-
tion of modern social and economic processes through the channel of their school systems. Modern ideology was insinuated without the consideration of the inherent needs of the individual, much less that of the community, a situation found, sadly enough, in many of our so-called normal communities through our land today.

Methods to alleviate this situation were undertaken, however, with the coming of a new school administrator, who immediately recognized the necessity of relating the school program to the immediate needs of the community.

Under the direction of this man and a faculty member of the University of New Mexico, a project was launched, beginning first with the formulation of an applicable philosophy of education, tailored to fit this specific situation. They were:

A school should be the center of the community. It should be sensitive to the needs of the community and, in cooperation with the parents, plan a program that will make the best use of all available resources. Such an environment should stimulate pupils to engage in many activities. Through participating in planning, executing, and evaluating their work, they will learn to think and use the facts and tools of learning. They should find the school a vital place in which to live.25

Following the formulation of these general principles, nine specific principles were also formulated. They were:

1. We shall try to find out what is now needed in the lives of the people of this community and minister to that before all else.

2. We shall constantly try to discover and utilize the resources of the community.

3. We shall utilize the services of all available agencies which other rural schools can use.

4. The starting point of every part of the curriculum shall be Nambe.

5. We shall not attempt to teach everything ... more time will be needed to develop certain areas of experience than is customarily given.

6. We shall expect each child to be reasonably proficient in the basic skills of the three R's and to use English effectively. ...

7. We shall allow pupils sufficient time for planning, discussing, experimenting, and thinking.

8. Since we are aware that certain commonly accepted areas of school experience may be omitted, we will arrange reading lists so that some of the students may acquire some of the knowledge themselves.

9. The curriculum will be kept flexible so that units of work may be shifted to different levels to meet the interest and ability of the various groups.  

These principles, based upon the general and specific needs and problems of Nambe, are cited in their entirety, since, in part, they are applicable to nearly every school situation in America.

A survey of immediate community needs pointed out the fact that health and land use had been the most neglected areas in education previous to the inception of this project. Instructional plans were immediately undertaken and put to use, developing integral work on health and land, used in both the elementary and high schools. Units of study were built around the topics of gardening, irrigation, water sources, trees and forest, and other local conservation problems. Conservation education became more than a theory; it became an experience in living.

26 Ibid, p. 100.
While the children were learning conservation facts, they also learned the academic subjects. An evaluation at the end of a five-year period proved this to be true. In comparison with three other schools, the results of achievement tests showed Nambe children did as well as their neighbors in the fundamental subjects, and learned considerably more about the natural resources of their community. More important even than the facts learned was the new attitude developed in the minds of the children toward the land. They now think in terms of their school grounds, and their fields.\(^\text{27}\)

A Demonstration Forest. "Only God can make a tree, but the pupils of the Plains (Montana) Schools are trying to help with the job,"\(^\text{28}\) so stated Rial Cummings and Emmerson Richardson in describing their community project.

In their studies of geography and conservation, the seventh grade children asked, "Why couldn't we study the subject in the woods instead of from books?" The response to this question was the establishment of a demonstration school forest. The area which was secured for this purpose was located just a few miles from the school and was land that had been heavily logged in recent years.

Their original work consisted of: 1) thinning and pruning, tagging, numbering and recording the size of individual trees; 2) tagging, numbering, and recording the size of individual trees in a control plot of the same dimension; 3) the thinning of a larger plot of some forty acres in order to secure a pure pine stand, Douglas fir being inferior in quality in this region; 4) planting of

\(^{27}\) Ibid, p. 102.

\(^{28}\) Rial Cummings and Emmerson Richardson, "In a Demonstration Forest," Montana Education, 26:15, April, 1950.
approximately a thousand ponderosa trees.

The children who participated were (in the authors' words):

... learning how to work in groups, to lead and to follow leaders. They are learning how to plan a project, then carry out the plan. They are gathering their own material for practical lessons in Arithmetic and Composition. Through their participation in this project, they will have a lifetime interest in and understanding of the work of the Forest Service and other agencies in conserving forests.29

The Vine Grove School Project. In the Vine Grove (Kentucky) School, a conservation program was undertaken that embraced practically all the community needs—social, physical, economic, and cultural. Through the leadership of the vocation agriculture teacher, this program of resource-use education has commanded considerable attention throughout the entire nation. Success came through "a total community program of education which used all aids available and called on the help of all agencies."30

The first problem of the vocational agriculture department was to educate the youngsters and the public in the value of using phosphates and lime upon the then depleted soils of that region. After these elements had been added to the soil and the desired results were proven in dollar returns, the growing of legumes for further soil improvement

29 Ibid, p. 25.

was emphasized. Further, soil conservation practices of terracing, strip cropping, and tree planting projects were pursued successfully. The advent of the reappearance of water in the formerly dry creeks, especially during the dry seasons, was considered almost a miracle. The "preaching" of soil conservation practices was no longer necessary, for the local farmers were clamoring for more "new" ideas to try.

This description shows some of the factors which run through many school activities on use of resources. There is the concern with a community problem, based on the conviction that the school has meaning in the life of the community; diverse agencies of the community are drawn into an effective working relationship under the stimulus of some one of them; agencies and individuals identify needs and adopt goals looking forward to community improvement; and finally the various agencies work according to their special competencies toward common ends so that a single, direct program emerges from the former welter of disconnected effort.31

II. URBAN CONSERVATION PROGRAMS

The "Tillamook Burn" Project. In the city school system of Portland, Oregon, a science club was formed to stimulate student interest in that subject. But, knowing that a club without an activity or definite responsibility is of little value, the leaders of the group looked to the huge, black skeleton of a former forest, the "Tillamook Burn" as an answer to that question.

Here, they reasoned, was a project of immense proportions, since the burn covers literally thousands of acres.

31 Ibid, p. 86.
Conservation education was to begin with the planting of seedling, a venture in reforestation, which would give the younger citizens of that city an opportunity to participate in an activity which would help the community, thus giving them practical experience in community service.

The coordination necessary in making the city-wide activity effective was tremendous, involving transportation, securing seed trees, class scheduling, supervision, to mention only a few, all of which were magnified by virtue of the numbers involved. However, with unbending determination, the details were expedited with little time lost.

Since the beginning of this project, many thousands of trees have been planted and much success has been achieved in the realm of conservation education.

As a result of the Tillamook replanting activity, students carry back to their classrooms an experience which can be capitalized on by all teachers. The problem of conservation comes into clear form, laying out of plots, figuring percentage loss, keeping logs and diaries, all tie in with regular classroom work, making arrangements for trips involves the best kind of teacher-pupil planning. Fundamental tool subjects are put into practical use in solving problems which arise."32

School Camps: 1) San Diego, California. The city and county schools of San Diego have established two camps, one for high school students and one for elementary school children. Here the children obtain firsthand knowledge concerning the natural sciences and conservation. The camp

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32 Amo deBernadis and Donald Statler, "Out of the Ashes of the Tillamook Burn," The School Executive, 72:74, January, 1953.
programs provide educational and recreational activities under the supervision of both classroom teachers and specialized personnel.

2) Philadelphia, Pennsylvania. Farm work camps are maintained by the school systems of this city for the purpose of providing recreation and work experience for older boys. A similar camp system is maintained for younger children, known as the Junior Garden Day Camp, where elementary youngsters experience activities related to the natural sciences, gardening, and conservation. Many of the urban children are provided the opportunity of growing vegetables and flowers and to live amongst animals for the first time in their lives. Here, as in no other way, urban children learn to respect the elements of nature and to appreciate the work involved in the production of food.

A Conservation Unit. As emphasized in their article, "They Studied Conservation by Doing," Margaret Seylar and Paul Blackwood point out that resource-use studies need not be as extensive as those mentioned above, but may be taught very effectively as an integral part of a regular school subject. In their language arts unit, they sought to discover the causes of stream pollution, game violations, and the uses of farm ponds, contouring land, to mention only a few.

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Language arts experiences were many, the authors report. To obtain the information that they wanted, the children had to read widely, enjoying for the first time, they felt, the reading of factual information that they had once disliked, simply because it was "their" idea and because they were looking for something to use purposefully. Much of the source material used in the unit was collected by writing letters, by securing the services of resource personnel, and through the use of rented movies. Classroom activities included the composition of poems, stories, feature stories for the school paper, bibliographies, book reviews, debates and panel discussions. The culminating activities consisted of scrapbooks, newspaper articles, editorials, collections of pictures taken by the children, essays and original poems.

Here, then, is effective conservation education without the benefit of a camp, or a demonstration forest, however desirable they may be.

III. A STATE PROGRAM

The Michigan State Camping Program. "If a picture or illustration is worth a thousand words, a camp-out is worth an entire textbook,"34 was the comment of a student returning from a school camp in Michigan. This state has done

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more in the providing opportunities for out-of-doors experience for children than any other state in the union. So successful has been their plan that it has become a national laboratory experiment for the testing of this unique method of education.

"The hopes of all democracy rest on a program of education designed to develop healthy, vocationally, and recreationally skillful and self-disciplined individuals who go out to meet life with some degree of scintillation and enthusiasm."35

Upon this premise, conservation education in Michigan State has developed. Getting the child out of the classroom into situations as close to nature as possible is the specific purpose of this plan.

The Michigan State Legislature has enacted laws enabling school districts to acquire camps and to operate them as a part of their regular school program, a policy which encourages the fitting of the program to the needs of each community.

The camp, once established, is visited by the children and their teachers for a day, or, in some instances, for a week upon school time. General emphasis is placed upon social living, health, recreation, and purposeful work experiences.

Teacher preparations for this experience is provided in teacher training institutions and extension work,

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emphasizing the understanding of the child, his growth and physical development, processes of democratic living, and the use of natural environment in the education process.

Camps of many types have been established, including the Day Camp, the Summer Camp, and the Elementary School Resident Camp.

The Day Camp offers opportunities for field trips, excursions and outings to many children, particularly those of urban areas, who otherwise could not have managed to leave the city. Planned visits to historical sites, civic projects, and parks are also a part of this plan.

The Summer Camp facilitates the placement of urban children in vacation summer camps, giving the child living experiences patterned after that of rural life. The facilities of these camps are made available to many children, regardless of race, religion, social or economic status.

The Elementary School Resident Camp was established upon the recognition of the fact that some learning experience in the school curriculum can be best carried on in the out-of-doors, moving the child into the open and allowing him to learn by doing. Formalized studies in spelling, reading, writing, and arithmetic are not usually followed; however, they are definitely motivated by camp experiences.

It is firmly believed that the school community camp with its emphasis on significant work experience . . . . knowing the out-of-doors and living together . . . . . offers one of the highly desirable ways to accomplish conservation results needed for the preservation of the nation. At the same time, it will broaden the experience
range of the total educative process, vitalize the school programs, and will tie youth to the democratic group in which he lives. The school-community camp program represents a natural and desirable extension of the school curriculum. It is education.  

**IV. CONCLUSION**

Demonstrated in the foregoing examples of contemporary conservation education is the fact that school programs managed inside or outside of the four walls of the classroom can be successfully built around the needs of the community, without the loss of achievement in the three R's. The services thereby rendered the individual participating, the community, and the nation are incalculable.

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CHAPTER THREE

THE TERRA VERDE CONSERVATION PROJECT

I. PLANNING PHASE

The planning phase of the project herein described began during the 1952-1953 school year, at which time the District Forest Ranger and the author conducted several conservation field trips for the Corvallis eighth grade. In order to find conditions that embodied the desired illustrative situations, many miles of terrain were covered, entailing considerable expense. This being highly undesirable, a plan to find one site that presented many aspects of conservation education was formulated. Fortunately, a most desirable site was located a distance of ten miles from the school, in which were found innumerable possibilities for conservation study, as one shall observe later.

Preparations for the establishment of the project were many. Several spring and summer survey trips were made to the area by the author, during which time a general inventory was taken of the possibilities for study upon this particular site.

The survey inventory was divided into two parts, existing conditions and horizons (see page 22), which was used as a cumulative check list in the field and as a basis for further planning. The items included the following:
Existing Conditions:

a) General soil conditions
b) Erosion conditions prevailing
c) Merchantable trees
d) Dead, defective and diseased trees
e) Native grasses and shrubs
f) Weeds and noxious annuals
g) Evidence of tree enemies present
h) General range conditions
i) Natural reforestation and revegetation
j) Types of wild life in area
k) Fish and stream conditions
l) Aquatic plants and insects
m) Evaluation of watershed management

Horizons:

a) Merchantable tree futures
b) Fire dangers in area and adjacent areas
c) Possible erosion control
d) Grasses and their improvement
e) Soil improvement
f) Grazing possibilities: commercial and wild life
g) Watershed management possibilities

Following the completion of the first draft\textsuperscript{37} of the survey inventory, the formulation of possible and actual

\textsuperscript{37} "First draft" is to be emphasized in that the list is continually being enlarged, insuring, in part, the continuation of the study from year to year.
school activities was undertaken. Every possibility was listed, both practical and impractical, so that the ensuing subject integration would be as wide in scope as possible.

The first draft of activity possibilities was:

**Art:**
- a) Handicrafts
- b) Sketching and color
- c) Photos and photo coloring

**Charts, graphs, maps:**
- a) Cost of thinning and pruning per acre
- b) Relief map of area
- c) Map showing location of area in county
- d) Salt and flour maps
- e) Annual growth records in study plots

**Financial possibilities:**
- a) Sale of wood produced in thinning and clearing
- b) Grazing fees

**Grass Testing Plot:**

Test of various grasses used for revegetation and erosion control

**Historical survey:**

Ecological results of past uses: grazing, logging, recreation, wood cutting

**Identification:**
- a) Trees, shrubs, grasses, flowers
Plantation:

a) Planting trees for reforestation experiment
b) Species example plot of native trees

Public relations:

a) Sign on public road designating area and purposes of project
b) Radio program on tape recording to be used during National Conservation Week
c) News articles
d) Conduct tours of other groups - school board, parents, 4-H, Boy Scouts, et cetera

Rain and moisture study:

a) Annual tree rings versus past weather records
b) Prevailing water conditions and snow records
c) Estimating water-holding capacity of area
d) Building water gauge in creeks and record water flow therein

Room newspaper and handbook:

a) Over-view of plan for year
b) Individual work and summaries of achievements
c) Photos
d) Public relations
Soil study:

a) Water-holding capacity of various forest and range soils
b) Humus content of various types of forest soils
c) Cross-section model of typical soil structures
d) Test for component ingredients in soil
e) Soil profile determinations

Study plot:

a) Thinning and pruning trees
b) Girdling defective trees
c) Annual growth records, diameter and core readings

Survey study:

a) Corner locations and lines
b) Abstract and title summary
c) Geological history of area
d) History of commercial use

The feeling of inadequacy of the author at this point was, to say the least, nearly overpowering. Complications such as integration, scientific knowledge, methods of teaching, orderly organization of potentials, evaluation of pertinent factual material as related to pupil experience and learning, and methods of evaluating the end results, pupil understanding, enlightenment, and curriculum enrichment, could be likened unto the gathering of a summer cumulus cloud.

The next logical step, therefore, was to seek aid in
the mitigation of these seemingly insurmountable problems. A list of resource agencies and personnel was compiled, whose services were solicited. They were:

- Conservation District Officers
- County offices
- Fire District Officers
- Local pioneers
- Montana State Agricultural Experimental Station
- Montana State Extension Library
- Montana State Fish and Game Commission
- Montana State Grass Conservation Commission
- Montana State University
- Montana State Water Conservation Board
- United States Forest Service
- United States Soil Conservation Service
- United States Weather Bureau
- Local Vocational Agriculture department

Most gratifying and assuring was the experience of the immediate and sincere response of these agencies and individuals. Their willing assistance dissipated the "cumulus cloud" of inadequacy as nothing else could have done.

In the meantime, District Forest Ranger Charles McDonald successfully arranged a "Special Use Permit" with the U. S. Forest Service. The document, which incidently carries no expiring date, permits the Corvallis Schools to "use the site chosen for the purpose of pursuing conservation education activities."

Finally, the first phase of planning was not complete until public sentiment, as well as that of the school administration was ascertained. The response was far from being encouraging. The reaction of the public was one of apathy. "Might be a good idea but what has the project to do with
reading, writing and arithmetic?" "It'll take too much time away from book work." "What does a kid learn trai­p­sing around the woods picking wild flowers and chasing butterflies?"

At the same time, the school board passively approved the plan, doing so with some doubt of its practicability. "The project is too broad and may use too much school time." This critical attitude, however, served well as an impetus, rather than a deterring element. Happily, their attitude has now changed to one of less passive approval.

II. DESCRIPTION OF THE PROJECT AREA

The Terra Verde Conservation Project area consists of 160 acres of forest land in the Willow Creek basin of the Bitterroot River drainage, Ravalli County, Montana. The area is found to be in the Saphire Quadrangle of the U. S. Geodetic Survey, bearing the following survey description: Range 19 West, Township 6 North, Northwest ¼ of section 11. The area is located ten miles from the Corvallis School and is easily accessible by means of a well-maintained forest road.

The quarter section in use is, as mentioned before, U. S. Forest Service land. The bordering lands are likewise under Forest Service management with the exception of the area just west of the survey line, which is a privately owned section, a situation that has proven invaluable for comparison purposes in the study of forest, ranges, and
land management.

The topographical features of the region are typical of Western Montana mountainous areas. The road enters Terra Verde at the elevation of about 5000 feet. Terra Verde is located on the south slope of the surrounding mountain escarpment which rises approximately 1000 feet to the mile, reaching the maximum elevation of 7400 feet at the crest of the nearest and highest mountain, Domonic Mountain.

Historically, this area has been in use for a period of some ninety years for purposes of grazing, logging, and recreation. The entire Willow Creek drainage was grazed heavily (1880-1920) by large flocks of sheep. The original cover of native bunchgrasses was, in the process, totally destroyed. Various national grazing laws, effecting public lands, practically removed the sheep industry from this area, as well as from the entire valley; however, in spite of this fact, grazing has continued to this very day by herds of cattle and horses, thereby preventing the re-establishment of any native, perennial grasses. Present day ground cover consists mainly of less palatable grasses, mostly of the annual variety.

In the meantime, 1900-1935, the area was logged extensively, privately owned land and easily accessible government land suffering clear cutting practices. Terra Verde proper was logged in the early part of the 1930's under the supervision of the U. S. Forest Service. Some
seed trees were left standing, and as a result, seedling ponderosa pine are abundant. Natural reforestation has been retarded considerably, however, by forest enemies, particularly the porcupine.

Here is a semiarid region characterized by unequal seasonal rainfall, amounting to some fifteen, possibly a maximum of twenty inches. Since the larger share of precipitation falls before or after the annual growing season (114 days on the average), water for irrigation is necessarily dependent upon subterranean water storage in these watersheds. One would assume, then, that in a local economy based upon irrigation, the people in the valley should be expected to be vitally interested in the protection and maintenance of those watersheds. Unfortunately, however, this is not the situation. As the man who sees only the shade and not the tree, and it a member of a community, so the farmer who sees only the water in his ditches and not the source of that vital element of his well-being. Fortunately, the watersheds occur largely within the borders of our National Forests, where maximum productivity of water is of considerable concern of the Forest Service.

Recreational uses of the region – picnicking, fishing, and hunting – has increased steadily, but with no apparent ill effects. Fish populations have dropped considerably in recent years; however, that fact can hardly be attributed to over use, all related facts being considered.
III. THE PLAN IN ACTION

Presentation of the Project. As far as foreseeable circumstances could be anticipated, the first phase of planning was complete. Inadequacies in planning, organization, and preparation were logically expected, a fact which was evident upon numerous occasions to follow. The very basis of these plans was the foregoing assumption that student interest would be spontaneous. Thus, the children's first response to the introduction of the project was looked upon with some anxious anticipation. Their inhibited enthusiasm, however, absolved these feelings of trepidation. In fact, the ensuing teaching problem became one of de-acceleration rather than one of motivation.

Much serious thought and discussion was given to the question "Must we learn first, then do?" or "Should we do and learn as a result of doing?" This bit of logic, although possibly trite to the adult mind, reoccurred again and again in practically each of the traditional school subjects. With some misgivings, to be sure, general class agreement was reached, agreeing that much learning must be accumulated, followed by further learning by doing; thus, in part, justifying the necessity of the continuation of "book work."

Organization in the Classroom. The first problem of organization was anticipated in the original phase of planning, that being the division of local conservation needs into the jurisdiction of individual committees. Those
divisions, and resulting committee titles were: 1) Erosion Crew, 2) Recreation and Public Relations Crew, 3) Species Example Crew, 4) Study Plot Crew, 5) Survey Crew, and 6) Watershed Crew.

In each case, the approach toward the individual problem was begun at the national level, proceeding as orderly as possible to the state, county, local and project proper, progressing from generalities to specific facts and condition.

Committee Organization. The predetermined skeletal committee responsibilities, restated, of course, in the vocabulary of an eighth grade pupil, were:

1) **Erosion Crew:**
   a) Survey erosion conditions prevailing in the United States
   b) The causes and the possible remediation
   c) The effect of soil erosion by wind and water upon the productivity of the land, and the resulting effect upon society proper
   d) Causes of erosion
   e) General land classification in terms of erosional horizons
   f) State, county, and local erosion problems
   g) Irrigation and erosion
   h) Methods of irrigation

   **Terra Verde:**
   i) Field trip survey of evidences of erosion on project
   j) Causes and methods of remediation to be put into practice
   k) Actual practice in water spreading techniques
   l) Construction of check dams and using forest debris and revegetation for the de-acceleration of runoff

2) **Recreation and Public Relations Crew:**
   a) Definition of conservation
   b) Public relations as a method of conservation education
   c) The importance of recreation to the welfare of a
democracy, a healthy society, and the individual
d) The inter-relationships of conservation and recreation
e) National parks 
f) National problem of the "litter-bug"
g) Hunting and fishing as a state and county resource

Terra Verde:

h) Forest manners
i) Clean-up of recreation area 
j) Construction of signs and information boxes to inform
   the public of efforts and achievements of the
   project
k) Determination of news items to be made public
l) Plan and demonstrate campfire building and putting
   the same "dead out"

3) Species Example Crew:
   a) Simple methods of identifying trees, shrubs, and
      grasses
   b) General types of vegetation in each of the four
      quarters of the nation
   c) Trees and grasses native to Western Montana
   d) Collection of common, native grasses
   e) Collection of sections of each native tree of Western
      Montana

Terra Verde:

f) Establishment of grass plots and bitterroot flower
   plot
   g) Establishment of species plot where each native
      species could be represented, general conditions
      permitting
h) Demonstrations of methods of tree identification
i) Collection of flora found on nature trail

4) Study Plot Crew:
   a) The history of timber resources of the nation and
      their use and abuse
   b) State and county timber resources and their use
   c) Annual rings and weather
   d) Exotics and principle of involvement
   e) Local climax trees and plants
   f) Plant succession
   g) Purposes of a study plot and methods of procedure

Terra Verde:

h) Location of area to be treated and area to serve as a
   control plot
5) **Survey Crew:**

a) The Geodetic Survey  
b) Montana: Prime Meridian, Baseline, townships, and ranges  
c) Ravalli: Townships and ranges  
d) Methods of forest survey as used by Forest Service  
e) Methods and tools of surveying  
f) Planning and construction of Hipsometer  
g) Practice on playground using survey tools  

**Terra Verde:**

h) Survey Terra Verde boundaries  
i) Locate "Witness trees"  
j) Location of contour elevations, 5200, 5400 and 5600  
k) Construct and erect sign locating 5280 feet elevation on nature trail  
l) Construction of scale map of Terra Verde  
m) Aid other crews in survey problems  

6) **Watershed Crew:**

a) The nation's system of watersheds  
b) Water pollution, a national problem  
c) The Hydrologic Cycle  
d) Watershed economics: dollar value of water  
e) Irrigation  
f) Local precipitation and water tables  
g) Water rights and local settlement of land  
h) Methods of water measurement  

**Terra Verde:**

i) History of land use  
j) Monthly water measurements of water yields from four selected watersheds  
k) Computation of acres in each drainage area in study  
l) Interpretation of measurements in relation to past use  
m) Average acre water yields  
n) Construction of charts and tables showing yields  

The appointment of the children to each of the several committees was not left entirely to chance or impetuous
choice. In order to avoid the problem of pre-established social relationships, a test (see example in appendix, page 92) was prepared and administered, the purpose of which was to place each child in a committee in which the subject matter most nearly fitted his individual interests. Further information was supplied the teacher for this purpose in the vocational interest and social adjustment tests administered each year in connection with the regular guidance program.38

On the basis of these tests, no less than six and not more than eight children were "enrolled" in each of the six committees. The chairman and scribe of each group were also selected on the basis of answers given in the test. Although this method of selection was in no way democratic, it effectively placed the children in categories compatible with their indicated individual interests, eliminating choice in terms of pre-formed friendships or class "cliques."

Previous to the first meeting of the individual committees, separate conferences were held, attended by the chairmen and scribes of each committee. In this session, the responsibilities of each "officer" were discussed, responsibilities including methods of committee study, class reports of materials collected in research and upon field trips, responsibility of disciplinary supervision in

38 The guidance tests referred to here are adapted from those of Charles E. Germane and Edith G. Germane, published in their work Personnel Work in High School (New York: Silver Burdett Company, 1941), p. 509-599.
group meetings and field trips.

At the same time, the scribes were charged with the responsibility of keeping a running account of committee activities, particularly on field trips, recording factual information for the purpose of recapitulation and the pursuit of further study in the classroom.

The functional organization of the project was completed with the assignment of committee tasks heretofore listed. The chairman and scribe were given a tentative list of subject matter within their jurisdiction, which in turn was the subject of discussion in their first committee session.

Although the children were concerned little with matters of integration, they expressed some anxiety concerning the factor of time. "Will we have time to do all this and get through our text books too?" To answer this logical question, we spent considerable time in "thumbing through" each of the subject textbooks, finding facts and functions that were relative to the project. At the close of this exploratory session, general agreement was achieved; namely, "Whenever subject matter relative to the conservation project was discovered in regular textbook work, it would be "used" in the realm of the project, to be treated, when deemed practicable, as a committee activity."
IV. INTEGRATION

To describe in its entirety the integration of the Terra Verde conservation project into the curriculum would require actually the necessity of considering the day-to-day lesson activities of the class. In that much of the integrational processes and methods of employment are, to the educator, self-evident, the general summation which follows will suggest the scope and some of the teaching possibilities, not only in the field of conservation enlightenment, but also the tremendous opportunities that were presented for the teaching of the three R's.

GENERAL OUTLINE OF SUBJECT INTEGRATION

I. LANGUAGE ARTS:

Fundamentals:
- Conversation
- Composition
- Discussion
- Grammar
- Letter writing
- Note taking
- Reading
- Spelling

Related Activities:

Conversation:
- Field trip planning, field trip activity reports, facts to be made public (public relations).

Composition:
- Sentence and paragraph structure, essentials of newspaper article writing, editorial writing, original poems; culminating in the publication of the "GREEN HORNET'S BUZZ", a room newspaper, issued once each six weeks. A. P. Correspondent interview demonstration, field trip to local newspaper plant.

Discussions:
- Unlimited variety relative to conservation, discussion of conservation films (one shown each week), Socio-drama: "Who should be made responsible for the
management of watersheds, both privately and public owned," panel discussions upon various phases of conservation.

Grammar:
Emphasis placed upon grammar in use, both oral and written.

Letter writing:
Composition and practice in writing: "Thank you" letters, business letters, letters of inquiry.

Note taking:
Methods and practice in taking notes on: field trips, resource personnel talks, interviews, research.

Reading:
Selected reading in texts and library with emphasis on how to use the encyclopedia, indexes, library source books and pamphlets.

Spelling:
Accumulative list of new and essential words in use.

II. ARITHMETIC

Fundamentals:
Board measure Percentage Square measure
Computation Ratio Tables and graphs
Cubic measure Rule of Pythagoras Taxation
Measurements Scale measure Volume

Related Activities:
Survey Studies:
Methods of land measure and description: the township, the section, the acre, chain measurements.

National: Longitude, latitude.

State: Baseline, Prime Meridian, construction of state map showing ranges and townships, of a few cities.

County: Ranges and townships, construction of Ravalli County map showing ranges and townships.

Local Community: Construction of map showing town and school district, locating each home site.
Terra Verde: Construction of map showing watershed area under study, construction of map showing Terra Verde proper; section numbers, elevation contours, computation of number of acres in each of four drainage areas in watershed study.

Preparation for Actual Survey:

Chain measure: Computations relative to this type of measure, practice use on football field.

Methods of dealing with topographical inclination: the hypotenuse, square root, construction of a Hipsometer, computation of accompanying tables, practice in its use.

Taxation:

County Taxes and Levies: Taxable valuation and use, methods of tax computation.

Government Land ownership in county: Comparison with that of privately owned land, land use and classification for tax purposes, construction of illustration charts and graphs.

Board measure:

In the forest: log measure, dollar values, timber sales.

General use: Practice in computing board measure in the purchase of signboard material for Parshall Flume.

Water measure:

Methods used locally: Acre inches and feet, second inches and feet.

The Parshall Flume: Construction of and use in actual water measurement in watershed study, water yield charts and graphs.

Computation of acre averages: Yearly average acre yield in each of the four watersheds, computation of actual daily yields, economic value in terms of irrigation water for crop lands computed in dollar values.

Computation of gallons of water falling during one storm on Terra Verde, using Weather Bureau records.
III. SCIENCE

Fundamentals:

- Environment
- Erosion
- Geology
- Soil
- Topography
- Trees and plants
- Water
- Weather and climate

Related Activities:

Trees:
Identification methods, practice in using identification books, native trees of Western Montana, tree physiology, annual rings, collection of cross section, longitude section, and bark sections of each native tree, historical time line projected upon large cross-section of a tree.

Plants:
Identification methods, planning and planting of three separate grass study plots, plant succession, collection of representative flora found on the nature trail.

Water:
The hydrologic cycle, illustrative chart constructed, watersheds and irrigation, the water table, floods and remediation.

Geology:
Basic rock structures, historical review of the geologic origin of the Bitterroot Valley, construction of diorama showing same, Gieger Counter and mineral light demonstrations, resource personnel lectures upon Gieger Counter and Geology of Western Montana.

Topography:
Map studies; symbols, contours, bench markers, section lines; salt and flour map construction to show watershed study in relief.

Plant succession:
Basic rock to climax plant, exotics, construction of nature trail begun, resource personnel lecture on plant succession.

Forest Enemies:
Chewing animals, local tree diseases, local parasites.
Soil:
Basic soil structures, profiles of various local areas, sub-marginal lands and their value, porosity, soil constituents, percolation of water.

Erosion:
Water and wind erosion, remediation, survey of existing local conditions, land classification according to erosional affectations, resource personnel lecture.

Weather and Climate:
World: general review, causes and effects; National: general classification according to weather and climate; State: general review; Local: winds, precipitation, relative humidity, resulting fire dangers, the rain shadow, the growing season, frost, snow, et cetera.

IV. SOCIAL STUDIES

Fundamentals:
Citizenship
Community problems
Conservation
Education
Ecology
Farming
Local history
Montana history
Resources
U. S. Government agencies

Related activities:

History of conservation:
The historical background to this problem through research.

Ecology of:
Grass, soil, and water.

Recreation in public lands:
Forest manners and personal responsibilities therein, planning needed facilities in Terra Verde, planning and constructing public signs.

The Forest Service:
Organization and responsibilities, Forest Service maps and their study, fire permits, grazing permits, fire fighting and control.

Other Government agencies:
Soil Conservation Service, County Extension Service, County Agent, Montana State Experimental Station, county officers, most of which have furnished personnel for lectures and demonstrations.
Forest uses: (local)
Economic values—a single tree example, acres of county in forest land, present uses and misuses, grazing, historical use of the forest lands in logging, grazing, and fishing and hunting.

Editorial writing:
The American way of life and conservation, watershed management, pioneer and his use of the forest.

V. SOME SPECIFIC EXAMPLES OF INTEGRATION

A Unit of Study. The very first question of the pupils concerning the project was "Where is Terra Verde?" Thus, the lesson plans for a time following were arranged to answer that question, planned as a unit of study, entitled, "Typical Methods of Land Description."

The logical point of embarkation was that of world geography, entailing some review and some research concerning matters of longitude and latitude, the inclination of the earth's axis, the magnetic pole and true north, Greenwich Time, globe and map studies. Methods of research, the utilization of indexes, tables of contents and cross-references, mechanics of outline organization were studied and discussed too. The necessary information was easily found in regular textbooks, source books, and encyclopedias. Some of the more general material was covered lightly in that nearly every item of study reoccurred in regular textbook studies at a later date.

From the consideration of world ramifications, similar studies of the United States were undertaken, proceeding thence to that of the state level.
At this point of study, survey descriptions of ranges and townships were considered at some length. Each child prepared a drawing to illustrate a typical example of the organization of ranges and townships in Montana arranged around the point of intersection of the Prime Meridian and Baseline (see page 60). Using this method of land description, the major cities of Montana were then placed on a duplicated, outline map of the western portion of the state which was supplied each child. The information necessary for the completion of this task was found upon large survey maps of Montana, hung about the school room.

To facilitate the assurance of continuity of thinking, the next problems to be considered were those of townships, sections, and acres. Once again, each child prepared charts, one showing the typical arrangement of section numbering within a typical township, and another showing a typical acre of land. In working with the latter, arithmetic manipulations of computation, measurements, square measure, perimeters, and scale measure were used at length. In order to "clinch" their understanding of the relative size of an acre of land, the Survey Crew demonstrated the actual measurement of an acre on the football field, and pointed out its relative size to that of the ten acres of school grounds.

Upon the completion of the study of typical land measurement, its application to the political division of the county and community was continued in that order. On a
TYPICAL SURVEY DIAGRAM

Township 2 North, Range 3 East
Section 16

Township 3 South, Range 3 West
Section 29

Scale: 1/8" = 1 Mile
Ravalli County map, taken by pantographic reduction and duplicated by the teacher, the townships and ranges were numerated (see page 62a). In addition, this map was made to show the U. S. Forest boundaries in the county, enlarging the subject of discussion to include government-owned lands and the ensuing effect upon county taxation. This topic was completed later in the application of arithmetic text-book work upon taxation.

The final phase of this study included the map work of: 1) the local community and its immediate outlaying districts, upon which the locations and legal descriptions of each family home site were entered (see page 62b); 2) the four areas of the projected watershed study (see page 80); and 3) Terra Verde proper (see page 78).

The "GREEN HORNET'S BUZZ". Nearly every effort made in the conservation project was culminated in the preparation of the room paper, the "GREEN HORNET'S BUZZ", duplicated and issued every six weeks (see sample copies in appendix). In each issue, the summarization of accomplishments were undertaken, hoping to achieve, in part, the prime goal of creating further pupil and public interest in the matter of conservation.

When a subject worthy of publication became evident, each child wrote an article to be read in a committee meet-

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39 Portions of this discussion were adapted from "Classrooms Unlimited," written by this author for Montana Education, 30:12, April, 1954.
Stevensville
Corvallis
Terra Verde
Hamilton
Derby
Stevensville
Corvallis
Terra Verde

RAVALLI COUNTY SURVEY MAP
Survey Lines
Forest Boundaries
Roads
Scale: 1/6" = 1 mile
CORVALLIS DISTRICT SURVEY MAP

- Highways
- Graveled Roads
- Rivers and Ditches
- Northern Pacific R.R.

Scale: 1" = 1 Mile
ing, where ideas were exchanged and where corrections were made, corrections which concerned: "Did it say just what we wanted it to say." The better papers were chosen to represent each committee's thinking and then handed to the editors, three in all, who composed the finished news article. If the article concerned a subject that was felt to need public attention or would serve as good public relations, it was given to the local news correspondent. Many of the resulting articles coming out of this procedure were published in daily newspapers throughout the Northwest. The clippings collected by the children for their scrapbooks served well as an impetus to do better work.

Probably the most difficult matter in the construction of the paper was the editorial. Since the children were dealing a great deal with controversial matters of a social nature, their thinking needed careful and deliberate guidance. As an instance, the discovery that the privately owned grazing land in one watershed studied had been continually abused during the past half century, to the point that the actual value of the watershed for that purpose was nil. Naturally, the question arose, "Who should have been responsible for the management of this watershed?" "Should the government force good management practices upon private owners, particularly when the abuse definitely reduces the irrigation water yielded annually to the water-right holder below?"

Needless to say, the temptation of avoiding highly
controversial subjects is sometimes nearly overpowering, particularly in this troubled age of "investigation." Nevertheless, to eliminate the possibility of allowing our children to do some "practice" thinking, would in itself stifle the child to a pitiable robot of a blind "follow-the-leader" philosophy.

The possibilities of integration in this approach to conservation enlightenment were limited only by the teacher's ingenuity and practicability.

Further examples of integration are to be noted in the following discussion. Whenever possible, the factual material supplied in the current classroom textbooks was applied to actual situations found in Terra Verde, practically eliminating the ever present task of motivation.

VI. FIELD TRIPS

Field Trip Planning. Much of the success attained in the Terra Verde conservation project was found to be somewhat dependent upon the experience of successful field trips. Upon these trips, six in all, the children found an opportunity of applying a portion of the knowledge they had attained in the classroom. Of all the culminating activities carried out in connection with this venture, the field trip was looked upon with keen anticipation. No other activity motivated more active and meaningful participation in classroom studies, as did this phase of the project.

Since the School District Trustees do not budget
funds for the purpose of field trip expenses, nor any of the extra expense concurred in the project, the necessity of raising funds for that purpose was undertaken at the beginning of the school year. This was done in the form of a magazine subscription drive, arranged with the Curtis Publishing Company. The drive netted approximately $150 which was deposited in a local bank, the account of which was used subsequently as an arithmetic project. These funds adequately covered not only the field trips, but also other project expenses occurring during the school year.

Like any educational activity carried on outside of the walls of the traditional classroom, the field trip must be managed with extreme care. The formulation of objectives was, for the teacher, the first order of business.

Field Trip Objectives. 1) A real reason for taking the trip was expected to be evident to justify the use of the children's time and efforts. The school administration, the Board of Trustees, and the public, particularly the children's parents, were to understand the purposes of the trip, and if possible, learn of the accomplishments gained thereby. The Public Relations Crew managed this problem admirably in the publication of news articles in daily newspapers, and in their own room paper.

2) Meticulous care was exercised in planning the venture, giving serious consideration to matters of safety, transportation, time schedules, and clothing and shoes to be worn.

3) In each case, the trip was first taken by the
teacher, at which time the consideration of many of the above-mentioned items were noted. A pre-view of the scheduled trip, too, enabled the instructor to "size-up" the educational possibilities to be pursued.

4) Shortly before the trip, a group discussion was planned for and carried out in order to acquaint the children with the objectives of the trip, and to allow for the discussion of matters of conduct and courtesy, all of which play such an important part in the public relations of the entire school system. During this session, the assignment of specific responsibilities of each individual and committee were reviewed, the planning of which enabled the teacher to re-evaluate the objectives of the trip and to decide whether or not the trip was actually an integral part of the school work at hand. At this time, too, the children learned of the necessary safety precautions, and the clothing requirements.

5) Upon return from the trip, the important function of reviewing and applying the information gathered was carried out. Much of this work was integrated into the regular subject work for a considerable time following, capitalizing on the lingering enthusiasm of their having done something outside of a textbook.

6) Finally, the practice of securing accompanying resource personnel, whenever possible, was arranged, including college professors, newspaper correspondents and parents. Their responsibilities on the program were incorpor-
ated in the over-all plan of the trip.

Five field trips were taken during the 1953-1954 school term. The sixth was taken as a summer activity with a small number of children who attended voluntarily. These trips are reviewed briefly in the following outline:

A GENERAL OUTLINE OF 1953-54 FIELD TRIPS

Field trip number one: Terra Verde

General objective: Orientation

Date: September 25, 1953

Accompanying resource personnel: District Forest Ranger

Stops:

Desert Creek (Area D):

Discussion subjects: The "dry" creek, erosion visible, prevalence of noxious weeds and impalatable annuals, lack of native grasses and palatable perennials. Allied subjects: overgrazing, improper logging practices, improper forestry practices (indiscriminate burning), soil deterioration, summary.

Little C Creek (Area C):

Discussion: Estimates on economic values of small stream yields, conditions observed similar to that found at first stop (Area D), summary.

Activity: Measure water in Little C Creek with Parshall Flume and record information.

Terra Verde:

Discussion: Identification of trees found in recreational area, identification of most prevalent grasses in same area, evidences of tree enemies: damage wrought and their control, summary.

Activities: First leg of nature trail traversed, measure water with Parshall Flume in Terra Verde Creek (Area B), and in Bear Trap Creek (Area A), clean-up of recreation area.
Field trip number two: Terra Verde

General objective: Survey of committee tasks

Date: October 14, 1953

Accompanying resource personnel: District Forest Ranger

Stops:

Desert Creek:

Discussion: "Who should be responsible for the management of watersheds, both privately and government owned?"--a setting for Socio-drama to follow later.

Activity: None, creek again found dry.

Little C. Creek:

Discussion: Maintenance of access roads, removal of dead and defective trees for fuel.

Activity: Measure water flow with Parshall Flume.

Terra Verde:

Discussion: Recreation Crew Chairman applied for and received a permit to build a fire, responsibilities involved thereby, campfire demonstration: methods of safe campfire building and "putting dead-out" demonstrated, summary.

Activities:

Survey Crew: Portion of north-south boundary on west section line surveyed, using Hipsometer and class prepared tables, staff compass and chain measure.
Recreation Crew: Further cleanup of recreation area.
Species Example Crew: Search for species samples for tree collection.
Erosion Crew: Survey area for erosion control remediation application.
Watershed Crew: Measure flow of water in Terra Verde and in Beartrap Creeks, survey of moisture content of various forest soils.
Study Plot Crew: Search for area for the purpose of thinning and pruning trees for a study plot.
Field trip number three:  Western News plant

General objective:  "How is a daily newspaper printed?"

Date:  January 14, 1954

Resource personnel:  Editor and printers of Western News

Place:  Hamilton, Montana

Discussion:  Methods of news collection, organization of news in office, general outline of printing processes in the production of the publication.

Activities:  Demonstration of office procedures, printing processes in the print shop, demonstration of "job" printing press.

Field trip number four:  Montana State University, Missoula

General objective:  Stimulation of interest in higher education.

Date:  March 24, 1954

Stops:

School of Forestry:

Lecture:  "The Geology of the Bitterroot Valley," Mr. S. L. Groff, Graduate Assistant.

Lecture:  "Plant Succession," Dr. Charles Waters, Professor of Forestry.

Museum:

Lecture:  "Indians of Western Montana," Mr. Carling Malouf, Assistant Professor of Sociology.

Other activities:


Field trip number five:  Terra Verde

General objective:  Work trip

Date:  May 12, 1954
Accompanying resource personnel: School Superintendent, News photographer, and one parent.

Activities:

**Study Plot Crew:** Thinning and pruning ponderosa pine, treatment of Douglas fir for Christmas tree production.

**Survey Crew:** Exploration of Terra Verde with Geiger Counter.

**Erosion Crew:** Construction of several check dams, collection of debris from study plot, placed in nearby erosion scars.

**Species Example Crew:** Establishment of bitterroot flower test plot.

Field trip number six: Bull Pine Test Plot and Terra Verde

**General objective:** The establishment of several grass testing plots

Date: June 5, 1954

Accompanying resource personnel: Local farmer

Activities:

**Bull Pine Testing Plot:** Preparation of ground and planting of fifteen varieties of native and introduced grasses.

**Terra Verde:** Preparation of ground and planting of six varieties of native and introduced grasses in two different sites.
CHAPTER FOUR

EVALUATION

I. ACHIEVEMENTS

From the standpoint of the public, material examples of achievement were many, as will be noted in the following summation; however, from the standpoint of the teacher, the greatest achievements were to be found exemplified in the child himself, in the understanding and interest that flowered in nearly every child.

When it is possible to teach, say, the process of square root without the necessity of tedious motivation, without the necessity of justification of that learning in terms of meaningless future needs, the achievement of the desired results far exceeds that of a public performance or exhibition. But, of course, the necessity of material gains are not to be overlooked. The first consideration of those achievements shall be those of each committee, followed by that of group endeavor.

Erosion Crew: The background material gathered by this group proved to be somewhat sketchy, due to the lack of source material. Some of the gaps left, because of that reason, were filled somewhat by the employment of resource personnel of the Soil Conservation Service, of the Montana State University Forestry School, and of the U. S. Forest Service.

In the field, the erosional conditions were surveyed
with particular interest paid to causation. With this information gathered, remedial techniques, such as check dam building, methods of water spreading, use of ground cover restoration, the utilization of forest debris, were studied and their use as a possible method of remediation discussed. In actuality, several dams were constructed upon the fourth field trip and the debris made in pruning and thinning trees was also used for water retardation purposes.

Recreation and Public Relations Crew: No fuller success was achieved than that of public relations. In addition to the fullest attainment of their pre-stated goals, public attention to the problem of conservation was achieved in the form of daily newspaper articles, written by the children themselves, and by local correspondents.

Further, this group successfully stimulated group interest in the matter of forest manners, i.e. the disposal of waste paper and picnic garbage in the forest, the fire permit and the responsibilities involved, and demonstrated the satisfying results of cleaning up and maintaining a clean picnic area. They also erected various types of signs for public information that were constructed in the classroom and one of large proportions that was constructed by the Forest Service. The latter was installed at the point where the Willow Creek road enters Terra Verde and

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40 For further information concerning the signs above mentioned, see volume 1, number 3 of the "GREEN HORNET'S BUZZ" page 102 in the appendix.
bears the following information: "We dedicate this forest area of 160 acres to the proposition that nature's commandments must be sought out, so that we, the future America, might be better enabled to use more wisely those resources so graciously provided by God—failing, we perish."

Species Example Crew. A general understanding of the methods of identification of native trees was attained by the class through the efforts of this committee. One school afternoon was given as a culminating activity, at which time collected samples of needles and leaves were identified under the able direction of U. S. District Forest Ranger Charles McDonald. The samples were "taken through" the identification tables found in the booklet Trees Native to Montana, \(^{41}\) one of which was supplied each child by the Ravalli County Agent.

Further studies involving the identification of trees led to the collection of wood samples of sixteen of the twenty-three native trees listed in the above-mentioned booklet, consisting of a cross section, a longitudinal section, and a bark section of each variety found growing in the valley. These were smoothed and polished, and mounted upon a large sheet of painted plywood, suitable for exhibition at a local county fair. The varieties in the collection were:

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Finally, the Species Example Crew led the class in the successful establishment of several grass testing plots, two on Terra Verde, and one on a new site, the Bull Pine Study Plot. The two plots on Terra Verde consist of row plantings of six varieties of grasses, the seed for which was obtained from local business concerns. Although the plantings are identical in a physiographical nature, the environmental situations are somewhat different. While both are in a situation of dry, thin soils, one has the characteristic of extreme arability. Germination results in each situation has been splendid; however, because of late seeding, no evaluation of particular importance can be made at this early date.

The Bull Pine Plot is an area located in the immediate foothills within five miles from the school. The land in use is owned by a local farmer, who is taking an active interest in the planning and actual work of the project. For a period of some fifty years, this area has been made use of for the primary purpose of fuel production. Since this area, eighty acres, and that adjoining it, some one thousand acres, has been left unfenced, the whole region has been grazed unmercifully, resulting in the complete destruction of ground cover, other than that of the hardy
bull pine.\textsuperscript{42}

Thus, the purpose of establishment of this plot was to discover a native or introduced grass that could be used successfully in the rehabilitation of this land, and similar submarginal areas in the valley. Fifteen varieties have been planted, while more have been secured for spring plantings next year.\textsuperscript{43}

Plans for the following year consists of a fencing program for test and control plots, further row plantings, testing of raking and broadcast planting techniques, and possibly experimental use of power machinery in soil preparation and seeding.

The Study Plot Crew. In an effort to determine the climax plant structure found on Terra Verde, this committee spent considerable time studying the process of plant succession, culminating in a lecture given by Dr. Charles Waters at the Montana State School of Forestry. Further studies of the physiology of the tree led to the construction of a historical time line, projected upon a twenty-

\textsuperscript{42} "Bull pine" is the local, common name for the ponderosa pine, which, grown in this particular environment, appears to be a different species than that ordinarily found at higher elevations. Several seedlings of bull pine have been removed and transplanted in Terra Verde in order to ascertain this fact.

\textsuperscript{43} Dr. Melvin Morris, Professor of Forestry at the Montana State University, Missoula, Montana; Mr. Myrton Reed, Division of Range Management, U. S. Forest Service, Missoula, Montana; and Mr. Lewis Hull, local farmer, are serving in an advisory capacity in the development of this phase of the project.
eight inch cross section of a recently cut tree. This was done in connection with a Montana History Unit. This effort involved research concerning local and state history, concise facts of which were printed on miniature signs, and placed upon the corresponding chronological annual ring.

Upon searching Terra Verde for a tree study plot, this crew found no specific site wherein the desirable attributes of such an effort were present. Because of this fact, the study plot was finally located upon an area a considerable distance from Terra Verde. This area, described above, was named the Bull Pine Study Plot. Under the supervision of the Survey Crew, two one-acre plots that were densely covered with a variety of sizes of ponderosa pines, ranging from 2 to 6 inches in diameter; one acre to serve as a control plot, the other for the purpose of thinning and pruning. Some initial work was begun; however, most of the thinning and pruning, individual tree numbering, girth records, and similar activities, will be done in the work of future classes.

At the same time, an area adjacent to the road in Terra Verde was treated in somewhat the same manner in order to present to the public the effect of these practices, but records of growth will not be kept due to the lack of an adjoining control plot. In addition, Douglas fir stumps left by Christmas tree cutters were pruned in order to show the possibilities of rehabilitation and future Christmas tree production.
Survey Crew. Practice in methods of survey was achieved with the aid of some improvised and some borrowed survey tools. The initial survey problem of this crew was to survey an acre of land upon the football field, as already mentioned. The task of surveying the west boundary of Terra Verde from the south, half-section witness tree (see definition of term on page 24) to that of the north witness tree was a real test of their classroom studies. The boundary was actually staked for only a distance of approximately a quarter mile, due to the lack of sufficient time to complete the task.

In addition, this crew was called upon to supervise the survey of the recreational area and the Bull Pine Study Plot, (a responsibility they took most seriously), and to collect and numerate the facts necessary to facilitate the drawing of Terra Verde topographical map (see page 78).

Watershed Crew. This group spent many long periods of concerted work in order to master the intricacies of the methods of water measurement, so that they could present their discoveries adequately and clearly to the whole class. The discussion of second inches and feet, and acre inches and feet brought into use voluminous but simple arithmetic computations. Mr. Clem Rose of the Ravalli County Soil Conservation Service was called in to augment the inadequacies of the room library.

Armed with the facts and figures, and a Parshall Flume (see page 23 for definition), they had planned and
constructed, the Watershed Crew undertook the measurement of the water flow of four selected watersheds, two within Terra Verde and two adjoining the project (see page 80). After measuring the water flow the first time, they discovered the need of further computations and research concerning: the number of acres in each watershed, the average yield per acre and the total yield of each watershed, considering the variations in the light of past land use. The economics of water yields in terms of crop production was also considered further.

Other culminating activities were: the construction of a large salt and flour relief map of the study, comparative water yield charts (see page 81), the writing of articles and editorials for the room paper. This committee also assumed the responsibility for the arrangement of the socio-drama on the subject of watershed management, a venture which produced excellent results.

II. GROUP ENDEAVOR ACHIEVEMENTS

Many of the achievements of the Terra Verde conservation project were a result of group work outside of the committee structure. In order to illustrate this fact, the following will be discussed: the Nature Trail, a Diarama, and further public relations.

The Nature Trail. Much of the studies in science concerning rock structures, soil originations, plant succession, climax plants, et cetera, were culminated in the marking and construction of a nature trail. The trail be-
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<tr>
<th>HEAD (feet)</th>
<th>1955-1956 MONTHLY WATERSHED YIELDS</th>
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**Figure 7**

1953-1954 MONTHLY WATERSHED YIELDS

- Head: 0.11 to 0.70
- Second: 0.11 to 1.17

(roads impassable)
gins at the point where Terra Verde Creek crosses the road and continues north for a short distance. The purpose of the trail is to bring the children into contact with living examples of soils in the making, rock deterioration by weathering and wearing processes, plant successions from the lowly fungi to that of the climax plant, insects at work, and many other aspects of science usually experienced only in reading textbook materials. When completed, the trail will also serve well for public education in that each item of interest will be labeled so that someone following the trail by chance discovery, will understand in part, these interesting aspects of nature firsthand.

A Diarama: Before the topographical situation of Terra Verde could be fully understood, the necessity of delving into the geologic origins of the Bitterroot Valley seemed mandatory. Thus, arrangements were made with the School of Geology of the Montana State University to furnish a lecture upon that subject. From the information given the class by Mr. S. L. Groff, Graduate Assistant, a large diarama was constructed, showing the cross section of the geologic and underlying parent rock structures of the valley. The diarama was constructed so that the valley was shown in perspective and at the same time, the underlying rock formations were shown in their true relationship to the surface. The excellence of the children's interpretation of the facts presented in Mr. Groff's lecture was witnessed in the fact that upon presenting the diarama to Dr. Kenneth McLaughlin, Chairman of the Geology School, for
evaluation, no structural or factual details were suggested.

**Further Public Relations:** Although not related to actual child activity in school, the project serves well in the public insemination of conservation principles. A small portion of the area has been set aside for forestry projects of a local 4-H group. In addition, guided tours of the Terra Verde project area have been undertaken and managed by the chairmen of several committees, taking parents, neighboring community Boy Scout Troops, and local high school classes for visitations. Finally, the project has served well as an example for teachers studying conservation in the annual Conservation Workshops at the Montana State University, who have visited the project during the summer quarter of 1953 and 1954.

**III. APPLICATION TO OTHER SCHOOL SITUATIONS**

To say this experiment in teaching conservation would be applicable to any school system would, of course, be folly. However, many phases of this particular endeavor could be put to good use in nearly every school system in the land.

To reiterate, the important point of approach to the teaching of conservation as an integral part of one subject, or as an extensive project such as this, is the idea that the needs and problems unique to the given situation be searched out, proceeding thence to similar problems of the state and nation.
The importance of the fulfillment of this "duty" by the educators of our nation cannot be over-emphasized; failing in this duty, "we shall surely perish."
CONCLUSION

In this particular region of bountiful natural resources, the falacious apparition of unlimited supply of those resources has been the very basis of our local and national economy. Historically, this is a philosophy hardly new, nor are the end-results entirely unknown. During the last half-century, we have witnessed an alarming acceleration of destructive forces working toward the ultimate elimination of our resources. The accompanying apathy of the general public is equally alarming.

Realizing the America of tomorrow is theirs, a handful of students here in Corvallis has accepted the challenge. They have, as a result, been striving, not only to acquaint themselves with the social, political, and ethical factors of the "wise use of resources," but, more especially, have been endeavoring to bring the issue before the general public, so that their interest might be aroused, moving the ponderous wheels of public opinion toward concerted action. Although they claim not to be the only "shoulder behind that wheel," the efforts of these children have stimulated considerably the interest of the public of this small community, the county, and the state. Their service to the welfare of this region, and thus to the nation, cannot be measured adequately in terms of generalities, nor described in terms of superlatives. The final measure of achievement of this group, and those of other equally
important groups will be evaluated finally in the future by the fact of our very existence as a prosperous nation.
BIBLIOGRAPHY
BIBLIOGRAPHY


Cummings, Rial, and Richardson, Emmerson, "In a Demonstration Forest," Montana Education, 26:15, April, 1950.


APPENDIX
I WOULD ENJOY:

1. Doing things that require careful attention to accuracy and neatness
2. Helping others instead of being helped
3. Keeping an accurate record of a meeting or field trip
4. Making maps and drawings that are useful
5. Taking photos of a carefully planned subject
6. Making posters
7. Writing news stories
8. Doing practical arithmetic problems involving measurements
9. Supervising and being responsible for the actions of others
10. Editing and planning a school paper
11. Working with my hands instead of with people
12. Making a table or chair
13. Surveying an acre of ground
14. Planting a tree or flower and carefully watching it grow
15. Measuring something very accurately and precisely
17. Being a committee chairman
18. Planning and serving a picnic lunch
19. Being responsible for reporting some facts to a group of adults
20. Cleaning up a recreational area
21. Being a guide in the woods
22. Studying plants and trees in the woods
23. Making artistic signs
24. Digging post holes
25. Working with people instead of with my hands
26. Following directions rather than being responsible for giving them
27. Drawing a scale plan for building a table
28. Working in a group, doing jobs that require physical strength
29. Painting fancy signs and posters
30. Pruning and trimming trees
31. Drawing with a pencil the picture of a tree for identification purposes
32. Sitting back, waiting for others to make plans
33. Experimenting with seeds and cuttings
34. Knowing the different kinds of trees and plants in this region
35. Dealing with people instead of making things
36. Explaining things to others
37. Learning about erosion control
38. Studying soil and water
39. Being a Forest Ranger
40. Measuring the "inches" of water running through a headgate

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**SCORE KEY:**

1. Recreation Crew
2. Study Plot Crew
3. Erosion Crew
4. Watershed Crew
5. Survey Crew
6. Species Example Crew
7. Leader
8. Follower
INTRODUCING:

TERA VERTE
CONSERVATION
PROJECT
CORVALLIS
JR. HI.

FIRST CONSERVATION FIELD TRIP TAKEN SEPT. 23

The Corvallis Jr. Hi. has been granted a special permit for a quarter section of land in the Willows Creek area. On Friday, Sept. 23, the eighth grade teacher, Mr. Russell Bay and Ranger McDonald took the class to the project area for a study of conservation.

The 160 acres under special permit has been named "Terra Verte" or green earth. They have maps both for study in the class room and in the forest.

C. M. Brandborg, Supervisor of the Bitter Root Forest believes this to be the first project of this kind in the United States, in that all the forest practices are under one study.

On the first trip to Willow Creek, the pupils learned to identify Douglas Fir, Englemann Spruce, Lodgepole Pine, White Pine, Pinion Pine and Ponderosa Pine. The varieties in the area over which they covered are mostly Yellow Pine, Lodgepole Pine, Fir, Spruce, and some Quaking Aspen.

This quarter section of land under study was logged by the Taber Mill Company two decades ago, giving the pupils an opportunity to study the type of logging methods used and the natural (Page 2, Column 2)
In biblical times, their homes lead their people into the wilderness, and into the desert. And they found a land described as "flowing with milk and honey," which, in effect, depicted the existence of natural resources—rich soil, lush grasslands and virgin forests. Today, in the same "promised land," could a desert, the rich soil eroded away, the grasslands over-grazed until only desert shrubs remain, and then one hundred Lebanon Cedars are left standing, dry?

Can this same tragedy happen to our United States, to Montana, to the Bitter Root Valley?

Our forefathers also found this valley blessed with rich soil, lush grasslands and expansive forests. Are we, as did our predecessors in Israel, going to destroy our natural resources through misuse and abuse?

It is up to us, a new generation, through study and research, to find ways that will help avoid the tragedy that overtook Israel. Likewise, it is up to every citizen of the United States to educate himself in the matter of conservation.

**PROJECT LAUNCHED**

*(Continued from page one)*

(Continued from page one) comeback of the forest. They will also be studying the different types of erosion and how to control it.

Ranger McDonald showed the pupils how the Forest Service surveys the land and how they mark it off. A small portion of the area was surveyed, using a chain measure and the Abney Level.

The class learned the correct way to use a Forest Service's tools, such as an Abney Level, Increment Borers, Diameter Tape, and a Pruning saw, all of which were demonstrated by Mr. McDonald.

After lunch the class was divided into two groups. The reason for this was that a resident of that area, called it this morning and reported having seen a bear in his orchard and for this reason the groups were kept together.

Ranger McDonald took the study plot and erosion

**INTERVIEWS CLASS**

(Continued from page one)

and Rosemarry.

Specie Example Plot:

Tommy - Chief Silviculturist, Trudy - Scribe, George, Betty, Ginger and Alice.

Erosion Control:

Marilyn - Chief Agronomist, Jessica - Scribe, Charlotte, Jacqueline, Bill and Wilke.

Survey: Brian - Chief Surveyor, Janice - Scribe, Joe, Margaret, Bobby and Leila.

Teacher: That is a real horse?

Johnny: It must be the past tense of real horse.

Control groups and Mr. Bay took the Recreation, Specie Example Plot, Restored Study and Survey Groups. Mr. Bay's group found a second witness tree, one-half of a mile from the quarter section tree.

The next trip that is planned for Oct. 31, will be a work trip.
The conservation project has been divided into six different areas of study. They are:

**Recreation:** Custodians of the public area have the task of keeping the area clean and presentable. They will put on a demonstration on camp lore, including fire building, camp meal planning and preparations, and construction of picnic equipment.

**Survey:** The survey committee plans to acquaint themselves with the methods and measurements used in surveying. They will also learn how to use the tools of a surveyor. They plan to construct a hiprometer. It will be their task to survey the North-South line on the East portion of Terra Verte.

**Erosion Control:** They will survey the area and measure the erosion that is presently, and to methods of control will reduce the amount of erosion in Terra Verte. They also plan to grass planting as an overgrowing the sand being eroded.

**Specie Example Plot:** Their plans are to acquaint themselves with all the different varieties of trees that are native to this area and the conditions under which they grow wherever they might be found. The committee will locate and clear an area where examples of each species might be transplanted. They will also make a collection of each variety of wood to be mounted for display.

**Watershed Study:** They will acquaint themselves with the various methods of water measure. They will construct a Parshall flume with which they will make regular measurements of the water draining from the Bear Trap watershed, the Terra Verte watershed and two watersheds yet unnamed. They will also determine the number of acres each watershed consists of.
MARY CONDON CONGRATULATES JR. HI.

Example of Turkey Conservation:

(Tool, Beef)

(Corn)

STAYE SUPY w  APPLAUI f . LOCAL CONSERVATION PROJECT

A letter was received today from Mary M. Condon, State Superintendent of Public Instruction, congratulating the Corvallis Jr. Hi. for their excellent conservation project and for their recently published paper, the GREEN HORNET'S BUZZ.

The first issue of the paper, also a new project for the eighth grade, was dedicated by the students to the subject of conservation and to their Terra Verte project in the Willamette Creek area. They are planning to publish the GREEN HORNET'S BUZZ once during each six weeks period.

Trudy Strate and Marilyn Mickenes are the co-editors and Tom Richardson is the assistant editor.

Miss Condon said in her letter, "I feel that the project will be of real value to your students and that it may well serve as a pilot program which other school communities might choose to follow. May I take this opportunity of congratulating you and the people of your community for this conservation program."

The Terra Verte project has attracted considerable interest in this area, and it is believed to be the first of its type in the United States, covering many phases of conservation.
BICHASON RETURNS

Continued from page one

... until there is none of valuable top soil and weathering has deep gulleys in the area. In this condition land, of course, can be farmed."

In St. Paul, Tom visited the Park Zoo and Conservatory. The Conservatory housed many kinds of rare and unusual plants, and the zoo was filled with all kinds of animals, birds, small amusement park, and that the trees in the region were completely destroyed. In place of that valuable perennial, unpalatable weeds took over, offering practically no food for grazing or natural cover to hold the moisture. Since we get most of our precipitation in the winter in the form of rain and snow, the water runs off without being of any use to the people below who depend upon that area for irrigation water.

Although Desert Creek represents an area of very few acres (784 acres), nevertheless, it does represent a condition that has happened and is happening all over the U. S.

Who, then, is responsible for the management of such an area? You? No! The Government? The Forest Service? The wateruser? The owner?

The owner of the watershed must consider his investment and realize some financial return. He usually gets that return by grazing or cutting timber. Ordinarily, he gives little thought to the effect it has on the watershed itself. Whereas, the wateruser below can do nothing but stand aside and watch his water dwindle each year. Since the welfare of the people in general depends somewhat upon the success of that farmer, they, too, probably without understanding the cause, stand aside watching their incomes dwindle.

The only suggestion that we might offer is that of education. Not until the situation is understood thoroughly by the owner, the farmer, the business man, and the housewife, can we suggest a working solution. And when the situation is understood, something will be done.

"Conservation is more than conversation!"

MAGAZINE DRIVE SUCCESSFUL

Friday, October 25, the annual Jr. Hi. magazine drive, sponsored by the Curtis Circulation Company, was launched.

The drive ended on Nov. 2 with a total of $348.50 worth of magazines sold, which represents a total of 232 individual subscriptions. The seventh grade sold $468.30, winning Esperelda, a toy goat which is given each year to the winning grade. The eighth grade brought in $360.20.

To the salesmen went $79.45 for prizes, including cameras, wallets, etc.

The profits received from this drive will be used for various Jr. Hi. activities, including the financing of the Terra Verte Project.
-98-

(Continued from page one)

original cover of bunch grass had been destroyed as a result. In the place of the perennial grasses came undesirable annuals and weeds which now form the cover of the land. They also discussed the question of who should be responsible for the management of the watersheds, particularly in privately owned land. No immediate decision could be reached; thus, the problem will be discussed further at a later date in the class room.

The second stop was at Little C Creek, where the watershed group measured the water, using a Parshall Flume to gather figures for later classroom work.

The third and last stop was at Terra Verde, where they discussed the placement of signs at different places along the road. They also discussed putting targets along the road for the poor sportsman to shoot at rather than at the project signs.

They then followed the first part of the proposed nature trail. The trail will begin at a boulder along the road on which lichens are growing. The lichens were of particular interest because of the fact they play in creating new soil from solid rock. Continuing farther along the trail, they stopped at a rotten stump. There they studied the workings of Carpenter Ants. The stump was found to be honey-combed with passages and cells. Outside the stump was found a large pile of sawdust. Each small particle was no larger than a speck of dust but represented one bite of an ant.
s. Felix, injured in accident last summer, ave of her crutches through October, en teaching October, a getting along fine, as he stated.
s. Schmidt found her allergy to apples as night shift packed. Her latest worry at having a wisdom amazed surgically.  

s. Duchscherer, seventh grade teacher, birth to a baby girl, eight pounds, November 30. The baby was named done.

Bratton "brought a bacon" in the form like oaten elk, which to Saturday, Oct. 30 by horse. His hounds, who was busy through fogged without effect, real. Bratton "standing statue of a Minute humor wet powder, pointed but not shooting," then explained later, simply judging the on and weight of the and had determined it grow a mite more." then downed the elk a shot, finally, as nail was disappearing brush. Buck fever?  

YITTO TIDS

3 primary grades danced for the Oct. of the Corvallis.  
The fourth grade owed a Thanksgiving spicing the history background of the holiday are also sponsor andy sale the third December for the of raising funds.

ACROSS:
1. Special day in November
2. Conjunction
3. Egg beater (modern)
4. Fourth month
5. Desire
6. Abbreviation of Argon
7. Jump
8. To knock
9. Girl's name
10. Prefix meaning minor
11. Metal container
12. General Electric
13. Mineral used in stoves
14. Snow transportation
15. Person of Italy
16. Opposite of close
17. Abbreviation of Telephone
18. Abbreviation for Thallium
19. Tidy
20. Combination of Ace and Queen or King and Jack
21. Adam's wife
22. Money in silver
23. Type of nut: tree
24. Suffix - act or fact

DOWN:
1. Adjective
2. Thomas Edison
3. Ask earnestly
4. Pronoun
5. Meat of small beef
6. To water land
7. A strong wind
8. Old womanish
9. Room in jail
10. Member of tribe of American Indian in Montana
11. Son of same parents
12. Disease: Malignant tumor
13. Kind of reptile
14. Scene
15. Number
16. One of five Great Lakes
17. Sea between Turkey and Greece
18. Abbreviation of Radium
19. Small insect
20. At what time
21. Bright color

LESSER GANG

Mrs. Ottinger and Mrs. Hansen report that three boys have transferred recently to Hamilton. They were: Dickey Grover, Larry, Binghamer, and Richard Brown.

The results of an election of officers held in...
IMPLIMENTS RECEIVED FROM GOVERNOR

Corvallis Jr Hi., Corvallis, Montana

Dec. 18, 1953

GOVERNOR'S COMMUNICATION LAUDS JUNIOR HIGH CONSERVATION EFFORTS

A letter was received November 28th from J. Hugo Aronson, Governor of the State of Montana, complimenting the Corvallis Junior High for their publication GREEN HORNET'S BUZZ.

Governor Aronson stated, "Your students are certainly to be congratulated on the excellent publication "Green Hornet's Buzz," copies of which I recently received."

The Governor, in referring to the recent publications which were dedicated to the subject of conservation, continued, "If we older people are to survive and have a heritage for the younger generation, we must learn to conserve wisely our natural resources, particularly our soil and water. The younger generation, in turn, will have a responsibility to their children."

In respect to the conservation studies undertaken in Terra Verde, Governor Aronson said, "I am sure that parents are keenly interested in the children's studies as well as their field trips and the information they have been able to acquire from various sources."

"I wish that time would permit me to be away from the office long enough to accompany the students on one of their field trips, but that does not seem possible."

GIFTS FOR CRIPPLED CHILDREN COLLECTED

The eighth grade is once again undertaking a Junior Red Cross project of gathering toys and playthings for the crippled children of the Shodair Hospital in Helena.

The Shodair Hospital is an institution supported entirely by contributions and was established to help the children of any race, creed, or color. These contributions come from all over the state, making this service available to these unfortunate children.

Each year during the (Page 2, Column 2)
Christmas meaning has been greatly changed in the last few years, due, possibly, to over-commercialization by large business enterprises. However, we usually think of it as a joyous family celebration.

The guests are arriving and the hurry-scurry of a busy Christmas day has begun. Wraps are put away, presents are laid by the tree, and the guests seat themselves in the warmth of a crackling fire in the fireplace. It is wonderful to be able to chat with friends and relatives once again but wait! Does Christmas have still another significance other than this: tinsel, Christmas trees, Santa Claus? It very definitely does.

Let us return in history nineteen hundred and fifty years to a lowly stable in Bethlehem. Men were astounded by the blinding light of a star, not knowing its meaning. We know, however, that on this glorious night, Jesus Christ was born. It is nearly impossible to imagine the state in which our modern world would be today if it were not for the birth of Christ on that night.

Thus, when next December 25th rolls around, let us not only celebrate by opening presents, but also by going to the church of our choosing, there to hear the singing of carols and to remember the real meaning of Christmas - and rejoice.

GIFTS FOR CRIPPLED CHILDREN

(Continued from page one)

Christmas holidays, the children who are old enough to remember their parents and their homes, think, "If only I could be home for Christmas with my family." By sending these toys and playthings, it is hoped that the children's spirits will rise and they will be somewhat happier.

In a recent letter received from the Shodair Hospital, Edwin Grafton, Administrator, stated, "We know you will derive great joy in doing something so worthwhile for boys and girls of Montana who are not nearly as fortunate as yourselves."

There has been a committee selected to manage the project. They are: Willie, Chairman; Terry, Margaret and Julie. This Committee will wrap the toys and write an age on each package, so that each child will get something of his own age. Among the items collected were: puzzles, books, games, automobiles, dolls, records and many other playthings that should greatly please the children who are so unhappily confined to their beds.
The various committees of the conservation project will plan and construct a number of signs to inform the public of the Terra Verde Project and of the different areas and purposes of their conservation study. The lettering and wording will be done by the eighth grade class as a part of their regular class room work this winter.

The purpose of their signs will be to inform the public of their project and to build up public interest in the matter of conservation.

There will be one large sign placed on the road at the point where it enters Terra Verde. They plan to have the following dedication lettered on this sign:

**TERRA VERDE CONSERVATION PROJECT**

We dedicate this forest area of 160 acres to the proposition that nature's commands must be sought out, so that we, the future America, might be better enabled to use more wisely those resources so graciously provided by God --- failing, we perish.

Corvallis Jr Hi, Corvallis, Mont.

---

**SLOWER SONGS**

Trudy Strate

I'm too curly, too bad, and messed, I'm so tired that I need a long rest.
I have a mouth that's too wide, we need a diet.
I am a bride.
My arms are so knobby, my feet are so big.
Together, I look like a rhyme with big?

"PARTY LINE"

Carlotte Ferguson

Party line are we, different people and me. I try to get the line, I can be heard in the busy sign.

JUST BOYS

Janice Carmichael

Laugh at you, look at you, all your braid; there's nothing I do about it, just the way they're made.
BED STUDY POINTS OUT NEED OF MORE EFFECTIVE MANAGEMENT

The phase of the Terra conservation project has proved to be exceedingly interesting. The grade has been investigating the conditions that presently exist and the amount of water that is flowing from each of the different drainage areas. The purpose of this was to compare the conditions existing on the hills to that of the conditions which they would produce. The class found that the varying conditions of the hills have greatly affected the amount of water that flows from them. Some of the hills that they discovered the conditions made to be quite startling.

The students found the following conditions to be true:

Area A, Beartrap Creek Drainage: This area has been practically untouched since this county was settled. The cover is in a completely natural condition, remaining so because of the lack of commercial timber and because of the difficult grazing conditions.

Area B, Terre Verde Creek Drainage: This area has been logged and lightly grazed at different times; however, these operations were under the supervision of the Forest Service.

Area C, Little C Creek Drainage: This small stream drains both private and Forest Service land. There is evidence of some abuse on the private land, particularly in that it has been clearcut during past logging operations.

Area D, Desert Creek Drainage: This entire watershed, which is privately owned, bears scars of years of excessive overgrazing and poor forest management.

The table below points out the great amount of water being yielded by these areas.

<table>
<thead>
<tr>
<th>Head</th>
<th>Gallons of Water</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Gallons per second</td>
</tr>
<tr>
<td>5.25</td>
<td>2.05</td>
</tr>
<tr>
<td>3.06</td>
<td>1.65</td>
</tr>
<tr>
<td>4.25</td>
<td>1.47</td>
</tr>
<tr>
<td>Dry</td>
<td></td>
</tr>
</tbody>
</table>

FURTHER WATERSHED STUDIES

The watershed situation presented here can hardly be understood until the amount of water that each acre produces is determined. The table on this page, prepared by the class, indicates the total amount of water flowing from these areas in inches, feet, second feet, and in gallons. However, the class discovered that this was not a good basis from which to form a comparison of the four areas. In order to make a logical comparison, the graph below was prepared to show the average acre inches that each acre in a given watershed yielded during each twenty-four hours.
CONSERVATION ARTICLES AND LEADERSHIP QUALIFIES ENTRIES

Marilyn Mickens, Tom Richardson, and Trudy Streets have been chosen as entries in the "Young Montana Conservation Program," sponsored by the Montana Wildlife Federation. Ten young people from this district will be chosen from all the entries in Western Montana to meet with Governor Hugo Arm学校的Conservation Committee, along with the young people from the other four districts of the state. The meeting will be held during the latter part of February.

The purpose of this state meeting is to honor the youngsters of Montana who have contributed something outstanding in the conservation movement. At the conference, one representative will be chosen to represent Montana at the "Young Outdoor Americans" national conference in Chicago, March 10 to 16.

Marilyn, Tom, and Trudy were chosen by Ranger McDonald and Russell Bay for their conservation articles published in the Green Hornet's Buzz and for their leadership in the Corvallis eighth grade Terra Verde project. Many of the conservation articles written by these teen-agers have also been published in the MISSOULIAN, SPOKESMAN-REVIEW, the GREAT FALLS TRIBUNE, the WESTERN NEWS and the RAVALLI REPUBLICAN.

FIRST PHASE OF WATERSHED STUDY COMPLETED

(Editors note: see recapitulation of this study on page 4)

In recent studies of the Terra Verde watershed areas on Willow Creek, the Corvallis eighth grade has been determining the water values of each acre in the four watersheds under study. They have undertaken this study so that they, the future America, will understand fully the tremendous value of these seemingly insignificant streams.

The watershed study is on page 3, Column 1.

IT TO "WESTERN NEWS" CAUSES MUCH INTEREST

Students of the eighth grade from the office and the WESTERN NEWS ton, January 14 at 12:00, the tour was that the pupils, whom are interested in their plant, could view how per plant is operated in entering the

The class was given talk about newy by Mr. Miles Romney, a editor of the

Mr. Romney pointed out that he is first page 2, Column 1.

...
TRIP TO "WESTERN NEWS" *(continued from page one)*

joined in or brought in at the front office. Here it is re-written and typed into standard form. This is then handed to the linotype operator who sets the type in his machine. The typewriter makes all of the type into lead impressions which are used in the printing. Each individual line is cast into a square form, resting on a plate called the make-up. After being set, an impression is made of the "plate" so that printing may be proofed and corrections made if necessary. The plates are then set in the flatbed and "run-off" or printed.

Advertisements are placed in a little different manner. The ready-made large national impressions are placed in a matte and melted metal by the operators. Upon thesett, they are placed in the machine along with the news and are printed and then set on the machine.

Field trip was culminated with the witnessing of the operation of the "job printing" press. The operator printed and re-printed several copies of an advertisement to show how the press prints exactly in the same place each "run." The tour was considered very interesting by the pupils attending, particularly those responsible for the publication of the "GREEN HORNET'S BUZZ.

Ordinarily, we of this region think of the forest land as being entirely under the management of the Forest Service. As a result, when we read or hear about the misuse and mismanagement of the forest, we think at first that the Forest Service is at fault; nothing could be farther from the truth, as the table below shows.

To see from these statistics that the chief problem in management is in the hands of farmers, other owners (railroads, mining interests, states, public domain, etc.), and, of all people, lumbering concerns.

It is our opinion that these owners must learn of the importance of conservation, seek the technical advice of government agencies and make use of the educational facilities which many agencies, both private and public, offer. CONSERVATION PAYS!

<table>
<thead>
<tr>
<th>Forest Owners</th>
<th>Forest Service</th>
<th>Pulp Co.s</th>
<th>Lumber Co.s</th>
<th>Others</th>
<th>Farmers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acres in Millions</td>
<td>65</td>
<td>14.5</td>
<td>34.5</td>
<td>130</td>
<td>123</td>
</tr>
</tbody>
</table>

Key:
- Good Management: 50% 19% 10%
- Fair Management: 40% 25% 45%
- Poor Management: 40% 25% 30%

(Taken from the film, "Forest Conservation")
During a recent rainstorm, forty-four hundreds of an inch of rain were recorded at the weather station in Hamilton. The eighth grade class became interested in learning the approximate number of gallons of water that had fallen on each acre in the Verde Valley.

In order to find the number of gallons of water that fell on each area, they first found the cubic feet in each acre. After converting the cubic feet to acre inches, they found the gallons of water that were contained in each acre inch. Finally, they found the gallons of water that fell upon each acre and by using the number of estimated acres in each drainage area, they discovered that 5,054,467 gallons of water fell on Area A; 5,198,393 gallons on area C; and 5,794,920 gallons on area D. This represents a total of 11,951 gallons per acre during this one storm.

After converting the second feet measurements to acre inches, the following figures are the suggested dollar value of the water yielded each growing season and theoretically used to raise irrigated alfalfa during that period: Area A, 444 acres, worth $2.95 per acre; Area B, 267 acres, worth $2.20; Area C, 756 acres, worth $1.20 per acre; and Area D, 480 acres worth nothing in terms of water value.

This study substantiates the belief that there is an increasing need for conservation. Had this entire area of 1056 acres of watershed been well managed during the last fifty years, we could assume from this study that nearly $3200 worth of water would have been yielded each year; whereas, this region produced less than $800 worth of water for irrigation.

Through proper care, the value of our land can be greatly increased. We know that if we fail our watersheds, they in turn will fail us. What is in the future for us — conservation or starvation?
Problem One: the determination of the average acre inches of water yielded per acre per day from each watershed.

<table>
<thead>
<tr>
<th>Area</th>
<th>Acres</th>
<th>Feet</th>
<th>Sec. Feet</th>
<th>Acre Inches per Day</th>
<th>Ave. Acre Inches per Acre per Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>444</td>
<td>.46</td>
<td>.079</td>
<td>6.7</td>
<td>.015</td>
</tr>
<tr>
<td>B</td>
<td>237</td>
<td>.23</td>
<td>.126</td>
<td>5.0</td>
<td>.011</td>
</tr>
<tr>
<td>C</td>
<td>735</td>
<td>.35</td>
<td>.198</td>
<td>4.7</td>
<td>.009</td>
</tr>
<tr>
<td>D</td>
<td>430</td>
<td>Dry</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Problem Two: the determination of the value of water yielded by each acre in each area for the irrigation of a crop:

1) Four tons alfalfa (irrigated) @ $20 per ton = $80 per acre
2) One ton alfalfa (dry land) @ $20 per ton = 20 " "
3) $30 " "
4) Labor $15 " "
5) Total value of water during growing season = $155 per acre

20 growing days
23 acre inches needed each 24 hours
5 acre inches needed during 120 days

<table>
<thead>
<tr>
<th>Acre Inches</th>
<th>Value per A. In.</th>
<th>Value per Day</th>
<th>Growing Season</th>
<th>Total Value</th>
<th>Total Acres</th>
<th>Value per Acre</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.7</td>
<td>$1.63</td>
<td>$10.92</td>
<td>120 days</td>
<td>$1310.40</td>
<td>444</td>
<td>$2.95</td>
</tr>
<tr>
<td>3.0</td>
<td>1.63</td>
<td>4.87</td>
<td>120 days</td>
<td>583.60</td>
<td>287</td>
<td>2.00</td>
</tr>
<tr>
<td>4.7</td>
<td>1.65</td>
<td>7.56</td>
<td>120 days</td>
<td>919.20</td>
<td>765</td>
<td>1.20</td>
</tr>
<tr>
<td>Dry</td>
<td></td>
<td>7.56</td>
<td></td>
<td>480</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Average water value per acre .37
(see story - page 1, Column 2)

- INTERESTING FACTS CONCERNING WATER

-50 percent of the body is water; this means that an eight grader, average weight of 100 pounds could be carried away in gallon can (6.8 per 100 pounds) ... water is often considered pure; however, it is hardly true, in that falling, it is collected in large quantities of dust and gases, such as carbon dioxide and nitrogen. Water can be made better by adding small of chemical agents, as the surface tension, increasing capillarity.
ELEVEN HORNETS BUZZ
No. 5
Corvallis Jr Hi, Corvallis, Montana
March 24, 1954

COLLEGE FOR A DAY" FIELD TRIP PLANNED

101

FIELD TRIP TO MONTANA U
TO BE TAKEN MARCH 24

The eighth grade is once again planning their annual field trip to Missoula. Instead of their usual visit to the various industries in the Missoula area, they have decided to visit the University of Montana this year. Their trip has been scheduled for Wednesday, March 24, an all day trip. The program has been arranged by Mr. Andrew Cogswell, Director of the Public Service Division of the University.

After reaching the University, they are to attend two lectures; first, a lecture on the Geology of the Bitterroot Valley to be given by Dr. Kenneth McLaughlin, Professor of Geology, followed by a lecture by Dr. Charles Waters, Professor of Forestry and Biology, upon the subject of plant succession. The lecture subjects were chosen by the students themselves to conform with their Terra Verde Conservation project. Dr. Waters will accompany them on a field trip at a later date to follow-up his lecture in the field.

Following the lectures, the pupils will assemble at the Bitterroot Room in the Student Union where they will have lunch. Following lunch, they will be conducted on a sight-seeing trip.

So it's off to college we go.
The American way of life, we know, differs from the living standards, customs, and freedoms of most of the other countries of the world, a fact in which we all rightfully take great pride. These freedoms are truly a wonderful heritage; but, it is possible that it could be our ruin. How could this come about? It is quite simple.

Consider the lowly beaver. In his natural habitat, he enjoys freedom somewhat like that we enjoy. He falls many trees for food and shelter, giving no thought to the future. In a short time, he has "used" all the useful trees nearby and as a result must move on, getting along nicely if there are more trees not too far away.

As a result of our freedoms, as Americans, like the beaver, have become careless, cutting down whole forests without giving much thought to the future, wasting water, showing little respect for the life-giving soil. Conservative use of nature's provisions must, yes must, become a part of our way of life.

Conservation is important to you and me, to our friends and neighbors, because by using wisely our resources, we can continue to live full, abundant lives, living in harmony with nature's countless beauties and benefits.

Yes, conservation has a place in our "way of life." In fact, it must be practiced in order to assure us of a prosperous future. There is still time to act, but it must be today, not tomorrow; failing, we shall perish by our own hands.

RESULTS OF "MONTANA'S YOUNG CONSERVATIONIST" CONTEST LEARNED

Recently the Corvallis eighth grade entered the three editors of the GREEN HORNET'S BUZZ, Marilyn Mickens, Trudy Strate, and Tom Richardson, in the Young Montana Conservation contest. This program was sponsored by the Montana Wildlife Federation and was for the purpose of choosing one school student who had done outstanding work in the field of conservation.

A letter was received March 16 from Mr. Ken Thompson, the Director of the State Department of Fish and Game Commission in Helena, who said that it would seem impossible to choose one individual to represent the group work being done on the Terra Verde Project.

In his letter, Mr. Thompson said, "We wish to express our interest in your efforts in the Corvallis Area and to congratulate you on the work accomplished to date. We all recognize that basically the "Terra Verde" project is one of the soundest and most worthwhile activities being conducted in the state."

The eighth grade has undertaken the project, not for individual work, as Mr. Thompson and the committee recognized, but as a group effort. The only exception to this intention will be some 4-H work planned for next year, to be done as an individual effort as a for-
Mr. E. D. Allen, a patrolman of the Missoula District Headquarters of the State Highway Department, came Tuesday, March 16, to conduct a driving safety assembly for the eighth grade and high school.

Mr. Allen explained how some of the more common accidents take place and how some of the students present could possibly get their diplomas in wheel chairs or maybe not at all because of careless driving.

He suggested, further, the following:

a) Never drive while under the influence of intoxicating liquor.

b) Never attempt to jump from a car that is about to become involved in an accident or from a car that is rolling over.

c) Do your day-dreaming at home, never while driving.

d) Failing to obey laws may cost not only a fine, but possibly a life.

e) Do not learn any of the safety rules the "hard way," resulting in arrest, injury or death.

Mr. Allen concluded his remarks by stating that being a patrolman was not always easy, and that there were many heart-breaks and blood involved. He emphasized the fact that a patrolman is the driver's best friend in that they are always willing and able to help the motorist who is in need.

The speaker then showed two films on traffic accidents. The first was titled "Traffic with the Devil," followed by "Screw Drivers and Screw Jays." Both films were very impressive.
THE STREAM AND THE POET
By D. O. Harriman

To a Mountain Stream

Oh, tarry here with me.
Wait, Madcap, I would have a word with thee.
Rush not so madly seaward, foolish one,
Do you not know where you will go
if you pursue the journey you've begun?

Wait, sparkling water,
Check that blind dash away,
You hosts of winter, mountains, bid you stay,
They placed the boulders in your downward way,
Why savagely assail the barriers
And keep o'er them, laughing, run away?
Then, when their tree trunks forest gods do place
Within your path, perchance to stay your pace,
You roar and bend them, casting them aside,
Or take them for a lunging, plunging ride.
Knowest not how flowers droop when you have gone?
Knowest not how mountains need you, Heartless one?

Bide here a while with me,
I'll tell you of the sea
Where lies the water that proceeded thee
With waters of a million such as you
Imprisoned there with nothing to do,
But beat their breasts against a rocky shore; Imprisoned there, Imprisoned evermore!

Revelation 9:4 — "And it was commanded them that they

Oh Prating Fool, I have no time to waste,
A thousand duties wait, I must make haste.

A turbine waits me down a little way
With it I turn your mills and light your way,
A hundred farmers, farther down the lea
With boots and shovels wait and pray for me
To slake the sun parched earth that bears their corn.

Wouldst have me wait and waste this summer morn?

Even though a mountain flower mourns for me,
A valley lily waits impatiently,
And though my journey must end in the sea,
I'll not be imprisoned there eternally.

Some later day my turn will come again
To rise in mist and fall once more in rain.

Meanwhile, the ships of commerce I shall bear,
And creatures of the deep I'll shelter there.

So, tarry if you will, Oh idler you,
I cannot linger, I have work to do!

After Thought

Still water, like a lazy poet's pen,
Soon tepid grows and slimy things crawl in.

should not hurt the grass of the earth, neither any green thing, neither any tree..."
GREEN HORNET'S BUZZ

CORVALLIS 8TH GRADE
CORVALLIS, MONTANA
1954
THE GREEN HORNET'S BUZZ

ANNUAL PROGRESS EDITION

Volume One - Number Six

The Eighth Grade

Cervallis, Montana

May, 1964
This is the final issue of the Corvallis eighth grade school paper, the GREEN HONNET'S BUZZ. We are presenting information herein, pertaining to the Terra Verde conservation project and will summarize the accomplishments and achievements made in the field of conservation by the class of 1954.

The Editors
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<td>32</td>
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<td>AUTOGRAPHS</td>
<td>24</td>
</tr>
</tbody>
</table>
CONSERVATION PLEDGE

I GIVE MY PLEDGE AS AN AMERICAN TO SAVE AND

FAITHFULLY TO DEFEND FROM WASTE THE

NATURAL RESOURCES OF MY COUNTRY -

ITS SOIL AND MINERALS, ITS

FORESTS, WATERS, AND

WILDLIFE
EDITORIAL: THE AMERICAN WAY OF LIFE AND CONSERVATION

The American way of life, we know, differs from the living standards, customs, and freedoms of most of the other countries of the world, a fact in which we all rightfully take great pride. These freedoms are truly a wonderful heritage; but, it is possible that it could be our ruin. How could this come about? It is quite simple.

Consider the lowly beaver. In his natural habitat, he enjoys freedom somewhat like that we enjoy. He falls many trees for food and shelter, giving no thought to the future. In a short time, he has "used" all the useful trees nearby and as a result, must move on, getting along nicely if there are more trees not too far away.

As a result of our freedom, we Americans, like the beaver, have become careless, cutting down whole forests without giving much thought of the future, wasting resources, showing little respect for the life-giving soil. Conservative use of nature's provisions must, you must, become a part of our way of life.

Conservation is important to you and me, to our friends and neighbors, because by using wisely our resources, we can continue to live full, abundant lives, living in harmony with nature's countless beauties and benefits.

Yes, conservation has a place in our "way of life." In fact, it must be practiced, in order to assure us of a prosperous future. There is still time to act, but it must be today, not tomorrow; failing, we shall perish by our own foolish hands.
Terra Verde, meaning green earth, is a 160 acre forest plot in the Willow Creek area of the Jitter road drainage. The land was obtained from the Forest Service under a special use permit, where the Corvalis eighth grade of 8th students are practicing many elements of conservation as though which they can bring before the public the dire need of conservation here in this region as well as in the nation. They are indeed fortunate in procuring an area presenting so many diversified conservation problems; so much so, that our Forest Service has stated that this project is probably the first of its kind in the nation.

The project is divided into six divisions, namely: Watershed Study, Erosion Control, Survey, Study Plot, Species Study Plot and Recreation and Public Relations, all of which consist of at least six students, headed by a committee leader and scribe.

The Watershed Study is an effort to seek out the streams of four small watersheds, consisting of 400 to 300 acres in areas. They are fortunate in that each area represents a different situation of management, ranging from excessive abuse to that of an untouched area, leading itself to immediate comparison possibilities.

Since part of Terra Verde was logged in the early thirties, the Erosion Control group has found many small roads and trails that have become eroded, which in turn presents a practical problem of dam building, application of water spreading techniques, and restoration of ground cover.

In that Terra Verde proper has not been surveyed, the Survey Crew has found it necessary to acquaint themselves with matters pertaining to survey procedures, and have in a small way, surveyed portions of the boundaries. This, of course, entails practical use of map reading, making maps, mastering scale measure and various arithmetic computations.

The Study Plot group is doing work similar to that being done all over the nation; that is, selecting a grove of trees
that will show the effect of pruning and thinning as compared with that of a control grove. In addition, they are treating Douglas fir stumps that have been left by Christmas tree cutting so that they will again produce new Christmas trees.

The Species Crew has set aside an area where they hope to transplant the native varieties of trees and where they will re-seed various native range grasses, all of which will be primarily for the purpose of species classification. A collection of mounted cross-section, longitude-sections, and bark sections of native trees has also been undertaken, eighteen varieties having been thus far collected.

Adjacent to Terra Verde is a picnic area which has been used by the public for years where the Recreation and Public Relations group hope to improve and, if nothing more, keep clean and presentable. The improvements depend, of course, upon their limited finances, which, incidently, are raised by the class through an annual magazine sales drive. The project has yet cost the school district very little.

Other activities here include the construction of a nature trail which has been started and will be marked with signs. The signs marking the whole area and individual plots are described further in this issue. The activities evolving around the subject of conservation are culminated finally, in the publication of the group paper, the GREEN HORNET'S EDZ. In this manner, the results, achievements and group thinking is expressed for both school and public attention. Nearly every major article written by the class as a whole, thus co-ordinated into a finished article, has also appeared in the "Missoulian," the "Spokesman-Review" and the "Great Falls Tribune"; thus, achieving, in part, one of their goals, i.e. to bring the subject of conservation before the public whenever possible.

Much of the progress made thus far could not have been possible had it not been for the able assistance of the U.S. Forest Service, particularly District Ranger McDonald. In addition, much information and assistance has been supplied by the Montana Forestry School in the person of Dr. Charles Waters.
FIELD CREWS

Watershed Crew

Species Example Crew

Survey Crew

Erosion Control Crew

Recreation Crew

Study Plot
REVIEW OF 1964 CONSERVATION ACHIEVEMENTS

The most important achievements of the pupils have been made, as feel, in the classroom. We have achieved, to a great extent, our aim of learning how essential conservation is to the individual, the state, and the nation, of gaining an appreciation of our natural resources, and of understanding the role these resources play in the vision of prosperous living for our posterity. These, without doubt, far exceed the importance of the achievements listed below.

We have accomplished the following in field sessions in the Terra Verde area: thinned and pruned a grove in the study plot; made provisions to assure some erosion control where it is needed; surveyed boundaries and watershed yields; collected cross-sections and longitudinal-sections of eighteen native trees; planted a bitter-root test plot; cleaned up the recreational area; erected various signs for public information; and laid out the first leg of the nature trail.

Achievements measured in terms of commendations received from those interested, consisted of letters from the following distinguished people: The Honorable J. Hugo Aronson; Mary Condon, State Superintendent of Public Instruction; Clifford Knapp, regional director of the mountain-states of the Association of Biology Teachers; Ken Thompson, Montana Fish and Game Commission; Andrew Oja, Editor of the Montana Education Journal; Homer Smith, DITTO Corporation; and Linus Carleton, Dean of the School of Education at the Montana State University.

The following are excerpts from the communications received from these people:

Governor Aronson, "Your students are certainly to be congratulated on the excellent publication, the GREEN HORNET'S BUZZ... I wish that time would permit me to be away from the office long enough to accompany the student on one of their field trips."

Mary E. Condon, "I feel that the project will be of real value to your students... Please extend my
Congratulations to you, and to all of us, on the success of your project.

Clifford D. Knapp, "Your staff is doing an excellent job. You are, in my opinion, way out in front on conservation. At the Boston convention, you really put Montana on the map!"

Ken Thompson, "We all recognize that the Verde Verde project is one of the nearest and most worthwhile activities being conducted in the state."

Homer Smith, "The GREEN HORNET'S BUZZ is one of the best duplicated papers I have seen. I have sent your paper to our art department, and they share my enthusiasm."

Linnus Carton, "My congratulations to you and the staff of the GREEN HORNET'S BUZZ for your very ambitious issue... While I was particularly "taken" by the conservation theme, the paper is very well done from page one through page four."

The Terra Verde project is to receive national attention in that it will be described this year in the National CONSERVATION HANDBOOK to be published soon by the National Education Association. In addition, many educators representing nearly every state in the nation heard of the project last fall at the National Biology Teacher's convention. At which time, the project was presented along with the GREEN HORNET'S BUZZ by Clifford Knapp of Boston, Montana. Finally, Montana teachers have also read of the activities here in Corvallis in an article entitled "Conservation Unlimited" written by Mr. Bey.

The conservation project probably will not receive as much public attention next year as it did this year. However, it is to be hoped that as much can be achieved in the classroom next year. We also hope that in the years to come, the future eighth graders will continue to carry on this project, and find it a worthwhile activity to carry on with their successors in the class of 1954.
RESULTS OF THE WATERSHED STUDY

In recent studies of the Terra Verde watershed areas on Willow Creek, the eighth grade has been determining the water values of each acre in the four watersheds under study. They have undertaken this study so that they, the future America, will understand fully the tremendous value of those seemingly insignificant streams.

The watershed study is divided into four drainage areas: namely, A, B, C, and D. Area A, Scarecrow Creek, was found to be in a completely natural condition, practically untouched. Area B, Terra Verde Creek, has been logged and lightly grazed at different times, but under the supervision of the Forest Service; Area C, Little C Creek, has been in private hands for many years and has been abused somewhat through indecorate logging and grazing; and Area D, Desert Creek, also privately owned, shows all the evidences of excessive grazing and poor forest management.

With these conditions in mind, the class began their study. Using alfalfa as a theoretical example crop, a comparison was made between a dry land crop and one produced with the use of irrigation. Mr. Roco, of the Soil Conservation Service, stated that alfalfa can be expected to use .23 acre inches of water every twenty-four hours. This means that 27.8 acre inches of water are required for the growing season (120 days). Comparison of hay on dry and irrigated land, shows an increased value of about $18 per acre in favor of irrigation. On this basis, the value of water amounts to $1.68 per acre inch used for the purpose of irrigation.
While on their first field trip last fall, the watershed crew measured the water flow in each of the four subdivisions and gathered the following information: Area A, .279 second feet; Area B, .124 second feet; Area C, .480 second feet; and Area D was found to be dry. This data was compiled by using a Parshall flume to measure the free flow of water.

After converting the second feet measurements to acre inches, the following figures are the suggested dollar values of the water yielded each growing season and theoretically used to raise irrigated alfalfa during this period: Area A, 444 acres, worth $2.96 per acre; Area B, 267 acres, worth $2.20 per acre; Area C, 765 acres, worth $1.20 per acre; and Area D, 480 acres, worth nothing in terms of water value.

This study substantiates the belief that there is an increasing need for conservation. Had this entire area of 1,956 acres of watershed been well managed during the last fifty years, we could assume from this study nearly $9,000 worth of water would have been yielded each growing season; whereas, this region produced less than $500 worth of water for irrigation, a difference of $8,500.

Through proper care, the value of our land can be greatly increased. We know that if we fail our watersheds, they in turn will fail us. What is in the future for us — conservation or starvation?

![Watershed Area Chart]
During the school year, the eighth grade heard eleven lectures given by outstanding professional men. They were called upon to talk about many subjects, but with particular emphasis upon conservation.

Mr. Charles McDonald, District Forest Ranger, talked to the class on two occasions, September 23 and October 14, upon facts relative to their Terra Verde project. He told them many interesting things about forest conservation, forest fire danger, how to use forestry tools, the value of watersheds, the value of soils and how to identify trees.

Mrs. B. K. Monroe, local Associated Press correspondent, interviewed the class, September 25. She explained to the group how a correspondent collects news and how to interview an individual. In doing so, she questioned them about their conservation project in order to demonstrate how news is secured. Following the demonstration, Mrs. Monroe's article concerning the Terra Verde project appeared in newspapers throughout the Northwest.

Mr. Clem Rose, of the Soil Conservation Service, gave the class a talk on the "Ecology of Watersheds," November 8. He discussed the amount of local precipitation received here each year, and of the economic value of water. The students took part in a short discussion following his talk.

Mr. Miles Romney, owner and editor of the "Western News," gave the class a brief talk, January 14, speaking on the subject of how newspapers are composed and printed.

Mr. DeForest Merriman, poet and historian, talked to the class concerning the history of Montana. Mr. Merriman traced the history of the State from the Dinosaur Age to the present. At the request of the audience, he quoted several of his poems, two of which were later published in the "GREEN HORNET'S BUZZ."

Sherman Hayes, staff artist at the Rocky-mountain Laboratory, lectured to the group, March 3, on the subject of
Mr. Croff, Graduate Assistant in the School of Geology, gave the class a lecture on the Geology of the Bitter-root Valley, March 24, at the University. He told the class about the movement of the earth's surface, which resulted in the formation of the mountains as we now see them. He also showed slides to illustrate his talk.

Dr. Waters, Professor of Biology in the School of Forestry, gave a lecture on plant succession, March 24. He traced the history of the growth of the plant kingdom from the barren rock stage to that of a climax plant. The lecture was illustrated, step by step, with a display of living examples of each plant discussed. This talk was later followed up by further remarks and demonstrations by Dr. Waters on the first spring field trip to Terra Verde.

Mr. Malouf, Assistant Professor of Anthropology, talked briefly to the eighth grade, March 24, before they visited the University museum. He told a story of a little Indian mummy found in Fergus County, explained the story depicted on an Indian ceremonial robe, which was painted by an Indian Chief, and called the attention of the class to many facts pertaining to the collection in the museum.

Mr. Brown, Manager of the University Field House, talked to the class about the construction details of the new Field House. He explained how the roof was erected and that it is now the longest wood span in the world. Other interesting details concerning the new building were discussed, such as its present use, seating capacities and plans for future use.

Mr. Lefond, Superintendent of the Corvallis Schools, explained to the group how a Geiger Counter is used in the search of radioactive minerals. Mr. Lefond demonstrated the machine following his talk, and displayed several samples of radioactive material. Later, on the spring field trip, he demonstrated the machine in the field; however, little radioactivity was noted on the Terra Verde landscape.
The various committees of the conservation project have been constructing a number of signs to inform the public of the Terra Verde project and of the different areas and purposes of their conservation studies. The purpose of this effort will be to inform the public of the project and to stimulate public interest in the matter of conservation.

The lettering and wording of the signs was done by the class as a part of their regular classroom work during the winter months. The smaller signs included the names of five creeks, a marker for the nature trail, targets, and a "help keep clean" sign. The letters were carved and painted green and the remaining part of the sign-board was finished in natural color. In addition, three boxes, built to resemble bungalows, were constructed and erected, in which typewritten pages were placed to inform any one interested in the work performed by each committee and explaining the significance of that work. Upon completion of this task, it was decided that help would be needed to rout the letters of the larger road sign.

Upon contacting the Forest Service through the District Ranger, Charles McDonald, it was discovered that they would construct the sign in its entirety. This was done, relieving the class of long tedious work, which would have hardly warranted the time required to do the work. This sign was installed on the Willow Creek Road where it enters Terra Verde. A small sign, pointing out a target, has been placed on the larger structure with the hope that the signs in the district will be spared by the hunters and "plinkers."

The class has considered the possibility of public abuse.
of the signs and equipment. In consideration of this need, they have placed a variety of targets at different places in the area, so that those who feel that they must shoot at some painted object will have one provided. It is hoped that these targets will be used for this purpose instead of the signs, thereby destroying their usefulness.

The following is the dedication lettered upon the sign at the entrance of Terra Verde:

TERRA VERDE CONSERVATION ASSOC.

To dedicate this forest park of 100 acres to the proposition that nature's amenities may be enjoyed as that we of future generations, shall be better enabled to pass more wisely and resourcefully at previously unmarred by man... Finally, we can assure you will find it delightful & quiet.

O'RiordanDr. H. O'riordan, Inc.
THE NATURE TRAIL

The Nature Trail begins at the Willow Creek Road where it crosses Terra Yerde Creek, and follows the creek a short distance up stream. The purpose of the trail is to acquaint the students with small things in nature that would not other wise be noticed. Too often we see, not the tree, but the shade.

It is first noticed that nothing grows in the hard gravel of the road, due to the wearing and packing down of soil.

Nearby, on a large pile of rocks, is found an excellent display of plant succession, beginning with the lichens, which are growing on bare rock, without the benefit of any soil. There are two varieties, felices and crusts. When enough soil is formed by the rotting bodies of dead lichens, mosses can be found growing. Further, the moss gives way to grasses, which in turn, supplies enough soil for the next stage of succession, the shrub. In the shade of the shrubs, tiny seedlings begin to show themselves, and the last step of plant succession is in view, the tree.

Further along the trail, is the evidence of the existence of tree enemies and their work. Porcupines and rabbits have damaged small Ponderosa pine saplings by eating the bark from their stems. Near here, "witches broom" can be seen in the over-hanging branches of the blighted trees. This condition is brought about by the growth of Mistletoe, a tree parasite, robbing the tree of its food. Trees thus affected, have no commercial value other than for fuel.

Next to be noticed is an old stump, in which can be seen the workings of Carpenter ants. Large sawdust piles at the base of the stump show the work of this ambitious insect.

Finally, three logs are next noted, all of which are in various stages of decomposition, clearly illustrating the work of insects, weathering, rot, lichens, and mosses in the production of new forest soil, further illustrating the great amount of time required in the production of that soil.
PLEDGE TO CONSERVATION
Thomas Richardson

American lands now lie, as we see, in terrible devastation.
Not that of nature, war, or strife, but of human depredation.
Our fore-fathers, like the beaver, passed from frontier to frontier.
The last frontier, now settled, is left in state

To our posterity, and their's in turn, we owe a

That they may live, and work, and play, on an earth conservatively kept.
Yes, it's our debt, both yours and mine;
But, the problem belongs with the nation.

Can we and our thoughtless, un-natural waste,
And pledge to conservation
A little time, a fraction of our energy
Resulting, we pray, in a more prosperous nation.
After reading an interesting article in the "Missoulian" about the bitter-root flower and of Mr. Frank Rose, the students wrote to Mr. Rose asking for further information that could be used in connection with the Terra Verde conservation project. Mr. Rose, a botanist, raises and collects the seeds of nearly all of the native wild flowers and shrubs of this region. In response to this inquiry, two dozen bitter-root plants, a packet of seeds, and a story of the history of the bitter-root were received from Mr. Rose. The plants and seeds were used to start an experimental plot in Terra Verde. We are pleased to print a portion of this interesting history which Mr. Rose so graciously furnished.

"The first specimen was collected near the mouth of Polo Creek about twelve miles south of Missoula, Montana, by Captain Meriwether Lewis of the Lewis and Clark expedition in 1803. Lewis had seen the root of the plant the previous summer among some dried foods abandoned by a party of Indians but first found the living plant on his return trip. Lewis carried his specimen the 3,000 miles of his return trip and turned his entire collection over to Dr. Frederick Fursh for determination. Sometime later, Dr. Fursh, while studying the plants collected by the expedition, discovered that one of the bitter-root that had been dried and pressed showed signs of life. He planted it in the garden in Philadelphia and there it continued to live for sometime, the first Western alpine to be introduced into the East."

"The bitter-root, which is the state flower of Montana, has given the name to a range of mountains, a river, and a fertile valley in Western Montana. Bitter-root used to be highly prized by the Indians as food, for it supplied the starch lacking in their essentially meat diet. Large parties camped each spring at the base of the Bitter-root Mountains while the squaws and children dug and peeled the year's supply for food. The root was dried and boiled like beans or ground and used as flour."

We wish to thank Mr. Rose for his kindness in sending the plants and the above interesting information.
FIELD TRIPS

Probably the most interesting activity of the school term was the field trips taken this year. Each trip added much meaning to "textbook knowledge" concerning many subjects, but with emphasis on conservation. The following paragraphs are intended to give a brief glimpse of what was discussed and seen on the various field trips.

Field Trip I, September 25. On the first trip to Terra Verde, the pupils learned to identify many different kinds of trees, shrubs, and grasses under the instruction of Ranger McDonald. He also demonstrated how a forest area is surveyed. During the afternoon session, the class was divided into two groups. Ranger McDonald took one group a short distance into the Bear Trap drainage area to investigate watershed conditions; while, Mr. Bay and the other group looked for and found the north boundary marker, a witness tree.

Field Trip II, October 14. Once again, the eighth grade visited Terra Verde. The morning session consisted of discussions on erosion control, watersheds, and a demonstration on how to take care of a camp fire, and how to put the fire completely out. The afternoon period was spent in working on specific jobs associated with each committee task.

Field Trip III, January 14. The students visited the plant of the "Western News," owned and edited by Mr. Milo Romney. The class was shown all the different processes involved in the printing of a newspaper.

Field Trip IV, March 24. The eighth grade once again took their annual trip to Missoula; this year to the Montana State University, where they attended two classes, ate lunch at the Student Union, and visited several new buildings.

Field Trip V, April 23. A follow-up trip on plant succession with Dr. Waters of the University to the project was taken, the first spring field trip. Mr. Lefond also accompanied the class, and demonstrated the Geiger Counter.

The annual spring trip is planned for May 20.
CONSERVATION FILMS VIEWED

In order to get a better understanding of the conservation problems here and in other portions of the United States, the class ordered a series of films last fall from the Educational Department of the Forest Service. Each week we have seen a film, and have received, altogether, twenty-six titles. The most impressive and outstanding of these were:

"The Adventures of Junior Raindrop" -- This was a cartoon in color about the adventures of a rain drop. The film points out the need for good water conservation and watershed management.

"Telephone Creek" -- promotes the use of the airplane for fire fighting as told by a smoke jumper.

"Wildlife and the Human Touch" -- tells what the human touch does to wildlife when planning and understanding of nature's ways are not considered.

"Avalanches to Order" -- a colored film in which a Snow Ranger deliberately starts avalanches so that skiers will not be injured or killed by the same avalanche which he might start unknowingly.

"A Decision for Bill" -- this film explains the many departments of the U.S. Department of Agriculture and the various services it performs. The film points out the work that might interest job seekers.

"Snow Rangers" -- shows the work of the Snow Ranger, how he measures the water content of the snow and how he records information gathered on the watersheds.

"Dead Out" -- this film shows what carelessness can do to the forest. In addition, it shows how those who are careful may still make costly mistakes.

"Timber and Totem Poles" -- shows Indians of Alaska making and painting totem poles.
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