Better Living *through* Wise Use *of* Resources

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Foreword

AS NEVER BEFORE, nations the world over are considering conservation a problem of vital concern to all peoples and an obligation which must be accepted by each person. It is becoming increasingly recognized that steps leading toward the establishment of harmonious relations between man and his environment will go a long way toward resolving the world's paramount problem — that of effecting continuing peace among peoples.

Yet with a speed unparalleled in history, man today is making dangerous inroads on the world's natural-resource base. With a population ever increasing, with human wants multiplying, with technology altering the balance of nature, and with world-wide tension and wars prevailing, the earth is fast declining in productivity. People the world over face a compelling choice. They must either safeguard the natural-resource base or resign themselves to progressively lower standards of living with the resultant impairment of human welfare.

The people of the United States have long expressed their concern for conservation through programs of education and action carried on by Federal and State governmental agencies and through programs outside the Government. This country also has actively cooperated in international programs to further conservation. The schools of America have contributed substantially to the achievement of conservation goals in this country.

The ultimate success of any conservation program depends on public opinion, and public opinion can be created through education. In a democratic society, no approach to the problem of counteracting the destruction and impoverishment of natural resources can be effective that neglects education as a means for developing an informed citizenry which understands conservation problems, policies, and practices.

This bulletin seeks to provide school administrators, supervisors, and teachers with basic understandings related to the problems of resource use and the effects of resource impairment upon human welfare and national security. It suggests educational measures for vitalizing the teaching of conservation at all levels of learning. It also contains a master bibliography of materials for students and teachers. The bibliography includes annotations of books and articles, charts and maps, pamphlets, teaching units, and lists of references related to various aspects of conservation education. In other words, the bulletin is a resource upon which administrators and teachers may draw in developing conservation education programs which meet the needs of their schools and communities.

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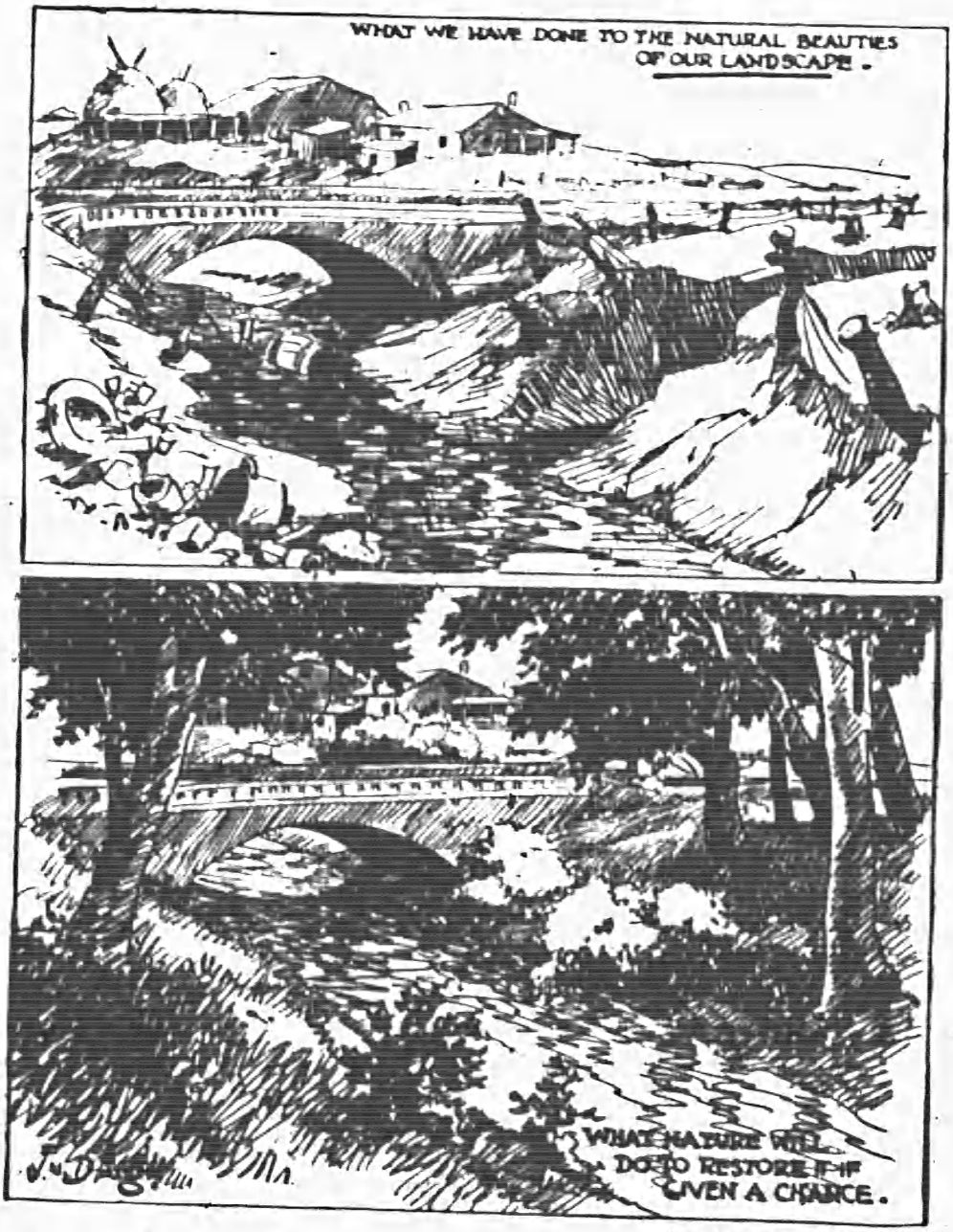


Courtesy, Jay N. Darling

Destruction in our Nation has proceeded in scope and speed unequaled by that of any other area. We have destroyed fast. We must apply corrective measures fast.

A NATION deprived of liberty may win it, a nation divided may reunite, but a nation whose national resources are destroyed must inevitably pay the penalty of poverty, degradation, and decay.

GIFFORD PINCHOT

Understanding our natural resources

Public education, to meet the needs of twentieth-century man, must concern itself with the fundamental issues of the world's most vital problems—that of effecting continuing peace among divergent peoples and that of establishing harmonious relations between man and his life-sustaining natural resources. Unless proper measures are taken toward resolving the latter problem, the noteworthy efforts directed toward solving the first will in the long run prove to be inadequate.

In *Breaking New Ground*, Gifford Pinchot aptly emphasized the close relationship between the physical conditions of the earth-base and the degree of political stability and well-being of the people by viewing conservation of natural resources as the key to the future—the key to the safety and prosperity of all the people of the world. Many of the major ills that threaten civilization today stem from man's failure to live in harmony with the principles that govern his environment. Without harmonious relations between man and his environment, "there is no hope for peace or plenty or progress."

The strategic value of conservation for the purpose of safeguarding peace was expressed by President Truman in forceful terms: "The real or exaggerated fear of resource shortages and declining standards of living has in the past involved nations in warfare. Every member of the United Nations is deeply interested in preventing a recurrence of that fear and of those consequences. Conservation can become a major basis of peace."

The same note was further stressed by Julius A. Krug in his welcoming address to the first world conservation conference, the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, 1949. To this conference the former Secretary of the Interior stated that President Truman's suggestion for convening the meeting "was aiming at the heart of the problem of world peace. Real conservation can re-

move economic pressures and fears of scarcity which have always played a large part in bringing on wars.

"Conservation touches not only the ability of the people to live well; it touches their ability to live at all. Conservation and wise development of our resources would insure world peace."[1]

It is now evident that, as never before, nations the world over are cognizant of this point and are considering conservation a matter of recognized necessity to each individual, an issue of vital concern to *all* peoples, and potentially a "major basis of peace."

It is, therefore, not only fitting but also urgent that conservation consciousness permeate our whole educational program and that the schools accept the challenge to further an understanding of the natural environment and to orient citizens to a recognition of personal responsibility for life in harmony with the earth. These are prerequisites to better living through wise use of resources.

Natural Resources Defined

The material culture of our nation has been made possible by a bountiful endowment of critical elements, more frequently called "natural resources," which constitute our physical environment complex. These elements are "the very essence of human existence—the natural materials and values—the geographical goods which we transform into economic goods through the means of our technology . . ."[2] They embody the natural equipment of any area and include many elements, such as air, sunshine, and wind; soil; surface water and underground water; minerals; wildlife; forests; grasslands; and scenic and recreational values. These are, as Van Hise termed them, material goods "provided by nature which may be used for the benefit of man." They form the basic foundation upon which any civilization rests and belong, at least theoretically, to all people.

As is obvious upon even a casual examination of the foregoing list of natural resources, striking contrasts exist among them in regard to their nature, characteristics, degree of impairment possible, and principles that must govern their use. A few of them cannot be despoiled by man's use irrespective of the method employed or the duration of time involved, whereas others are easily

[1] Krug, J. A. "Resource Development for the World." Address delivered at the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 17, 1949.

[2] Renner, George T. *Conservation of National Resources:* An Educational Approach to the Problem. New York, John Wiley and Sons, Inc., 1942. p. 33.

and often unnoticeably impaired. This injury in turn spreads to other resources. Consequently, conservation is primarily concerned with the latter group including, chiefly, soils; waters, both surface and underground; forests; grasslands; minerals; wildlife, both plant and animal; and scenic resources.

These resources can be critically damaged by man-induced or man-aggravated impairment, or they can be materially bettered. It is, therefore, urgent that all resource consumers—ALL HUMAN BEINGS—understand what resources are, how they are classified, their value to civilization, how they are impaired, and the principles that should govern their use. For each resource possesses its own particular conservation problems and its own unique set of interrelationships to the total ecological pattern. Thus, a classification of resources in the light of these factors will facilitate a better understanding of the total resource-use problem.

Natural Resources Classified

As is implied in the foregoing paragraphs, all the natural elements, materials, or forces of man's environment, which he "adapts to his own ends," are fundamentally grouped into two main classes—those resources that are inexhaustible and those that are exhaustible or subject to impairment. However, adequate understanding of resource-use problems necessitates a more detailed analysis, the most widely accepted of which is that formulated by Renner who gives a diagrammatical division as follows:[3]

Resource Problems Categories

A. Inexhaustible	(1) Immutable	
	(2) Misusable	
B. Exhaustible	(1) Maintainable	(a) Renewable
		(b) Non-renewable
	(2) Nonmaintainable	(a) Reusable
		(b) Nonreusable

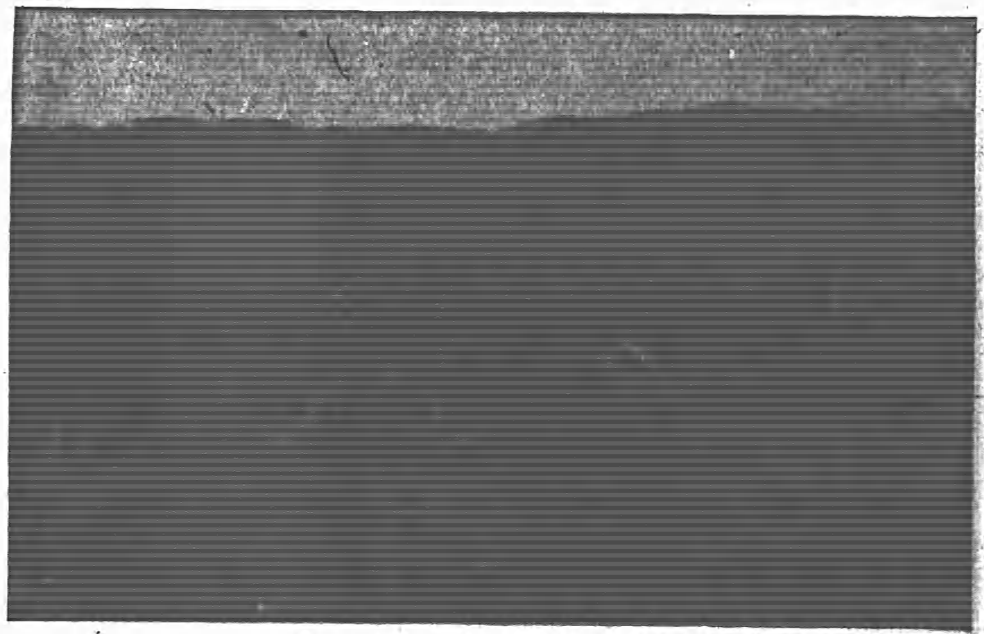
This, as Renner further emphasizes, embodies the following six major classes:

I. Inexhaustible—Immutable

These resources, except in certain local situations, present few problems in conservation; for man's activities have no appreciable effect either for good or for bad upon the almost limitless world supply of them.

[3] Renner. *Op. cit.*, p. 49.

Foremost among the elements in this group are solar power, the ocean waters, wind power, and air. While it is evident that locally problems of air pollution may arise and may have to be solved, the total supply of air is inexhaustible and immutable. Certainly, the bleak, barren wasteland surrounding the Sudbury nickel area of Ontario and that extending for miles around the copper smelters of Ducktown, Tenn., bear silent, yet vivid, protest to man's failure to deal adequately with air pollution problems on a local basis.



Courtesy, U. S. Forest Service

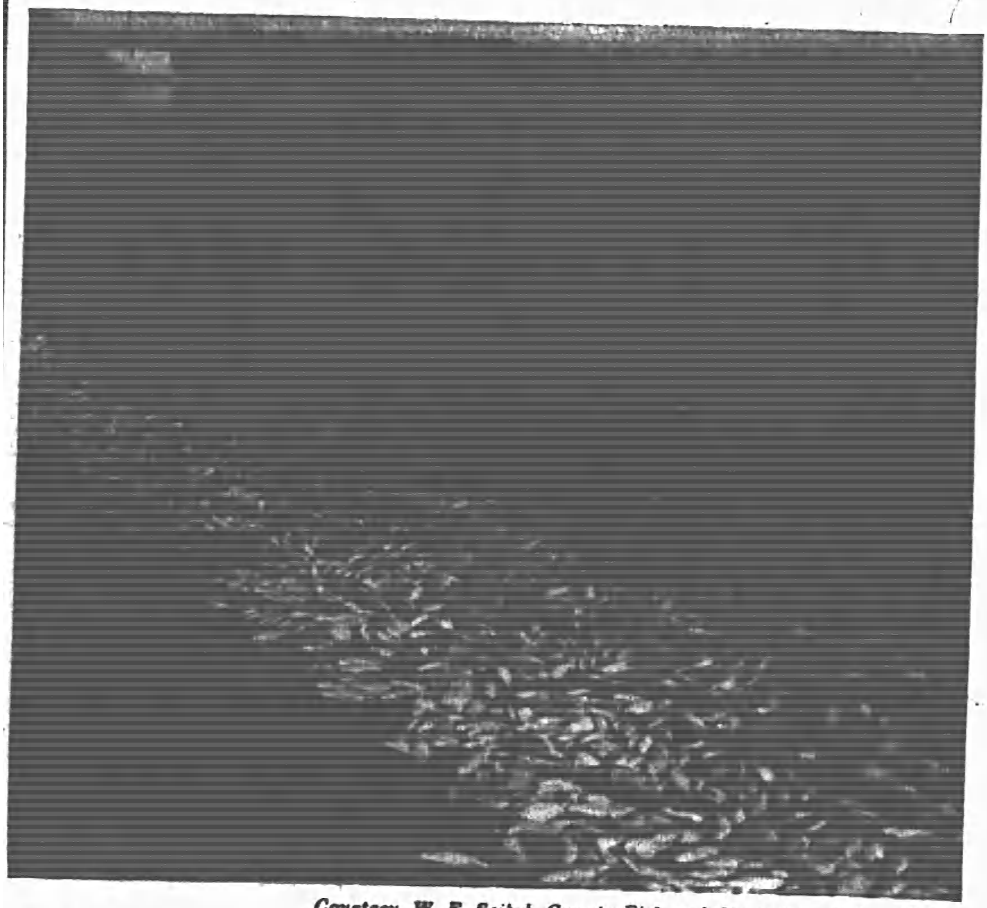
Uncontrolled gullying followed the destruction of the forest cover by smelter fumes.

II. Inexhaustible—Misusable

Other resources, such as water power, surface water bodies, and scenery, that present no danger of possible exhaustion do, however, give rise to complex problems if man uses them injudiciously. Here again, human activities cannot bring an end to these resources, for the source of supply is permanent.

Marked differences in the extent to which various areas are endowed with specific material resources exist. A most advantageous combination of favorable factors for water power development characterizes some regions, yet these attributes may be entirely lacking in others; while surface water bodies are numerous in certain areas, they are practically nonexistent in others. Since the source of supply of these resources is virtually unlimited, they are termed "inexhaustible." Therefore, the primary conservation problems relate not so much to restricted use but rather to wise use so that the maximum good may be realized from the particular resource and others associated with it.

Inland waterways, converted to fishless channels of liquid filth—a menace to health and a deterrent to recreational pursuits; roadsides, defaced with billboards and strewn with rubbish; navigable rivers, too poorly located to attract much traffic in any event, made more navigable by spectacular developments necessitating large



Courtesy, W. E. Seibel, County Fish and Game Association, Ohio

This inland waterway, polluted by sugar beet wastes, can no longer support valuable species.

expenditures of public funds; and great dams, which created deep lakes that in time became silt-laden reservoirs, are only a few of the indices that might be selected to indicate the tragic misuse of resources. The best approach to effecting the wisest and most complete use possible of these resources lies in areas of "socio-economic planning" of an enlightened, self-disciplined citizenry, cognizant of the value of the natural resources, sensitive to their misuse or abuse, and capable and willing to work cooperatively together in a democratic manner to develop sound resource-use programs.

III. Exhaustible—Maintainable—Renewable

Unlike the resources just examined, the degree of permanency of the source of supply for this group of materials—including,

among others, soil fertility, timber, underground water, scenic beauty, and range grasslands—is dependent upon the nature of use made by man. If these materials are used as "a mine" with the philosophy of "get while the getting is good," rapid exhaustion is the inevitable result. On the other hand, they may be so used as to maintain permanently a high degree of usefulness. Moreover, after depletion occurs, man can bring about a restoration of the resource. The restorative process is usually slow and costly.

Consequently, the most vital approach to conservation problems related to this group of natural elements is that of intelligent use accompanied by "replacement as used." Forests when used as "a crop" become a resource of continuous productiveness; arable land when farmed according to proper agricultural practices has lasting fertility; and underground water when treated as an intricate part of a total complex ecological pattern, the welfare of which necessitates proper use of the whole watershed, reflects a substantial increase of stability of the water table. But where either exhaustion or serious depletion of these resources occurs, the only "road back" is that of restoration to be followed in turn by proper use.

IV. Exhaustible—Maintainable—Nonrenewable

Like the group just studied, the resources of this class, including physical soil materials, many forms of fish, wild animals, trees, shrubs, and wild flowers, can be so used that a high degree of productivity may be maintained indefinitely. But in striking contrast to the foregoing resources, these materials can never be restored if man heedlessly continues impairment of them until exhaustion occurs. Once these values disappear, they are gone forever. *There is no "road back"!* Soil (not soil fertility), the product of millions of years, cannot be replaced once it is destroyed; the passenger pigeon, extinct since 1914, cannot make its reentry on the ecological stage; and certain species of plant and animal life, perished to the last individual member, can never be restored. Therefore, for these resources to be of continuous value, man must concern himself with basic issues of wise use designed to maintain their usefulness and to eliminate the danger of exhaustion.

V. Exhaustible—Nonmaintainable—Reusable

The source of supply for resources such as gems, some nonmetallic minerals, and most metals is not only exhaustible but also nonmaintainable. These materials, as Keenleyside termed them, are "wasting assets" that definitely are not replaceable.[4] The supply, when exhausted either by waste or beneficial use, can never be renewed or restored. The danger of exhaustion, however, is somewhat lessened by the fact that these materials may be used and reused, again and again, often prolonging almost indefinitely their period of service.

The collecting of scrap iron, the salvaging of discarded aluminum, and the saving of tin cans are only a few of the efforts made

[4] Keenleyside, H. L. "Critical Mineral Shortages." Address delivered at the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 18, 1949.

to postpone the day of exhaustion and to extend for the longest time possible the period of usefulness of certain exhaustible, non-maintainable natural resources. The careful husbandry of such materials necessitates not only practices of reuse but also reductions in waste and restrictions in use. Furthermore, "the remedy not only must be planned use; it must involve an increasing amount of government supervision and regulation as well."[5]

VI. Exhaustible—Nonmaintainable—Nonreusable

Resources such as coal, petroleum, natural gas, helium, most non-metallic materials, and certain metals are aptly termed "one-use resources." Their supply is limited; ultimate exhaustion, a certainty; and replacement or reuse of the material, an impossibility. Hence, man's wasteful exploitation of the past and his present, dangerously heavy inroads upon the supply of these non-maintainable, non-reusable materials are cause for grave concern. Despite the ingenious developments in science or the increased use of low-grade resources, effective conservation practices are imperative. If our Nation is to maintain its high standard of living, waste of these vital materials must be reduced to a minimum; competitive exploitation, eliminated; substitutes, provided where practicable; and the period of exhaustion of these "fund resources," deferred as long as possible.

It is now apparent that of the many interrelated elements constituting the natural equipment of any areas conservation is concerned primarily with those resources the impairment or destruction of which is man-aggravated or man-induced and the betterment of which lies within the influence of man. Thus, the most critical conservation problems center, for the most part, on the counteraction of the impairment and destruction of seven resources: soils, waters, forests, grasslands, wildlife, minerals, and scenic resources. These and many similar problems must become a major concern of man.

Resource Destruction and Impairment

Historical records convincingly indicate that man's presence in any area effects changes in his natural environment and tends to put into motion certain processes that impair or destroy the life-sustaining resources. The more complex civilization becomes, the more devastating are man's activities and the greater are his potentialities for changing, injuring, or despoiling these vital elements that make the earth habitable and attractive. Man, especially if civilized, cannot inhabit any area without impoverishing important natural resources. However, too frequently, man unnecessarily accelerates and induces the impairment of the resource-base. Thus he often leaves in his wake barren wastelands to which oncoming people cannot turn for their subsistence. At

[5] Renner. *Op. cit.*, p. 52.

times, because of lack of understanding, man is not even aware of the injurious results of his activities. At other times, he deliberately plans the destruction of certain resources. How the impairment takes place and how injury to one element may cause untold damage to many other closely related resources has been carefully analyzed by Whitaker.[6]

Deliberate Removal of Resources

The most evident way in which impairment takes place, according to Whitaker, is the deliberate removal of resources in order to use them. The mining of coal, the digging of iron ore, the quarrying of marble, lumbering operations, hunting and fishing, the pumping of oil, and all other extractive industries are examples of deliberate removal of resources because they have value when put to use. Failure to remove these materials from their place in nature and failure to use them advantageously would preclude the desired development of the people in the area.

Again, deliberate impairment or destruction is found where two or more resources occur together and the use of the preferred resource necessitates the destruction of another. Here, the greater value is realized through the sacrifice of the lesser. For early Americans the destruction of the forest was an essential step in the preparation of the land for crops. With primitive tribes, the burning of brush to drive out the game is not an uncommon practice, and rural people, "traditional enemies of trees," have destroyed forests through their practice of burning to bring about supposed improvements in pasture.

However, examples of the destruction of one resource in order to use another are not confined to early or to primitive man. Fertile farm land, flooded by backed-up water where dams are built for power development, flood control, navigation, etc., is a frequent type of sacrifice of one resource of value for another. The drainage of swamp and marsh to make the land available for crops destroys the value of the area as a water reservoir and as the refuge for wildlife. Furthermore, extensive drainage projects, designed for increasing agricultural acreage, may result in alkali or acid deserts. "Two-thirds of the 80,000 drained acres of Wisconsin's Great Swamp turned out to be unprofitable for farming."[7] Comparable projects, involving large expenditures and the destruction of existing resource values, are numerous. Today, many of the complex resource-use problems stem from unwise choices as

[6] Whitaker, Joe Russell. *The Life and Death of the Land.* Nashville, Tenn., George Peabody College Press, 1946. p. 8–11.

[7] Carter, Vernon Gill. *Man on the Landscape.* Washington, D. C., National Wildlife Federation, 1949. p. 98.

to which resources should be utilized or sacrificed. The resource destroyed may or may not be the one of lesser potential value, and the sacrifice may prove to have been unwise.

Another type of deliberate impairment or destruction "consists of changes in conditions considered injurious, thereby sacrificing, possibly, a resource of unsuspected value."[8] The promiscuous spraying of DDT and other insecticides, the unskilled use of weed-killing hormones, and the ruthless extermination of predators are striking examples of prevalent practices. The indiscriminate use of super-insecticides in utter ignorance of the environment and of the way in which it reacts may produce changes of serious import. Similarly, what may seem to be desirable destruction of a particular animal may unleash nonapparent sets of controls most detrimental to existing values. The farmer, who encouraged the boys to trap skunks, later observed that the ducks were disappearing from the marsh. The farmer did not realize how much the skunks contributed to the well-being of the ducks. With the disappearance of the skunks, consumers of snapping turtle eggs, the turtles multiplied; they in turn fed on the ducklings. Because of the close interdependence among the component parts of an extremely complicated and intricately complex nature, "no living thing should be exterminated before its entire life history and relation to environing things is known."[9]

Damage Through Use in Place

In contrast to the deliberate removal or intentional destruction of resources is the deterioration or destruction that accompanies the use of the material in its place in nature. The user, though perhaps wholly unaware of the resulting injury, has no intention of destroying or removing the resource. This is often true in farming. The farmer, if ignorant of land-use capability principles and well-balanced programs of agriculture, may not only impair the soil fertility, but may markedly accelerate erosion. Farming may thus be an activity as extractive in nature as the mining of metals.

The pollution of air and streams is another example of injury through use. Air filled with fumes and smoke is a menace to health. Inland waterways laden with industrial wastes, acid solutions from mining, sewage, and other wastes become not only less attractive but also less useful. Severe stream pollution destroys fish and makes the water unfit for many uses.

[8] Whitaker. *Op. cit.*, p. 8.
[9] Whitaker. *Op. cit.*, p. 9.

Courtesy, Soil Conservation Service

This Iowa pasture shows the disastrous effects of overgrazing.

Overgrazed grasslands and defaced scenic and recreational features are striking illustrations of damage through use. Defaced markers, damaged flowers, and injured trees are found in many public recreation areas.

Damage to Associated Resources

The exploitation and utilization of resources by no means confine injury or destruction to those resources being deliberately removed or to those being used in place. On the contrary, either the removal or the use of a desired resource often effects injury to closely associated resources. Because of the interdependence of coexistent elements in nature, injury to any one part is felt throughout the whole intricate complex. The destruction of the forest often reduces wildlife, accelerates the run-off of precipitation, aggravates erosion, lowers the water table, and makes floods and droughts more frequent and more disastrous. As is apparent, the destruction of the natural vegetation, in this case the forest, produces ill effects which spread and extend injury to many other resources, especially to water, soils, and wildlife.

Furthermore, associated resources suffer injury because of proximity. The deteriorated soil extending out from exploited oil deposits is a common example of this type of impairment. The treeless hills surrounding the copper smelters of Ducktown, Tenn., and the nickel smelters of Sudbury, Ontario; scarred landscapes strewn with mine dumpings; and fertile farmland lost for crop production by the extension of built-up areas, by the development of airports and military camps, or by the utilization of other site values are evidence of damage to associated resources because of proximity.

A study of resource destruction and impairment makes clear "these fundamental truths: much of the damage is indirect and unintentional, and it is almost never if ever limited to one resource. . . . Nature is one, and the injury to one part of the natural set-up spreads to other parts, both in the area initially affected and in more distant areas."[10]

Acceleration of Resource Destruction and Impairment

Though the destruction of natural resources is an age-old problem, it is fast becoming a vital concern to all nations. The wearing out processes, which proceeded locally and slowly with primitive man, are today world-wide in scope. Furthermore, with a speed never before equaled, the destructive forces are making dangerous inroads on the world's natural-resource base.

Among the many factors which tend to accelerate the impoverishment of the earth, the following are especially significant:

1. The population of the world is surging upward.
2. Human wants are multiplying.
3. Record-breaking developments in technology and science are making heretofore unknown demands on the natural heritage.
4. World-wide tension and wars prevail.

Increasing Population

The explosive upsurge of the world's population, with accompanying pressure for subsistence, is fundamentally related to the widespread destruction and impairment of resources and to the resulting low standard of living of two-thirds of the earth's people. Only three centuries ago the world's population was 400,000,000, a violent contrast to the present population of 2,200,000,000. Still more striking is the fact that within the last century the popula-

[10] Whitaker. *Op. cit.*, p. 11.

tion has doubled, making a total increase in four generations of more than one thousand million people.

Not only is the population of the world surging upward, but it is increasing at an accelerating rate. It is estimated that the present population will double in about 70 or 90 years. The per annum gain is approximately 20,000,000 people. Putting it differently, William Vogt places the net daily increase in the world's population at 50,000. Startling as this estimate may appear, it is conservative when compared with that of 60,000 per day suggested by Keenleyside.[11]

Notwithstanding the tragic number of lives lost in combat during World War II, the figure—13,000,000—is less than that for 1 year's natural increase. Moreover, the total gain in population since Hitler's march into Poland on September 1, 1939, is estimated to be more than 200,000,000; while for Europe alone, the increase is held to be more than 20,000,000.

An examination of the population trends in America likewise reveals a marked upsurge. During the first half of the twentieth century the population increased approximately 100 percent; during the past 35 years, 40 percent; and during the past 5 years, almost 6 percent.[12]

Unquestionably, changing conditions in many countries will affect the rate of population change. But it is important to recognize that the present-day rapid increase in population results primarily not from increased reproductivity but from decreased mortality. Significant developments in medical science and their widespread diffusion throughout the world will tend to prolong life, especially in countries which now have extremely high mortality. These figures should not stun us into despair; they should spur us to improve the management of our resources. For truly the world is fast becoming "a sanctuary without exits for a fast breeding human race" which in the twentieth century, unlike the past, finds the habitable and cultivable areas of the globe well occupied. Practices and methods termed wasteful a few generations ago become suicidal with an ever-increasing population.

Rising Standards of Living

A second fundamental factor that critically accelerates the destruction and impairment of resources is the almost universal

[11] Keenleyside. *Op. cit.*

[12] Renner, George T. Teach Americans to Conserve Resources. *The Phi Delta Kappan*, 31:165–167, December 1949.

multiplicity of human wants associated with the struggle for higher standards of living. As people have shifted from a simple, pioneer economy of self-sufficiency into an infinitely more complex pattern of interdependency, their needs and wants have multiplied. This multiplying of human wants and the intensifying of the urge for rising living standards have led to a demand for materials not only in greater abundance, but also in strikingly greater variety.

The truth of the preceding statement becomes more apparent upon a careful examination of the impact of rising standards of living upon the eating habits and demands for food. Studies reveal that an increasing per capita demand for food accompanies an upward trend in living standards. Although the change is most marked at the lower income levels, it is estimated that—other things being equal—a 50 percent increase in real income in China would result in an increased per capita demand for food of approximately 35 percent. Moreover, at the income levels prevailing in America, a per capita rise of 50 percent in real income would increase the per capita demand for food by 25 percent.[13] A rising standard of living leads not only to the accelerating of the individual demand for food but also to changes in the diet, especially the replacing of coarser foods by a greater quantity and variety of fruits, dairy products, and meats. These trends, when viewed in the light of the increasing population together with the declining productivity of the earth, become significant.

The universal demand for a higher standard of living inevitably means an accelerated drain upon resources. During the first 49 years of the twentieth century, the quantity of mineral products consumed by man has far exceeded that of the whole preceding period of his existence on earth.

Since 1900, the production of pig iron, lead, and tin has more than doubled; that of zinc and copper has quadrupled; that of aluminum, tungsten, and nickel has made an even greater increase. Further, since the middle of the 19th century, iron production has increased 5 times as fast as the population has increased. The way in which a rising standard of living affects resource demands may be seen if one compares pig iron production in the United States with that of the rest of the world. In 1945, the per capita utilization in the United States was 790 pounds; the figure for the entire world was 97 pounds. The disparity becomes even more marked when the 790 pounds is compared

[13] Clark, Colin. "World Resources and World Population." Address delivered at the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 17, 1949.

with a per capita utilization of 47 pounds for the world excluding the United States.[14]

Even for petroleum, a relatively new commodity, there has been a marked increase in use. The total world production of oil in the year 1946 was slightly more than 1½ times that for the first 43 years of petroleum development. For the United States, the consumption of oil in 1948 was approximately 1.9 billion barrels with a per annum increase rate of 4¾ percent. During the past 20 years our oil production has gone up 96 percent. Likewise, there was during the same period a marked increase in the demand for other sources of energy, especially electric power, with a production increase of 186 percent; natural gas, 77 percent; and coal, 9 percent. Naturally, the urgent demands of World War II are reflected in these figures, but these are only a few of the many illustrations that might be used to demonstrate that the almost universal demand for higher standards of living, together with other factors, has led to an increased drain upon the resource-base.

Developments in Technology and Science

Great developments in science and technology during the twentieth century have made possible a more rapid exploitation of resources. This trend has been especially strong in the United States. Obviously, efficiency effects marked acceleration in the exploitation of resources. According to Flynn and Perkins, 1.7 hours of labor in the United States will mine a ton of soft coal in contrast to the 7.5 hours of labor required to do the same job in England.[15] Fairfield Osborn maintains that the drain upon the earth's resources resulting from an increase in population is not directly proportional to that increase but rather twice that amount. This accelerated increase reflects the fact that a greater number of people demand a greater variety of products from a more complex industrial system.[16]

Despite the fact that the technologists together with the scientists constitute our principal hope for alleviating critical shortages through creating substitutes, they likewise develop many new uses for both common and rare resources. For example, world-wide attention today centers on uranium, a source of atomic energy, the utilization of which will necessitate marked increases in the

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[14] Keenleyside. *Op. cit.*

[15] Flynn, Harry E., *and* Perkins, Floyd E. *Conservation of the Nation's Resources.* New York, Macmillan Co., 1941. p. 206.

[16] Osborn, Fairfield. "The World Resources Situations." Address delivered at the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 17, 1948.

production of steel, copper, lead, and the rarer metals. Titanium, still in its experimental stage of production, captures the imagination of both the metallurgist and the manufacturer who recognize the potentialities of such inherent qualities as a strength equal to that of steel; weight, approximately half that of steel; and very great resistance to corrosion.

"Man's mastery over nature" levies still other tolls on our resources. The demand for metals has been greatly accelerated by developments in transportation, radio, television, electrical refrigeration, air conditioning, and rural electrification. The new advancements in chemurgy have provided many substitutes for metals. Plastic from soy beans, alfalfa protein, or other vegetable source is now a common item. Nylon, mainly from coal, may be made from crops; synthetic rubber may be obtained from alcohol made from soil-grown carbohydrates; and glue, paint, imitation ivory, and sizing may be made from milk casein. These newly created processes, in other words, will place new demands on the soil and its products. Although the amount of organic materials being used in chemurgy is not known, the National Farm Chemurgic Council, New York, N. Y., estimates that in the United States products from approximately 40,000,000 acres are going into chemurgic uses.[17]

It must be remembered that while science, by activating and supplementing the processes of nature, gives us an imposing array of substitutes for many materials, we have for every substitute discovered invented two or three new uses.

World-Wide Tension and Wars

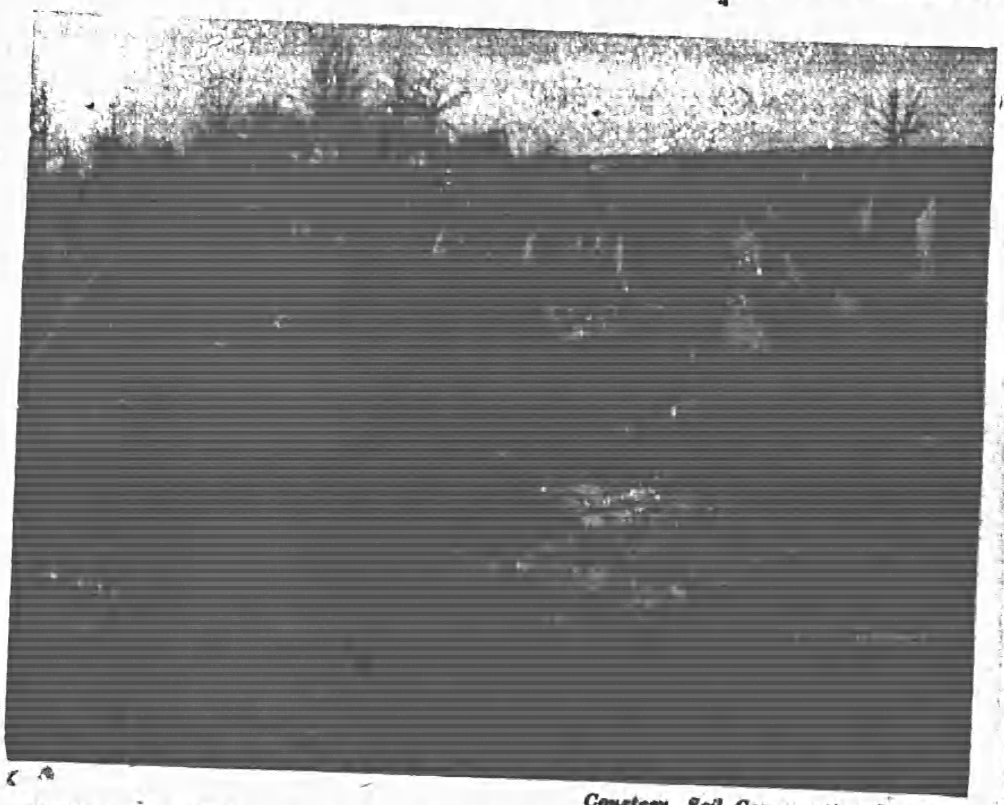
Of all the forces which accelerate the impoverishment of the earth, none operate with a speed so rapid as that of present-day, world-wide wars. The 45-percent increase in the production of oil from 1940 to 1948 reflects tremendous wartime demands. The Department of National Defense estimates our future military use of oil in war at 900 million barrels per year, approximately half of our total production in 1948. The future wartime drain on oil will be somewhat accelerated by the increasing use of jet planes. Even though the type of fuel varies, the 65 gallons per hour used by a P–51 fighter is in vivid contrast to the 300 to 500 gallons an hour required for a jet fighter.[18]

With two world conflicts in one generation, with an ever-

[17] Carter. *Op. cit.*, p. 46.

[18] Raushenbush, Stephen. *Our Conservation Job.* Report Number 4. Washington, D. C. The Public Affairs Institute, 1949. p. 43-44.

increasing population, with technology altering the "balance of nature," and with sharply rising standards of living, the depletion of the world's resources proceeds at an accelerated rate. It is, therefore, imperative that twentieth century man face the



Courtesy, Soil Conservation Service

"When the soil is gone, men must go and the process does not take long."

fact that he is using exhaustible, nonrenewable resources at a rate never before equaled in the history of mankind and that his use of renewable resources records tragic failures.

Tragic Inroads on Our Resources

Convincing, even appalling evidence of the despoliation of the earth abounds on every hand. Scarred landscapes, dotted with abandoned homesteads surrounded with deserted fields; water tables, sunk to threatening levels many feet below former positions; drained swamp land, converted into barren wasteland devoid of wildlife; crop yields, appreciably reduced; fishless streams, laden with sewage and industrial wastes; useless dams, choked with silt within a few years after construction; barren, denuded hillsides, stripped of their once fertile soil; timber and grazing lands, shrunk to a small portion of the original acreage; destructive

floods in increased frequency and with greatly raised peaks during the last century; and ghost towns, long deserted, are only a few of the evidences of the growing impoverishment of the earth.

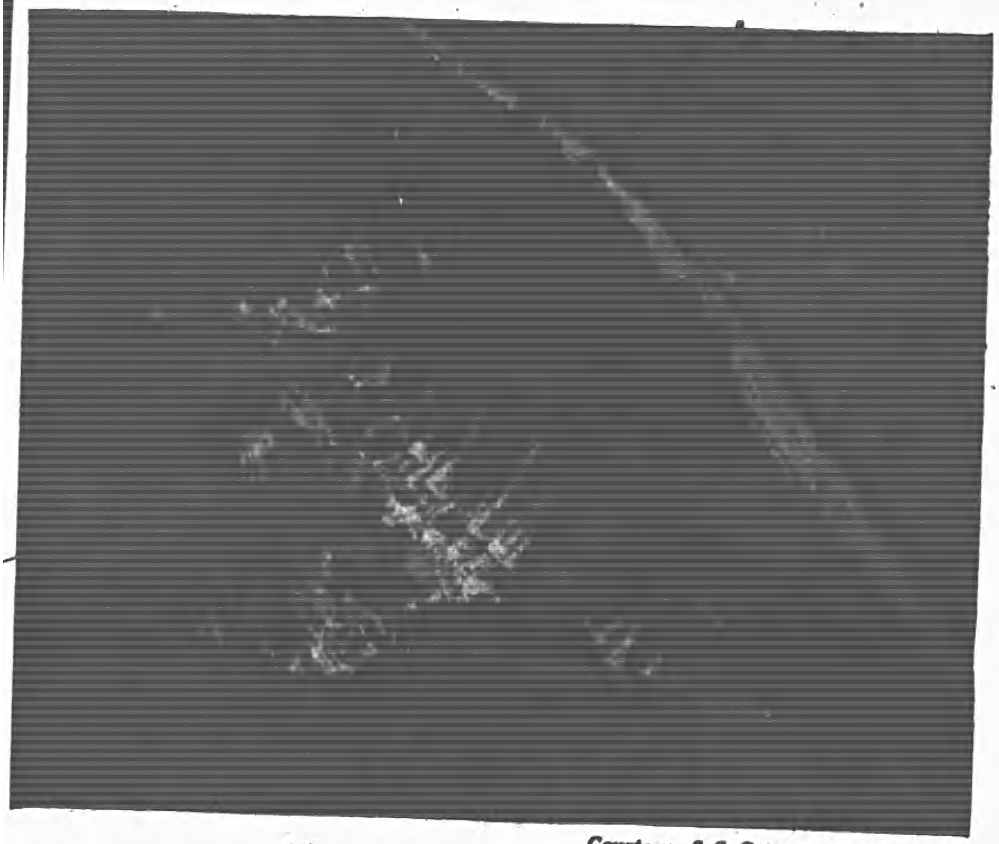
Courtesy, U. S. Forest Service

Many projects, developed in the light of an examination of only a few of the interrelated factors involved, resolve themselves into costly concrete monstrosities. Within two years, this reservoir was filled with silt.

Soils

The multiplying of these and other disturbing signs of tragic inroads on our natural heritage indicates that the forces of deterioration are exacting terrific tolls. In the United States, as the result of wind and water erosion and bad land-use practices, we are losing half a million acres of crop-land each year. Furthermore, according to an estimate by Bennett and Pryor, the annual cost of reckless soil exploitation mounts to the staggering sum of $3,844,000,000. Three billion of this startling figure represents the loss of 3 billion tons of soil materials. Half of the remaining $844,000,000 reflects losses resulting from

Soil minerals are removed by erosion five or six times as fast as by the harvest of crops.



Courtesy, Soil Conservation Service

An uncontrolled gully, started by a drip from a barn roof in Stewart County, Ga., marked the beginning of this destruction.

reduced farm income and forced abandonment of land ruined by erosion. A great portion of the balance denotes expenditures to counteract the impairment to irrigation and drainage ditches and reservoirs, to transportation facilities, to city and public property damaged by floods, and to recreational facilities. Not only has one-third of our original average of 9 inches of top soil been washed or blown away, leaving us "6 inches from starvation," but we are losing soil minerals five or six times faster through erosion than through the harvesting of crops.

Although the farms of the United States are producing approximately 40 percent more than before the war, according to a January 1948 report of the Production and Marketing Administration of the United States Department of Agriculture, the losses from erosion and waste exceed the gains from improved farming practices. As Hugh Bennett, Chief of the Soil Conservation Service, forcibly expressed it, "We American have ruined more good land in less time than any other nation in recorded

history. In the space of three centuries we have wasted, worn out, and discarded 100,000,000 once-fertile acres—most of it—in the past 50 years."

One glaring example indicative of the speed with which we have permitted destructive forces to operate is to be found in the scarred and yawning chasms in Stewart County, Ga., where uncontrolled erosion resulted in the permanent destruction of more than 100,000 acres of good cropland. This maze of gullies, created in less than 70 years, bears evidence of man's failure to establish harmonious relations to the land.

Forests

Our inroads on other resources are equally appalling. Of our original saw-timber stand, less than one-fourth remains. According to a recent report of the United States Forest Service, the forests of our Nation are operating in the red as more timber is cut or destroyed each year than is replaced by growth. Since 80 percent of the drain is in saw timber, it is significant to note that "the 54 billion-board-foot annual drain by cutting and by natural losses in 1944—though well below the 60 billion board feet of the peak war years, 1941–43 and below that of 1946 and 1947—exceeded saw-timber growth by about 50 percent."[19]

The loss by forest fires, 90 percent of which are caused by man, equaled 3 billion board feet of wood for the year 1946. The United States Forest Service estimates that before World War II we were adding annually 850,000 acres of devastated forest land to the large area already wrecked. Furthermore, on only 5 percent of our cut-over land is any effort being made towards maintaining a satisfactory second growth. In spite of rather recent improvements, Clapp maintains that two-thirds of the cutting on private lands, which include 345,000,000 acres of commercial forest land from which 90 percent of our total timber is cut, continues to be either poor or destructive.[20] Only 8 percent of the cutting measures up to really good standards; and intensive forest management, including desirable cutting practices and fire protection, prevails on only 1 percent of our privately owned forests.

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[19] *Forests and National Prosperity: A Reappraisal of the Forest Situation in the United States*, Miscellaneous Publication No. 668. Washington, D. C., Forest Service. U. S. Department of Agriculture, 1948. p. 2.

[20] Clapp, Earl H. "Public Forest Regulation." Address delivered at the National Emergency Conference on Resources, Washington, D. C., May 12, 1949.

Water

Few resource problems are more acute than those resulting from our increased demand for water. With two-thirds of our public water systems drawing upon underground water, our drain upon this source for 1947 was twice that of 10 years earlier. Evidences that water supplies are being dangerously overused and misused and that watersheds are being abused and unwisely used are reflected in the increasing frequency of floods, in the rising of flood peaks, in recurring problems of siltation, in the rising cost of stream pollution abatement, as well as in the critical lowering of underground water levels. The 1943 figures of the Ohio Water Supply Board revealed that the water table for that 1 year dropped a mean of 3.17 feet, making a fall of 100 feet in the last 50 years for some portions of the State.[21] Louisville experienced a drop of 40 feet in the water table during the past 10 years.

The lowering of the water table along coastal areas results not only in a reduction in supply but also in a deterioration in quality. As the ground water levels drop below sea level and wells increase in depth, sea water encroaches unless preventive measures are taken. The practice of recharging underground water supply by pumping used water back into the ground has often, as in the case of Long Island, resulted in undesirable rising in temperature of the ground supplies, as much as 20 degrees in some extreme cases. New York City, with its water supply from deep wells supplemented by that from distant reservoirs in the forested watershed of the Catskills, faces a deficiency that increasingly handicaps both industrial and municipal developments.

More pronounced lowering of ground water levels may be found in the West where irrigation combines with the expanding industrial developments, the ever-increasing population, and other factors to drain the ground supplies much faster than they are being replenished. The Central Valley of California, with an annual drop of as much as 10 feet, has felt the loss of some 50,000 cultivable acres. Another 380,000 acres now irrigated seem to be doomed eventually to a semidesert condition unless water shortages can be overcome by providing additional supplies from streams rising in the distant forested mountains.[22]

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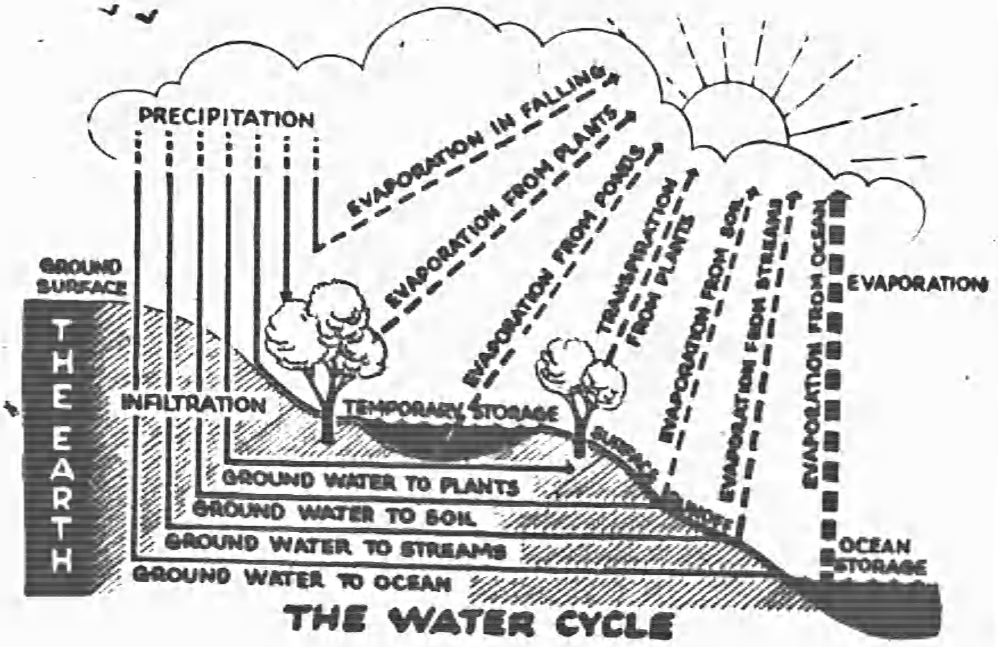
[21] Titus, Harold. Will There be Enough Water? *Saturday Evening Post*, May 27, 1944. p. 28.

[22] Frank, Bernard, and Betts, Clifford A. *Water and Our Forest*. Miscellaneous Publication No. 600. Washington, D. C., Forest Service, U. S. Department of Agriculture, 1946. p. 5.

It is difficult to understand the tremendous impact of expanding industry upon the water supply without considering a few specific examples. One paper mill in Houston, Tex., uses 22 million gallons of water a day—a quantity more than twice that pumped by Austin for its 100,000 inhabitants.[23] Cooling a ton of molten steel requires 65,000 gallons; making a ton of coke, 3,600 gallons; and producing a barrel of crude oil, 180 gallons.[24] The



The supply of water is ever renewed. Yet, man by unwise practices seriously alters the natural course. By deforestation, overgrazing, and unsound farming methods he accelerates the surface runoff and decreases infiltration by which ground water levels are maintained; by excessive pumping of the ground water, he critically lowers the water table in many areas. (Adapted from "The Water Cycle," p. 15, *Conservation: Soil and Water*, North Dakota Department of Public Instruction, Bismarck)

expansion in air conditioning places heavy demands upon water supplies. During one 5-year period, out of 800 applications for approval to drill large wells in Long Island, the Water Power and Control Commission found that 204 of them were planned to provide water needed in air conditioning. These wells would

[23] Grove, Nathan Clifford. *Water*. Washington, D. C., Geologic Survey, Department of the Interior, 1947. p. 1.

[24] Munns, Edward N. Our Growing Water Problem. *American Forests*, August 1948. p. 346.

draw 2,500,000,000 gallons annually from supplies already taxed to the limit.[25]

Water is a renewable resource. Yet, with the present abuse of surface waters, with the increased demand upon supply, and with the misuse of watersheds accelerating the surface run-off and precluding satisfactory storage of precipitation in underground levels, man has "short circuited" the water cycle. The water supply problem is no longer local. Nor should it be recognized only by those confronted with the immediate difficulty.

Other Resources

An examination of inroads on other resources reveals trends comparable to those for soils, forests, and water. Eighty percent of our range land is overgrazed or destructively overexploited. Our critical minerals have shrunk to the point where, in the words of Harold L. Ickes, it "is not that we will be weak in a hundred years, but that we are relatively weak now." Putting it differently, Elmer Pehrson of the Bureau of Mines emphasizes "that the faster we grow in industrial strength and military potency—a growth made possible largely through mineral output —the faster we liquidate the very basis of our power."

Within the continuous demand for greater productivity on an increasingly unproductive land lies a grave threat to civilization—that of a lowering standard of living, the evils of which will endanger human welfare and engender future wars.

Civilization Dependent upon Resources

Natural resources form the basic foundation upon which any civilization rests, and the "progress or decadence of a people is determined by the manner in which it accepts and utilizes these gifts of nature." History is filled with the records of people who rose to great heights as they consumed and exploited their resources; but those civilizations waned when the support for their existence, the life-sustaining natural resources, declined. No civilization drawing heedlessly on its fund of exhaustible resources can be permanent; it is of necessity a passing phenomenon in human history.

The findings of W. C. Lowdermilk, as stated in "Conquest of the Land Through Seven Thousand Years," point to the relation between man's use of the land and the permanency of his civilization. The excavated ruins of mighty Babylon, long buried under the

[25] Titus. *Op. cit.*, p. 28.

sands of Mesopotamia bear mute evidence of the failure of man to effect a lasting adjustment to the land. When the irrigation ditches were permitted to fill with silt, they could no longer water the lands that supported the city; and Babylon, the capital of most of the civilized world of only 4,000 years ago, died. Antioch, buried under 18 feet of silt; Tarsus, removed from its seaport position to 10 miles inland by an ever-extending delta; Ur, a great city and thriving seaport during the time of Abraham, now located 150 miles inland in a barren desert; the ruins of more than a hundred dead cities of north Syria, left standing like stark skeletons on a bare rock base from 3 to 6 feet below the doorways; and the Yellow River, confined in channels high above the surrounding, eroded landscape, are all indicative of man's tragic failures to effect harmonious relations with the earth. These and other convincing records written on the landscape reveal that the fate of the decadent civilizations was related to the destruction of the means of subsistence.

Although impoverishment of natural resources has followed the march of man, there are areas which reflect man's success in establishing a just and enduring relation to the sustaining earth-base. The sloping hills of Lebanon evince both failures and successes in man's occupancy. In striking contrast to the ruins of dead civilizations are the rock-walled, bench terraces which have provided enduring civilizations with food, clothing, and shelter for the past 3,000 years. In these islands of permanency, man early established harmonious ecological relationships.

How the Tragedy Can Be Averted

To survive in an age when power can easily and effectively be directed to destroying rather than enriching life, our citizens must recognize that the method of using natural resources is inescapably related to the determination of the character and degree of permanenecy of our civilization, to the preservation of human welfare, to the perpetuation of our Nation's strength, and to the maintenance of its military potency. They must realize the urgent need for more effective conservation in the United States. The concentration of half of the world's population on one-twentieth of the land mass with the resulting unfavorable ratios of land to man, engendering lower standards of living, increasing economic instability, and decreasing political security, suggests the urgent need for wise use of resources. The United States now has an average of 3 acres of cultivatable land per person; and nutrition experts maintain that anything

less than 2½ acres of land of average productivity is inadequate for providing even the minimum essentials necessary to sustain 1 person in good health for 1 year. Contrast this needed requirement with that of 0.88 acres of arable land per person in Europe, 0.75 for Italy, 0.69 for Germany, 0.20 acres for Japan, and 0.45 acres for China. We cannot—like our forefathers—move to new, fertile frontiers and thus escape the disastrous effects of wasteful exploitation of resources. If we do not wish to suffer consequences of depletion of our resources, we must put forth every effort to solve the problem on the land we have.

The fertile, habitable lands are occupied; science is not a substitute for a sound ecological balance; and wars of aggression no longer are a profitable means of acquiring new resource possessions. It is, therefore, clear that people must evolve adequate and lasting adjustments to the land, based not upon exploitation, but upon conservation, not upon profligate consumption of resources, but upon restoration of productive powers of the earth and upon judicious use of its exhaustible, nonrenewable wealth. If civilization is to escape decline, or perhaps destruction, society must, in the words of Lowdermilk, "be born again out of an economy of exploitation into an economy of conservation." For this rebirth, effective conservation education is imperative. To this challenge the schools must give their best.

A CIVILIZATION based on a fund of exhaustible resources cannot be permanent; it is necessarily a passing phenomenon in human history.

ERICH ZIMMERMAN

Significant conservation concepts

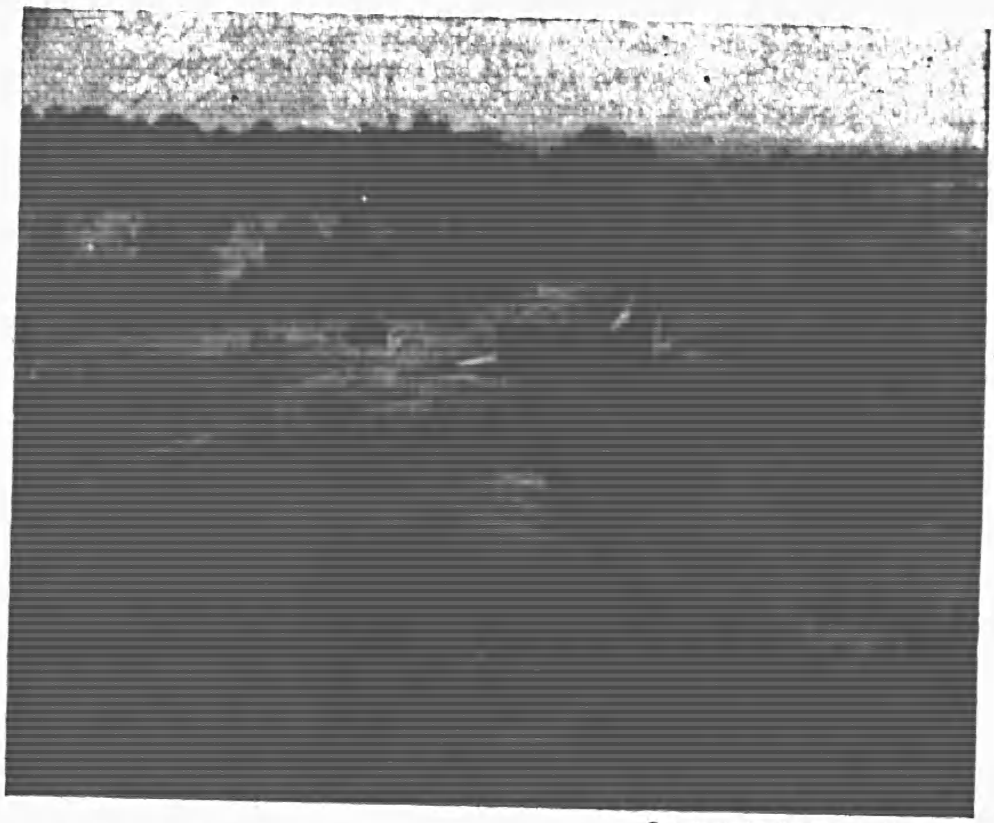
Conservation, as the term is used today, was unknown a little more than 40 years ago. Its present-day meaning evolved slowly as man learned from his failures and successes in adjusting to the land. As early as 550 B.C., Jeremiah observed that "many pastors have destroyed my vineyard . . . they have made my pleasant portion a desolate wilderness . . . the whole land is made desolate because no man layeth it to heart." Since the days of Ezekial and Isaiah, leading thinkers have maintained that the despoliation of land is not only inexpedient but wrong. Society in general, however, has not yet affirmed their beliefs.

The idea of sustained-yield forestry is by no means new. The concept, though crude, evolved during the medieval period and resulted in the development of a few community forest lands.[1] No less true today is the warning of George P. Marsh made in 1869: "Man has too long forgotten that the earth was given him for usufruct alone, not for consumption, still less for profligate waste." During the period of colonial exploitation of America, discerning individuals in forceful terms cried out against despoliation of resources. Thomas Jefferson, as early as 1817, observed that "new fields were no sooner cleared than washed away," and Patrick Henry denounced the prevalent wastage of resources by affirming that since victory has been achieved, "he is the greatest patriot who stops the most gullies."

Through the ages, measures for counteracting resource impairment were usually insufficient and applied by too few people. Relief from resource depletion was often achieved by migration into more fertile lands. In spite of the fact that vital conservation concepts were early held by some, the "slowly spreading growth of conservation knowledge" did relatively little to abate the impoverishment of resources.

Conservation policy, now a world movement, began to crystallize

[1] Crofts, Alfred. "History of Conservation." Address delivered at the Inter-American Conference on Conservation of Renewable Natural Resources, Denver, September 1948.



Courtesy, U. S. Forest Service

In a region of sloping fields, row crops, abundant rainfall, alternate thawing and freezing in the winter, this misused South Carolina farm soon became nonproductive.

during Theodore Roosevelt's administration. In 1907 Gifford Pinchot conceived the idea that the interrelatedness of the resources is not the complete story, that each resource is not only related to other resources but is more significantly related to the one "central problem of the use of the earth for the good of man"—a policy pertaining not only to the welfare of man but intricately associated with his very existence on earth.[2] With the emergence of this conception, "conservation" took on a new meaning and a new movement was born.

The True Meaning of Conservation

W. J. McGee, who grasped the implications of Pinchot's idea, helped to deepen its meaning by defining the new policy as "the use of the natural resources, for the greatest good of the greatest

[2] Pinchot, Gifford. *Breaking New Ground.* New York, Harcourt, Brace and Co., 1947. p. 322–323.

number for the longest time." Conservation when viewed merely as the hoarding or saving of natural wealth is a misnomer. In reality, conservation implies development as much as it does protection; it implies farsighted, judicious utilization of resources with all possible elimination of waste, rather than indiscriminate consumption; it includes policies of renewal or restoration of renewable resources in striking contrast to the philosophy of "get while the getting is good"; and it involves continuous effort to relate satisfactorily the methods and techniques of development and utilization of resources to advances in science and technology.

The following basic concepts, among others, are related to effective conservation:

1. Civilization is dependent upon natural resources.
2. Enriched living on a permanent basis depends on the wise use of a continuously productive resource-base.
3. The environment of all living things is ever changing.
4. Civilized man's way of living makes marked changes in his environment.
5. To be successful in his use of the environment, man must work in harmonious relations with nature rather than struggle against her.
6. Nature is one; the natural resources are intricately related one to another; and injury to one spreads to others.
7. Wise use of the natural environment depends upon man's understanding of ecological relationships and upon his willingness to be guided by them in his use of resources.
8. If undisturbed by man and if unaltered by a great natural cataclysm, nature tends to maintain a balance or equilibrium through interrelations of plants and animals with each other and with their physical environment.
9. A slowly made change in any aspect of the natural environment makes possible relatively easy adjustments in the other aspects.
10. Either a man-made phenomenon or a violent natural change tends to disturb or upset the balance of nature and often produces disastrous results.
11. Plant and animal life is directly or indirectly dependent upon the soil.
12. The nature of the soil is basically related to the welfare of both plants and animals.

13. Water is essential to all life. Whether it supports life or destroys it depends largely upon the way man uses water and the closely related resources, including soils and native vegetation.
14. Land must be treated according to its needs and must be used according to its capabilities.
15. The mineral salts essential to life lie in the topsoil within the first few inches of the surface.
16. Progress of mankind from a simple primitive economy to a technologically advanced civilization has increased man's power of destruction of resources and has made conservation measures imperative.
17. Resource impairment is an age-old, world-wide problem that is becoming increasingly important in man's struggle for survival.
18. If accelerated impoverishment of natural resources and increase in population continue, the standard of living must decline.
19. The destruction of civilizations has often resulted from the destruction of the means of subsistence.
20. Natural forces react unfailingly to man's abuse or to his wise use of the natural heritage. Abuse intensifies his struggle for subsistence.
21. The social, economic, and political ills of the world today are basically related to the nature of man's environment and to his abuse and misuse of it.
22. No living specie should be exterminated before its relation to other things in its environment is fully understood.
23. Establishing harmonious relations between man and life-sustaining natural resources is essential to the ultimate welfare of human beings.
24. The uneven distribution of resources, their extreme variations in quality, and the universal struggle for higher standards of living suggest how conservation may contribute to reducing the incidence of war.
25. The population of the world is increasing; the carrying capacity of the earth is declining.

If conservation is to become a potent force—a way of living—fashioning our patterns of thought and of action relative to the use of resource wealth, the fundamental understandings providing a sound basis for critical judgment in matters of resource use must become a functioning part of the intellectual equip-

ment of each citizen. For conservation in its broadest sense is a philosophy of daily living and, therefore, must become an item of concern in everybody's business. Effective conservation begins in the minds of men. The attitudes of all the people will appreciably affect the use man makes of his material possessions. For the improvement of human welfare, requisite to enriched living, a sound conservation program is indispensable.

Courtesy, Soil Conservation Service

4-H Club members of Armour, S. Dak., study how contour furrows prevent soil erosion.

A Sound Conservation Program

A conservation program to be dynamic must be so implemented that its principles become a part of the thinking of all citizens. It must be so designed that it rests, as William Vogt expressed it, "like a tripod on three legs: research, education, and action on the land." These three aspects functioning simultaneously are absolutely essential to any program of conservation. Although it is in the action on the land that the effectiveness and

ultimate value of the other aspects are realized, there can be no action program without education which rests upon scientific investigations. Scientific knowledge must be translated into values that make ecological health a common objective of all and, thereby, effect cooperatively planned programs of action on the land. Herein lies the challenge to all persons and agencies engaged in supplying information to the public.

Conservation Education—a Social Imperative in a Democracy

No approach to the problem of wise use of natural resources can be effective unless it results in the development of an informed citizenry. The people must have knowledge of the environment and of the complexity of interrelationships as a basis for initiating better resource-use practices. The citizens must be sensitive to resource misuse and know the vast amount of knowledge upon which they may draw in seeking solutions to their problems. They must be self-disciplined, willing to make choices in the light of social responsibilities rather than in terms of personal gain. If Americans generally are to possess these qualities, education must build positive attitudes and arouse the will to conserve natural resources. The schools must accept the responsibility for helping to build an intelligent, enlightened public opinion relative to resource-use. Individual use of material wealth must be based upon wisdom and judgment if lives are to become increasingly enriched and free. Effective regulation in matters of resource use for the common good must stem from the unselfish, cooperative efforts of an adequately informed citizenry imbued with significant conservation concepts.

THOU SHALT INHERIT the holy earth as a faithful steward, conserving its resources and productivity from generation to generation. Thou shalt protect thy fields from soil erosion and thy hills from overgrazing by thy herds, so that thy descendants may have abundance forever. If any shall fail in this stewardship of the land, his fertile fields shall become sterile stones and gullies, and his descendants shall decrease and live in poverty or vanish from the face of the earth.

WALTER C. LOWDERMILK

Effective conservation education

The implementation of effective conservation education is based upon the premise that those engaged in its development possess an adequate, clear-cut understanding of the full meaning of the term "conservation education." Despite the increasingly greater emphasis now being placed upon this vital area of learning, too many teachers continue to label such interesting activities as the pressing of leaves, the identifying of trees, the mere painting of a woodshed, the drawing of birds, the practicing of thrift, and the reciting of "Woodman Spare That Tree" as significant conservation activities.

One teacher recently described at length one of her outdoor activities in a "conservation unit." The pupils, equipped with cameras, enjoyed the beauty of the glistening sun on ice-encased, broken tree limbs, entangled communication wires, and drooping boughs. The pictures provided material for the making of scrapbooks, for projecting school activities into the discussions in the home, and for the developing of interesting and, no doubt, worthwhile language arts units. A lot of integrated activity! But wherein can one find anything that pertains to conservation? In the first place, the damage by the ice storm to trees and other material wealth was not man-induced or man-aggravated, nor can it very well be abated by man. Man's activities were not related to the damage. Neither can he do much about devising schemes to counteract the impairment or destruction of resources caused by the "freaks of nature." At all points of the described learning activities, ecological relationships—the real heart of conservation education—were entirely lacking. Herein lies a grave

danger with far-reaching implications—that of not only failing to "hit the mark" of conservation education, but also of conditioning the pupils negatively toward conservation concepts.

Indispensable for implementing effective Nation-wide conservation education is the acquisition by all teachers of an adequate, clear-cut understanding of the real meaning of conservation education, its objectives and guiding principles, its place in the curriculum, and measures for vitalizing its teaching. The acquisition of these understandings by persons who influence public opinion relative to resource use is a requisite to a Nation-wide implementation of effective conservation education.

The Meaning of Conservation Education

Though somewhat difficult to define, "conservation education" may be viewed as the sum of all learning experiences which facilitate the development of an understanding of and an appreciation for the nature and complexity of the natural environment; a recognition of the dependency of human welfare upon life in harmony with the earth; a sensitivity to resource misuse; a desirable combination of favorable attitudes relative to wise use of the earth, and a feeling of individual social responsibility for its continued productiveness and ultimate well-being. Conservation education projects a conservation consciousness—the impetus for effecting changed behavior and for stimulating individual participation in making, and in causing to be made, intelligent choices dedicated to the furtherance of the wise use of natural resources rather than to the satisfaction of immediate selfish gains. Conservation education, in the words of Ollie E. Fink, "prepares man to understand his environment and to continue to live there happily and usefully."[1]

Objectives in Conservation Education

The essence of conservation education is the betterment of human welfare. Citizens need to develop a conservation consciousness toward all resources and to form attitudes, habits, and patterns of behavior that make "conservation a way of living." Stated in general terms, the enriching of life; the increasing of national stability, efficiency, and military potency; the improving of international good will; and the implementing of a sound basis for peace are paramount goals of conservation education. Basic among the specific objectives are the following:

[1] Fink, Ollie E. Let's Teach Conservation. Address delivered at the International Technical Conference on the Protection of Nature, Lake Success, Aug. 23, 1949.

Courtesy, U. S. Forest Service

The destruction does not end with the passing of the fire. Soil is impaired and eroded; surface water runoff is accelerated; the water table is lowered; floods are increased in frequency, acceleration of flow, height of crest, and degree of destructiveness; fertile farm lands, miles away, are buried by silt; water power projects are made useless by silt-laden reservoirs; wildlife is destroyed; and deterioration of human welfare is augmented.

1. *To develop an understanding of and an appreciation for all natural resources.*

A requisite to any effective program of conservation is an appreciation of the values of the resources to be conserved and an understanding of their nature and the complexity of their interrelationships. This is essential to the developing of desirable attitudes, to the shaping of socially preferred behavior patterns, and to the exercising of critical judgment in resolving resource-use problems. The impelling and guiding force in wise use is an intelligent understanding of resources, of their relation to each other, and of their relation to human welfare. Failure to understand and to

recognize the value of resources precludes a recognition of the great possibilities inherent in the wise use of resources and the need for combatting waste.

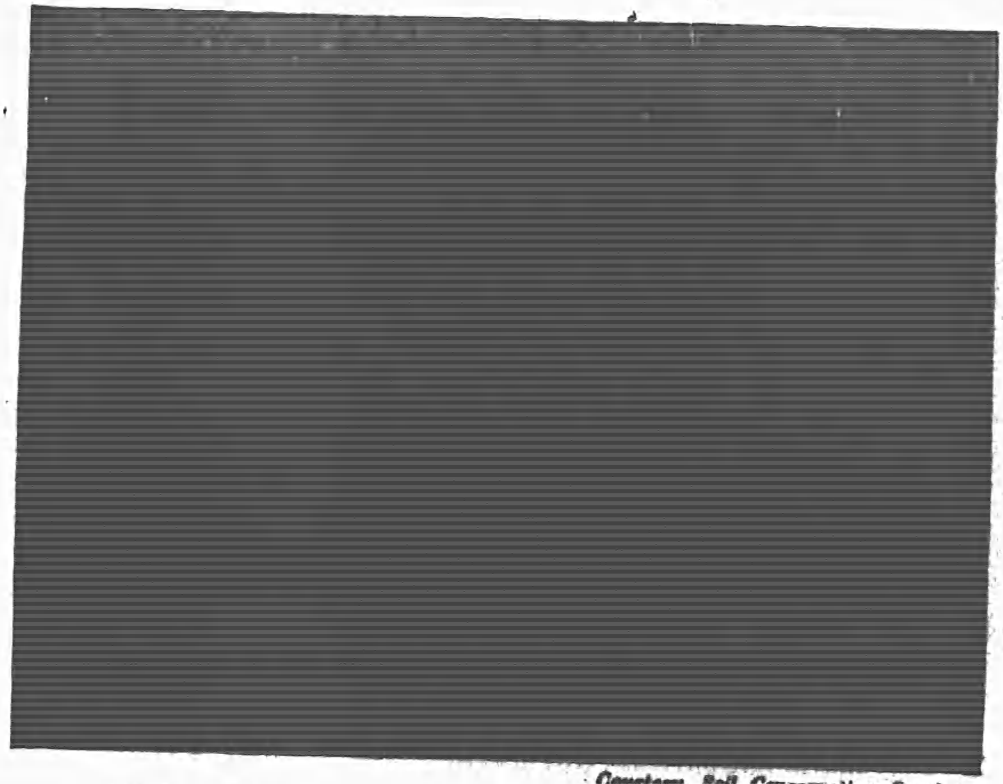
Courtesy, Soil Conservation Service

With land capability a prime consideration, man's use of the land takes on a permanent aspect.

2. *To make apparent our dependence upon natural resources.*

It is highly important that individual citizens realize the relation between their ultimate well-being and the nature of their life-sustaining resources. Each should be aware of the fact that he is an integral part of his environment which affects, and is affected by, his daily choices relative to the use of resources. With 56.5 percent of our population living in urban areas, with the resulting feeling of detachment from the land, and with the widespread apathy toward matters of resource use, every person should realize that urbanization offers no escape from dependence upon the land. Furthermore, each individual should realize that not only is

his well-being dependent upon wise use of a fertile resource-base, but also that the permanenecy of his civilization rests squarely upon the maintenance and preservation of a sound ecological balance. To relate adequately conditions resulting from man's misuse of his resources to the movements of peoples and the origin of wars would not only illuminate history and other social studies, but would at the same time help to make apparent our dependence upon the resources. The continued productiveness of the earth should become an issue of vital concern to us all.



Courtesy, Soil Conservation Service

Wind erosion on a severely overgrazed South Dakota pasture.

3. *To develop a sensitivity to resource misuse and abuse.*

Though resource depletion should be viewed as a "process inevitably tied up with life," all citizens should be senstive to impairment that is man-induced and man-accelerated. This is essential for effecting action for combatting the impoverishment of natural resource wealth; for making desirable changes in well-established, though economically and socially suicidal, practices and customs; and for putting into operation needed measures of regulation concerning re-

source use and abuse. Too long in our Nation, have waste and disfigurement of resources been either ignored or accepted as inevitable. As Lewis Mumford phrased it, "The pioneers left us a double burden—not merely blasted and disorderly landscapes, but the habit of tolerating blasted and disorderly landscapes."

4. *To eradicate the popular belief that science and technology can free us from dependence upon natural resources.*

Modern science with all of its marvels is not a substitute for a sound ecological balance. Indeed, in science lies our greatest hope for alleviating pressures in critical resource shortages, for supplementing and activating the processes of nature, for revealing the most efficient use of commonly used resources, and for providing an imposing array of substitutes for many essential materials limited in quantity. Yet, the new processes developed by science create heretofore unknown demands upon vital materials. It must be recognized that science, with all of its potentialities, cannot eradicate the tragic effects of an ill-used, depleted resource-base.

5. *To relate pertinent knowledge and findings of the natural scientists to the daily resource-use problems of the people.*

The citizens need to be sensitive to the vast amount of knowledge and experience which may be used in the solution of their problems. Moreover, effective programs of action in the school, in the community, in the region, or in the Nation must be evaluated, projected, and developed in the light of scientific principles and the ultimate good of all rather than for the benefit of a few people or of a limited portion of society.

6. *To promote the philosophy that freedom to use resources entails the responsibility for reasonable husbandry.*

The challenge of good stewardship of earth resources is an issue worthy of prime consideration in a democratic society where freedom to make choices inescapably places upon the individual the responsibility of choosing wisely for the ultimate benefit of all. Most certainly, a refining of the meaning of "ownership" of material wealth is needed in a nation where "personal rights" have been highly emphasized. Citizens must recognize the fact that no individual,

no group, no community, and no governmental unit has the "right" to exploit or to use any of the earth resources "in a manner inimical to the general rights of society." The true spirit of conservation makes it imperative that individuals recognize limitation to their personal rights in matters of resource use. Today, as never before, we need citizens with "ecological conscience."

7. *To develop the proper respect for all material wealth irrespective of ownership.*

Herein lie numerous opportunities for teaching fundamental concepts which are significant in vitalizing citizenship education. The urban child in the rented apartment; the class picnicking in the public park; the student with a State-owned text; the adolescent with a new, untried knife at the soda counter; the careless smoker in the home of a friend; the tenant in the cotton field; the owner of cattle grazing on a rented pasture—all these and countless others need to be aware of the value of material wealth and to have functioning principles of good citizenship.

8. *To correct undesirable customs and practices relative to resource use.*

Many are the customs, steeped in the traditions of the past, that need to be reexamined in the light of present-day information. Subdividing fields into rectangles and cultivating them irrespective of slope; burning over woodland and grassland in the spring; using streams for open sewers; dumping cans, trash, and other waste along roadsides or into ditches; despoiling flowers, shrubs, and trees are all indicative of unwise practices in need of correction. The developing of new customs and practices, however, depends upon the overcoming of inertia and reluctance to change. The degree to which this is accomplished is, to a great extent, indicative of the effectiveness of the conservation education program.

9. *To translate conservation into social terms.*

There is urgent need for a broad understanding of basic social problems and policies as they are related to deficiencies in or misuse of vital resources. Problems may well be studied in the setting of the locality, the region, the nation, and the world.

10. *To reorient the community ambition.*

Most localities possess the ambition to grow materially, but too few put forth cooperative effort to produce significant changes in making the community, region, or nation a better place in which to live.

Conservation in the Educational Program

Conservation embodies concepts that cut across all areas of learning, relate fundamentally to every phase of human activity, give impetus for vitalizing citizenship education, and provide a sound basis for continuous betterment of human welfare. For conservation to become a potent force influencing behavior patterns, it must be made an all-pervasive element with its ideas and principles permeating the whole education program of all schools at all levels of learning. Authorities agree that conservation education can best be furthered in the elementary and, perhaps, the secondary schools by integrating it into present school programs rather than by introducing it as an additional subject in an already crowded curriculum. Many leaders are of the opinion, however, that for the senior high school an effectively taught course in conservation is most rewarding.

If the school is organized around the traditional subject-matter areas, conservation may most advantageously be integrated with geography, which has its basic "roots" in both the natural sciences and in the social studies; with history, sociology, civics, or other social studies; and with elementary sciences, general science, biology, or other subjects in the natural sciences. Of course, integration may well extend into other subject areas, including, among others, mathematics, language arts, health education, art, and vocational education. Integration necessitates awareness of the fact that the applications of conservation are far reaching. To be sure, the teacher, if following the principle of integration, must be imbued with the point of view that conservation is not a single subject but an area of learning and a way of living. The teacher must so present the work that the pupils will see in their communities and their daily living the principles of conservation.

In the core curriculum, special units on the conservation of natural resources need to be incorporated into the program for both the elementary and secondary schools. Moreover, the central theme or basic concepts of conservation must be all pervasive in the school philosophy and must figure in the development of the core.

Certainly, in the light of the crucial bottleneck in conservation education—the lack of adequately trained teachers—the need for special conservation courses in institutions of higher learning, especially those engaged in teacher training, cannot be ignored or overemphasized. Indeed, it is upon these institutions that devolves the paramount responsibility of making significant contributions toward implementing effective in-service and preservice training in conservation education and toward demonstrating how best to project the influence of the school into community activities within the region served.

The prime consideration is that vitalized conservation gets into the school program and functions as a dynamic force in conditioning the way of living of the people so that their lives may be enriched; the quality of citizens, improved; and the occupancy of the land, given a degree of permanency.

Irrespective of the pattern of organization of the school, there is urgent need for adequately projecting conservation activity programs into the life of the community and for providing ample opportunities for cooperative participation by adults as well as youth.

Conservation education is often introduced into the school program through either the combined or individual efforts of interested teachers, school administrators, or other concerned leaders and organizations on the national, State, county, or local level. On the other hand, legislation designed to secure conservation instruction in the schools has been adopted by a few States. According to Funderburk, Tennessee in 1921 and Mississippi in 1926 passed measures requiring the teaching of forestry and plant life.[2] These narrowly conceived measures have been followed by more comprehensive legislation requiring school instruction in the wise use of natural resources. At least eight States have, since 1929, enacted measures of this type. The list includes Arkansas, Florida, Georgia, Kentucky, Maryland, North Dakota, Oklahoma, and Wisconsin.[3]

Implementing Effective Conservation Education

Effective conservation rests, in the final analysis, upon a favorable combination of many requisites. To be sure, regional dif-

[2] Funderburk, Robert Steele. *The History of Conservation Education in the United States.* Nashville, Tenn., Bureau of Publications, George Peabody College for Teachers, 1948. p. 27–28.

[3] Association for Supervision and Curriculum Development. *Large Was Our Bounty: Natural Resources and the Schools,* 1948 Yearbook. Washington, D. C., ASCD, National Education Association, 1948. p. 124.

Courtesy, Minneapolis Public Schools

Teachers study conservation problems during a summer workshop.

ferentiation suggests the desirability of adapting experiences to the needs of the locality viewed in its larger settings, both national and world. Teaching materials, methods, or activity programs ideally suited to one community may be far from appropriate for another. Yet, despite geographic, economic, and social diversification necessitating flexibility and variations in local programs, the general elements basic to any effective conservation education program can be clearly formulated. How to vitalize these elements, how to secure a most desirable functioning combination of them, and how to further conservation education that will effect a continuing and dynamic impact upon the daily lives of the citizenry are paramount questions that merit study. The following are some suggestions that need to be critically examined and widely applied:

1. *Provide adequate training program for teachers, administrators, and others engaged in influencing public opinion relative to wise use of resources.*

Essential to an effective program in conservation in the schools is the adequate preparation of teachers, supervisors,

and administrators. The need for eliminating this crucial bottleneck in conservation education was made clear by Eckelberry in these words, "The schools will not be well started on the way to an adequate conservation education program until teachers have had experiences which do things to them. If I may crib some language from the New Testament, we shall not enter into the kingdom of conservation until teachers have been born again—born into an understanding of, and concern about, conservation problems, and into commitment to, and skill in, conservation education. Until this rebirth has taken place, the materials that we prepare at best will be used in a formal, ineffective manner; in many cases, they will not be used at all."[4]

To bring about this "rebirth," the right kind of educative experiences must be provided for all teachers at all levels of learning. Since conservations is "a matter of human behavior" and since it is desirable to have its concepts permeate the whole educational program, teachers in all areas of learning must be imbued with them. Even though all do not experience equal opportunities or responsibilities for furthering conservation education, "all should have a share in it and be properly prepared for it. Conservation education will not be properly done until it becomes the responsibility of the entire school staff."

How, then, can proper education of all or nearly all teachers be provided? The National Committee on Policies in Conservation Education, having conducted a workshop designed to study this problem in 1949, maintained that preservice education of teachers, even if of the highest quality, is not in itself sufficient.

Teachers already in the field must be reached in the most effective manner. The Committee, fully aware of the values and also the limitations of conservation courses and related offerings during summer terms of teacher-education institutions, held workshops to be the best means of providing desirable training for in-service teachers. The Committee, therefore, recommended the extension and enriched development of central workshops (State or regional) serving large areas and functioning as training centers for teachers and other leaders who in turn will be instrumental in effecting local in-service conservation education programs. The stimu-

[4] Eckelberry, R. H. "The Next Step Needed in Conservation Education." Address delivered at the Fourteenth Educational Conference, Roosevelt Hotel, New York City, Oct. 28, 1949.

lation of interest in and the organization of central conservation education workshops may stem from single or cooperative effort of the State department of education, the State advisory committee on conservation education, the State university, other State-supported institutions of higher learning, the department of conservation, or any other agency vitally concerned with the wise use of resources. West Virginia, with six institutions sponsoring a State conservation school, is an example of cooperative sponsorship by several colleges and universities. While, among many States, Illinois and Texas are significant examples of cooperative development sponsored by institutions of higher education and numerous agencies concerned with wise resource-use.[5] The effectiveness of central conservation workshops can be appreciably increased by providing follow-up programs designed to help teachers incorporate the aims of the workshops into their own teaching situations. Alabama, Georgia, and North Carolina are among the few States with excellent follow-up activities.[6]

The success of the central workshops may be mirrored in the work of the local in-service conservation education programs. For in-service training of teachers, the local community workshops are indispensable. They provide opportunity for reaching the greatest possible number of teachers, for studying resource-use problems in the community settings in which the members work, for demonstrating desirable approaches and methods of study of local conservation problems, and for contributing to the development of genuine community schools.

2. *Recognize the role of the teacher as that of counselor and guide.*

It is highly important for the teacher to approach all phases of conservation as a learner rather than as a specialist. To be sure, he needs to be competent in many subject areas. But resource-use problems cut across practically every phase of human activity and across the traditional fields of knowledge. Requisite knowledge and understanding cannot be acquired once and for all. Ecological relations vary; scientific and technological knowledge increases, and opportunities for application multiply; and social, economic, and cultural

[5] National Committee on Policies in Conservation Education. *Report of the Eagle River, Wisconsin, Workshop Conference Held at Trees for Tomorrow Camp, June 5–8, 1949.* Izaak Walton League of America Inc., 31 North State Street, Chicago 2, p. 14.

[6] Ibid., p. 15.

conditions change. Consequently the teacher should view conservation education as continuous learning. The attitude of the teacher is, therefore, extremely important. For best results he should:

(a) Be favorably inclined toward and effective in the use of the problem-solving approach to resource-use education.

(b) Be willing to raise questions and to experiment along with the pupils.

(c) Be inclined to withhold judgment until sufficient evidence can be found.

(d) Be willing to make realistic and thorough plans for first-hand learning experiences in the field.

(e) Be sensitive to opportunities for stimulating the widest possible participation in cooperatively planning and developing of activity programs for more efficient use of all resources.

The teacher will, at all times, find his most effective role to be that of learner rather than specialist; that of counselor and guide rather than director.

3. *Give the proper motivation.*

Conservation education must not be based upon emotional appeals. To be of lasting worth, the approach must take into account underlying values and scientific principles. Eckelberry suggests that desirable motivation may be found by relating fundamental generalizations to the economic welfare of the people, to an individual's sense of patriotism or love of the country, and to his duty of good stewardship. At all times, conservation must be viewed as a practical, as well as ethical, responsibility which every individual owes to himself, to his country, and to his fellow men. With proper motivation and illumination of learning experiences, conservation education will aid the individual in being "not merely a mature and well-informed citizen, not merely a convert to the cause, but a responsible human being who, understanding his relation to the living world, is determined to leave it a fairer place for his children."[7]

[7] Brewer, George. "Education in Conservation Dynamics." Address delivered at the Inter-American Conference on Conservation of Renewable Natural Resources, Denver, September 1948.

4. *Emphasize the contributions the individual can make to the conservation of natural resources.*

At all levels of learning, conservation education must clearly point to and provide for contributions which the individual can make. His daily choices relative to efficient use of resources and his efforts to effect desirable regulations concerning resource problems, practices, and policies can contribute much toward bettering human welfare. To be able to use wisely the resources and to influence others to do so, the individual must be:

(a) Aware of the interrelationships existing between his treatment of material wealth and his ultimate well-being.
(b) Tolerant toward resource-use problems.
(c) Concerned with issues related to the resource problems in the local, regional, national, and world setting.
(d) Intolerant toward unnecessary destruction of resources.
(e) Appreciative of the esthetic and recreational values of the natural landscape and aware of the importance of protecting them.
(f) Willing to participate in an active, community program designed to implement efficient use of resources.
(g) Sensitive to the need for personal responsibility for making and causing to be made wise choices in all matters of resource use.
(h) Aware of the desirability of working by democratic rather than autocratic methods.
(i) Considerate of the rights of society rather than the selfish, anti-social acts of resource exploiters.
(j) Concerned about his personal habits with respect to the use of resources.
(k) Skeptical toward untested proposals or opinions related to matters of resource development.
(l) Willing to delay forming decisions and actively supporting proposed projects until ecological relationships of all the resources can be thoroughly examined.
(m) Concerned about the appropriate use of public and private property.
(n) Sensitive to advancements in science and technology

which make possible new opportunities for more efficient use of resources.

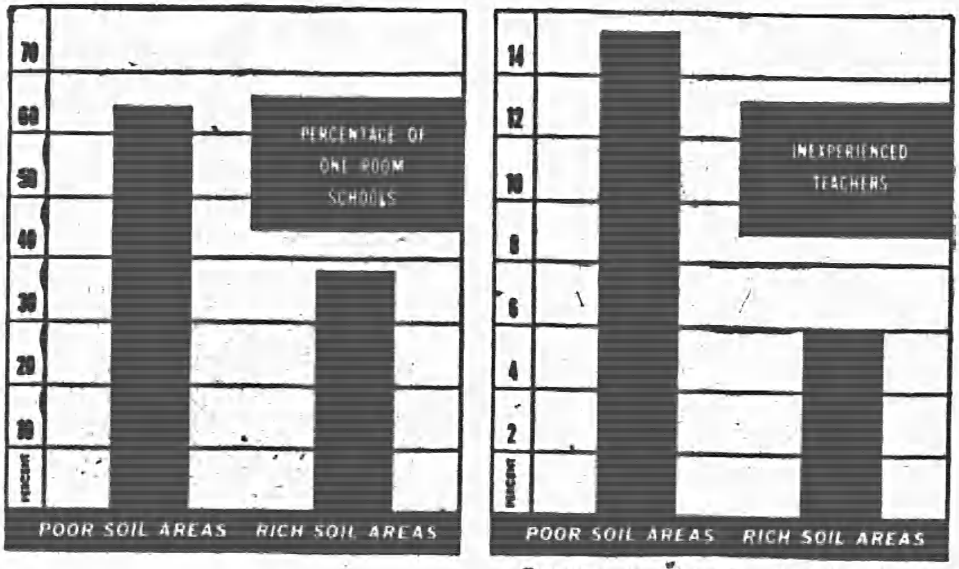
For awakening the individual to his opportunities for implementing wise use of resources, the teacher must select approaches determined in the light of geographic, economic, social, and cultural factors. The urban dweller, for example, may be more keenly interested in projects for abating water or air pollution, for improving scenic and recreational values, for maintaining adequate water supply, for controlling floods, for developing water power, for protecting wildlife, for making better use of many unsightly spots within the city, and for solving other vital resource problems that are regional, national, and international in scope. The welfare of the city is critically related to that of its tributary area which may extend from the surrounding region to the entire world.

The rural individual may be more deeply interested in problems of local nature. He is in direct contact with the results of the impairment of the resources upon which he depends, to a large degree, for his subsistence. His prime concern may relate, for example, to problems of using more efficiently the soil, native vegetation, scenic values, water supply, and wildlife.

The nature of resource problems will vary from place to place and from time to time. The teacher and the pupils must, therefore, arrive at the best approaches for leading individuals to a recognition of opportunities for furthering wise use of resources. From the beautification of the school lawn to the proper disposal of picnic papers, lollypop wrappers or tin cans; to the control of erosion in the school yard; to the management or development of school or community forest; to the participation in the activities of a demonstration farm or wildlife refuge; to the conduction of a survey to discover available local resource people and agencies; to the protection of school or personal property; or to the participation in a community-school project, there is ample opportunity for individuals to make important contributions to the conservation program. This is essential if conservation education is to constitute "a substantive rule of conduct, a principle for the present life of the pupil."

5. *Stress economic and cultural aspects of wise use of resources.*

Throughout the program, at all levels of learning, em-



Courtesy, American Forestry Association

The University of Tennessee study relates soil fertility to school conditions in six selected counties, three typical of poor land areas and three typical of fertile areas.

phasizing the economic and cultural problems of the people as they are directly related to the wise use or abuse of the resources places significance on the present values of conservation practices rather than on those of the future alone. This is an essential phase to stress, especially when dealing with younger people. Comparative studies, graphically presented, will illuminate the material and aid considerabily in making evident the relationship between better living and wise use of resources. The study made by the University of Tennessee is indicative of the type of presentation that may well be made in any region.

6. *Include educative experience for adults as well as for children and youth.*

To be fully effective the conservation program must provide for active participation of all age groups, and the different phases of the program must be related as closely as possible to each other. No doubt, the interest, enthusiasm, and acquired ecological learnings of the pupils tend to carry over to the parents; those of the parents, to the children. Thus, each part of the program when effectively developed and closely related enriches and strengthens the other. Moreover, it is upon the lay citizens that the major responsibility

rests for immediately implementing action programs of conservation on the land and for effecting desirable regulations concerning resource-use policies and practices. Popular education must parallel and supplement that of the youth.

Implementing effective conservation education for the lay citizen is a tremendous responsibility that must command the best efforts of many organizations, including government

Courtesy, Soil Conservation Service

Georgia farmers learn of effective farming practices as they study an actual farm in miniature showing both wise and unwise land utilization.

agencies, schools of all types, the church, youth organizations, and civic groups. The challenge is so great, so complex, and so difficult that no one organization can adequately meet the needs. Cooperation among individuals, groups,

and agencies is a requisite to an effective community-school program in conservation education for all ages.

For providing educative experiences for the adults and for bringing them into closer relation to the daily activities of the school the following suggestions may prove of value:

(a) Project the organization of a community-school study of conservation for making a positive, creative approach to the problem of using wisely all resources for the enriching of life.

(b) Make a survey of the community to determine the major resource-use problems, to reveal possibilities for more efficient use of resources, and to locate most capable leaders and specialists who can contribute significantly to the development of the program.

(c) Stimulate civic clubs and study groups to focus attention on critical resource-use problems; to aid in planning and developing practical projects related to conservation in the home, the school, and the community; and to sponsor radio programs presenting outstanding speakers, forum discussions, and reports of on-going projects.

(d) Plan with the Soil Conservation Service and Forest Service personnel, with the vocational agriculture teachers and county agents, and with Extension Service specialists for developing demonstration projects in the community.

(e) In agricultural areas, encourage and assist in the organization of a local soil conservation district, if none exists.

(f) Request assistance from the State Extension Service for enriching the educational program.

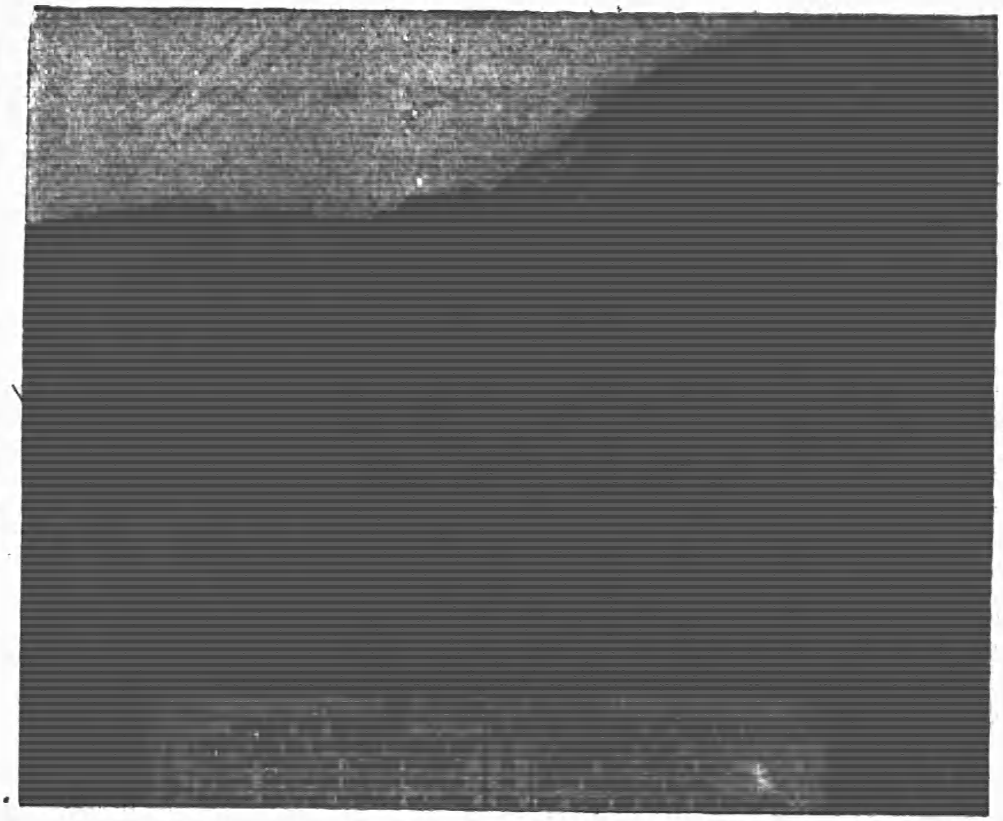
(g) Prepare exhibits—soil maps and profiles, cartoons, posters and scrapbooks, model farm lay-outs, grass herbariums—for display in community stores, in the school, or in other appropriate centers.

(h) Plan for pupils and parents some field trips which command the best cooperative efforts of local leaders, resource-use specialist, parents, teachers, and pupils.

(i) Project plans for a community museum designed to

Courtesy, Soil Conservation Service

The soil conservation districts are local governing units organized and run by farmers with the privilege of receiving assistance from State and Federal Governments. The districts include more than three-fourths of all farm and ranch land.



Courtesy, Soil Conservation Service

Land must be treated according to its needs and used according to its capability. The land capability map, made by the Soil Conservation Service before the farm plan is started, is used by the farmer who works in Soil Conservation Districts.

help implement effective conservation education for all.

(j) Assist in planning a section in the community or school library to be devoted to an adequate collection of sound, up-to-date conservation materials.

(k) Set up faculty-parent-pupil participation programs for the radio, for PTA meetings, or for other concerned groups.

(l) Encourage the establishment of community forests, game refuge, or conservation demonstration plots.

(m) Where available, invite the personnel of the State fire control units, usually known as forest districts, and/or the personnel of the ranger districts of the national forests to assist in developing projects related to forestry and to provide for

more direct contact with the realities of conservation problems.

(n) Make the most appropriate use of the press.

7. *Relate learning experiences to the central theme of conservation and to the major educational objectives.*

In selecting or developing content material and in projecting activity-centered experiences, participants must never lose sight of the guiding objectives and of the real heart of conservation—the impairment and destruction of resources and means of counteracting these processes. This underlying theme must permeate every phase of the conservation education program and must be applied as a decisive test as to the suitability of materials and learning experiences.

8. *Make adequate and effective use of direct study in the field.*

That field teaching is a serious responsibility, not just a casual, aimless enterprise, was stressed by the late Henry Chandler Cowles of the University of Chicago. In his forceful words he warned, "If you are going out on a field trip to show something to a class, be sure it's there if you have to sneak out the night before and put it there." Certainly, the great ecologist was not insinuating some kind of fraud. But as his words do suggest, most careful planning is a requisite to successful study in the field. Too often, "everything that comes along to catch the eye is pointed out and labelled, often with erudite comments, but with no real distinction. In the end the disciples are aware that they have seen many things. They are impressed, possibly fatigued by the muscular scholarship of their guide. But they are left with no sense of the unity and interrelationship of what they have seen. They have the pieces, but not the picture which those pieces form."[8]

Fragments of information have little value unless they are functionally related to each other and to the more intricately complex whole. It is of paramount importance that the interrelatedness of the component parts of nature be emphasized and that we "see ourselves as a part of the landscape about us, dependent upon it and responsible for its continuing health and productiveness."

[8] Sears, Paul B. Teaching Ecological Relationships Through Biological Field Trips. *The American Biology Teacher*, 8:102, February 1946.

Skillfully projected field experiences, if not too limited, offer unrivaled opportunities for relating the nature of the resource-base to the welfare of the people. Correlations may be drawn, for example, between soil erosion and housing: soil erosion control—good housing; unrestrained soil erosion—poor housing. Thus, the field excursions enable the participants to see for themselves the problems of local conservation which in turn may be more adequately studied in the light of their regional, national, and world perspective. Certainly, for the elementary grades, first-hand experience with conservation problems in their natural settings is the

Courtesy, Soil Conservation Service

The production of animals in association with that of plants is an agricultural safeguard, making for improved soil fertility, economic stability, and higher level of living.

key to effective conservation education.

Some learning experiences may be made more meaningful by short trips, perhaps to the schoolyard or the immediate neighborhood. Others may be appreciably enriched by longer trips if transportation is available. But irrespective of the length of the trip or the nature of the area selected as a site for the first-hand learning activity, there are some general suggestions that may prove of value to teachers of all levels of learning:

(a) Make careful, preliminary plans. The teacher will often need to make a personal excursion to the area for thorough study before helping to guide the pupils in their preliminary preparation for the activity.

(b) Bring information gained from the preliminary study of the selected area into the discussion ant planning periods. This will help prepare the pupils for observnig specific things.

(c) Provide, where expedient, for the collection of materials to be used later for exhibits and experiments.

(d) Make available the most suitable maps, charts, and other graphic aids for use both in preliminary study and in work in the field.

(e) Do not let the field trip end with the return to the classroom. The first-hand learning experience should suggest and be the impetus for many types of follow-up procedures. The findings in the field may reveal need for scientific experiments to be developed in the laboratory or the regular classroom. They may give rise to numerous questions which start the learners on their search through suitable printed materials. They may sensitize the group to the need for follow-up field trips with invited specialists in various areas of conservation.

9. *Build a broad, well-balanced program.*

It is imperative that conservation education treat the whole problem of wise use of resources rather than isolated segments. The shift of emphasis frequently needs to be made from the narrow approach to conservation through the study of forests, soils, or wildlife, etc., to that of a more equal stress on the wise use of all resources. The broader approach not only makes for better understanding of ecological relationships, but also facilitates the focusing of attention on conservation problems that are most significant to the local area, the region, the nation, or the world.

For the broad, well-balanced program, great care must be taken that the plan is flexible enough to admit adjustment to the needs both of individuals and of class groups and also to unforeseen incidents. Moreover, the program must ade-

quately provide opportunities for "the integration of instruction with normal activities of life." It is equally important to note that the "conservation activities of different grades in the same school and of different schools in the community should be coordinated with respect to the interests of the entire group."[9] Furthermore, the program must be so planned and so adapted to the different age levels of learners that repetition of the same work will not occur to impede the progress of the total conservation education program.

Courtesy, Greenville City High School, Greenville, S. C.

Students study better farming practices.

6. *Utilize the best available teaching materials.*

To relate adequately classroom learnings to those gained directly through first-hand contact with conservation problems and to make all educative experiences vivid and meaningful, exploit the best of all available teaching aids. Sketch maps or regional diagrams; various types of resource maps; and charts and maps showing related land uses, drainage basins, ground water conditions, and other related geographic features have their unique contributions. Slides, motion pictures, cartoons, filmstrips, charts, recordings, and other graphic aids must be selected with care and appropriately

[9] Bathurst, Effie G. *Teaching Conservation in Elementary Schools*, Federal Security Agency, Bulletin 1938, No. 114, Office of Education, p. 6.

used to enrich the learning experiences. Suitable materials—books, magazines, pamphlets, community resource studies—are indispensable.

11. *Keep the faith.*

Though, indeed, we need to be stirred into action, we need not fall into despair. As Sir Herbert Broadley warned, "so far, we have only just begun to realize the dangers of a world population hungry, underfed, ill and discontented." But, on the other hand, as he continued, "we have only glimpsed the possibilities of increased food production on a vast scale . . . . We are preparing for a new day . . . . confident in the assurance that victory is possible—nay, sure—if we have courage, plan intelligently, and use all resources of this world aright."[10] Even though there is no cause for despair, there is, to be sure, cause for serious reflection and real determination to establish lasting adjustment to the land.

If conservation permeates our educational programs, we may have an ever-increasing number of self-disciplined citiezns, aware of the value of the natural resources, sensitive to their abuse or misuse, and able to work together in a democratic manner to effect action programs of conservation on the land. This is essential to the preservation of human welfare, to the perpetuation of our Nation's strength, and to the maintenance of its military potency.

Most assuredly, conservation is not going to bring the desired solution for the major ills of the world or of our Nation. Other measures including those of economic and political nature are indispensable. However, unless all who influence public opinion seek to establish a program effecting harmonious relations between man and his habitat, we shall surely "sit down to the table of consequences."

[10] Broadley, Sir Herbert, "Critical Shortages of Food." Address delivered at the United Nations Scientific Conference on the Conservation and Utilization of Resources, Lake Success, Aug. 18, 1949.

HE WHO KNOWS what sweets and virtues are in the ground, the waters, the plants, the heavens, and how to come at those enchantments, is the rich and royal man.

RALPH WALDO EMERSON

Teaching materials and aids

Conservation education is a study so broad and so comprehensive that it relates to many areas of learning and touches nearly every phase of human activity. It draws upon such subjects as geography, biology, botany, sociology, physics, engineering, geology, economics, and education. For conservation education to be dynamic and to be focused adequately on basic concepts related to the wise use of resources, the teacher should use effectively a variety of appropriate procedures and materials for all levels of learning. Conservation education is continuous learning. The ecological balance constantly undergoes change; new destructive forces are set into operation through the changing activities of an ever-increasing population; and a reorientation of attitudes and a reshaping of habits become imperative. The teachers not only must be alert to all types of available aids but also must understand "how," "when," and "for what purpose" they contribute most significantly to the achieving of the overall objectives.

Certainly, all sources of information and all media should be utilized to the best advantage. Carefully planned field trips and other contacts with conservation problems in their natural ecological settings are unparalleled in value. There are times, however, when direct contact with the resource is neither practical nor possible. But at all stages in the development of the study, reading materials and various types of audio-visual aids are indispensable. The radio, motion pictures, slides, photographs, charts, posters, maps, guides, cartoons, etc., can make unique contributions for vitalizing the learning process.

One of the major responsibilities of the teacher involves the surveying of the vast array of various types of materials, selecting those most appropriate for the given purpose, and adapting the chosen materials to the needs of the pupils, the school, and the community as each is viewed in its proper world-wide setting. Herein lies a challenge that commands a careful examination of

Courtesy, U. S. Forest Service

School children plant 2-year-old pine in an old New York field.

a great range of available material which must be evaluated in the light of specific objectives or criteria.

Criteria to Aid Teachers in Evaluating Materials

For the teaching of conservation to be most effective, it is essential that all learning materials be selected or developed on the basis of their contributions to the promotion of sound views and to the development of desirable attitudes and patterns of behavior relative to the most important aspects of conservation problems.

What specific standards, then, must guide the teacher in this vital work? The following criteria may be of value in appraising instructional material:

1. *Central Theme*

As the central theme of conservation is the counteraction of resource impairment and destruction for the ultimate purpose of bettering human welfare, the material for teaching use must be evaluated in this light. Bulletins or other aids, no matter how colorful or otherwise how attractive, have little or no place in a sound conservation educational program unless they embody the fundamental concepts and further the development of an undistorted view of natural resources, of conservation, and of man's ecological relation to his environment.

2. *Purpose*

The material must be designed so as to appeal to reason and judgment, not to emotion or sentiment.

3. *Treatment of Interrelationships*

The unity and interdependence of all living things must be adequately recognized. The material must clearly reveal that "Nature is one" and that damage to any one element of the natural set-up of any area spreads to other parts, both near and remote. Man must be viewed as an integral part of Nature's great scheme-of-things in which he can succeed on a permanent basis only by working with Nature, not against her. Moreover, emphasis must be placed on the relationships existing between the nature of man's treatment of natural resources and his economic, political, and social well-being. The dependency of human welfare upon life in harmony with the earth must be recognized.

4. *Scientific Accuracy*

Materials that fail to meet the acid test of scientific soundness have no place in the educational program. For as Stephen Leacock expressed it, "a half truth, like a half brick, is always more forcible than a whole one. It carries further." Controversial issues occur in the field of conservation. These must be clearly recognized. But they must be presented in such a manner that they will lead the

learners to research and experimental activities rather than to blind acceptance.

5. *Recency*

It is highly important that the materials be up to date. Figures, graphic aids, textual materials, etc., depicting conditions which do not exist today, lose their effectiveness and deaden the interest of the pupils, concerned primarily with the present and the near future. Information about past conditions is of value, primarily, to bring out trends and to make possible comparisons.

6. *Adaptability*

Are the materials for pupils suitable for use with other curricular materials? Do they fit into the program of work for the particular grade level for which intended? Are the materials readily adaptable for use to aid in meeting the needs of the school, the community, the region, and the Nation? Do the professional materials appropriate for teachers adequately relate conservation problems to the political, economic, and social realities of the world today?

7. *Substantial Content*

Does the content embody essentials basic to an adequate treatment of the given problem of conservation, or is the content limited only to vague generalities? Is "conservation" used synonymously with "preserve," "save," "thrift," "protect"? Is conservation education presented only as nature study, safety education, or health education? It is essential that the materials selected for use give evidence of substantial content designed to facilitate an understanding of the WHOLE PROBLEM of conservation and to further the interpretation of its REAL MEANING.

8. *Effectiveness*

Unquestionably, attractive, well-illustrated materials have the greatest possibilities of vitalizing conservation education. The graphic and pictorial quality, color, type, quality of the paper, and general appearance of the printed matter are all points that merit consideration.

9. *Vocabulary*

The vocabulary must be in harmony with the demands and abilities of the particular group by which the material is to be used.

10. *Interest Appeal Keyed to Age Level*

Content must appeal to the interest of the age group by which the materials are to be used. If the school develops community-centered activity programs capturing the interest of all age groups and stimulating active participation by both pupils and adults, it will be confronted with a very vital problem—that of selecting some materials of elementary level in terms of reading difficulties but of adult level in terms of interest appeal. Materials for sixth-grade pupils will not be appropriate for adults in need of reading materials on the same level of difficulty. The interest appeal must be for pupils, on the one hand; for adults, on the other. It is of equal importance that materials be keyed to the level of interest of the reader as it is that they be written in a style and with a vocabulary suited to his comprehension ability.

11. *Action Centered*

Do materials adequately relate the knowledge and findings of the natural scientists to the everyday living of the people? It is imperative that scientific findings be translated into values that make ecological health not only a matter of concern to the people, but also an objective for the attainment of which citizens work cooperatively together.

Selected References on Conservation

The degree to which basic understandings in conservation education are developed depends, in part, upon the quality and variety of materials available to the learner. To aid the teacher in the important responsibility of making the selection is the primary aim in bringing together the following list of selected references to some of the essential, available materials on conservation. This bibliography refers only to materials national in scope. It is by no means an exhaustive coverage of the field of conservation. ***Bulletins, instructional units, and guides prepared by State departments of education, State departments of conservation, and various governmental agencies are usually either***

free or priced at a nominal fee. Materials marked with the asterisk are obtainable only from the issuing agency.

For convenience of the teacher, the materials are arranged in the following groups: Selected References for Elementary Schools; Selected References for Secondary Schools; and Selected References for Teachers.

Selected References for Elementary Schools

AMERICAN FORESTRY ASSOCIATION, STATE FORESTERS, U. S. FOREST SERVICE, *and* THE ADVERTISING COUNCIL. *Forest Fire.* Washington, D. C., American Forestry Association, 1950. 16 p.

A four-color comic book that gives in 50 cartoon panels the story of our forests and why we should take care of them. Smoky, the fire preventing bear, relates the story to his animal friends.

BENNETT, HUGH H., *and* PRYOR, WILLIAM G. *This Land We Defend.* New York, Longmans, Greene, and Co., 1942. 107 p.

Discusses land waste resulting from settlement and exploitation and tells of modern practices in keeping with the new conservation movement to save the land.

BLOUGH, GLENN O. *Animals That Live Together.* Evanston, Ill., Row, Peterson and Co., 1945. 36 p.

For use in the second grade.

——— *Plants Round the Year.* Evanston, Ill., Row, Peterson and Co., 1943. 36 p.

May be used in developing an elementary understanding of and an appreciation for plants. Keyed to third grade level.

BRINSER, AYERS *and* SHEPARD, WARD. *Our Use of the Land.* New York, Harper and Bros., 1939. 303 p.

A treatment of conservation problems related to six vital resources—land, water, grasslands, forests, wildlife, and minerals. Suggests student activities and projects.

DEUSING, MURL. *Soil, Water, and Man.* Evanston, Ill., Row, Peterson and Co., 1941. 47 p.

For use in teaching soil conservation in the upper elementary grades.

GUNNING, ROBERT, *and* GUNNING, MARY. *Balance in Nature,* Little Wonder Book 512. Columbus, Ohio, Charles E. Merrill Co., Inc., 1939. 32 p.

For use in developing an understanding of the balance of nature, the interdependence of plants and animals, and basic problems of conservation. Written for use in the fifth grade.

HALL, DOROTHY. *Our Land of Plenty.* Little Wonder Book 501. Columbus, Ohio, Charles E. Merrill Co., Inc., 1948. 32 p.

Pictures the original conditions on "our land of plenty," the deterioration that has accompanied our occupancy, and methods for conserving soil, water, forest, and mineral resources. Fifth-grade level.

HOWARD, ETHEL K. *Lumber,* Little Wonder Book 607. Columbus, Ohio, Charles E. Merrill Co., Inc., 1947. 36 p.

Written for use in the sixth grade; stresses the value of forests, the enemies of destruction, and conservation methods and measures necessary.

HOWELL, HENRIE ANDREWS. *Muddy Water.* New York, Applied Economics, (280 Madison Avenue), 1949. 94 p.

A school reader presenting a dramatic story of Jerry and Millie Todd and their young son Chuck who learned how to improve an old, worn-out farm so that it could yield a good living for them. The interest of the story is never dimmed by the inclusion of basic information on soil conservation. May be used in the fifth and sixth grades and also in secondary schools.

*MATTISON, CHARLES W., *and* VITAS, GEORGE. *Comps. Ranger 'Rithmetic.*

Forest Service, U.S. Department of Agriculture. Washington, U.S. Government Printing Office, 1948. 10 p. Free.

Contains practical problems to aid sixth-grade teachers who are integrating conservation in mathematics, science, or social studies.

MCKEE, LILLIAN. *Trees*, Little Wonder Book 407. Columbus, Ohio, Charles E. Merrill Co., Inc., 1947. 32 p.

A fourth-grade-level bulletin designed to further a better understanding of the nature of trees, their values, evils resulting from their destruction, and means of conserving them.

MELROSE, MARY, *and others*. *My Land and Your Land Conservation Series*,

a. Would You Like To Have Lived When? 1941. 32 p.

b. Raindrops and Muddy Rivers. 1942. 32 p.

c. Plants and Animals Live Together. 1942. 48 p.

d. Nature's Bank—The Soil. 1942. 48 p.

Washington, D. C., National Wildlife Federation.

A series of booklets designed to facilitate adequate understanding of soil, water, and wildlife conservation.

NOFZIGER, ED *and* DOWLING, ELLEN C. *Gabby and the Forest Fires*. Washington, D. C., American Tree Association, 1947. 50 p.

The story of the cause of forest fires, their results, and methods of preventing them.

PARKER, BERTHA MORRIS, *and* PARKER, MARGARET TERRELL. *The Earth a Great Storehouse*. Evanston, Ill., Row, Peterson and Co., 1941. 36 p.

Provides content material which may be used in developing an understanding of the nature of deposits and the major characteristics related to practices and methods of use of some of the vital mineral resources.

PRYOR, WILLIAM C., *and* PRYOR, HELEN S. *Water—Wealth or Waste*. New York, Harcourt, Brace and Co., 1940. 242 p.

Deals with water resources and their value. Written for use in the upper elementary and intermediate grades.

VAN DERSAL, WILLIAM R., *and* GRAHAM, EDWARD H. *Land Renewed—The Story of Soil Conservation*. New York, Oxford University Press, 1946. 110 p.

A presentation of the disastrous effects of erosion, major land-use problems, and significant conservation practices in the United States. May be used in both the upper elementary grades and in the junior high school.

Selected References for Secondary Schools

AHLGREN, HENRY L., *and* CLARK, J. W. *Plants Link Soil and People*. Madison, Wis., College of Agriculture, University of Wisconsin, 1948. 36 p. Free.

Designed primarily for use in Wisconsin schools, but adaptable for use in any area. Shows how man, through the production of grasses and legumes, can work with nature rather than against her.

AMERICAN PLANT FOOD COUNCIL, INC., *and* AGRICULTURAL EDUCATION SERVICE, U. S. Office of Education. *Our Land and Its Care*. Washington, D. C., American Plant Food Council, Inc., 1949. 64 p. Free.

Designed especially for students of vocational agriculture, but may be used in a unit on the soil and its protection.

BENNETT, HUGH H, *Our American Land—The Story of Its Abuse and Its Conservation*. Soil Conservation Service, U.S. Department of Agriculture. Washington, U.S. Government Printing Office, 1948. 30 p.

Describes the needs for and essential aspects of maintaining sustained productivity of our agricultural lands and gives pertinent content material relative to the wise use of soil and water resources.

BUTCHER, DEVEREUX. *Exploring Our National Parks and Monuments*. Boston, Houghton Mifflin Co., 1949. 224 p.

Contains 227 pictures, 2 maps, and content material designed to add to the understanding and enjoyment of the parks and to further the development of desirable attitudes and

programs of action to protect and to preserve the beauty and usefulness of the parks.

BUTLER, OVID M. *American Conservation in Picture and in Story.* Washington, D. C., The American Forestry Association, 1941. 160 p.

Relates the role of the organic natural resources to the development of our country, pictures the use and abuse of these resources, and traces the development of the conservation movement in the United States.

FLYNN, HARRY E., *and* PERKINS, FLOYD E. *Conservation of the Nation's Resources.* New York, The Macmillan Co., 1941. 385 p.

Covers both natural and human resources. Suitable for use as a text in the secondary schools.

FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *Forest and National Prosperity: A Reappraisal of the Forest Situation in the United States.* Miscellaneous Publication No. 668. Washington, U. S. Government Printing Office, 1948. 99 p.

Brings together in concise form content material of value in furthering an understanding of our forest resources—their use and their abuse.

——— *Some Plain Facts Abouts the Forests.* (Miscellaneous Publication No. 543), Washington, U. S. Government Printing Office, 1945. 22 p.

Spotlights and answers 17 crucial questions related to the present supply of timber, its growth in comparison to the drain, and the influence of ownership upon forest management.

——— *Know Your Watersheds.* Washington, U. S. Government Printing Office, 1948. 13 p.

Gives material basic to an understanding of what constitutes "healthy" watersheds, their strategic relation to both water supply and flood control, and means of protecting them.

FORESTRY DEPARTMENT OF THE VENEER ASSOCIATION *and* AMERICAN WALNUT MANUFACTURERS ASSOCIATION. *Forgotten Acres.* Chicago, Ill., American Walnut Manufacturers Association, 666 N. Lake Shore Drive, 1949. 36 p. Free.

Of special value for use in vocational agriculture classes or in adult education work.

GABRIELSON, IRA. *Wildlife Conservation.* New York, The Macmillan Co., 1948. 250 p.

Emphasizes the interdependence of related resources such as wildlife, grasslands, forests, soils, and water, and treats of the history, problems of restoration, preservation, and use of wildlife.

LOVERING, T. S. *Minerals in World Affairs.* New York, Prentice-Hall, Inc., 1943. 394 p.

A simplified treatment of the vital relation of metals to the economic, social, and political developments of industrial nations.

LOWDERMILK, W. C. *Conquest of the Land Through Seven Thousand Years.* Washington, Soil Conservation Service, U. S. Department of Agricultulture, 1948. 33 p. Free.

Presents the dire results of man's misuse of the earth; relates lessons learned from the Old World to present-day American problems; and points the way to an enduring pattern for occupancy of the land.

MICKEY, KARL B. *Man and the Soil.* Chicago, International Harvester Co., Public Relations Department, 1945. 110 p. Free.

Presents basic aspects of soil conservation; gives reality to the dependence of human welfare on conservation measures.

PARKER, BERTHA MORRIS. *Balance in Nature.* Evanston, Ill., Row, Peterson and Co., 1941. 36 p.

Facilitates an understanding of the intricate interrelationships in nature and the advantage of a "balance in nature." May be used in the upper elementary grades or in the junior high school.

RENNER, GEORGE T., *and* HARTLEY, WILLIAM H. *Conservation and Citizenship.* New York, D. C. Heath and Co., 1940. 367 p.

Includes both natural and human resources and emphasizes extravagant waste of resources, means of getting better utilization, and the necessity for using resources more wisely.

RHYNE, CONWAY L., *and* LORY, ELLSWORTH E. *Conservation of Natural Resources.* Columbus, Ohio, Charles E. Merrill Co., Inc., 1948. 48 p.

A text unit prepared for the Committee on Experimental Units of the North Central Association of Colleges and Secondary Schools to facilitate effective teaching of conservation in the secondary schools. Contains valuable content material, illustrations, and suggested projects and problems for action programs.

*SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *Our Remaining Land.* Washington, U. S. Government Printing Office, 1949. 12 p. Free.

Presents the evils accompanying soil erosion and the beneficial results of soil conservation practices.

——— *Soil and Water Conservation in the United States.* Washington, U. S. Department of Agriculture, 1949. 35 p. Free.

A graphically illustrated presentation in both English and French of fundamenals related to the conservation of soil and water in the United States; well-fitted for use in a program which integrates conservation in language arts and other existing subject areas.

*——— U. S. DEPARTMENT OF AGRICULTURE. *Use the Land and Save the Soil.* Washington, U. S. Government Printing Office, 1949. 16 p. Free.

Discusses basic questions related to soil and water conservation and explains how the Soil Conservation Service helps farmers and landowners.

TENNESSEE VALLEY AUTHORITY. *Soil—The Nation's Basic Heritage.* Washington, U. S. Government Printing Office, [no date.] 60 p.

Graphically pictures what is happening to the country's farm lands in the Tennessee Valley and describes some present practices designed to further the conservation of soil and the restoration of its fertility.

UNIVERSITY OF CHICAGO ROUND TABLE. *National Resources: Progress and Poverty.* Chicago, University of Chicago Press, 1949. 16 p.

An NBC radio discussion by Edward Ackerman, William Vogt, and Gilbert White who relate President Truman's program of aid to underdeveloped areas to current problems of resource-use, population pressure, and conservation needs.

WALES, H. BASIL, *and* LATHROP, H. O. *Conservation of Natural Resources.* Chicago, Laurel Book Co., 1944. 554 p.

Designed to serve as a text for a special course in conservation in the junior or senior high school work. Provides a comprehensive treatment of essential areas of conservation.

WISCONSIN STATE DEPARTMENT OF PUBLIC INSTRUCTION. *Guide to Conservation Education.* Madison, Wis., Cooperative Educational Planning Program, Office of Superintendent of Public Instruction, 1949. 96 p. Free.

Designed mainly for use in Wisconsin schools, but contains materials of value to teachers in any region.

Selected References for Teachers

ARTICLES

BARTON, THOMAS F. High-School Conservation. *Journal of Geography,* 47:81–92, March 1948.

Explains how geography departments can promote high-school conservation education. Gives suitable approaches to conservation education and a bibliography of valuable materials.

——— Conservation Education. *Education,* 69:41–48, September 1948.

Describes the major bottlenecks in conservation education, their cause, and how to eradicate them; analyses handicaps confronting teachers; and suggests six important steps in presenting a conservation problem.

BAILEY, FRED. Six Inches from Starvation. *The American,* p. 50–51, 146–148, May 1948.

Graphically relates the disquieting results of soil impoverishment to deficiencies in plant and animal life and to impairment of human welfare.

CARTER, VERNON GILL. Conservation—Or Else! *The Clearing House,* 23:387–91, March 1949.

A vigorous plea for the introduction of conservation education in the schools.

——— Guideposts to Teaching Conservation. *NEA Journal*, 33:184–85, November, 1944.

Sets forth 10 noteworthy goals or guideposts to aid teachers in implementing effective conservation education.

CLAYTON, A. S. What Conservation Attitudes Should We Teach? *Progressive Education*, 27:10–12, October 1949.

Offers a new orientation for education in the wise use of our resources.

DAHLBERG, E. M. The Value of Field Experiences in Conservation Education. *The American Biology Teachers*, 11:124–26, May 1949.

Relates field experiences to enriched programs in conservation education and to increased efficiency in vocational guidance.

ECKELBERRY, R. H., *and* JOHNSON, CARL S. Conservation Education in the Schools. *Journal of Soil and Water Conservation*, 4:74–76, April 1949.

Suggests principles and criteria for the development of effective conservation programs; stresses the importance of relating the education program to the major problems of life—health, citizenship, family living, conservation, and others; and discusses desirable contributions of the lay citizens to the conservation program.

HARTLEY, W. H. Illustrative Materials for Conservation Education: Lesson I, Pictures, Charts, and Posters; Lesson II, Slides; Lesson III, Filmstrips; Lesson IV, Objects, Specimens, Models; Lesson V, Maps; Lesson VI; Motion Pictures. *Journal of Geography*, 41:288–95, November 1942; 41:332–35, November 1942; 42:33–37, January 1943; 42:59–61, February 1943; 42:108–11, March 1943; 42:153–57, April 1943.

A series of articles with bibliographies of source materials.

HATCHER, HALENE. Conservation Education or Tragedy. *Journal of Geography*, 48:20–27, January 1949.

Stresses the need for initiating better resource-use practices; describes essential aspects of a sound conservation program; and shows the relation of conservation education to the total program.

LATHROP, HARRY O. An Experiment in Conservation Education. *Journal of Geography*, 46:96–100, March 1947.

Describes a program designed to give special in-service training to teachers in the field of conservation.

MATTISON, CHARLES W. Forest Conservation. *NEA Journal*, 37:452–53, October 1948.

Outlines the objectives of forest conservation education and stresses the necessity of correlating the teaching of forest conservation with that of other resources such as soils, water, wildlife, etc.

REITZ, WILLIAM W. Teaching Resource Conservation Through Geography. *Journal of Geography*, 46:227–34, September 1947.

Explains ways in which geography can function effectively to further conservation education.

RENNER, GEORGE T. Teach Americans to Conserve Resources. *The Phi Delta Kappan*, 31:163–67, December 1949.

A concise analysis of the appalling waste of resources and of the needs for redirecting education so that "Mr. Average American" will understand and will be concerned about the source of wealth rather than the mere process by which goods are obtained. Presents conservation of natural and human resources as one of the greatest of our enduring tasks, and points out new ideas and attitudes requisite to a sound program of action based upon careful, long-range planning.

——— *and* STEELE, WILLIAM C. Conservation—An Educational Challenge. *Progressive Education*, 27:5–9, October 1949.

Examines the security of our national existence in the light of our dwindling resources, advocates a thorough-going program of re-education of our people, and briefly outlines essentials of a national program of education for the wise use of resources.

SEARS, PAUL B. Teaching Ecological Relationships Through Biological Field Trips. *The American Biology Teacher*, 8:101–104, February 1946.

Evaluates field work as a method of studying interrelations between man and his en-

vironment and gives practical suggestions for planning and conducting field trips.

WHITAKER, JOE RUSSELL. The Place of Geography in the Social Studies: From the Viewpoint of Conservation Education. *Journal of Geography*, 42:12–21, January 1943.

A comprehensive treatise of the geographic approach to the conservation problem, the opportunities afforded by the geography courses, the objectives in conservation education, and guiding principles in teaching conservation.

——— World View of Destruction and Conservation of Natural Resources. Association of American Geographers, *Annals*, 30:143–62, September 1940.

Traces the history of thought on resource destruction and conservation from a world point of view within the last century.

AUDIO-VISUAL AIDS

BUREAU OF MINES, U. S. DEPARTMENT OF THE INTERIOR, *Motion Picture Films*. Washington, the Bureau, 1949. 42 p. Free.

An annotated list of films available on loan from the Bureau of Mines.

FISH AND WILDLIFE SERVICE, U. S. DEPARTMENT OF THE INTERIOR. *Fishery Motion Pictures*. Washington, the Service, 1949. Fishery Leaflet 255. 8 p. Free.

A list of available educational motion pictures closely related to commercial fishery operations. Most of the films are 16mm sound motion pictures which may be borrowed free of charge upon request.

FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *Forest Service Films*. Washington, the Service, 1949. 14 p. Free.

Provides general information relative to the place and the method for making application for loan and gives an annotated listing of the available Forest Service films.

——— U. S. DEPARTMENT OF AGRICULTURE, *and* NEW YORK CITY BOARD OF EDUCATION. *Bill Scott—Forest Ranger*. Washington, the Service, First Series, 1949. 52 p. Free. Second Series, 1949. 52 p. Free.

Radio scripts so written as to be adaptable for use in any section of the country. Transcriptions are available on loan from the U.S. Forest Service or the Office of Education, Washington, D. C., to schools, radio stations, and conservation study groups. They are designed for "playback" equipment adapted to 33⅓ RPM and are not suited to normal phonograph speed of 78 RPM. In ordering be sure to specify "first" or "second" series.

SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *Motion Pictures and Slide Films on Soil and Water Conservation*. Washington, the Service, 1949. 16 p. Free.

Briefly describes each film listed; evaluates it as to suitability for various types of audiences and different levels of work; indicates the sources from which films may be obtained; and classifies them according to the following four main groups: films produced by the Soil Conservation Service, films produced by other government agencies, foreign films, and slidefilms produced by the U.S. Department of Agriculture.

——— *Teacher's Set of Kodaslide Duplicates*. Washington, the Service.

A set of 45 2" x 2" transparencies accompanied by a lecture outline, "Soil Conservation Practices." The set is available to schools on loan or by purchase for 15 cents a slide.

UNITED NATIONS EDUCATIONAL, SCIENTIFIC AND CULTURAL ORGANIZATION. *An International Index of Films on the Conservation and Utilization of Resources*. 405 East 42d Street, New York Office, UNESCO, August 1949. 175 p. Free.

A comprehensive bibliography designed to stimulate international distribution of the more useful films in resource fields.

BIBLIOGRAPHIES

BUREAU OF RECLAMATION, U. S. DEPARTMENT OF THE INTERIOR. *List of Publications*. Washington, the Bureau, 1949. 6 p. Free.

Listing of publications, pictures, and exhibits many of which are of value for classroom use.

CLAY, ELEANOR W., *Comp. List of Available Publications of the United States Department of Agriculture.* (Miscellaneous Publication No. 60). Washington, U. S. Government Printing Office, 1948. 187 p. Free.

A list of materials, many of which may be used in implementing effective conservation at all levels of learning.

*FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *Materials To Help Teach Forest Conservation*, K–28. Washington, U. S. Government Printing Office, 1949. 5 p. Free.

Annotations include materials related to curriculum building, audio-visual aids, bulletins, teaching outlines, brief pamphlets, etc.

HATCHER, HALENE. *Selected References for the Teaching of Geography and Conservation.* I, Philosophy and Goals; II, Programs and Procedures; III, Audio-Visual Aids; IV, Inexpensive Teaching Materials; V, A Bibliography of Bibliographies. Washington, Office of Education, Federal Security Agency, 1949. 4 p. (each bibliography). Circular No. 310. Free.

A series of bibliographies, the first three of which contain annotations of recent periodical materials dealing with objectives, methods and techniques of instruction, units of study, etc.; the fourth includes annotations of free or inexpensive materials of value in vitalizing the teaching of geography and conservation; the fifth gives annotations of recent bibliographies.

——— *Selected References on Conservation.* Washington, Office of Education, Federal Security Agency, 1948. 2 p. Free.

A selected list of conservation materials classified according to references for elementary schools, for secondary schools, and for teachers.

JORGENSEN, ARTHUR W. *Current and Selected References on Conservation.* Madison, Wis., Conservation Department, 1949. 15 p. Free.

An annotated listing of recent materials arranged according to those best suited for teachers and for pupils at the early elementary, the intermediate elementary and the high-school levels.

NATIONAL COMMITTEE ON POLICIES IN CONSERVATION EDUCATION *and* OFFICE OF EDUCATION. *Some Selected References on Conservation for Pupils and Teachers.* Washington, Office of Education, Federal Security Agency, 1949. 6 p. (Circular No. 307.) Free.

A list of materials classified according to general references and special area references for the early elementary, the intermediate, and the high-school levels with a list of professional materials for teachers.

SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *Available Publications of the Soil Conservation Service.* Washington, the Service, 1948. 10 p. Free.

Contains references to many bulletins, miscellaneous publications, conservation charts, circulars, and conservation educational materials of value to teachers of conservation.

——— *Bibliography—Available Literature on Conservation for Schools.* Washington, the Service, [no date.] 16 p. Conservation Education Report No. 4. Free.

Gives detailed annotations of books and pamphlets suitable for use as texts, references, and supplementary readers on the elementary and secondary levels.

TANKSLEY, MARY ANN. *Your Region's Resources.* Nashville, Tenn., Regional Materials Service, George Peabody College for Teachers, 1947. 149 p.

An annotated bibliography of materials related especially to resources of the Southern States.

VIRGINIA STATE BOARD OF EDUCATION. *The Conservation of Natural Resources—A Bibliography.* Richmond, Va., State Board of Education, 1945. 93 p. Free.

Contains two major divisions: Section I dealing with audio-visual aids and printed materials grouped into reading levels, for the high school, the intermediate grades, and the primary grades and a block of materials for teachers; and Section II listing materials according to a number of topics definitely related to conservation and resource use.

BOOKS

ASSOCIATION FOR SUPERVISION AND CURRICULUM DEVELOPMENT. *Large Was Our Bounty: Natural Resources and the Schools*, 1948 Yearbook. Washington, D. C., ASCD, National Education Association, 1948. 216 p.

Provides background material for implementing better understanding and wiser use of our natural resources, suggests some guides for action, and points to forward-looking practices in particular schools.

BEARD, WARD. *Teaching Conservation.* Washington, D. C., American Forestry Association, 1948. 144 p.

Sets forth proper concepts of conservation and contains materials of value to those attempting to make effective teaching of conservation a reality.

BENNETT, HUGH H. *Elements of Soil Conservation.* New York, McGraw-Hill Book Co., Inc., 1947. 406 p.

Deals with the important aspects of our Nation's problem of soil wastage and presents methods for conserving the soil.

CARTER, VERNON G. *Man on the Landscape.* Washington, D. C., National Wildlife Federation, 1949. 129 p.

A treatment of the relation of man's activities to the complex interrelationships existing among the elements of his physical environment.

DEPARTMENT OF STATE. *Proceedings of the Inter-American Conference on Conservation of Renewable Natural Resources, Denver, Colorado, September 7–20, 1948.* Washington, U. S. Government Printing Office, 1949. 782 p. (Publication 3382).

A valuable compilation of conference proceedings with papers arranged according to the following program sections: Section I, Human Populations and Productive Capacity of the Land; Section II, Renewable Resources and International Relations; Section III, Land Use and the Social Sciences; Section IV, the Dynamics of Renewable Resources; Section V, Education in Conservation Dynamics; Section VI, Making Conservation Effective.

FUNDERBURK, ROBERT STEELE. *The History of Conservation Education in the United States.* Nashville, Tenn., George Peabody College for Teachers, 1948. 151 p.

Traces the development of conservation education as relates both to natural and human resources in the schools and colleges of the United States.

GRAHAM, EDWARD. *Land and Wildlife.* New York, Oxford University Press, 1947. 232 p.

Shows the relation between wise land use practices and improved permanent environs for wildlife. Offers suggestions for restoring nonproductive wastelands into areas enriched in esthetic and recreational values and endowed with native wildlife.

——— *Natural Principles of Land Use.* New York, Oxford University Press, 1944. 274 p.

A practical and comprehensive treatment of wise land-use practices and desirable measures for soil and water conservation; a useful reference tool for teachers.

GUSTAFSON, A. F. *Using and Managing Soils.* New York, McGraw-Hill Book Co., Inc., 1948. 420 p.

Basic information and practical suggestions on using and wisely managing soils.

NEW YORK HERALD TRIBUNE. *Our Imperiled Resources.* New York, New York Herald Tribune, Inc., 1948. 247 p.

A compilation of papers given at the *New York Herald Tribune* Forum in October 1948.

ORDWAY, SAMUEL H. *A Conservation Handbook.* New York, The Conservation Foundation, 1949. 76 p.

Presents in simple form basic terms, concepts, and practices commonly used in conservation of renewable resources.

OSBORN, FAIRFIELD. *Our Plundered Planet.* Boston, Little, Brown and Co., 1948. 217 p.

Points out the effects of man's misuse of the earth and presents basic information to deepen the understanding of man's conflict with nature and the evitable consequence.

PARKINS, ALMON E., *and* WHITAKER, J. RUSSELL. *Our Natural Resources and Their Conservation.* New York, John Wiley and Sons, Inc., 1939. 647 p.

A college text designed to provide a general survey of the field of conservation—the principles, problems, and philosophical background—and to give a balanced, concrete view of resources and problems in their ecological setting. Valuable as a reference tool for teachers of conservation.

PINCHOT, GIFFORD. *Breaking New Ground.* New York, Harcourt Brace Co., 1947. 522 p.

An autobiography tracing the evolution of practical forestry in America and showing how the movement for the conservation of natural resources stemmed from these early developments in forestry.

RENNER, GEORGE T. *Conservation of National Resources: An Educational Approach to the Problem.* New York, John Wiley and Sons, Inc., 1942. 228 p.

Reviews evidences of resource waste in America, makes a forcible argument for an effective educational attack upon this basic problem of our Nation, and provides material for teachers of conservation at all levels of learning.

SEARS, PAUL B. *Deserts on the March.* Norman, Okla., University of Oklahoma Press, 1947. 178 p.

Deals with the despoliation of our natural resources and points out means by which the forces of deterioration may be arrested.

VAN HISE, CHARLES R.; HAVEMEYER, LOOMIS; *and others. Conservation of Our Natural Resources.* New York, The Macmillan Co., 1936. 551 p.

A comprehensive presentation of basic principles of value in enriching and in broadening the teacher's understanding of conservation and of problems related to water, soil, forests, mineral, wildlife, and human resources. Though the quantitative data are outmoded, this volume—long used as a college text—gives reliable and authoritative background material for teachers and curriculum makers.

VOGT, WILLIAM. *Road to Survival.* New York, William Sloan Associates, Inc., 1948. 335 p.

A revelation of the consequences of man's conquest of nature, a clarification of pertinent relationships between man and his environment, and a treatment of the requisites to sound ecological health of the world.

WHITAKER, JOE RUSSELL. *The Life and Death of the Land.* Nashville, Tenn., George Peabody College Press, 1946. 118 p.

Ten essays arranged into three groups: the challenging problems related to the "life and death of the land," the geographical approach to conservation education, and the history and theory of conservation.

CHARTS AND MAPS

*FOREST SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *What We Get From Trees,* M–5293. Washington, U. S. Government Printing Office, 1946. Free.

A chart available in two sizes: small, black and white, 11" x 16", suitable for individual use; large, 28" x 48", in four colors, designed to depict graphically the manifold products derived from trees.

*——— *How a Tree Grows.* Washington, U. S. Government Printing Office, 1949. Free.

A chart, 16" x 21", in four colors, for use in teaching a forest conservation unit at the secondary level.

*——— *Forest Trees and Forest Regions.* Washington, U. S. Government Printing Office, [no date]. Free.

An 18" x 24" chart showing forest regions and listing principal trees of each. For use in intermediate grades and in secondary school.

*——— *U. S. National Forests.* Washington, U. S. Government Printing Office, 1940. Free.

An 11" x 17" map in 4 colors presenting national forests and national parks.

SOIL CONSERVATION SERVICE, U. S. DEPARTMENT OF AGRICULTURE. *Generalized Map of Soil Erosion in the United States.* Washington, U. S. Government Printing Office, 1948. Free.

A 18" x 21" map in four colors. Shows areas with severe erosion, with moderate, and with slight or no erosion.

——— *Soil Conservation Charts.* No. I, Soil Conservation Service and Soil Conservation Districts Cooperating; No. II, Why Soil Conservation Districts Succeed; No. III, Energy through Conservation from Soil to Table; No. IV, Grasses—for Feed, and for Soil, and Water Conservation. Washington, U. S. Government Printing Office, 1949. Free.

A series of charts, 19" x 24", of value in both the intermediate and secondary levels.

PAMPHLETS AND UNITS

BATHURST, EFFIE G. *Curriculum Content in Conservation for Elementary Schools.* Washington, U. S. Government Printing Office, 1940. (U. S. Office of Education, Federal Security Agency, Bulletin 1939, No. 14.) 79 p.

Examines conservation problems in the school program, significant aspects of conservation, nature and scope of activities, areas of curriculum content as relates to wildlife, mineral resources, water, forests, soils, and other resources.

DARLING, J. N. *Poverty or Conservation.* Washington, D. C., National Wildlife Federation, [no date.] 30 p.

Presents vital issues of the conservation problems and points to education in conservation as a requisite to successful programs of action.

FARLEY, EDGAR S. *Save Our Soil—A Resource Unit on Soil Conservation for High School Teachers.* Lincoln, Nebr., Division of Supervision and Curriculum, Nebraska Department of Public Instruction, 1949. 34 p. Free.

Directs attention to vital issues related to soil conservation, suggests suitable learning experiences to aid pupils in gaining desired understanding, and lists references.

FRANK, BERNARD, *and* BETTS, CLIFFORD A. *Water and Our Forests.* Washington, D. C., Forest Service, U. S. Department of Agriculture, 1946. 29 p. (Miscellaneous Publication No. 600.) Free.

Gives basic content material which shows the relationship between well-managed, forest-covered watersheds and the regulation and maintenance of the flow and quality of the water.

GILLE, ALAIN. *Education for the Conservation and More Efficient Use of Natural Resources.* 405 East 42d Street, New York Office, UNESCO, 1949. 115 p. Free.

A study based upon an inquiry made in 31 countries to determine in each the role of education in effecting conservation practices and the methods used for encouraging the protection and more efficient use of natural resources.

GUSTAFSON, A. F.; GUISE, C. H.; HAMILTON, W. J. *Jr.*; *and* RIES, H. *Conservation in the United States.* Ithaca, N. Y., Comstock Publishing Co., 1949. 534 p.

A college textbook of value as a basic reference volume for all teachers of conservation.

HOLLISTER, GEORGE E., *and* STERNIG, JOHN. *Instructional Units in Conservation For Elementary Schools.* Laramie, Wyo., The Bureau of Educational Research and Service Bulletins, College of Education, 1949. 40 p.

Four units—I, Soil and Water Conservation; II, Conservation of Wildlife; III, Forest Resources and Their Conservation; IV, Mineral Resources: Their Importance and Their Conservation—adapted to various teaching situations.

RAUSHENBUSH, STEPHEN. *Our Conservation Job,* Report No. 4. Washington, D. C., The Public Affairs Institute, 1949. 64 p.

Presents basic issues related to resource-use problems and analyzes a controversial method of resolving our conservation problems.

SOIL CONSERVATION SERVICE. *An Outline for Teaching Conservation in Rural Elementary Schools.* 21 p.; *An Outline for Teaching Conservation in Urban Elementary Schools.* p. 13; *An Outline for Teaching Conservation in Junior High Schools.* p. 26; *An Outline for Teaching Conservation in High Schools.* 56 p. Washington, U. S. Department of Agriculture, 1945. Free.

A series of outlines, adapted for use in any region and in various courses of study. Contains suggestions as to objectives, topics for study or discussion, activities, and references.

WALKER, ERNEST D., *and* FOSTER, ALBERT R. *This Is Our Soil.* Springfield, Ill., Department of Public Instruction, 1949. 48 p. Free.

Contains basic content material and suggested activities designed to facilitate an understanding of, an appreciation for, and an increased interest in the soil and its conservation.

WARING, P. A. *Teamwork to Save Soil and Increase Production.* Washington, U. S. Department of Agriculture, 1943. 64 p. Free.

Written with an especial appeal to farmers and designed to embody major principles by which soil conservation can be achieved. Of value for use in school-community project planning or for use in adult education work.

Sources of Materials and Aids

The teacher, on whom the effectiveness and success of vitalized conservation education depends, is too often unaware of the wealth of materials or the type of aids readily available from local or public libraries, from governmental and nongovernmental agencies, and from other organizations active in conservation. Many of the agencies and organizations included in the following listing provide invaluable documentary materials, audio-visual aids, excellent bibliographies, sample units of work, speakers, service projects, work experiences, and service for handling inquiries and loan materials. The list is by no means exhaustive, but it does provide for the teacher selected references of sources from which many types of materials and aids may be obtained.

Governmental Agencies

BUREAU OF AGRICULTURAL ECONOMICS, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Collects and disseminates agricultural statistics; acquires, analyzes, interprets, and diffuses useful economic information relative to agricultural production and distribution, land utilization, and conservation in their broad aspects; compiles, analyzes, and disseminates economic and statistical data relating to agriculture and food.

BUREAU OF AGRICULTURAL AND INDUSTRIAL CHEMISTRY, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Conducts investigations and experiments on problems related to the conservation and industrial utilization of agricultural commodities and seeks to develop new and more adequate uses for agricultural products through research in chemistry, physics, and related sciences.

BUREAU OF HUMAN NUTRITION AND HOME ECONOMICS, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

Conducts research designed to aid families to make the best use of their resources so as to obtain the best returns in health and enriched living.

BUREAU OF INDIAN AFFAIRS, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Provides agricultural and industrial guidance for the conservation and improvement of the land through planned land-use, irrigation, erosion control, forestry management, and the development of natural resources. Provides a general health program and works for the economic, educational, social, and civic advancement of the Indians.

BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Responsible for surveying, managing, and disposing of public lands and their resources and for administering the mining and mineral leasing laws and the Taylor Grazing Act.

BUREAU OF MINES, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Responsible for making studies of economic problems affecting the mineral industries; for collecting and publishing data concerning mineral production in the United States; and for investigating the methods and the utilization and preparation of mineral substances as related to improving the working conditions of the miners and to preventing waste through increased efficiency.

BUREAU OF RECLAMATION, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Promotes the development of agricultural and industrial economics; constructs and operates multiple-purpose projects providing water for irrigation, hydroelectric energy, control of floods, aids to navigation, water for domestic and industrial uses, and other purposes.

EXTENSION SERVICE, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
Provides leadership in all general educational programs of the Department for various action agencies and makes available to farmers, farm homemakers, and rural youth the results of research related to local farm and home conditions.

FEDERAL POWER COMMISSION, WASHINGTON, D. C.
Administers the Federal Power Act, regulates interstate sale of natural gas, conducts general investigations related to power resources.

FISH AND WILDLIFE SERVICE, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Promotes the conservation of wildlife; administers federal wildlife conservation laws; acquires and maintains game refuges and preserves; engages in research on wildlife; furthers the extension of wise management and utilization of fishery resources of the Nation; directs the propagation, salvaging, and distribution of food fishes to suitable waters; examines the methods of the fisheries and utilization of fishery products; conducts investigations and compiles data on the fisheries; and administers the fisheries of Alaska, the black bass, the whaling treaty acts, and the act authorizing fishery cooperatives.

FOREST SERVICE, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
Charged with the responsibility for promoting the conservation and wise use of the Nation's forest lands, including, among other things, the general administration of the national forests; cooperating in programs for the protection and improved management of State and private forest lands; and conducting research in forest management, watershed protection, and utilization of forest products.

GEOLOGIC SURVEY, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Carefully examines and classifies public lands as to their potentialities for mineral development and water power utilization; conducts investigations to determine the distribution, quantity, quality, and availability of

mineral resources and water supplies in the United States; studies the problem of water power development for public use; and supervises oil, gas, and mining operations on public lands included in prospecting permits and leases under mineral leasing laws.

NATIONAL FOREST RESERVATION COMMISSION, WAHINGTON, D. C.
Determines policies and approves programs for federal purchase of forest lands for the protection of watersheds, regulation of streamflow, and other national forest purposes.

NATIONAL PARK SERVICE, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Charged with the responsibility of administering the national parks and monuments, of protecting and preserving their values for all generations, of utilizing them to the best advantage for recreation, and of cooperating with regional and State planning boards and conservation agencies.

OFFICE OF EDUCATION, FEDERAL SECURITY AGENCY, WASHINGTON, D. C.
Maintains cooperative relations with schools at all levels of learning in the United States and with international, national, regional, and State groups seeking to effect vitalized programs of conservation education. Conducts research, advisory, and informational services on all matters concerned with education, including conservation education.

OFFICE OF LAND UTILIZATION, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Responsible for coordinating and integrating the land-classification, land-use and management activities of the Department and for maintaining cooperative relations with federal, State, and private agencies in the protection and wise use of public lands of the United States and Alaska.

OIL AND GAS DIVISION, DEPARTMENT OF THE INTERIOR, WASHINGTON, D. C.
Charged with coordinating and unifying federal policies on the conservation of oil and gas; with considering and recommending necessary steps to safeguard our petroleum future; and with administering the Connally Law, prohibiting the shipment in both interstate and foreign commerce of petroleum or its products produced in violation of State law.

PRODUCTION AND MARKETING ADMINISTRATION, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
By working through committees composed of cooperating farmers, this agency carries out certain provisions of the Soil Conservation and Domestic Allotment Act, as amended, authorizing payments to agricultural producers for voluntary participation in programs designed to use wisely the national resources; to check the loss of soil fertility; to preserve, maintain, and rebuild the farm and ranch land resources; and to better appreciably the purchasing power of the farmers.

SOIL CONSERVATION SERVICE, DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.
Aids in effecting desirable adjustments in land use designed to better human welfare, conserve natural resources, establish a permanent, balanced agriculture, and reduce the hazards of floods and sedimentation; prepares valuable teaching aids to help implement effective conservation education programs; develops a well-rounded, coordinated program of soil and water conservation and land use; cooperates with the soil conservation districts; and conducts research in soil and water conservation.

TENNESSEE VALLEY AUTHORITY, KNOXVILLE, TENN.
Responsible for the adoption of improved practices relative to the protection of the Tennessee River watershed and to the development and

wise utilization of its soil, forests, fish and wildlife resources; responsible for surveying and planning for the most appropriate use of land and other natural resources for the ultimate benefit of the general social and economic well-being of the people in the Valley.

WATER RESOURCES POLICY COMMISSION, WASHINGTON, D. C.
A recently organized commission to aid in formulating a sound comprehensive water resources policy along lines which will enable such resources to make their maximum contribution to the long range development of the country's economic life.

Nongovernmental Agencies and Organizations

AMERICAN FORESTRY ASSOCIATION, WASHINGTON, D. C.
Publishes *American Forest*, a monthly magazine, and numerous other materials, designed to implement effective, Nation-wide conservation education. Treats mainly of renewable resources, especially of those closely related to forests.

AMERICAN NATURE ASSOCIATION, WASHINGTON, D. C.
Prepares books and other materials to stimulate public interest in various phases of nature and publishes *Nature Magazine*.

AMERICAN TREE ASSOCIATION, WASHINGTON, D. C.
Encourages conservation through the publication of books, bulletins, and other materials on forestry.

BOY SCOUTS OF AMERICA, NATIONAL OFFICE, 2 PARK AVENUE, NEW YORK, N. Y.
Encourages activity programs related to the conservation of selected resources.

CAMP FIRE GIRLS, INC., 41 UNION SQUARE, NEW YORK, N. Y.
Promotes conservation in many of its activity programs.

CONSERVATION FOUNDATION, NEW YORK, N. Y.
Produces aids including *Conservation Handbook* and the Living Earth Series which includes four films, Birth of the Soil, This Vital Earth, Arteries of Life, and Seeds of Destruction, all of which graphically explain with scientific accuracy the essential links in the "chain of life", the story of basic interrelationships, the urgency and need for conservation, and the tragic results if the links in the chain are broken. Gives impetus for effecting public conservation consciousness by providing speakers and leaders for conferences, forums, seminars, workshop sessions, and other groups.

EDUCATIONAL CONSERVATION SOCIETY, WOODSIDE, LONG ISLAND, N. Y.
Promotes the vitalizing of conservation education in schools.

FRIENDS OF THE LAND, 1638 NORTH HIGH STREET, COLUMBUS, OHIO.
Promotes an active program to develop understanding of wise land-use. Publishes a quarterly magazine, *The Land*; the Land Letter, a frequent supplement to *The Land*; and other conservation materials.

GARDEN CLUB OF AMERICA, CONSERVATION COMMITTEE, 15 EAST 58TH STREET, NEW YORK 22, N. Y.
Distributes conservation education materials, prepares for school use data on various phases of conservation, and cooperates with organizations and agencies engaged in developing conservation programs.

IZAAK WALTON LEAGUE OF AMERICA, INC., CHICAGO, ILL.

Publishes *Outdoor America*; prepares and distributes materials on woods, waters, and wildlife; and seeks to enlist the interest and support of sportsmen and others in the cause of conservation.

NATIONAL COMMITTEE ON POLICIES IN CONSERVATION EDUCATION, 31 NORTH STATE STREET, CHICAGO 2, ILL.

Prepares and disseminates specific suggestions for the development of curriculums in teacher-training institutions; examines available teaching materials and compiles bibliographies and other invaluable aids for teachers; formulates plans for state or regional in-service, teacher-training workshops designed to equip teachers for effective teaching of conservation of natural resources and for serving as leaders in local teacher-education programs; and promotes the development of programs of local action.

NATIONAL PARKS ASSOCIATION, WASHINGTON, D. C.

Publishes *National Parks Magazine* and other materials designed to further the protection and wise development of national parks.

NATIONAL WILDLIFE FEDERATION, WASHINGTON, D. C.

Maintains information service through the semi-monthly publication of *Conservation News* and the more frequent publication of *Conservation Report*; publishes *My Land and Your Land Conservation Series* for the elementary grades; and distributes other valuable teaching aids.

WILDERNESS SOCIETY, 1840 MINTWOOD PLACE, WASHINGTON, D. C.

Publishes *The Living Wilderness* and contributes toward the protection and preservation of remaining wilderness on State and private lands lacking governmental protection.

WILD FLOWER PRESERVATION SOCIETY, 3740 OLIVER STREET, WASHINGTON, D. C.

Prepares and distributes information and materials on the preservation of wild flowers.

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