

TEACHING CONSERVATION IN ELEMENTARY SCHOOLS

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FOREWORD

That which legislation many times fails to accomplish with adults, organized public education achieves through children. There is no better way, and perhaps no other way, to save the Nation's natural resources from three centuries of ruthless exploitation than by a program of adequate instruction in the Nation's schools. Children cannot begin too young to be active conservationists.

The purpose of this bulletin is to aid teachers in the selection, adaptation, and organization of materials for the teaching of conservation in grades 1 to 7 or 8. The bulletin is one of several publications by the United States Office of Education in the field of curriculum materials for conservation education. Others deal with the present status of conservation education and with curriculum content in the field of conservation. They include annotated sources of information in the way of books, bulletins, and auditory, visual, and other supplementary aids.

The United States Office of Education is indebted to many Federal Government agencies for their helpful cooperation in supplying information and material of value in the development of this bulletin. Among these agencies are the Bureau of Mines, the Geological Survey, the Division of Civilian Conservation Corps, Education, the National Resources Committee, the Reclamation Service, the National Park Service, the General Land Office, the Soil Conservation Service, the Bureau of Biological Survey, the Agricultural Adjustment Administration, the Forest Service, and the Bureau of Fisheries. We express appreciation to them for their assistance. We also appreciate the use of illustrations supplied for the most part by the Bureau of Biological Survey, the Forest Service, the Farm Security Administration, and the Soil Conservation Service and by divisions of the United States Department of the Interior. We are particularly grateful to Irving Brant and Carl R. Dion of the National Park Service for reading the manuscript and checking its factual accuracy.

BESS GOODYKOONTZ,
Assistant U. S. Commissioner of Education.

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TEACHING CONSERVATION IN ELEMENTARY SCHOOLS

ORGANIZATION OF CONTENT

Studies¹ in the teaching of conservation indicate the need for a Nation-wide program of conservation education to establish a more prudent use of the earth's resources. The goal of such a program is the development of social groups and individual citizens with attitudes and habits that make conservation a way of living.² The United States no longer has the rich resources which early settlers found here. More than four-fifths of the forests have been cut. It is estimated that 15 million acres of soils once tilled have been totally destroyed by erosion and that more than 800 million tons of soil annually are carried to the oceans, a complete loss.³

Wildlife is rapidly decreasing with resulting danger to the human population. For example, the reduction in the number of birds has resulted in a great increase in insect populations, a direct threat to human life. This danger is in addition to the loss in enjoyment and appreciation realized by study and observation of our feathered friends. The reduction of animal groups is also seriously upsetting the balance of nature. The American bison was nearly exterminated by wasteful slaughter. Among the animals that have been exterminated are the passenger pigeon, heath hen, great auk, and California grizzly bear.⁴ Certain varieties of wild flowers and many kinds of birds and wild animals have disappeared or become very rare.

¹ Bristow, William H., and Cook, Katherine M. Conservation in the education program. U. S. Department of the Interior, Office of Education. Bulletin 1937, no. 4. p. 7-9.

² Bode defines a way of life as "A comprehensive plan for the organization of both individual and collective conduct." Bode, Boyd H., Democracy as way of life. New York, The Macmillan Company, 1937. p. 7.

³ Van Hise, C. R., Havemeyer, Loomis, and others. Conservation of our natural resources. Rev. ed., edited by Loomis, Havemeyer, and others, based on Van Hise's Conservation of natural resources in the United States. New York, The Macmillan Co., 1937. p. 361, 363.

⁴ U. S. Department of the Interior, National Park Service. Fauna of the National parks of the United States. (Fauna series, no. 1). 1935.

TEACHING CONSERVATION

The liquid oil supply from known sources may not last more than 15 years. Some coal mines have been worked out. In the long run the unwise exploitation of any resource will result in lowered standards of living. Iron is wasted when it could be saved. Some coal mines and oil fields have been exhausted.

This country is still one of the world's richest, but the warning has come. The people must save and use more wisely the resources that remain, or lose their heritage. Consequently, activities of conservation should be included in every child's education at the earliest age at which he can participate. They should be introduced into the school curriculum whenever appropriate situations arise.

Not facts alone, but methods of teaching and organization of curricular materials are considerations in conservation education. The curriculum content of conservation, when effectively organized and correctly taught, is varied and interesting. It contributes to the development of character and to the improvement of human welfare, and comprises social problems which children must understand and help solve. It is more than a body of scientific knowledge, such as is the content of botany, biology, or nature study. It includes also activities which are used in normal living. For example, through lessons in nature study, a child learns to identify birds and to know their habits; with the acquisition of such knowledge, the objective of the subject is normally fulfilled. In the study of conservation on the other hand, while a knowledge of the characteristics and habits of birds is useful, it is not an ultimate aim. Instead it is a step toward more important achievements, the protection of birds, and, through appreciation and enjoyment of them, a more abundant life. Not knowledge alone but enriched living is the goal of instruction in conservation. Such instruction has been attempted by different methods and plans of organization: By integrating conservation with certain aspects of existing programs; by introducing it as a separate subject; by treating it as a series of topics in one or more of the social studies; or by teaching it through activity or experience units related to or independent of other subjects or activities.

This bulletin deals with the organization of material concerning conservation and ways of teaching it. No section is intended to be an exhaustive treatment. The material is flexible and therefore should be of help to teachers in various sections of the country. The suggestions should not be followed without regard

for the particular environment in which they will be used. City children, for example, cannot study natural resources in exactly the same way as children in farming communities. Many such or similar adaptations are indicated.

Suggestions are given for helping children learn more about conservation of soil as an example of one approach to the study of conservation, beginning with situations or experiences which are more or less common and familiar, gradually leading to new problems and lines of growth.

The choice of soil erosion for treatment in this bulletin should not be interpreted to mean that this is the most important phase of conservation. Rather it was selected for illustrative purposes because of the presence of soil erosion in practically every locality and the subsequent easy access of all pupils to actual examples of it for observation and study. The acuteness of the Nation's wildlife problems, forest destruction, unregulated oil exploitation, and other phases of conservation all demand attention.

It is expected that teachers will make their own plans for treatment of these and other conservation topics. The suggestions given for teaching soil conservation are designed to be applicable in their preparation.

Content is outlined flexibly with consideration for only general differences among children's interests and abilities at different

SILD AT BOTTOM OF CORNFIELD.



grade levels. Supplementary information about the conservation of soil in the appendix is written in line with the general idea of proceeding from the known to the unknown. For example, the reader's attention is directed to effects of erosion in the home community first, and then to problems of erosion in the United States and in the rest of the world. This summary of significant facts and concepts gives the teacher an organized overview of the study with ideas presented somewhat as the children will arrive at them in their study.

In the development of the bulletin the scarcity of published material for children was evident, especially with respect to the restoration and preservation of soil. Until many simple and inexpensive materials on conservation suitable for children's use are generally available, it is especially important that teachers gradually develop bibliographies of their own and build up collections of bulletins, pictures, and other inexpensive material to aid the pupils in their study. The reference list on page 85 of this bulletin illustrates the type of bibliography which teachers can build.

Other suggestive bibliographies are:

American Association for the Advancement of Science *with the cooperation of* Ench Pratt Free Library of Baltimore.

Conserving Our Natural Resources.

United States Department of the Interior, Office of Education.

Good Reference Bibliography No. 55, Conservation Education in Secondary Schools.

Good Reference Bibliography No. 70, Conservation Education in Elementary Schools.

Good Reference Bibliography No. 71, Conservation of Trees and Forests for Use in Elementary Schools.

Good Reference Bibliography No. 72, Conservation of Birds, Animals, and Wild Flowers for Use in Elementary Schools.

United States Department of the Interior, Division of Motion Pictures.

Motion Pictures.

United States Department of Agriculture, Division of Motion Pictures, Extension Service.

Motion Pictures of the United States Department of Agriculture.

PRINCIPLES OF ORGANIZATION

Conservation education cannot be confined to any one subject or field, nor limited to a single unit or a series of units. Although many subjects may be utilized for materials, and different units developed for the sake of emphasis, it is only as the concepts of

conservation are made a fundamental part of curriculum planning that the subject can be adequately treated.⁵

Divisions of content should be practicably apportioned to grades and years in loosely, not closely, organized form. There is little evidence supporting specific grade placement of items in social studies,⁶ of which conservation is frequently considered a phase. However, in developing an outline of conservation content, at least three principles are worthy of consideration, namely, flexibility, coordination, and differentiation.

Flexibility

Any plan or outline of content should be flexible enough to allow for adjustments to needs of classes and of individuals, and to unforeseen interests and incidents. Wide study of the possibilities of the content, of the needs and interests of the children to be taught, and of the materials of the community will be helpful in the development of a flexible outline. Each item included should be broad and somewhat general rather than narrow and detailed; more items should be included than can be used by any one class; the items should be varied in type and difficulty. Type of community, whether city, or country district, mining or manufacturing community, and the like, should also be considered in apportionment of content.

Coordination

There are two important principles of coordination, one respecting activities and the other respecting grades and schools. Since conservation includes not only a body of knowledge, but also a way of living, a significant consideration with respect to the teaching of conservation is that instruction be so merged with activities that children have unified experiences with flowers, birds, soil, and other natural resources. Accordingly, one principle of coordination is that *the organization of teaching material should afford opportunities for the integration of instruction with normal activities of life.* This can be met in part by an analysis of the activities in which children of a particular group normally engage and by proper adjustment of conservation content to them. Integration of school and home activities is very important

⁵ Bristow, William H., and Cook, Katherine M. Op. cit., p. 9.

⁶ National Education Association. The social studies curriculum. Department of Superintendence, Fourteenth yearbook. Washington, D. C., The Association, 1936. pp. 176-77.

Study of erosion in rural schools, for example, becomes more meaningful in connection with activities which the children carry on at home to help their parents in the control of erosion. In city schools, study of erosion can be related to items which children read in newspapers, hear discussed at home, or observe in parks or vacant lots. In forest communities, children have first-hand experiences in forests, as well as discussions at home to make practical their study of erosion in school.

A second principle applies to grades and schools in the same community. Many activities of conservation appeal to the entire school. If the eighth grade, for example, plans an excursion to study gullies, the sixth grade may wish to go along. If any grade in school plans to beautify the school ground, it is necessary for the total success of the project that all grades take part. It is also well for different schools in the same community to cooperate in activities in which all are interested, such as a community forest. Accordingly, *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.*

Differentiation Among Grades

In any school, *curriculum content should be adapted to children of different ages⁷ in such a way that they will not repeat the same work as they pass from grade to grade.* Many conservation concepts are simple enough for 5- and 6-year-olds.⁸ Very young children can learn to identify a few wild flowers, for example. They can develop a love for trees, learn to identify different trees, learn how trees grow, and why they help keep the soil from being washed away. As children grow older, they are better able to study causes than younger pupils are, and the concepts and generalizations which they develop are more complex. As they progress further, they develop increased understanding of the Nation's responsibility for a wise use of its resources and of the individual's

⁷ Organization of curriculum for one-teacher schools. Department of rural education, National Education Association, Washington, D. C., February 1933.

⁸ General principles and patterns of construction in the Texas State curriculum-revision program. The Texas curriculum-revision movement, Curriculum news bulletin no. 4, 1:8, April 1936. Reprinted in Caswell, Hollis L., and Campbell, Doak S., Readings in curriculum development, New York, American Book Co., 1937. p. 681.

SMALL GULLEYS DEEPEN WITH CONTINUED NEGLECT.

responsibility for conserving nature's richness, unimpaired, for a future generation. Again, whereas primary children for the most part are not expected to gain ideas which they cannot experience first-hand, intermediate-grade children may be expected to think about problems similar to ours in other times and in other lands. Advanced pupils may satisfy their curiosity about causes and reasons by reference to history and by comparing their own nation's problems with similar problems in other countries. Differences such as these should be met in the organization of content.

A SUGGESTED CURRICULUM PLAN

It is not an easy task to plan a program of instruction so that children will have each year a succession of fresh, interesting, and growth-promoting activities related to other experiences in the home and school. Each school must plan the type of program suited to the needs of the children. A program suitable for one school is not necessarily the type of program desirable for another school. As an example of curriculum planning for conservation study, a tentative outline is included herein. (See p. 10.)

To develop activities included in the suggested outline (pp. 10 to 18), teachers and pupils will find information (1) in texts (especially geographies, books on science, and readers); (2) in periodicals; (3) in publications of private or philanthropic agencies and local conservation groups; (4) in publications issued by State departments of education and State departments of conservation; (5) in bulletins and pamphlets issued by Federal Government agencies.

Areas of Experience and Conservation Topics

The outline is a plan for 3 years' work for each of the primary, intermediate, and advanced groups of pupils. One year's work is outlined with the home and school as an area of experience for the year. Conservation of wildlife and human life are arbitrarily suggested for this year's work in conservation. If the children's other school activities and subjects can be centered about home and school experiences, the curriculum will be better integrated than if there were no common center of interest. For example, within the home and school area of experience, primary pupils study family activities and needs; intermediate-grade pupils

study houses and building materials of different historical periods; advanced-grade pupils study problems of housing or changing ways of living with emphasis on the home. Conservation of health, safety in the home, sanitation, and the like, are conservation topics in line with home experiences. Conservation of bird and plant life is closely related to home life from the standpoint of making life more beautiful and happy and of maintaining an enjoyable means of recreation.

Another year's work is designed to be developed with farms and factories as an area of experience. The conservation studies in this year's work are soil and water. Other subjects and activities in the school can very profitably develop within the large experience areas of farms and factories, as illustrated in the outline (pp. 10-18).

Still a third year's work, with community life as an area of experience, has conservation centers in forests and mines. The children may study the community institutions in their home city, town, or county; government services in the community; agencies and groups of people organized not only to conserve the community's natural resources, but to serve the public in any way whatsoever.

FOREST AFTER A FIRE.

OUTLINE OF ILLUSTRATIVE ACTIVITIES FOR TEACHING CONSERVATION¹

		Areas of experience and suggested activities		
Grade or group	Home and school (Wildlife and human life)	Farms and factories (Soil and water)	Community life (Forests and mines)	
1				
Primary pupils (grades I, II, III).	<p>Using school equipment carefully and safely, learning how to avoid accidents, and avoiding waste.</p> <p>Crossing highways and streets at the proper time.</p> <p>Walking on the left side of road facing traffic.</p> <p>Learning how to take care of one's self:</p> <p>How to plan.</p> <p>How to keep neat and clean.</p> <p>How to save our clothes.</p> <p>Saving food at home and school.</p>	<p>Taking an excursion to learn new things about soil:</p> <p>That good soil is often darker than poorer soil in same place.</p> <p>That good soil is very mellow.</p> <p>That soil is blown by wind and washed by water.</p> <p>That soil is the top layer of the earth's surface.</p> <p>That there are two layers of soil—topsoil and subsoil.</p> <p>Planting seeds and observing—</p>	<p>Learning the names of a few common trees at home or on the school ground.</p> <p>Learning new things about common trees:</p> <p>How trees get water through their roots.</p> <p>How the surface roots hold water from running off the land.</p> <p>Taking a trip to the park:</p> <p>Seeing different kinds of trees.</p> <p>Observing flowers.</p>	

<p>Helping serve school lunch. Planting flowers or bulbs and taking proper care of them. Identifying a few common birds and learning how to keep them around the home. Identifying a few common wild flowers and planning ways to protect them. Learning how to pluck wild flowers without destroying plants. Learning which wild flowers are rare and should not be plucked. Learning about the earliest people in our community: How they had to conserve by making soap, furniture, clothes, preserves. How they built their homes. How they cared for the soil.</p>	<p>How the roots spread out in the soil. In what kind of soil the seeds grow best. How plants hold soil. Visiting a woods or park and observing the leaves, sticks, and roots in the top layer of the soil. Observing how these save the soil. Taking care of lawns and observing— What happens to grass and roots when paths are made. What happens when weather is very dry. What happens to soil where paths are made. Learning more about water: Where water comes from.</p>	<p>Helping to plant trees on the school ground. Writing labels for trees in a nature trail which the school is making. Deciding what trees to label. Collecting pictures of trees and arranging them with pictures of the same kind together. Visiting a CCC camp and observing the kind of work done there. Learning about the uses of petroleum products. Making a collection of petroleum products. Oiling playground equipment. Observing, using, and taking care of things made of iron—decks, paint, pans, scissors. Learning about the uses of iron and ways of taking care of it.</p>
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¹The basic organization of this plan was suggested by needs pointed out in the following:

- (1) Dunn, Fannie W. and Everett, Marcia. Four years in a country school. New York, Teachers College, Columbia University, 1926. pp. 7-8.
- (2) Maryland, Department of Education. Goals in social studies for primary grades, I-III, with suggestions for their achievement. Maryland school bulletin, 13: 56-57, October 1931.

- (3) Holic, James F. The cooperative group plan of organization. School and society, 31: 6-7, January 4, 1930. Reprinted in Caswell, Hollis L. and Campbell, Doak S. Op. cit., pp. 608-9.
- (4) Dunn, Fannie W. and Bathurst, Effie G. Social studies for rural schools, a tentative three-year plan for combining classes. Guide and general outline. Rev. ed. New York City. Department of rural education and Institute of school experimentation. Teachers college, Columbia University, 1938.

OUTLINE OF ILLUSTRATIVE ACTIVITIES FOR TEACHING CONSERVATION—Continued

Grade or group	Areas of experience and suggested activities		
	Home and school (Wildlife and human life)	Farms and factories (Soil and water)	Community life (Forests and mines)
Primary pupils (grades I, II, III).	Making a collection of Indian relics.	Learning more about water: Where water goes. What water does to soil. What water does to plants. Where water goes when there are no plants or trees to hold it. Finding out new things about the uses of water at home and school. Learning how to water flowers and plants properly. Learning how to keep the water from running off the school gar- den too fast. Saving water.	Learning what coal is used for.

Intermediate pupils (grades IV and V, or grades IV, V, VI).

Making things to improve homes or rooms at home.
 Helping younger pupils cross highways safely.
 Helping younger pupils use playground apparatus safely.
 Developing our health and physical vigor.
 Caring for and saving clothes.
 Choosing and developing hobbies and recreations.
 Learning ways of making the best use of time.
 Learning to identify birds in the community.
 Attracting birds about home and school ground:
 Building feeding stations.
 Providing shelters of shrubs, trees, and grass.
 Planning for bird baths.

Making a collection of different kinds of soil in the community.
 Performing experiments to learn how soil is made.
 Finding out how soil is wasted in the community.
 Consulting farmers about the ways in which the soil of the community is being conserved and renewed and why these are expected to be effective:
 Different ways of plowing.
 The building of check dams in gullies.
 The planting of trees.
 Rotating crops and planning for wise use of the land.
 Learning what happens to soil in a dust storm.
 Finding more uses for water at home and in the community.

Building a nature trail in the woods (for children who live in wooded regions).
 Identifying trees at home or in the home community in winter and summer.
 Planting trees.
 Building protection for young trees against rabbits or other animals.
 Learning about the home State's parks and forests.
 Learning more about common trees—uses, enemies, needs.
 Learning about famous trees of history.
 Helping maintain a school forest.
 Helping to organize a forestry club and participating in its activities.
 Visiting a CCC camp and observing the forestry work done there.

OUTLINE OF ILLUSTRATIVE ACTIVITIES FOR TEACHING CONSERVATION—Continued

Grade or group	Areas of experience and suggested activities		
	Home and school (Wildlife and human life)	Farms and factories (Soil and water)	Community life (Forests and mines)
Intermediate pupils (grades IV and V, or grades IV, V, VI).	<p>Attracting birds about home and school ground: Arranging separate nesting corners.</p> <p>Scattering material for nests. Protecting them from cats and thoughtless people.</p> <p>Collecting and identifying birds' nests in autumn, modeling eggs of clay for them, correct in size and color.</p> <p>Learning to identify and plan ways to protect wild flowers; not to pluck rare flowers; to pluck other flowers correctly.</p> <p>Transplanting wild flowers to home or school ground.</p>	<p>Performing experiments to learn how water gets into the clouds, and how and why it falls as rain (the water cycle).</p> <p>Studying about the school's supply of water:</p> <p>Studying about the community's supply of water.</p> <p>Location of watersheds.</p> <p>Sources and uses of underground water.</p> <p>Location of falls.</p> <p>Use of falls for power and electricity.</p> <p>Learning more about floods:</p>	<p>Making a survey of the uses and care of iron in the homes and farms of the community; of other metals; of oil and gas.</p> <p>Collecting and selling old iron in the community.</p> <p>Planning ways to conserve the iron that is now used in homes or on farms.</p> <p>Learning more about the coal and oil we use:</p> <p>How they are made.</p> <p>How they are mined.</p> <p>Waste in mining.</p>

Preparing exhibits of wild flowers such as bouquet arrangements of flowers that may be plucked, displays in empty stores, exhibits at county fairs or community flower shows.
 Making a collection of relics of early homes in our community.

Advanced pupils (grades VI, VII, VIII, or grades VII and VIII).

Surveying the housing problems of the home community such as—
 Sources of water.
 Running water in houses.
 Labor-saving equipment.
 Screening of windows and doors.
 Removal of garbage, and the like.
 Precautions for safety in the home.
 Helping to improve one's own home.

Where floods occur.
 Why there are floods.
 Results of floods in loss of soil, human life, property, fish.
 How floods can be prevented.
 Learning about lands where water is scarce.
 Learning about lands where water is very plentiful.

Getting acquainted with representatives of the agencies that help conserve the soil in the community, and learning about their work.
 Small groups of farmers.
 State agricultural stations.
 Federal Government.
 Farm organizations.
 C. C. C.
 Making a survey of the farms in the community and comparing eroded farms with conserved with respect to prosperity and profit.

Helping to establish a community forest (for schools in wooded regions).
 Planning arrangement of trees for school ground or lawns at home.
 Planting trees.
 Organizing a school forestry club and participating in its activities.
 Learning more about the uses of forests:
 National forests.
 Forests privately owned.
 State forests.
 National Parks (Recreation).

OUTLINE OF ILLUSTRATIVE ACTIVITIES FOR TEACHING CONSERVATION—Continued

Grade or group	Areas of experience and suggested activities			
	Home and school (Wildlife and human life)	Farms and factories (Soil and water)	Community life (Forests and mines)	
<p>Advanced pupils (grades VI, VII, VIII, or grades VII and VIII).</p>	<p>Learning more about the Junior Red Cross program for accident prevention on home and farm and for courses for lifesaving and first-aid. Securing literature about these activities from the local Red Cross chapter. Planning for the best use of nature's resources at home.</p> <p>Attracting birds. Planting wild-flower plots. Planting trees advantageously. Using water to the best advantage in the home. Taking care of things made of iron and other metals.</p>	<p>Learning about our country's losses through soil erosion in different sections:</p> <p>Amount of erosion each year. Value of land lost. Homes destroyed, reservoirs silted, crops ruined.</p> <p>Relation of erosion to prosperity of cities and Nation as a whole.</p> <p>Carrying on a study to learn how farmers of the community regard methods of erosion control.</p> <p>Learning about the Nation's relatively abundant supply of water: The water cycle.</p>	<p>Learning about the conservation of forests:</p> <p>Prevention and control of diseases and insects. Prevention of waste in cutting operations. Prevention of fire. Cutting and renewal. Government activities.</p> <p>Collecting publications of agencies that conserve the Nation's natural resources. Maintaining a library bulletin service for the community on—</p> <p>Mines. Health. Birds. Fisheries. Forests. Mammals.</p>	

<p>Learning how the people of the United States are housed in different sections: Improved and unimproved housing in cities. Good and poor housing in rural communities. Ways of improving poor housing conditions in the Nation. Studying wild flowers, birds, and other wildlife seen and enjoyed about the home. Studying wildlife in America in the Indian's days and ours? What caused extermination of certain bird species? Why kill harmless birds and animals? Why and how destroy the supply of fish? What is the Government doing to protect wildlife?</p>	<p>Location of main watersheds, lakes, rivers, falls. Floods and the whole Nation's responsibility for their control. Pollution of streams. Investigating the type of service given by State and Federal Governments. Finding how very wet lands are reclaimed and the gains which result from their reclamation: In the United States. In other countries. Studying about soil problems of other times. Colonial. Pioneer. Great Plains. Studying about soil problems of other lands.</p>	<p>Soil. Water. Safety. Wild flowers. Learning about the national parks. Places of recreation which all can visit some time. Means of saving all wildlife and forests. Means of preserving historical monuments. Interesting spots in different national parks. Where important national parks are located. The facilities of parks for certain types of recreation. Learning how other governments protect their forests and their natural resources. Studying the occurrence of petroleum, geological formations. Learning how the Nation's coal and oil can be conserved.</p>
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FIELD OF FURROWS, A TYPE OF EROSION CONTROL.

persistent interests in other lines to distract their attention. Second, the teacher's reading, study, and other preparation for one group of pupils facilitates her preparation for the other two groups. Third, longer class periods are available for activities because all groups of pupils are working on the same study or unit and the number of "recitations" is thus reduced. Fourth, the daily schedule can be arranged in large blocks, rather than in 20 or 30 class periods, which is not unusual in schools in which activities are planned without common areas of experience.

When an outline of this kind is used in city schools, the fact that the entire school is engaged in activities of similar content enables teachers to cut across grade lines and to bring together in working groups or committees, pupils who have common interests and needs, or similar abilities.⁹ This can be done by arranging for committees from different classrooms to develop different parts of the study. Suppose, for example, that some of the children who belong in different grades wish to study about floods and their relation to soil erosion. These children form committees, plan their studies together, gather material, take excursions, and, finally, perhaps, prepare a report to give to the school at assem-

⁹ Hasic, James F. The cooperative group plan of organization. *School and society*, 31: 67, January 4, 1930. Reprinted in Caswell, Hollis L., and Campbell, Doak S. *Op. cit.*, pp. 608-9.



FORESTS NOT ONLY SHELTER WILDLIFE BUT RETAIN THE RAINFALL.

Adaptations

In large areas of experience like the three just mentioned—home and school, farms and factories, and community life—are incorporated all the subjects of the school course and many activities. The same area of experience and conservation topic each year of the course are suggested for primary, intermediate, and advanced pupils. Planned thus, the outline contributes to the flexibility of the entire school program and is adaptable to different types of schools, such as one-room schools, city schools, and schools in special types of communities.

For example, in one-room schools, all grades—primary, intermediate, and advanced—can work together to develop the same study, activity, or curriculum unit.⁸ Children of the primary group carry on activities and develop concepts peculiarly within their ability and needs. Intermediate pupils make contributions according to their capabilities. Advanced pupils develop suitable activities and encourage or assist primary and intermediate pupils. The values of this coordination are evident. First, with the pupils of the entire school interested in one project, there are fewer

⁸ Organization of curriculum for one-teacher schools. *Op. cit.*, pp. 15-17, 33-35.

Dunn, Fannie W. Modern education in small rural schools. *Teachers College Record*, 32: 421-23, February 1931.

— Experimentation in organization and teaching in one-teacher schools. *Teachers College Record*, 33: 504, March 1932.

— and Everett, Marcia. Four years in a country school. New York, Teachers College, Columbia University, 1926. pp. 7-8.



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persistent interests in other lines to distract their attention. Second, the teacher's reading, study, and other preparation for one group of pupils facilitates her preparation for the other two groups. Third, longer class periods are available for activities because all groups of pupils are working on the same study or unit and the number of "recitations" is thus reduced. Fourth, the daily schedule can be arranged in large blocks, rather than in 20 or 30 class periods, which is not unusual in schools in which activities are planned without common areas of experience.

When an outline of this kind is used in city schools, the fact that the entire school is engaged in activities of similar content enables teachers to cut across grade lines and to bring together in working groups or committees, pupils who have common interests and needs, or similar abilities.⁹ This can be done by arranging for committees from different classrooms to develop different parts of the study. Suppose, for example, that some of the children who belong in different grades wish to study about floods and their relation to soil erosion. These children form committees, plan their studies together, gather material, take excursions, and, finally, perhaps, prepare a report to give to the school at assem-

⁹ Holic, James F. The cooperative group plan of organization. *School and society*, 31: 67, January 4, 1930. Reprinted in Caswell, Hollis L., and Campbell, Doak S. *Op. cit.*, pp. 608-9.

bly. Reports of this nature need not all be in the form of talks. For example, one group of pupils can plan a play, designed to illustrate a problem in flood control; another group, after having investigated the causes of a recent flood, can prepare maps or charts to illustrate their study and explain it to the school.

In activities of conservation, whether or not the children and the teacher organize them in curriculum units, it is particularly important that challenges be found in normal situations and that the children participate as much as possible in community projects in conservation. Communities differ with regard to opportunities in this respect. In the country, of course, there are opportunities for participating in projects of conservation more frequently than in cities. The limited opportunities for participation in conservation in cities make it necessary sometimes to shift content and activities from lower to higher grades and change the point of view. For example, a study of soil, such as that outlined on p. 36, may be inappropriate for children in primary grades of city schools who have no garden in which to plant seeds and little opportunity to secure samples of soil for study. In such cases it is advisable to postpone soil studies until the upper grades are reached. The principles of conservation can be realized through study of some other resource such as birds, trees, iron, or coal, in which the children can more conveniently have first-hand experiences.

Conservation topics which cannot be studied in primary grades can be reserved for higher grades. Older pupils have ability to generalize from abstract ideas and vicarious experiences. They can study conservation from the point of view of its national importance. For example, fifth-grade children in a certain city school became seriously interested in the protection of soil even though the class was unable to take a trip to the country and only a few individuals had ever seen a gully.

It is not necessary, either in a one-teacher school or in a graded school, that the children's activities in conservation be limited entirely to the area of experience planned for the year. Suppose a school has planned a campaign to protect bird life in the community. This need not eliminate discussion, or even study, of some problem in the conservation of soil, especially if an urgent community need should arise, such as the changing of

the course of a river,¹⁰ a flood, a duststorm, or the collapse of a road which long has been threatened by a treacherous gully. A planned program can always be temporarily suspended in order that pupils may study some current event of importance.

Adaptations are not limited to rural and urban or to one-room and graded schools. Types of schools are as varied as the communities in which they are located. School curricula vary correspondingly. For example, the curriculum must meet certain needs in a mining community; other needs in a farming region; still different needs in a community of foreign laborers or in a lumbering town. Conservation topics and areas of experience must be chosen to fit school and community needs. When these have been selected, however, outlines of content may be planned for groups of pupils and years of work similar to the outline on pages 10-18.

The teacher will find that demands for certain types of instruction in conservation recur from year to year. Regardless of the area of experience planned there will be special activities for the celebration of Arbor Day, Conservation Week, Bird Day, and the like. Beautifying the schoolground, planting flowers on highway terraces, and caring for the school garden are activities that need constant attention. However, so far as study is concerned, recurring activities, once started, may be subordinated to the dominant conservation interest.

The outline on pages 10-18, with its organization of conservation topics and activities around three major areas of experience, follows the so-called group plan of organization.¹¹ This group plan with various areas of experience has proved effective in different types of schools. Naturally it is only one of many ways in which a conservation program can be organized. Different areas of experience can be chosen, depending upon the content

¹⁰ Everett, Marcia. Progress toward integration in a rural county. *Educational method*, 15: 179-91, January 1936.

¹¹ Maryland Department of Education. Goals in social studies for primary grades, I-III, with suggestions for their achievement. *Maryland school bulletin*, 13: 56-57, October 1931.

New Jersey Department of Public Instruction. A handbook in social studies and related activities for primary teachers. Trenton, N. J., 1932.

Dunn, Fannie W., and Everett, Marcia. *Op. cit.*, p. 7-8.

Hosic, James F. The cooperative group plan of organization. *School and society*, 31: 6-7, January 4, 1930. Reprinted in Caswell, Hollis L. and Campbell, Doak S. *Op. cit.*, 608-9.

of the particular course of study in use in the school. Conservation topics, chosen from various natural resources, can be apportioned to different years of the school course. For example, with respect to wildlife, birds can be studied one year, mammals another year, and fish a third. With respect to soil, the composition and formation of soil can be planned for 1 year, the water cycle and the effect of water on soil another year, and the balance of nature and ways of preventing erosion the third year. With respect to minerals, fuels can be the topic 1 year, metals another year, and nonmetallic resources, like cement, salt, and sulphur, the third year.

Supervisors and teachers who are following restricted courses of study may need to make decided adaptations of the outline and other plans suggested, in order to incorporate instruction in conservation in their program. It is not essential to the teaching of conservation that studies be planned in connection with the organization of social problems or areas of experience mentioned. On the other hand, conservation should not always be taught casually as a single unit or series of units unrelated to any larger plan, nor as another separate subject. To develop a unified conservation program with any specified course of study, teachers should study the material they are required to teach in various subjects and plan conservation activities which are related to it.

It is understood that the conservation of human life is dependent upon the conservation of all natural resources; that the very purpose of conservation itself is that mankind may live longer, healthier, happier, and more comfortable lives. In the maintenance of social welfare, conservation of natural resources is the basic consideration.

INTRODUCTION OF CONSERVATION

The teaching of conservation can be introduced in a school by the superintendent, the supervisor, or the teacher with the approval of superintendent or supervisor. In teachers' meetings and in conferences with individual teachers, oral instructions can be given and sometimes mimeographed or printed outlines provided to guide in the initiation of appropriate activities.

SOURCES OF HELP FOR TEACHERS

Sources of help, besides superintendent and supervisor, are the children's homes, the county agent, Future Farmers and 4-H Club members, farmers' organizations, and sometimes other agencies, such as Kiwanis clubs, the American Legion, the National Association of Audubon Societies, and the Emergency Conservation Committee. These leaders and agencies are frequently willing to cooperate by providing materials and can do much to stimulate children and teachers by visiting the schools and participating in activities or in other ways showing their interest and desire to help. Their services can well be sought by teachers as well as other school authorities and integrated with the desired school program of instruction in conservation. Local and State libraries and museums may have material or be able to secure it on request. Government bulletins are helpful sources of pictures and information. In the bulletin entitled "Conservation in the Education Program,"¹ a number of sources of information are suggested. In this bulletin, also, various agencies are listed, both Government and private, which prepare materials or provide other services to help teachers who desire to teach conservation.

Certain auditory aids and visual materials are stimulants in schools where they can be obtained.² The radio is an important source of information. The teacher probably will familiarize herself with yearly programs of educational broadcasts. Local stations often broadcast information of great help in a conservation

¹ Bristow, William H., and Cook, Katherine M. Conservation in the education program. U. S. Department of the Interior, Office of Education, Bulletin 1937, No. 4.

² Good references for conservation education in secondary schools. Washington, U. S. Department of the Interior, Office of Education. Bibliography No. 55.

program. Sometimes by writing to the station over which the broadcast is given, teachers can secure copies of the speeches. Many schools, of course, have no radio. Frequently, patrons are glad to invite the children into their homes for the purpose of listening to educational broadcasts. Motion pictures are useful. Sometimes a county agent or county club leader is able to secure an appropriate film from the agricultural extension service of the State agricultural college or the State university. Pictures, slides, charts, and posters are obtainable from Government agencies, such as the Motion Picture Division of the United States Department of the Interior.

THE TEACHER'S PREPARATION

Problems of conservation, like other new problems, should not be initiated before the teacher has had time to think through the situation, to gather the information which she needs to teach the subject, and to make a collection of materials from which the children may secure facts to answer questions which arise. In making her preparation, the teacher should advise with the supervisor or county superintendent and secure his cooperation and help and consult her local and State librarians, either through the superintendent or by writing. She should survey the community for the purpose of beginning contemplated studies based on the community's needs. She should try to discover what plans, if any, are being made in the community for carrying on conservation enterprises.

For various studies in the field of conservation, the teacher ought to understand the physical and social environment. She needs to have a knowledge of the animals that are disappearing and of the measures necessary to conserve them, of the flowers and forests in immediate need of conservation, the source of the water supply, and the nature and condition of the soil. The institutions of the people, their accepted beliefs and standards, and their living conditions should be considered and utilized in the development of projects.

THE TEACHING PLAN

How much to plan in advance for teaching is a troublesome problem. Some teachers feel that planning in advance prevents children from developing initiative and creativeness. They believe that pupils should make the plans; that learning to plan is

part of a child's education and adds to the educative potentialities of any school enterprise. Consequently, lest they dominate the children's planning, they restrict their own to making lists of references, gathering materials, and reading for information in line with the type of interest evinced by the pupils.

On the other hand, there are thousands of teachers who plan their work definitely in advance. By carefully planning for a school enterprise or activity, a teacher may anticipate and prepare for many difficulties that would otherwise seriously handicap the children's progress; she is alert to each child's needs and ready to help him take the "next step." Correct planning prepares her the better to guide pupils in individual lines of growth. It would seem that teaching of conservation problems, especially, should be planned in advance because of their newness and the consequent lack of helpful precedent in teaching them.

Obviously, a teacher's plans should be flexible. They must permit her, for example, to lead a group of children into a field or a park to study erosion, or to change at will and help the children classify pictures they have gathered illustrating methods of combating floods. A teacher might plan to have her class investigate the causes of a recent dust storm and then find it necessary instead to help them discover why the Yellow Sea is so yellow, or why the American colonists so frequently abandoned their old farms for new ones.

By planning, the teacher is able to incorporate in studies and activities, suggestions and ideas from many different sources. The course of study or curriculum guide is one source. Careful planning enables one to use a curriculum guide for ideas, inspiration, and stimulation. By no means, however, should a teacher be satisfied with incorporating in her plans the suggestions given in her curriculum guide. There are many other publications to help children enliven their activities. Accounts which other teachers have written of curriculum units developed by their pupils are especially helpful because they contain ideas which have been tried. They may be found in teachers' magazines or purchased from publishers at little expense.³ Many suggestions may be gleaned from material and services of conservation

¹ For example: Unit teaching materials. Chicago, Ill., W. F. Quarric, Inc.

² Teachers' lesson unit series. New York, Bureau of publications, Teachers College, Columbia University.

agencies, such as the National Park Service, the Bureau of Reclamation of the United States Department of the Interior, the Forest Service or Soil Conservation Service of the United States Department of Agriculture. Books, professional magazines, and other published teaching aids are useful.

In planning for the teaching of conservation the teacher will find it helpful to use two kinds of plans. One is an initial outline for the large enterprise—a "long-time" plan; the other, a plan for next steps made at the close of each day's work. In making a plan for a large enterprise, there are several considerations for guidance. Some of them will now be considered.

Long-Time Plan

The long-time plan should be adapted to the children's needs, interests, and abilities. It should be brief, but at the same time clear and helpful. It should, whenever possible, be made far enough in advance for the teacher to gather materials and study the community before initiating the enterprise. It should be in harmony with the general organization of the curriculum guide or course of study. It should be flexible enough to permit deviations and revisions from day to day which incorporate children's suggestions and meet their changing and unpredictable needs.

Long-time plans vary somewhat according to types of schools. The teacher of a one-room school, for example, planning for the entire school, must have in mind the abilities and interests of the three groups of children to be taught—primary, intermediate, and advanced. Insofar as possible, the work of many subjects should be united and centered about activities in which all groups of children have an interest and in which they can engage according to their ability. In an enterprise for the protection of birds, for example, primary children can be expected merely to learn to identify two or three common new birds; intermediate grade children can plan a way of attracting more birds to the vicinity of the school; and the advanced children can make a study of commercial and agricultural values of birds to the community. Classroom teachers in graded schools, planning for one class only, have fewer levels of ability to consider but greater variety of individual interests when their enrollment is large. If several classrooms or several schools are cooperating in the study of a conservation unit, the teachers should confer and plan accord-

ingly. In such cases the group plan made by all the teachers for the whole school will be similar to that which the teacher of one-room school makes for her three groups of pupils.

Here are a few items a teacher's long-time plan can include for any phase of conservation:

1. A natural situation or two, such as a conservation enterprise developed by the community, in which the children will wish to participate or in which they can find some challenges or questions with which to begin.
2. A few familiar experiences which pupils have had in line with the desired activity, briefly jotted down, merely to keep herself alert to the children's needs.
3. Significant topics and problems which it will be necessary for the class to study if the enterprise or study is to have educative value.
4. A list of activities, some of which the children may suggest, or be led to initiate, or which they can study with profit. These should be both school activities and out-of-school activities, with special attention to community needs.
5. A central problem or culminating activity if one is evident in the beginning of the enterprise, around which minor activities can be organized, or toward which a large proportion of the children's study will be directed.

IMPROVING THE WOODLOT.



6. A list of the needs of individual pupils and ways in which study can meet them.
7. A bibliography.
8. A list of inexpensive materials for which the children can write.
9. A few permanent interests that pupils can develop. The course of study and other teaching materials will help at this point. Study of the needs of the children in relation to the community's needs also is useful. Conservation is not a subject which can be taught in a series of lessons or activities and then abandoned. Activities, such as protecting birds, growing a wild-flower garden, or filling a gully, must be followed from time to time during the year. This follow-up should be included in the teacher's plans.
10. A few suggestions jotted down as leads to further activities when they can be brought to the children's attention.

Probably the teacher will find that her long-time plan is not sufficient to guide her in the development of the entire study. The children will ask questions that did not occur to her or will suggest activities not anticipated in the initial planning. Individual and group shortcomings and deficiencies unexpectedly will be revealed as new activities are initiated. Her long-time plan will need to be revised frequently.

Some daily planning also will be necessary. The question is: "How much daily planning should a teacher do, and what type of planning should it be?" Undoubtedly, it must be brief. It cannot be made far in advance because it must provide for new problems that appear each day. The best time for one to make a daily plan is after a day's work when the children's needs are fresh in mind. At this time it is not difficult to recall particular activities in progress, and materials are at hand for planning.

The Daily Plan

The daily plan must be flexible. The teacher of one- and two-room schools must plan for two types of activities for each period of the day—one for the groups working independently and one for the group working directly with her. She must plan especially carefully for the primary pupils, who have not yet learned to employ themselves profitably without guidance. She must always plan for groups of children who will work without guidance while she helps other groups. In some graded schools teachers plan thus for independent groups. In any type of school a daily plan can consist of such items as the following:

1. A list of the things that need to be done next in furthering the main enterprise.
2. Deviations from long-time plan to meet suggestions of pupils and unforeseen needs and difficulties.
3. Particular needs of individuals.
4. Names of pupils who are responsible for certain tasks, such as a report on a wild-flower garden at home or finding different types of soil for a display.
5. Materials the teacher must secure or contributions she must make for the next day's lesson, such as a book about trees from the State library or information to help the children plan a terrarium.
6. The special part of the enterprise in which each grade group or committee will be engaged.
7. Points of interest common to all grades or groups and difficulties which can be met by class instruction.
8. For the one-teacher school, suggestions to aid pupils in preparation of records of conservation work in progress and of reports, drawings, bibliographies, and the like, which two groups can accomplish while the teacher works with the third group.
9. Special plans for new activities such as organizing newly discovered information, labeling displays, and rounding up projects which though provided for in the long-time plan often take different turns during the children's development of the unit.
10. A question or two to help pupils criticize and evaluate work which they have done and to set up higher standards for the next similar work.
11. Items of significant information that may be needed for the next day's work.
12. Sources of information which the children will need to investigate.
13. Very brief suggestions to recall systematic ways of handling new materials—where to put new bulletins or pictures, for example, how to pass out construction paper with the least possible confusion, ways of using paste, where and when to do noisy work such as sawing and hammering.

THE DAILY SCHEDULE

Some revision of the many-class daily schedule is necessary for the introduction of a program for teaching conservation, as it is for any other program, for that matter, which includes studies and enterprises requiring long periods of time. Instead of a large number of "recitations" arranged by subject, such as history, geography, or arithmetic, the revised program must have several

long unbroken periods during the day in which children of various groups can plan normal activities in conservation and make certain decided progress which they consider valuable in carrying out their plans; and finally round up their study, summarize and report information, formulate conclusions, and evaluate their activities. The simplest type of program for the teacher who has but one grade of pupils, is that in which a block ⁴ of time is set aside for social studies and activities related to them, another for reading and other English activities, and one for nature study or science with an extra period or so each week for additional needs. If curriculum units or other types of projects are carried on with centers of interest to which these subjects contribute, such a program affords time for them. Minor subjects and drill activities are fitted in where needed.

In one- and two-room schools, every block of time on the program must allow the teacher to work with each of the different ability groups in the school; but a program with long periods in which subjects and activities are coordinated is the most practicable.⁵ It should be planned differently for different days in the week. In schools with many grades it is necessary to combine and coordinate subjects not only to save time, but, in smaller schools, to provide working groups large enough for socialization.

⁴ Rugg, Harold O., and Shumaker, Ann. *The child-centered school. An appraisal of the new education.* Yonkers-on-Hudson, World Book Co., 1928. pp. 70-71.

Gustin, Margaret, and Hayes, Margaret L. *Activities in the public school.* Chapel Hill, The University of North Carolina Press, 1934. p. 68, 74.
Teachers' guide to child development. Washington, U. S. Department of the Interior, Office of Education Bulletin, 1930, No. 26. pp. 178-86.

⁵ Dunn, Fannie W., and Everett, Marcia. *Four years in a country school.* New York, Teachers College, Columbia University, 1926. p. 19.

Suggested daily program for one-teacher schools. Harrisburg, Commonwealth of Pennsylvania, Department of public instruction⁶ [n.d.] chart. 1 p.

THE DEVELOPMENT OF CONSERVATION UNITS

THE CURRICULUM UNIT

Because of the present tendency¹ of courses of study to organize experiences and activities in the form of units, this chapter is devoted to suggestions for use in developing curriculum units on conservation. The suggestions are flexible, however, and will be helpful, also, for teachers who desire to teach conservation as a subject, and for those who wish to teach it as a body of principles to be arrived at in connection with many different subjects, topics, themes, units, or single activities.

Definition

What is a curriculum unit? When an unexpected event occurs or something needs to be done, children usually are interested. They can be led to think of many things to do. Often they will raise questions which carry them into wider study, will plan and work until their study grows into a larger enterprise that has organization and unity for them. Such an enterprise, though known by a variety of names, can conveniently be styled a curriculum unit. It can best be defined by an example. The children in two country schools in Warren County, N. J., developed recently a study or curriculum unit on reclamation of muck land in their community. The story² of the unit begins in the history of the reclaimed land.

About 40 years ago the drainage of an old lake bottom in Warren County, N. J., brought a large section of land now known as the Meadows under cultivation. The rich black muck was ideal for raising celery, lettuce, and onions by the Polish and Ukrainian farmers who settled there. Frequently, however, the Pequest River, which flows through the Meadows, flooded the land and ruined the crops. Help from the nearby C. C. C. camp was finally secured to dredge and straighten parts of the river.

¹ Harap, Henry. A survey of courses of study published in the last 2 years. Cleveland, Ohio, Western Reserve University, Curriculum Laboratory, No. 44, May 20, 1935, pp. 6-9. Reprinted in Caswell, Hollis L., and Campbell, Doak S. Readings in curriculum development, New York. American Book Co., 1937. p. 635.

² Everett, Marcia. Progress toward integration in a rural county. Educational method, 15: 179-91, January 1936.

One morning the teachers and some of the children of the two schools in this community were informed that a charge of dynamite was to be set off which would change the course of the river. They were at the spot in time to see the explosion. As soon as these children had returned to their schools they were deluged with questions by the other pupils. The teachers had questions also about the work they had observed. All the questions were written on the blackboard, organized under problems, and copied in notebooks for further study. Here are some of them:

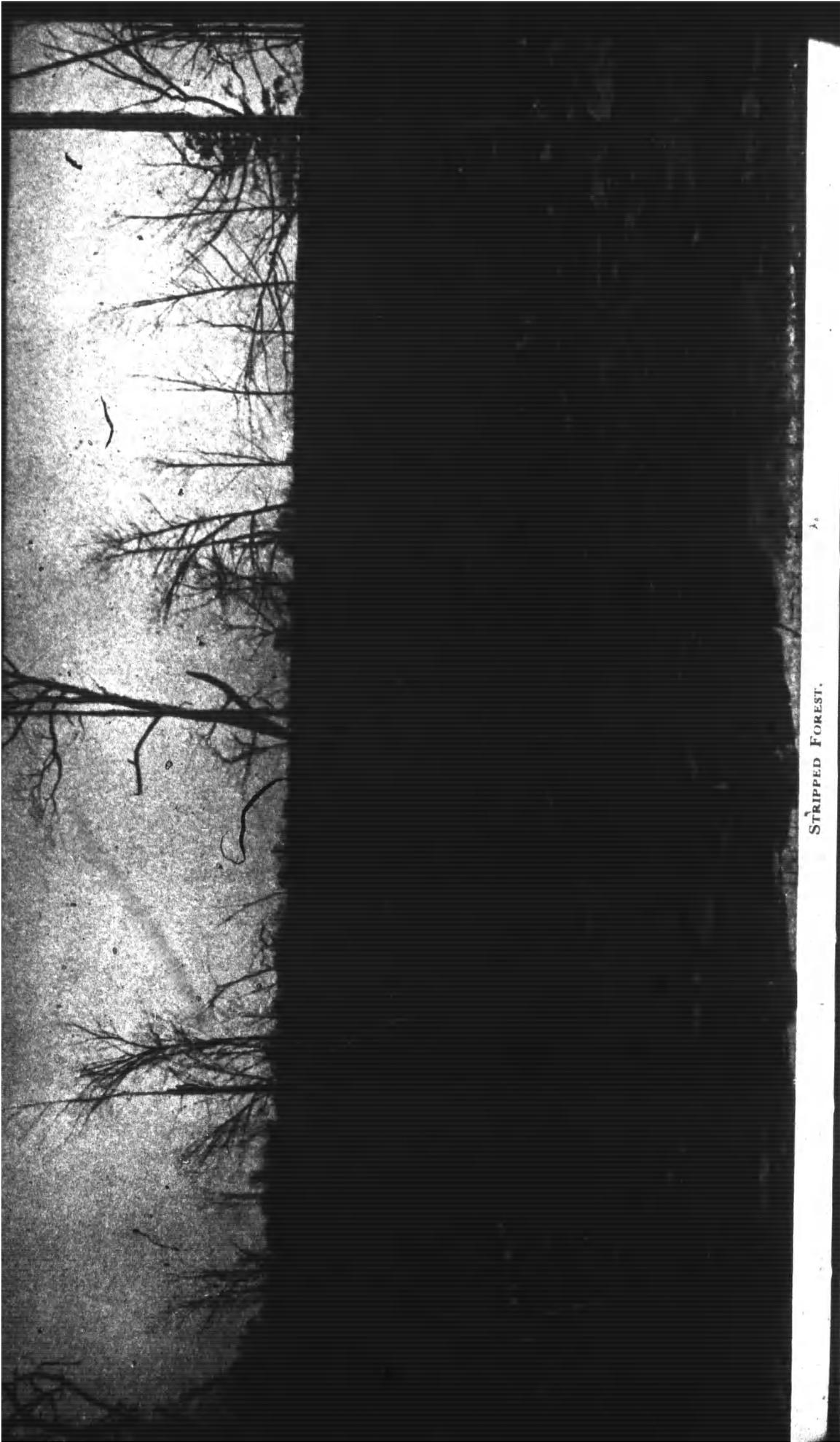
- What is the flood-control project doing for our country?
- Where does the Pequest come from and where does it end?
- Why do we have C. C. C. camps?
- Where does the water we drink come from?
- Is it good? (When the source was found to be dangerous, plans for remedying the matter were made.)

In the larger school, a six-teacher school, the questions were organized under the following problems: (1) How was the Pequest River cleaned? (2) What caused the mountains, rivers, and valleys in our country? (3) What kind of work is done in Warren County? A story of the Pequest drainage project summarized the study. In the eighth-grade room of this school the children became especially interested in the conservation movement both past and present throughout the entire United States. In the one-room school children from grades 1 to 8 studied every phase of the problem:

Searching out the answers to their problems involved many experiences. The answers could not be found in books. All the children could not find all the answers. They were faced with the problem of getting information in new ways; of recording information for themselves and others; of relating their experiences so that others could understand; and of finding various ways to express their new-found information and ideas.

All this, of course, involved meeting people, writing for information, learning to work with other persons concerned with the same problem; of observing interesting phenomena, heretofore unnoticed, within their own community; of questioning what they heard and saw; of working purposefully; of checking the value of the time spent on an activity; of planning their time to get the most good from it; of developing confidence in their own ability; of learning new skills in expression and in human relationships.³

³ Everett, Marcia. Op. cit., pp. 182-83.



STRIPPED FOREST.

Variation in the Development of Units

Many more examples of curriculum units might be given. No two examples would be alike because no two curriculum units on the same subject can be developed in exactly the same way, no matter how narrow the scope of that subject. This point can be illustrated by an incident from a supervisor's notebook. Several teachers were given more or less detailed suggestions for developing "units of work" on the topic, "Home Life in Colonial Days." The suggestions were written in such a way that the teachers could have followed them in detail, had they had no plans of their own. However, when the units were taught and the teachers' reports compared, it was found that all had been developed differently. In one class, the children's interest centered about school life and social life. The major activity was a play and a colonial party. In another school, the children became interested in antiques. They were invited to visit a home in the community to observe a unique collection of colonial relics. In school, these children made a collection of relics and of pictures of relics. A third school placed the emphasis on colonial houses and a study of building materials in early times and the present.

The incident indicates the variation which usually occurs in the development of curriculum units in any subject. If the teacher is alive to the interest and needs of her pupils, if she encourages them to initiate activities and to work on aspects of the study in which they are most interested as individuals, her curriculum unit will be new. It will be new regardless of the plan with which she started, regardless of the number of times she or others may have developed units on the same theme. No teaching situation can be exactly duplicated. If the teacher, the plan, and the materials are the same, the children are different, and the needs and interests of the children are different one month from another. All teaching materials, all suggestions for activities and organization, and the teacher's plans must be adapted to unpredictable needs and interests of each group of children and to the situation or to the problem to be resolved.⁴ If curriculum units on historical and cultural subjects are apt to vary as illustrated, one can expect conservation units much more surely to

⁴ Gustin, Margaret, and Hayes, Margaret L. Op. cit. Practical discussions and illustrations of activities and units of work including a description of a second-grade activity, "Growing Flowers."

vary because their subject matter is in the field of nature, which is never exactly the same from year to year, from month to month, or day to day.

Qualities of Excellence

In any curriculum unit qualities of excellence or the lack of them are recognizable. One desirable quality of a conservation unit is normal experience for children in the protection and saving of natural resources. Closely related to this quality is flexibility in providing for children's choice of activities. Correctness of procedure in teaching is a third desirable quality. The teacher should be a guide rather than a director. Her responsibility is not in making assignments, but in helping children to make them, to formulate questions, to plan activities, and to organize their work. She should give due recognition to practices and ideals that children accept or value, and respect each child's personality. A fourth point of excellence is evaluation—the extent to which children are led to set up standards and work to achieve them and the extent to which the teacher uses the children's present standards to help them improve their work and to formulate new and higher standards of measurement. The fifth quality of excellence lies in the extent to which children achieve permanent interest in conservation and find leads to other activities. Conservation activities should continue after special study has temporarily ceased. All future citizens should have more than academic interest in conservation. They should be active participants in conservation programs.

WHAT A CLASS CAN DO ABOUT SAVING SOIL

In the section which follows, materials are assembled for teaching the conservation of soil. The organization as presented in the outline follows somewhat the development of a curriculum unit; however, the materials may be used for any method of instruction the teacher prefers.

1. Outline

Suggestions for the teacher in planning.

Enterprises of interest to the entire school.

Primary pupils:

- Situations (illustrative).
- Questions and problems (illustrative).
- Activities for study—observation, investigation, reading, and discussion.



PREVENTING EROSION THROUGH BUILDING OF STONE DAMS.

Activities in keeping records and making reports and summaries.

Permanent interests.

Leads to other units.

Intermediate pupils:

Situations (illustrative).

Questions and problems (illustrative).

Activities for study—observation, investigation, reading, and discussion.

Activities for keeping records and making reports and summaries.

Permanent interests.

Leads to other units.

Advanced pupils:

Situations (illustrative).

Questions and problems (illustrative).

Activities for study—observation, investigation, reading, and discussion.

Activities for keeping records and making reports and summaries.

Permanent interests.

Leads to other units.

Ways of closing the unit.

The story of erosion and its control,

References.

2. Suggestions for the Teacher in Planning

The suggestions and materials outlined in this section are illustrations of activities and procedures, not assignments to be passed on to the pupils nor directions to be followed by the teacher. They are designed to stimulate teacher or children to think of other things to do or learn, more appropriate, perhaps, for their own situation. They are not presented in organized unit form. More suggestions are given than can be fully developed in any one unit.

The organization as well as the content is intended to be flexible. Although the suggestions are arranged in three groups according to the age or grade of the pupil in any group, pupils will be found who should now and then carry on activities here suggested for the pupils of a different group. For example, an advanced pupil particularly interested in a wild-flower garden or a terrarium for which intermediate-grade pupils have responsibility should be allowed to work with them. An intermediate-grade pupil may wish to work with a primary group labeling trees in a park. Some of the suggestions given here for primary pupils may be new, fresh, and interesting for intermediate-grade pupils in certain schools. Some activities and problems suggested can be more readily adapted to country schools and to rural children than to city schools. Where this difference is significant, attention is called to the fact. In a unit on soil in large city schools it is difficult to find first-hand experiences for first- and second-grade pupils. For this reason such schools will wish to teach conservation of soil in middle and advanced grades, in which children's ability to read enables them to gain concepts vicariously. Generally speaking the activities suggested for the three different grade groups supplement and complement one another.

In using the suggestions in this bulletin, each teacher's procedure should be original. It will vary according to the need or interest of the children, the incident or situation in which the study is initiated, the materials available. A few principles may be useful:

- (a) Since the community is a significant factor in the development of a unit in the conservation of soil, the community and not the classroom alone should be the laboratory for study. Its values are threefold:
 - (1) The chief materials of instruction⁶ will be found in the community.
 - (2) In the community, children can participate in normal activities in the conservation of soil.

⁶ From *Progressive Education and the Science of Education*, by John Dewey. *Progressive education*, 5: 200-1, July-August-September 1928. Reprinted in Caswell, Hollis L., and Campbell, Doak S. Op. cit.

- (3) In the community, both teacher and children will find individuals and agencies eager to have a part in the enterprises in which the school is interested.
- (b) The teacher should plan her teaching and guide the children in their planning.
- (c) Children should learn to organize their work.⁶ Each child should be able to see his contribution to an enterprise in relation to the contributions of the other children, and to other things which he has done or learned; to mold ideas and activities in new relationships. An activity which is so organized as to have value for a child has order and continuity which he, and not the teacher, has established. An organization which a teacher plans for the children and not with them, has little value for them.
- (d) Summaries and rounding-up of activities should be planned at opportune times in the development of a unit and at its close. The teacher should guide the children into organizing and summarizing activities most promising for a unified view of the study. Plays, reports, school newspapers, bulletin boards, are examples of activities which serve this purpose.

To use the suggestions on the following pages to the best advantage, the teacher should first:

- (a) Read the outline, pages 36-37. This shows the order in which the different topics are presented, and gives a bird's-eye view of the suggestions.
- (b) Read the section entitled "Enterprises in Which the Entire School May Be Interested," page 40. Decide on several appropriate major enterprises in which the children may wish to engage.
- (c) Read the section which is designed for the grade to be taught—primary, page 41; intermediate, page 49; and advanced, page 60.
- (d) Read the sections designed for other groups than the one to be taught.
- (e) Decide which, if any, of the activities the class is apt to plan.
- (f) Read widely for information. See references. This bulletin indicates the type of facts to be sought and suggests sources. Details must be developed by teachers and pupils gradually as the need arises.

⁶ Dewey, John. Progressive education and the science of education. *Progressive education*, 5; 200-1, July-August-September, 1928. Reprinted in Caswell, Hollis L., and Campbell, Doak S. *Readings in curriculum development*. Op. cit., pp. 286-7.



PREVENTING EROSION THROUGH THE USE OF SAND BAGS.

- (g) Gather available materials for children's use, referring to those listed in references on pages 85-106.
- (h) Plan according to suggestions given on pages 38-39.

3. Enterprises of Interest to the Entire School

In the development of a study about the saving of soil there are many activities in which the entire school can participate. One of these can be carried on at any time during the development of the unit. For example, in a rural school all the pupils can take part in the filling of a gully on or near the school ground or in sowing grass seed for a lawn. In a city school a school newspaper can carry news about soil conservation in the community. The children in all groups or grades can contribute. Other activities in which all the pupils of a school, either city or country, can take part are:

- (a) A soil exhibit.
- (b) A balanced aquarium.
- (c) A balanced terrarium.
- (d) The filling of a gully near the schoolhouse.
- (e) The terracing of a roadside grade.
- (f) A sand table reproduction of a restored and properly conserved landscape.
- (g) A large pictorial map showing erosion-control projects in the community.
- (h) A wild-flower garden.
- (i) A large scrapbook about the control of soil erosion in our community.

- (j) A bulletin entitled "Soil News."
- (k) A frieze showing the history of soil depletion and its possible restoration and conservation.
- (l) A display of pictures of erosion.
- (m) A soil club.
- (n) A community library of books and bulletins on conservation of soil.
- (o) In large schools, a soil section in a room which has been set aside for a conservation room.

4. Suggestions Appropriate for Primary Pupils

(a) Situations (illustrative):

Urban

- (1) Children watch a rainstorm and ask where the water comes from. They ask where the water comes from which they drink.
- (2) Children visit a park and note how soil and sand collect at places along the sides of a stream. Where does this material come from? How can the water carry so much? Why is the soil a different color near the water's edge?
- (3) Children bring soil to school for window gardens. They note different kinds of soil, or ask why pebbles should be placed in the bottom of the box. Perhaps some child wants to try planting seed in pebbles. Such experiences lead children to observe how soil in gardens and parkways produces plants and to realize the importance of soil.
- (4) Children learn to read "Keep off the Grass" signs. The teacher helps them understand why it is important not to cut across terraces, lawns, or park corners. A study of soil results.

Rural

- (1) Primary pupils have older brothers who are members of a CCC camp in the community. It is natural for them to tell what their brothers are doing or learning in camp, to ask questions about the work of the camp. Why is there a camp in our community? Or, why isn't there a camp in our community? Of what use to the community is the work of the CCC boys?
- (2) An ordinary whirlwind, often seen in spring or fall, may result in questions. The teacher suggests that the pupils watch for a whirlwind—see where the dust is thickest, how it seems to disappear as it blows across a pasture.

- (3) If the study is made in the spring, children come to school with accounts of the sowing of wheat or of oats. They can be led to plant seeds and watch how they take root and grow. As they observe the roots forming and the soil clinging to them, they get an idea of what the roots of plants may do to prevent soil from blowing away. They may compare their own plants with the grass of the lawn or field or with the plants of the field crops.

Either Rural or Urban

- (1) Perhaps on the school ground there is a lawn or plot of grass which the children are trying to keep beautiful. Beginning pupils each year will need to be taught how to care for the lawn, to refrain from crossing it, and from wearing it down near the walk. Questions arise about the growth of the grass, the need for good soil and plenty of moisture. Why does grass grow thickly? Why cut it? Why won't it grow where we walk? Is grass in the pastures like grass on our lawn? Why is it good for the soil? What does it do for the soil?
 - (2) Children usually are interested in watching a rainstorm. They ask where the water comes from and where it goes. They are interested in seeing brooks and creeks rise. A rainstorm is a good situation with which to begin a study about water and soil erosion.
 - (3) A duststorm occurs blowing dust into the building and over books and furniture. It heaps piles of dust in the road. The air is cloudy with dust. Children ask where so much dust comes from.
- (b) Questions and problems (illustrative):

Urban

- (1) Where did the soil in the flower boxes come from?
- (2) How do the trees in the park grow so large?
- (3) In what kind of soil will the plants in the schoolroom grow best?

Rural

- (1) Why don't people plant more grass and trees so the dust can't blow?
- (2) How can farmers save the soil?
- (3) Can little children do anything to save soil?

Either Rural or Urban

- (1) Where does the rain come from? Where does it go?
- (2) Where did the storm get the dust?
- (3) How deep is the soil?
- (4) What are the CCC boys doing in our neighborhood?
- (5) Why doesn't the grass grow where people walk?

Activities for study—observation, investigation, reading, discussion:

Things to do

Desirable understandings and observations

1. Take an excursion in a warm rain:

(a) During the rain—

(1) Wear coats and rubbers.

One should wear coats and rubbers in the rain to keep his clothes dry.

(2) Catch rain water in hands or pans.

(a) Note that it is perfectly clear.

Rain water is clear as it first comes from the clouds.

(b) Keep some for further observation and comparison.

(3) Take up some rain water from side of road or from a puddle in the garden, field, park, or vacant lot.

(a) Note that it is muddy.

Rain water that one takes from the roadside or field is muddy. It contains soil.

(b) Compare with clear rain the water caught directly from clouds.

Water has power to carry soil, sticks, stones, as it flows along. Water carries soil away.

Wet clothing should be dried as soon as possible.

(b) After the rain—

(1) Walk through mud in a plowed field or vacant lot. Compare with road or street.

More water soaks into a field than into a road because the soil of the field is looser.

(2) Dig down and note the kind of soil that is wettest.

Mellow, loamy soil is wettest.

(3) Note fresh appearance of plants in fields, park, or window box.

After a rain, plants look fresher and their stems and leaves are stiffer.

Published reports of four activity units afforded stimulation for some of the suggestions included in this outline:

Water and Its Work. Unit teaching materials by W. F. Quarrie, Inc., Chicago, Ill. Developed by Gladys Jacobson, teacher, and Elsie Flint Neuner, supervisor, New Rochelle, N. Y.

Hall, Jennie. A report of a study of conservation. Made at the John Ericsson School. Minneapolis Public Schools, 1935. 35 p.

Doverly, Marie. A unit on soil erosion. Arizona teacher, 25: 70-73, November 1936.

Everett, Marcia. Progress toward integration in a rural county. Op. cit.

Burges, Austin E. Soil erosion control, Atlanta, Ga., Turner E. Smith & Co., 1936. 187 p. illus.

It is intended that the activities suggested be planned and developed by the children with the teacher's guidance when appropriate situations arise.

Things to do

- (4) Look for soil that is washed off a hill.
 (5) Find where soil washes most.

Desirable understandings and observations

- More soil washes off steep hills than level land or hills with very gradual slopes.
 Plants need water.
 Water sinks into mellow soil.
 Soil holds water and food for plants.
 There could be no large healthy plants without water and soil.
 Roots grow larger and larger. Soil, water, sunshine, and air cause plants to grow. Earthworms help keep the soil loose. Soil holds food for plants.
2. In country schools select a plot to observe and study by a brook side, in a pasture, or along the road. Each child marks out a plot 3 or 4 feet square and observes this from day to day. Notice new plants as they come up; notice stages of growth in old plants; find animals and insects in the plot from day to day. Notice how plants thrive where soil is moist and mellow, with grass roots and leaves mixed in it. Make other observations.
3. Plan a wild-flower garden and transplant wild flowers from roadside or woods; or a garden in which to plant seeds. Give special attention to observations about the soil.
- (a) Its depth.
 (b) The amount of work it takes to pulverize it.
 (c) Its color and texture.
 (d) Roots and broken leaves in the soil.
4. In country or small town, observe a dust-storm.
- (a) During the storm.
- (1) Where does the dust blow hardest?—
 across the lawn, in the garden, in the woods or grove, across the plowed field, across the pasture?
- (2) Where does the dust seem to go?
- The best soil is a porous, deep, rich, dark, well-drained loam.
 Decaying roots, trunks, leaves, and branches make soil rich and loamy.
 Dust appears to be blowing hardest across the plowed field. One can see the wind take up soil from the field.
 The dust fills the air. It is hard to breathe. People want to stay indoors during the storm.
 In pastures and grove wind does not take up fresh soil, and it deposits soil which it took from plowed fields.
 The soil settles where the wind is weakest.
 Soil that is blown away is very fine.

*Things to do**Desirable understandings and observations*

- (b) After the storm—
- (1) Where is the dust that was blown away during the storm?
 - (2) Can you find the places that lost soil during the storm?
 - (3) What places appear to lose no soil—pasture, lawn, woods, hill-tops, plowed fields?
5. Improve the school lawn or a park nearby.
- (a) Plant wild-flower seeds in protected corners.
 - (b) Make "keep-off-the-grass" signs.
 - (c) Explain the campaign to other children and urge them to observe the signs.
 - (d) Label flowers so that other children can learn their names.
6. Invite a C. C. C. boy to address the class.
Ask questions:
- (a) How many boys are in the camp?
 - (b) What do they do when they work?
 - (c) Why are they working for the community in this way?
 - (d) What fun do they have?
 - (e) Do they go to town, to church, and to shows as other people do?
 - (f) Who pays them?
 - (g) Why do they try to save soil?
7. Plan ways to save soil:
- (a) Take care of the lawn on the school ground.
 - (1) Do not make paths across it.
 - (2) Help plant trees, flowers, and shrubs.
 - (b) Take care of lawns at home.
 - (c) Protect wild flowers and shrubs.
 - (d) Erect wire or boards to protect young trees and shrubs.
 - (e) Do not break small branches of trees and shrubs.
- After a duststorm one can see that loose soil has been blown off the road into the grass.
Loose soil has settled in fence-corners, by buildings, in shrubbery.
- Soil where wild flowers grow best is often dark in color.
Transplanted flowers grow best with plenty of their native soil around them.
Correctly spelled signs and labels look best.
A good sign is clearly written.
Some ways of wording signs are better than others.
- There are many boys in C. C. C. camps.
They plant trees and shrubs to save soil from washing away.
They build dams in streams to hold back water.
- Holding water in streams keeps some plants alive.
Holding water in streams keeps some of the soil from washing far away.
- Walking on grass causes it to die and also destroys roots which save the soil.
Planting flowers, trees, and shrubs will save soil on our lawns.
Lawns and flowers make home and school yard beautiful.
Wild flowers, trees, and shrubs keep much soil from blowing away.

Things to do

- (f) In a garden at school or at home plan how to keep soil from washing away.

Desirable understandings and observations

People can save soil by not picking wild flowers and by protecting young trees and shrubs.

8. In city schools prepare soil and plant flowers in pots and window boxes.

- (a) Why put pebbles in the bottom?
 (b) Why is the soil so dark?
 (c) What becomes of the water we give the plants?

Soil needs air and drainage.

Decayed leaves and roots frequently make soil darker, as in the park, grove, or forest.

Some of the water given the plant in the window box is taken up by the air, some used by the plant.

9. Study seeds.

- (a) Find many different kinds of seeds.
 (b) Plan an exhibit of the seeds found and make labels.
 (c) Plant grass seeds thickly in a small box of soil. Watch them grow. What do the roots do to the soil?

Roots hold soil together and make it more porous.

10. Take an excursion to a place where soil has been excavated for a building or cut away for a road.

- (a) Note topsoil: its depth, its color compared with lower soil, its texture.

Topsoil is mellow, granular, and loamy and often darker than the layer next to it.

- (b) Note roots and the way they hold the soil on top.

The layer under the topsoil, or subsoil, is less loamy.

- (c) Collect samples of different kinds of soil observed.

Often lower than the subsoil are layers of clay and rocks.

11. With other grades (in country schools) take excursions to visit gullies, sheet erosion and wind erosion in fields near the school.

- (a) Note kind of soil washed away.
 (b) Note effect of grass, trees, or shrubs on erosion.
 (c) Note dams, contour plowing, strip farming, terracing, and other attempts to control erosion.

In the case of plowed crops like corn, much loose soil is washed away.

In a pasture, little soil is washed off slopes.

- (d) Gather information to answer questions, help save soil on school ground, write articles for school paper, or write stories and plays.

Grass, trees, and shrubs prevent gullies from becoming deeper and wider.

- (e) Gather pictures to show ways of controlling erosion.

Plowing around the hill instead of straight with the slope helps keep the soil from washing.

d) Activities for keeping records and making reports and summaries:

The activities suggested in this section can be carried on at different points in the development of the unit whenever the need for them arises. Many of them afford opportunity for the class to talk about investigations which different pupils have made. A large amount of group discussion under the supervision of the teacher will give each pupil a view of the unit as a whole.

Things to do

1. Tell classmates about individual experiences, such as:

- (a) Collecting rainwater and measuring its depth.
- (b) Noticing soil washed from the slope to the foot of a hill in a field.
- (c) Observing soil, sticks, and pebbles washed alongside of a road in the yard at home or school, or anywhere that the rest of the class have not seen.

(d) Making definite effort to protect the lawn at home.

(e) Learning interesting things from a brother who belongs to a C. C. C. group.

2. Classify different kinds of soil for exhibit. It may be desirable to have the pupils of middle grades help sort and classify this soil. Primary pupils who gather samples may:

- (a) Tell where the samples were found, whether on hill-top, in valley, in woods, and the like.
- (b) How to classify each sample, as rich or poor, forest soil, and the like.

3. Write something for the primary group's contribution to the school newspaper.

- (a) Plan "Our Own Page," or something of the sort.
- (b) Dictate "news" and stories for this to teacher who writes on the board for all to read.

4. Collect or draw pictures of rainstorms, duststorms, erosion, ways of controlling erosion. Put these on school bulletin board.

- (a) Pictures clipped from newspapers.
- (b) Large pictures which are the result of plans and work by the entire primary group.

Desirable understandings and observations

Ability to give a short account of an experience.

Tendency to notice changes that take place after a rain, such as washing of the soil in open places, absorption of rain on lawns, in pastures, in parks by sidewalks; power of running water to carry pebbles and sticks; gullies in the field.

Desire to do something to save soil.

Recognition of the worth of a community activity (C. C. C.).

Appreciation of the contribution of older pupils.

Satisfaction in being able to contribute to an activity in which entire school is interested.

Increased facility in expressing ideas in good English according to needs of the group and individuals and the requirements of the course of study.

Facility in creative expression according to standards set for grade.

<i>Things to do</i>	<i>Desirable understandings and observations</i>
<p>5. Help the middle and advanced groups entertain C. C. C. boys (small community).</p> <p>(a) Sing songs learned about the rain. (b) Recite poems. (c) Tell about experience in saving soil. (d) Take part in school play.</p>	<p>Wholesome acquaintance with older young people (C. C. C.). Satisfaction in taking part in an activity that the entire school considers valuable. Appreciation of C. C. C. activity.</p>
<p>6. Draw or paint pictures of the plants found in "nature plots."</p>	<p>A tendency to observe plants and ability to identify a few.</p>
<p>7. Collect seeds and plan a way of mounting, labeling, and preserving them.</p>	<p>A tendency to observe types of seeds. Inclination to recognize the worth of things other children have done.</p>
<p>8. Observe conservation week by performing tasks which are related to the work with soil.</p> <p>(a) Plan appropriate functions for a part of a whole-school program such as explaining the soil exhibit, or arranging soil pictures for display. (b) Write invitations to guests. (c) Country pupils make picture books showing children engaged in activities in conservation.</p>	<p>Skill in contributing to an enterprise of value to the entire group. Ability to recognize worth in classmates' contributions. Increased facility in expressing ideas in good English.</p>
<p>(e) Permanent interests:</p> <p>(1) Interest in the changes and movements of soil. (2) Desire to save soil and wild animal and plant life as observed in "nature plots." (3) Pleasure in flowers and in preserving rare wild flowers. (4) Interest in different kinds of farm crops, methods of producing them, and their effect on the soil.</p>	
<p>(f) Leads to other units:</p> <p>(1) A study of the conservation of plants. The desire to study plant conservation sometimes grows out of experiences with wild flowers, nature plots, and similar activities connected with a study of soil. (2) A unit on trees and their uses. Questions about trees may arise from study of forests as a means of conserving soil. Such questions can lead to a study of forests and ways of conserving them.</p>	

5. Suggestions Appropriate for Intermediate Pupils

(a) Situations (illustrative):

Urban

- (1) Children who have visited a farm where different kinds of erosion have occurred, or where the Government or individual farmers are carrying on activities to control erosion, can be encouraged to report their experiences to the other pupils. Interesting questions will arise to carry the pupils into a study of soil and of ways in which they can help save it.
- (2) Other studies can be used as leads to a study of soil, soil conservation, or erosion. In geography children read about the formation of the Mississippi Delta. They learn that this was formed by soil carried out of the Mississippi Valley and decide to study the streams in their own community to find whether or not these also carry soil.
- (3) The teacher can utilize things which pupils tell about their experiences in parks. They have seen soil deposited along the shores of streams. They have noticed how the roots of plants and leaves of trees form a covering for the ground in those parks which have been left in their natural state.
- (4) In one city school a fifth grade compared the Amazon Valley with the Mississippi Valley with respect to possibilities for agricultural development and out of this study grew some questions about erosion which carried the class into a study of soil erosion in the United States. One of the pupils lived next door to a specialist in the field of soil erosion and learned many interesting facts to report to his classmates. Eventually the children planned a sandtable display of a farm badly injured by erosion, the house nearly ready to tumble into a gully. They carried on an experiment to show the effect of running water on soil. The unit closed with a program in which the pupil who knew the specialist showed colored slides and gave a lecture on soil erosion.

Rural

- (1) A gully near the schoolhouse arouses the curiosity of the children and a study can be undertaken to find what caused the gully, what harm it does, how it increases each year, what the children can do to keep it from increasing in size, and the like. Such a study leads into studies of other forms of erosion.

- (2) The muddiness of creeks in the neighborhood leads children to ask questions leading to a general study of soil. The group can plan to help conserve the soil that is being washed away.
- (3) A school garden calls for more information about soil than the children possess, and so a class initiates a search for facts. This, in turn, leads to an enterprise in soil conservation.

Either Rural or Urban

- (1) In many States children in rural schools and also in city schools have experienced duststorms. The teacher can use an incidental discussion to lead the children into a study of the causes and effects of duststorms and what can be done to prevent them.
- (2) Pupils have heard their grandparents tell about better days when the country had no duststorms, fewer floods, and more forests. "What causes the difference between early days and our day?" a child asks, and a study of erosion begins.
- (3) In some communities, in town, city, and country, trees have recently died by the hundreds and people are cutting them for wood. If the question arises as to why so many trees have died it will lead the children to study the effects of droughts as a possible cause and to try to find ways of conserving water.
- (4) In all grades in city and country schools, the presence of a C. C. C. camp in the community is likely to cause comments and arouse questions among the children. If the teacher invites a C. C. C. boy to visit the school and talk to the children informally, enough questions will arise to lead the class into an enterprise for the conservation of soil.
- (5) Individual pupils find articles in the newspaper about saving soil or other natural resources. A discussion of these articles leads the class to observe natural resources or types of soil in the home community. They wish to find how the farmers are using these to the best advantage and how they are trying to restore losses or to recover from them.
- (6) In nature study, geography, and other subjects in the regular curriculum, children engage in activities which have conservation aspects. Curriculum units on birds, trees, and forests are examples. Units such as these do not fulfill their educative possibilities unless the pupils engage in activities of conservation.

(b) Questions and problems (illustrative):

Urban

- (1) If the soil blows away, can't farmers produce more soil by putting fertilizer on their fields? How does nature make soil?
- (2) Are city-people affected by the farmers' care of their soil?
- (3) Why don't farmers haul dirt and fill up the gullies?

Rural

- (1) Is there anything the children can do to help save the soil in the home community?
- (2) When the topsoil washes away, can the farmers not plow deeply and loosen more soil?
- (3) Could floods be prevented if all the water were saved that runs off our fields?

Either rural or Urban

- (1) What causes the floods in other parts of the country? Why are there no floods at home? Do the waters that run off the fields near home cause floods anywhere?
- (2) How deep is the soil?
- (3) From what parts of the country does the dust of the duststorm come?
- (4) What do the C. C. C. boys do? Who pays them? What do they study?
- (5) How do farmers in other lands save their soil?

(c) Activities for study—observation, investigation, reading, discussion:

Things to do

Desirable understandings and observations

1. Take an excursion after a rain⁸ to learn more about soil in the community. This will serve as the first step toward answering many questions similar to those in the foregoing pages. (Single class, with primary grades, or with whole school).

(a) Try to decide:

- (1) How deep the soil is on top of the hill.
- (2) On the side of the hill.
- (3) At the bottom of the hill.

Water has power to wash soil and to carry sticks and pebbles.
Some water runs downhill, carrying soil with it.

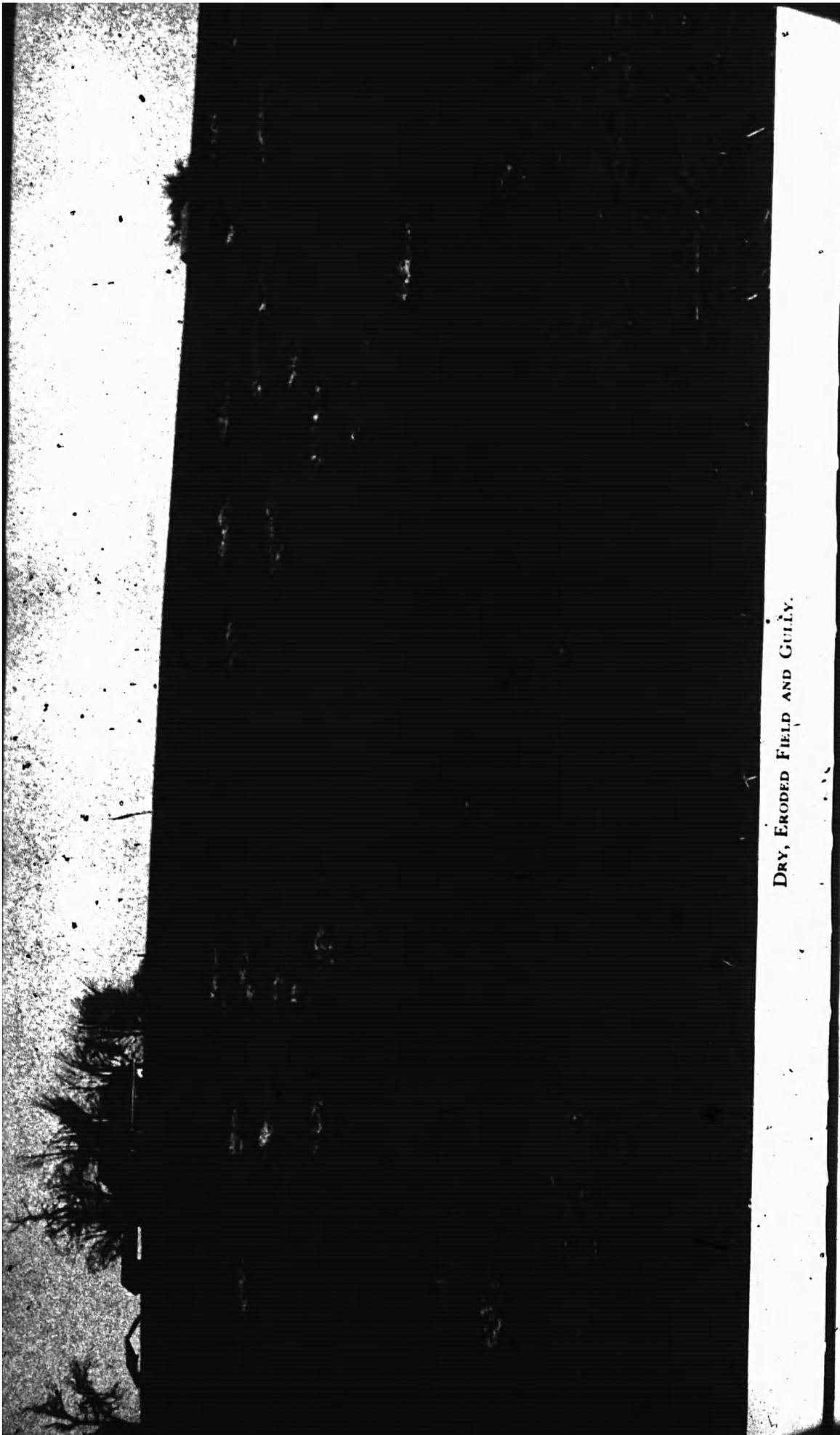
(b) Gather samples of soil:

- (1) From top, slope, and bottom of hill.
- (2) From bottom of creek.
- (3) Near the creek.
- (4) From grassland.
- (5) From grade near road.

(c) Compare the different types of soil:

- (1) Which is finer?
- (2) Which is more granular?
- (3) Where is the darkest soil found?

Soil is usually darker and more mellow below forest floors, at the foot of hills, and where grass and plants are luxuriant.



DRY, ERODED FIELD AND GULLY.

Things to do

Desirable understandings and observations

- (4) Why is it dark?
- (5) Where is the most mellow soil found? Why is it so mellow?
- (d) Observe where water has run off most quickly, and decide why there is a difference:
 - (1) Top of hill, slope, bottom.
 - (2) Grassland, forest, or grove.
 - (3) Roadside grade.
- (e) Note where the largest plants grow and try to tell why:
 - (1) Where soil is washed away.
 - (2) Where silt is mixed with plant growth.
 - (3) On roadside where there is no topsoil.
- (f) Ask a pupil of the advanced group to explain how the amount of slope on a hillside can be measured.
- (g) Observe gullies and ditches in pastures, in vacant lots, in woods, or park:
 - (1) Where are the largest and deepest gullies on hilltops, slopes, or the foot of a hill? How long? Deep?
 - (2) Are there any washed-out culverts in the community?
 - (3) Is the water high or low in streams?
 - (4) Is the flow strong or weak?
 - (5) Do rocks, trees, or shrubs make any difference in the power of the running water?
- 2. Read about the way soil is made. Try to think of an experiment to prove what has been read. For example, what can be done to prove:
 - (a) That rocks can wear one another away.
 - (b) That rocks can be split and made finer by heat.
 - (c) That rocks can be split and made finer by freezing.
 - (d) What kind of soil running water is most likely to carry away.
 - (e) What kind of soil wind is most likely to carry away.
 - (f) That water can climb up the stalk and branches of a plant.
 - (g) That leaves and roots hold moisture in the soil.
 - (h) That leaves and roots make soil richer for plants.

Soil is less mellow and often lighter in color where there is little vegetation.

On grassland water does not wash the soil away as fast as on plowed fields.
On bare soil water runs off faster than on grassland.

Largest, healthiest plants grow where there is deep rich soil well mixed with decayed plant and animal life.

Gullies begin where water collects and drips or flows.
Gullies usually are deepest where there is no plant growth to hold the soil.
In large gullies, great masses of earth are sometimes torn loose by heavy rainfall.

Rocks are broken fine by freezing and thawing. These particles compose part of the soil.
Plant roots grow into crevices and cracks of rocks and break off little pieces or leave places for water to enter and freeze. This process helps to produce soil.
Leaves, tiny branches, and other litter from plants and trees decompose, form humus, and mix with rock particles. The litter helps the soil hold moisture.
Running water carries more fine soil than coarse soil.

*Things to do**Desirable understandings
and observations*

- (i) How much soil is washed away by a single downpour.
- (j) That plant roots give off acid which decompose rocks.
- Soil which is mixed with roots and leaves is not easily washed away, holds water, and is rich. Topsoil is made up of the finest particles of rock mixed with litter of plants, animals, and water.
- Some kinds of soil have much humus in them. These soils, usually are darker and richer than other soils. They produce better crops than soil that has less humus. Other soils have less humus and frequently are lighter in color. Usually they produce less abundantly.
3. To learn more about soil, take an excursion to a roadside nearby where a grade has been cut; or to a city lot where excavating is done.
- (a) Observe layers of different kinds of soil. Where is the richest soil? How can you tell? Can you account for its richness?
- (b) Observe soil about the roots of trees if any trees have been cut. Is the black soil as deep or deeper than in other places?
- (c) Make a sketch or picture of the layers of soil as they appear in the roadside grade you observe.
- (d) Gather samples of soil for a soil exhibit for a school museum.
- A roadside grade shows soil arranged in layers. The soil on top is more loamy and usually darker. Rich soil often is deeper on the lower part of the slope.
- Rich soil is looser and more porous where plants grow profusely. Several layers underneath the topsoil there may be rocks that have not been broken into fine particles.
4. Take an excursion to a field where corn is being cut for a silo, or where wheat or oats is being threshed, or corn picked, or to a large garden. The class might make a list of questions and read to answer them:
- (a) Where did the material in the fodder come from? (soil, air, sunshine, water).
- (b) How can a farmer save his field when he takes all this material from it year after year?
- When a crop of any kind is harvested, a great amount of material is taken away from the soil. The efficient farmer tries to put back on his farm some of the richness which the crops take from it. Each year he spreads on his land commercial or barnyard fertilizers.

*Things to do**Desirable understandings
and observations*

- (c) What fertilizers are good for worn-out soil?
- (d) What part do dead plants play in renewing soil?
- (e) How long does it take to produce topsoil?
5. Have a class meeting to discuss experiences with duststorms, and decide how to learn more about duststorms; decide what the class wishes most to know:
- (a) How does the air look?
- (b) How does the dust feel that is blown against one?
- (c) How one can breathe in a duststorm?
- (d) Are people ever lost in duststorms?
- (e) Can a duststorm kill people?
- (f) According to all the experiences that different children tell, what is happening to the soil in those States that have great duststorms?
- (g) Have pupils read anything in books or magazines about duststorms? What articles can anyone recommend to his classmates?
- (h) From what kind of land does the dust blow most freely—plowed land, pasture land, fallow land, forest floors?
- (i) Is there any way of preventing duststorms?
- (j) What books tell about regions that have duststorms?
6. Take a trip to observe evidences of erosion control. Formulate questions and try to answer them:
- (a) How are farmers in the community trying to save their soil?
- (1) Find out how many have large pasture lands; clover fields; other fields of hay or grass.
- (2) Make a map of the community to show where all the grasslands are.
- (3) Learn if any of the farmers try to plow their land in certain ways to keep the soil from being blown or washed away.
- (4) Learn if any of the farmers are planting new trees.
- It will require hundreds and even thousands of years to renew the Nation's worn-out soil.
- Topsoil can be produced approximately at the rate of 1 inch in 400 to 1,000 years.
- The wind in a duststorm is very strong.
- The wind blows great quantities of rich soil from the fields. This soil cannot be replaced for generations; perhaps never. The soil is less easily blown off grass and pasture lands and earth than off plowed fields and pastures too closely grazed.
- The soil blows most quickly away from plowed lands or closely pastured lands. Trees planted in belts as windbreaks help prevent soil from blowing. Strip farming helps prevent duststorms because the dust blows into the close-growing strip and is held there, and because there is less area of unprotected soil.
- Sometimes farmers plow ridges across their hill-sides to keep the water from washing away.
- Some farmers build obstructions of wire, poles, and soil across gullies and plant trees in them to keep the water from washing soil farther. These obstructions hold the water until it sinks

Things to do

- (5) Learn what farmers do to keep the rains from washing gullies in their fields.
- (6) On the map locate places where farmers have tried to prevent their soil from being washed or blown away.
 - (b) How did the farmers learn to save their soil?
 - (1) What has the county agent done in the community?
 - (2) What are the C. C. C. boys doing?
 - (3) How is it that the community can have a county agent and a C. C. C. camp?
 - (4) Who pays them? How?
 - (5) Can the county agent or the C. C. C. educational adviser help the school study?
7. Plan ways for the school to help save the soil of the community. Discuss questions, such as:
 - (a) Can the children plant trees on their home farms, school yard, or highway?
 - (b) What can be done to protect the grass on the lawns at home or school? Does protecting grass save the soil?
 - (c) Is there any way in which the children can take part in what the farmers are doing?
 - (1) Visit a farm bureau meeting where the farmers have planned to discuss terraced plowing, grassed highways, and other methods of cultivation.
 - (2) Talk about methods of saving soil with father or an older brother.
 - (3) Offer to help the county agent distribute announcements of programs for study of soil conservation.
 - (4) Offer to take part in conservation program of local farmers' organizations by telling about experiences in saving soil.
 - (d) How can anyone influence a playmate or brother or sister to help save soil?

Desirable understanding and observations

beneath the surface instead of running off.

The county agent is employed to give advice to farmers in the community.

The Government employs the C. C. C. boys to plant trees and build dams and in other ways prevent the soil from being blown or washed away.

Planting trees saves soil from wind and rain.

Protecting grass on lawn and roadside helps save soil.

Things which children do to help save soil sometimes cause other people also to want to save it.

Inviting others to help in conservation projects often wins their interest and cooperation.

*Things to do**Desirable understandings
and observations*

8. Learn how people live where there is almost no rain at all.
- (a) What books and pictures tell about Arabia?
- (1) What kind of plants grow there?
- (2) Is there any way of watering plants in the desert?
- (3) What is an oasis?
- (4) What difference does lack of water make in the people's way of living?
- (b) What materials have information about desert lands of Africa?
- (c) Are there any lands in the United States at all like desert lands of other countries? What has made them so? What books tell about them?
9. Plan to learn how farmers in other lands save their soil. What books and pictures can we find to help:
- (a) Holland.
- (b) Switzerland.
10. Plan to learn about lands that have more rainfall than the people need.
- (a) What kinds of plants grow in lands like these and how do the people live?
- (b) What are plants, animals, and people like in jungle lands?
- (c) What books and pictures will help?
- Few plants and animals can live in desert countries, except near rivers or oases.
- People in desert countries must be careful not to waste water. They cannot wash their hands and clothing as often as we do. They raise flocks; and farm very little. They travel about looking for fresh grass and water for their flocks.
- Sometimes rivers that start in snow on the mountains flow across desert countries.
- A river in a desert country furnishes water for irrigation. By irrigation people can have farms and gardens near the river. Sometimes there are springs in desert lands. These springs water the soil about them and make it possible for plants and animals to live.
- Farmers in Holland live on farms from which the sea is shut out by great walls solidly built.
- Many farmers in Switzerland build terraced farms on steep hillsides.
- In France sand dunes in Landes were conserved.
- In wet jungle lands, plants are large and abundant. There is plenty of food for people and animals.
- Fewer people live in jungle lands than in temperate lands.
- Animals are often large and fierce.

(d) Activities for keeping records and making reports and summaries:

*Things to do**Desirable attitudes and abilities*

Planning and developing the activities of this section afford opportunities for children to evaluate work that has been done and arrive at conclusions. A large amount of group discussion under supervision of the teacher will afford a view of the unit as a whole for pupils who largely have engaged in individual activities and participated in the work of small committees.

1. Have a class meeting and discuss experiences in conservation of soil at home:
 - (a) Helping to fertilize the garden.
 - (b) Planting shrubs in a gully.
 - (c) Preparing ground for a lawn at home and planting grass seed.
2. If the entire school is preparing a soil exhibit, bring specimens of different kinds of soil; sort and label them. On labels tell:
 - (a) Where the sample was found, whether on hill-top, slope, valley, woods, in garden, in a certain part of a grade cut away for a road, from a post hole or gopher hole.
 - (b) How the different kinds of soil may have been formed.
 - (c) Which are best for plants and why?
3. If there is a school newspaper, contribute as follows:
 - (a) An article telling how soil is made.
 - (b) Articles telling how farmers of other countries, such as Switzerland, Holland, and Russia have conserved their soil.
 - (c) Sketches of the layers of soil found in a grade which was cut away for a roadbed; or in an excavation for a house.
- (d) Cartoons on soil conservation.
- (e) Editorials urging children of the school to have some part in community conservation.
4. If the school entertains the C. C. boys, plan how to take part:
 - (a) Plan a play about a conservation project for the community.

Ability to give a connected account of an experience in a 2- or 3-minute talk to a class group.

Extended pleasure in creative expression.
Increased sensitiveness to correct spelling, especially of words used in study of conservation.

Increasing sensitiveness to correct punctuation, and the like, according to pupils' individual needs.

Increase in ability to cooperate in group enterprises.

Increase in ability to organize ideas and material.
Improvement in the expression of ideas in good English according to individual needs and grade requirements.

Wholesome pleasure in acquaintance with older young people (C. C. C.).

Things to do

- (b) Conduct a group geography contest in which conservation projects of other countries are described, locating on the map the countries described.
5. Draw illustrated or pictorial maps showing desert lands, wet lands, and conservation projects in different countries.
6. Discuss topics and questions for a school program on conservation.
- (a) What is soil and how is it made?
- (b) How is soil depleted or removed?
- (c) My experiences in fertilizing the soil of the garden.
- (d) How running water affects soil.
- (e) My experiences in a duststorm.
- (f) Ways in which erosion of the soil may be prevented.
- (g) Conservation in other countries.
- (h) What early settlers knew about control of erosion; in Virginia; in New England.
- (c) Permanent interests:
- (1) Interest in different types of conservation of soil reported in newspapers and magazines.
- (2) Desire to learn more about the way people live in other countries.
- (3) Desire to learn more about the soil problems of the United States and other countries and ways of solving them.
- (f) Leads to other units:
- (1) More detailed studies of life in Switzerland, Holland, the jungle, or desert lands.
- (2) Study of forests to learn more about the ways in which they can be conserved.
- (3) The life of a forest ranger or other forest workers.
- (4) Studies of farm crops and the way they are grown.

Desirable attitudes and abilities

Satisfaction in taking part in an activity that the entire school considers valuable.

Consciousness of the existence of other countries and geographical regions and some understanding of their peculiar problems in conservation.

Sensitiveness to location of regions on the map.

Increase in ability to recall and organize ideas.

Greater ability to organize and summarize important facts learned.

6. Suggestions Appropriate for Advanced Pupils

(a) Situations (illustrative):

Urban

- (1) Some of the children visit a farm where a Government experiment in conservation is conducted. When they return to school they will have questions appropriate for a study of conservation from the point of view of the city dweller.
- (2) The children hear their parents discussing a rise in the cost of bread. In trying to find the reason for the rise, the children learn that drought and duststorms, or possibly hordes of grasshoppers, have destroyed much of the Nation's wheat crop. This is a lead into a study of optimum use of the land in dry States or during seasons of drought in humid States.
- (3) If there is a school garden, a study of the best kind of fertilizer to use for the soil leads into a study of the different kinds of soils in the United States and good ways of preserving them.
- (4) Seeing a group of men working to reseed or to landscape a boulevard leads into a study of different kinds of soil, the value of soil, and the best ways of saving it.
- (5) A duststorm is interesting to children. Where does the dust come from? What will the farmers do if the wind blows their soil away? Can they just plow more deeply and so have more soil? What difference does it all make to the rest of the country?

Rural

- (1) In wandering about on their own farm or on a neighbor's farm, as boys often do, some of the boys in the class will note large gullies made by erosion. They walk through dark or loamy soil lying thick at the foot of the hills from which it was washed during the rains. In school they mention the gullies or the surplus soil. They ask questions about ways of controlling gullies. They disagree as to the cause of the soil at the bottom of the hills. Some are not convinced that harm is done to the field by the washing away of this soil. Discussion may follow and study may be needed to settle disputes.
- (2) When rains are few, children have experiences in driving cows long distances to water. In a year of drought many farmers pasture cattle and horses in the road. The children have to watch them to keep them from straying. Children discuss their experiences in school and formulate questions. Is there any way in which water of the spring rains might be conserved for a dry

season? Is there a supply of water that might be used to irrigate gardens or trees on individual farms? Such questions lead to a study of water and soil.

- (3) If farmers in the community are trying new ways of plowing, such as contour plowing, the children in the sixth, seventh, and eighth grades will be interested. They can discuss advantages and disadvantages of different ways of conserving soil and begin activities leading to a unit of study.
- (4) In the country a duststorm causes more concern than it does in a city or town, simply because it is a matter of direct interest to the people. The storm is blowing their best soil away—the soil upon which their living depends. Children ask: “If the wind blows all of the soil away, can it ever be replaced?” This is a lead to the study of wind erosion.

Either Rural or Urban

- (1) Perhaps farmers in the community are planning various dry-weather crops, such as soybeans, lespedeza, and the like. Children ask, “Why don’t people plant more grain or wheat and other crops that make good food?” “Do beans bring the farmers more money?” Such questions are leads to studies of crop rotation and erosion control.
- (2) A newspaper article or magazine article about saving soil will lead children to try to learn whether or not soil is being wasted in their surrounding community.
- (3) A flood in parts of the city or in nearby city or country will lead children to study floods, and to find how their community can contribute to the prevention of floods.
- (4) The boys in a C. C. C. camp in the neighborhood are building dams or planting trees to prevent erosion of the soil. Children ask why these activities are being carried on now and not in earlier days. They begin a study of activities of C. C. C. workers, some of which are leads to a study of conservation of the soil. Some of the children may have brothers in the C. C. C. and so desire to learn more about the life and work in the camps.
- (5) Children who have read an article about resettlement may ask, “Why did people settle where they cannot make a living?” To answer a question like this, the class should seek information from histories and encyclopedias. The question sometimes leads into a study of the public domain, or present resettlement enterprises. Information can be obtained from Government bulletins cited in the bibliography.

- (6) Perhaps a community committee asks for help from F. E. R. A., W. P. A., or C. C. C. organizations in solving problems of soil erosion. The children wish to find out why people don't carry out for themselves the necessary conservation of soil instead of asking the Government to help them. Perhaps they hear a discussion at home about buying land from the Government and they wish to know how it is done. This leads them into a study of the way the Government helps farmers finance their purchase of land. The study might be extended into other problems which the Government has in conserving the Nation's land.

- (b) Questions and problems (illustrative):

Urban

- (1) What kind of fertilizer does the school garden need?
- (2) What caused the flood which has destroyed so much property in parts of the city and in other cities? What will help prevent future floods?
- (3) Where do duststorms come from?

Rural

- (1) How can the class tell whether or not there is serious erosion in the community?
- (2) Will the farmers have better crops next year if they enter the Government's conservation plan, or is the Government just trying to save the soil for the future?
- (3) Can the class do anything to help save soil in the community?
- (4) Can the class have a conservation club and plan studies and programs?

Either Rural or Urban

- (1) Why is there erosion now when the colonists and pioneers had none? Or was there erosion in early days also? (a question which leads to study of accelerated erosion).
- (2) Is it true that early farmers in the Eastern part of the country wore out their soil, or was soil always poor in that part of the country?
- (3) Why did people plow up the Great Plains? Did they not know that the climate there was too dry for cultivated crops?
- (4) What will happen to the country if farmers allow all the soil to be washed away?

c) Activities for study—observation, investigation, reading, discussion:

Things to do

*Desirable understandings
and observations*

1. Learn whether or not soil is being wasted in the home community, and what types of erosion exist. The following activities will help:

With older, as with younger pupils, it usually is better to begin with a first-hand experience than by reading. In city schools, where it is impossible for the entire class to go to the country together, it may be possible for two or three pupils and the teacher to go after school or on Saturday and prepare a report for the rest of the class. Near the school there is often erosion in vacant lots which the children can observe, and layers of soil are noticeable in excavations.

(a) Observing soil:

- (1) Appearance of crops at foot of hills compared with appearance on slopes. When erosion removes soil from hillsides, crops are small and sickly looking.
- (2) Drifts of dust or soil at foot of slope. Soil washed from a slope frequently accumulates at foot of hill.

(3) Barren pasture land:

- (a) Grass killed by close cropping. On pasture greatest erosion occurs where grass has been killed by close cropping.

- (b) Grass killed by animals cutting surface with their hoofs. Sheep crop grass closer than cattle.

- (4) Amount of grass destroyed by sheep and cattle. Sheep hoofs are sharp and break the sod.

- (5) Ditches and gullies in fields, barnyards, or vacant lots. Gullies sometimes begin in furrows that are plowed down the slope.

- (6) Appearance of crops on different slopes. (Learn to measure amount of slope.) Some gullies begin with washing of soil below the eaves of a barn or in other places where nothing checks continued flow.

(b) Observing watersheds:

- (1) Location of farms in neighborhood with respect to rest of watershed. Farms in lowest parts of watersheds are frequently very fertile because of accumulations of topsoil from the hills.

- (2) Location of trees. Have these trees any apparent effect on rain or wind? Trees check the force of wind and rain and help to prevent erosion of soil.

- (3) Location of places of worst erosion with respect to rest of watershed? More erosion occurs in cultivated fields than in grass or forest regions.

Things to do

- (4) Relation between waters that run off slopes in the neighborhood and floods in other States?

Desirable understandings and observations

The waters which rapidly run off ungrassed or un-forested slopes increase the volume of streams, but do not alone cause floods. The chief cause of destructive floods is unusually great precipitation over partially deforested or poorly farmed watersheds.

- (5) Indications that erosion and floods are community problems and not one for the individual to solve.

- (c) Reading about soil erosion to help understand the problems in the local community.

- (d) Constructing maps.

- (1) Map showing location of main or smaller watersheds in the community. Consult watershed maps in geographies. Locate:

- (a) Farms.
- (b) Largest streams.
- (c) Richest soil.
- (d) Best crops.
- (e) Drainage.
- (f) Forests, woods.
- (g) Places of floods.
- (h) Places of greatest erosion.

- (2) Map showing where water flows on leaving community. Locate:

- (a) Large rivers.
- (b) Arms of ocean.
- (c) States.
- (d) Large cities.

2. Try to learn:

- (a) What becomes of water that falls as rain?

- (1) Observe depth of streams in neighborhood after a heavy rain.

Part of the water that falls as rain runs off the surface into larger and still larger streams and finally reaches the ocean.

- (2) After a rain dig down into soil to find how deep the water has sunk into the ground.

- (3) Observe or measure the change in depth of a surface well in the community after a heavy rain.

Some of the water that falls as rain sinks down into the soil and increases the supply of underground water.

- (4) Note increase in ease of pumping water from a surface well after a heavy rain; discuss reasons for this.

Some of the water is absorbed by plants and trees.

- (5) Observe freshness of plants and trees after a rain. Is this an indication of what use is made of some of the water?

Trees and plants give off water into the air.

*Things to do**Desirable understandings
and observations*

- (6) Partly fill tumblers with soil of different textures. Pour same amount of water into each. Note what kind of soil absorbs most water. Note rate of absorption.
- (7) Construct a gage that tells you how much rain falls at any time. (See *Save the Soil*, Cornell Rural School Leaflet 29:7, March 1936.)
- (b) How water gets into the air (clouds):
- (1) Put a pint of water into a pan and let it boil for a short time; measure the water that is left, and then try to explain. Why is there less water in the pan after it has boiled a while? Where has part of the water gone?
- (2) Try to explain why a pond is more shallow after a long dry season.
- (3) Wash hands and allow them to dry in the air. Where did the water go?
- (c) How water forms into drops in the atmosphere:
- (1) Fill a pitcher with cold water and allow it to stand in a warm room. Where did the drops of water come from which formed on the outside of the pitcher?
- (2) Read about the formation of clouds in an elementary text on science or nature study.

Water that is heated passes into the air.

Water that stands, or is exposed to the air, is absorbed through the process of evaporation.

Some of the water from the surface of ponds, lakes, streams, and the ocean collects in the air.

When water in the air is cooled it forms into larger and larger drops which finally fall as rain.

CONTRAST THIS MAN-MADE DAM WITH THAT IN THE NEXT PICTURE:



*Things to do**Desirable understandings
and observations*

- (d) What is meant by the water cycle?
How does the circulation of water vary in different parts of the country?
- (1) Read an elementary text on science or nature study. Can a knowledge of the water cycle help people understand problems of erosion and of controlling erosion?
- (2) Construct maps or diagrams:
- (a) To show that the run-off waters which cause excessive erosion start in the upper parts of watersheds.
- (b) To show that eroded soil is deposited at river mouths, in shoals in river beds, and in reservoirs.
- (c) To show rainfall belts of the United States.
- (3) Construct a diagram to show what happens to underground water table when run-off waters are retained in the upper parts of watersheds.
- 3 Carry on an experiment to learn how erosion affects crops.
- (a) Try to find on what kinds of soil the largest and healthiest plants grow:
- (1) On thin soil on the slope of a hill, measure the size and number of plants.
- (2) On thick soil at the bottom of a hill, measure the number and size of plants.
- (3) Compare well-drained soil with poorly drained soil as to size and number of plants.
- (4) Compare plant growth on rocky soil with the plant growth on soil that has few rocks.
- (5) Compare plant growth on the side of a roadside cut with that on top. What causes the difference?
- (b) Discuss differences in lakes, streams, and ponds in the community in dry and rainy years. Follow the discussion by reading for information.
- (1) How do lakes and streams vary in the amount of water which they carry in different years?
- The water cycle is the natural circulation of waters from the clouds to the earth, where it exists in various places, and then back again to the clouds by evaporation and transpiration.
- Headwaters uncontrolled may carry tons of soil from slopes and fertile upper valleys and help cause floods in lower valleys.
- Erosion not only deprives land of its fertility, but proves a nuisance in rivers, lakes, and reservoirs.
- Run-off retained raises the underground water table which sometimes nourishes tree roots, and which furnishes water for domestic purposes and for irrigation.
- On thin soil on the side of hills, plants are fewer and smaller.
- Where soil is thick and loamy, plants are large and strong.
- Well-drained soil produces better crops than poorly drained soil.
- On rocky soil, plants that grow best have long tap roots.
- On a roadside grade there is little or no topsoil.
- A muddy stream indicates accelerated erosion.



THIS DAM IS THE PRODUCT OF AN EFFICIENT CONSERVATIONIST, THE BEAVER.

Things to do

- (2) Are there bars of mud near the shores? What may these indicate?
 - (3) What condition of land might be indicated by the filling up of a lake or pond?
 - (c) Make a balanced aquarium, putting in it fish and other water animals and plants. To balance an aquarium, enough plants should be used to provide food for the animals. The children will find it necessary to experiment a great deal with an aquarium before they secure the proper balance. They will know that the aquarium is balanced when water, fish, snails, water bugs, or other animal life appear to be healthy and when the plants are freshly growing. An elementary science text will afford information.
 - (d) Construct a terrarium to show how land plants are balanced. Use an elementary science text for information.
4. Prepare a list of conservation practices which would be appropriate for a farm in the community. It may be necessary for the class to study about different ways of controlling erosion and perhaps ask the opinion of farmers before deciding what practices will be good for the farm they have selected for study.
- (a) Rotation of crops.
 - (b) Contour tillage.

Desirable understandings and observations

Bars of mud near the shores of lakes indicate accelerated erosion in the valleys surrounding the lakes.

Erosion causes lakes to become filled up.

Nature balances plant and animal life and soil and water on earth in somewhat the same way that children balance an aquarium or terrarium.

Rotation of crops is good for all farms whether

Things to do

- (c) Strip crops.
 - (d) Terraces on slopes.
 - (e) Pasture conservation (contour furrows, light cropping, rotation of grazing, and the like).
 - (f) Gully control.
 - (g) Reservoirs to save surplus water.
 - (h) Irrigation.
 - (i) Many profit-making activities, such as poultry raising, growing of vegetables, keeping bees, raising calves, and colts.
 - (j) Proper management of wood lots.
5. Make a survey of farms in the community to determine all the profit-making activities besides raising crops. Any of the following?
- (a) Fruit raising.
 - (b) Poultry raising.
 - (c) Dairying on small or large scale.
 - (d) Gardening.
 - (e) Selling vegetables not needed for family.
 - (f) Raising calves, colts, dogs.
 - (g) Growing fence posts.
 - (h) Keeping bees.
6. Visit erosion-control projects in the community and try to determine how they prevent soil from washing away.
- (a) Strip-crops. What kind of crops are used? Have they stopped erosion? How?
 - (b) Gully dams. What materials are used? Are they effective?
 - (c) Terraces on slopes. How are they effective? What precautions must be taken to keep them from causing damage?
 - (d) Contour furrows in pastures. How are they effective? What precautions keep them from causing gullies where the water breaks through?
 - (e) Grassed waterways. How are they made and what kind of control do they give?
7. Visit a farmer in the community and ask his opinion about various questions in the problem of erosion control. Follow up the visit by reading. Try to decide the difference between the facts read and the opinions and experiences of the farmer. Decide which of the things read are mere opinions; which are facts. For example:

Desirable understandings and observations

sloping or level and fertile or unfertile. Grazing on pastures should be alternated and the grass only lightly cropped to prevent erosion by wind and water. There may be erosion without gullies. Many profitable activities assure income when crops are under control.

When farmers have many profit-making crops, they can afford to farm the soil less intensively. They can have more pasture land, for example, instead of soil-exhausting crops like corn, cotton, or tobacco.

Close-growing crops or grass are planted between open-growing crops like corn. Many different materials are used for control of gullies, including rocks, poles, cement, and wire.

Terraces and contour furrows must be carefully made or they cause gullies where the water breaks through, or at the ends where it collects and overflows.

Things to do

- (a) What are the advantages and disadvantages of different types of erosion-control methods?
 - (b) How old is the biggest gully in the community?
 - (c) Does the soil produce as well now as formerly?
 - (d) Are immediate benefits realized from any of the methods of erosion control?
8. Try to learn more about duststorms and the places where they occur. Use books and magazines. For example:
- (a) What causes duststorms?
 - (1) Lack of rainfall.
 - (2) Wind.
 - (3) Loose soil.
 - (b) Could a duststorm occur in a climate like ours? Study:
 - (1) Annual rainfall of home community.
 - (2) Amount of annual rainfall necessary for crops.
 - (3) Date when frost begins in home community. (What effect has frozen ground on run-off after rain?)
 - (4) Precautions farmers take to prevent the soil from being blown away.
 - (a) Grass and pasture land.
 - (b) Strip farming.
 - (c) Trees.
 - (c) Where do duststorms begin?
 - (1) Rainfall and duration of rainy seasons in other parts of the United States.
 - (2) Driest parts of the country:
 - (a) Great Plains; locate.
 - (b) Southwestern United States; locate.
 - (3) Where grasslands have been plowed.

Desirable understandings and observations

It requires careful thinking to determine the difference between facts and mere opinion, propaganda, and prejudice. When an author is an authority, his statements may be taken as facts. Facts are often supported by figures.

Duststorms occur when there has been little rainfall, and the fields are too closely cropped or too continuously plowed. The wind picks up loose soil and whirls it into thick heavy clouds of dust.

Duststorms occur where many acres of sod have been torn loose and upturned by plowing.

Severe duststorms are not apt to occur in regions where the rainfall is over 20 inches yearly.

Planting grass and similar crops prevents the soil from being blown away. Strip farming helps control wind erosion because soil from the cultivated strip is blown into the grassy strip and held there.

The Great Plains and Southwestern United States have most duststorms. The annual rainfall is less than 20 inches.

Things to do

(d) How do people live in the Great Plains?

- (1) How farming and other industries survive.
- (2) How life might be different in our community if we had one dry year after another.
 - (a) Struggle for farmers to secure money to buy food and clothing.
 - (b) Condition of business in towns and cities.

(c) Ownership of farms.

- (d) Condition of crops.
- (e) Insects that eat the crops in dry regions.

(e) Why did people ever plow the Great Plains? Consider:

- (1) The World War and the Nation's need for food.
- (2) The invention of labor-saving machinery and the temptation to make more money.
- (3) The difficulty of making a living by raising sheep or cattle on the small 160-acre farms which the Government at first allowed.

Desirable understandings and observations

In places where dust storms and erosion occur, the struggle to make a living is intense. Farmers do not get enough money from crops to buy the things they need. Farming does not pay and farm owners often lose their farms because they are unable to pay mortgages. Business shrinks in towns and cities.

In dry lands where dust storms blow there are many insects to eat the crops.

Many crop-eating insects are killed by rainy weather.

In early days the Great Plains were covered by grass.

Much of this grass had long, tough, clinging roots. The grass and the roots held the water which fell in the early spring rains.

The grass and the roots bound the soil to the earth and the wind could not blow it away.

When people wanted more land, the Government gave farms to settlers who would improve the property, or sold land for a small price per acre.

When the World War came the Nation needed food for soldiers and for the soldiers of the Allies, so grasslands were plowed.

After the war a great amount of machinery was invented and more land could be plowed and planted in wheat.

Thousands of acres of loose soil were exposed to the wind and sun by plowing.

*Things to do**Desirable understandings
and observations*

(f) Why don't people move away from their homes in the Great Plains? Can anything be done for them if they remain where they are? Investigate:

- (1) Efforts of Government to help people increase the size of their farms.
- (2) Establishment of irrigation systems.
- (3) Government aid in control of insect pests.

The Government is trying to help people who live in the Great Plains by lending them money to buy seed for drought-resistant crops, by moving some of them on to farms in more humid regions, and in other ways.

9. Try to decide what types of erosion must be controlled by individuals, by cooperating groups of farmers, and by Federal and State governments. Children might divide the problem into parts such as those below, compare, and decide why all groups must help conserve the soil.

(If various types of conservation are being carried on in the community, it is well for the class to find out from farmers how the soil is conserved. If the entire class cannot visit a project for the control of erosion, it may be possible for one or two pupils to do so and to prepare reports about methods in which erosion is being controlled.)

(a) By individual farmers.

- (1) Rotation of crops.
- (2) Reforestation of slopes.
- (3) Intermittent pasturing of poor soils and slopes.
- (4) Contour plowing—around the slopes instead of straight across in line with fence or rows.
- (5) Terracing—the forming of parallel strips of soil with smaller slopes than that for the hill.
- (6) Strip cropping—planting strips of small-grain between strips of cultivated crops.
- (7) Filling gullies and building check dams.

(b) By the farmers in the community as a group. Cooperation in:

- (1) Building check dams throughout the length of gullies which run through fields owned by different people.
- (2) Planning small drainage areas in which the needs of several farms are considered.
- (3) Maintaining irrigation projects over small areas.

There are many problems which the farmer and even the scientists themselves do not understand about control of erosion—what kind of crops are best to rotate, for example; how wide and steep the terraces should be for different kinds of hills and different kinds of soil; what kind of crops give best control of erosion when planted in strips with other crops, and the like. Each farmer must use the methods which are most effective on his farm.

By planning control of erosion together, small groups of landowners can check the washing of soil in gullies that exist in several farms.

TEACHING CONSERVATION

Things to do

*Desirable understandings
and observations*

(c) By the Government:

(1) State Government. Children write to State department of conservation or to State agricultural college for bulletins of information. Consult geographies and encyclopedias.

(a) Encouragement to farmers to withdraw from poor lands.

(b) Storage of surplus water.

(c) Damming of streams.

(d) Transplanting beaver to upper parts of streams where their dams will check the flow of water.

(e) Artificial lakes.

(f) Examples of State drainage projects with advantages, disadvantages, defects, and mistakes.

(1) Florida.

The State government helps people carry on activities that do not affect the people of another State.

Drainage in the Everglades of Florida is one of the most striking drainage projects in the United States. The land is fertile but there is danger of loss as a result of hurricanes and fire.

(2) Minnesota.

A region of shallow lake bed once forested was reclaimed in Minnesota. It was found that the poor peat soil would not support a farming population and the dryness of the region caused great forest fires. Finally dams were placed in the ditches and the area was again watered with beneficial results.

(3) Illinois.

The central part of the State has drainage to improve land already in farms. This is an example of a type of drainage in several middle western States.

Sometimes drainage increases the value of land.

Not all land is improved by drainage. Some wet land has harmful accumulation of salts slowly deposited by surplus water in the past, and is not improved by drainage.

(2) Federal Government:

(a) Experimental projects with W. P. A. assistance.

The Federal Government can carry on enterprises which affect more than one State.

Things to do

- (b) C. C. C. camps.
- (c) Crop regulation and payment for acreage withdrawn from cultivated crops.
- (d) Irrigation projects extending across State lines.

Desirable understandings and observations

Crop regulation in a community helps control flood conditions in lower parts of the watershed to some extent.

The Federal Government regulates and maintains C. C. C. camps where young men are paid to carry on forestry work and soil conservation for the Nation as a whole.

10. Try to learn whether or not people in towns and cities are affected by the way farmers use their soil.

(a) Consult businessmen.

- (1) Ask about the condition of business during the depression when farmers were receiving very little for their crops.

Businessmen in towns and cities seldom prosper when the farmers are affected by drought, flood, and erosion.

- (a) Grocers.
- (b) Doctors.
- (c) Ministers.
- (d) Teachers.
- (e) Sellers of farm machinery and implements.
- (f) Bankers.
- (g) Others.

- (2) Ask how business is affected by droughts and floods.

- (b) Make a list of businessmen who are interested in farm organizations in the community.

- (1) How do the businessmen help these organizations?

- (2) What things are farmers apt not to buy when times are hard?

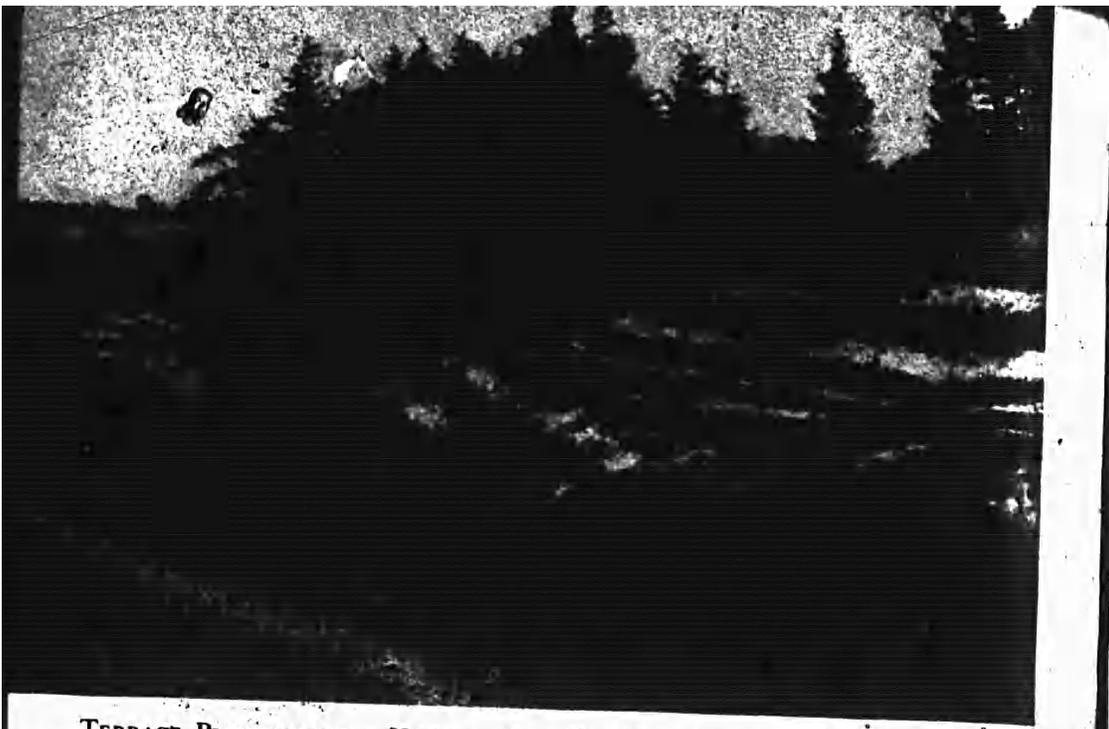
11. Have a class discussion on reasons why the Nation as a whole is affected by the prosperity of the farmers.

- (a) Manufacturers of food, clothing, and other articles.

When farmers' income is low, they cannot buy the products which other groups have to sell for a living. They cannot afford to travel and so do not help support the railroads and the people who work for them.

- (b) Miners and mine operators.
- (c) People engaged on railroads, buses, and other transportation.
- (d) Artists.

12. Study erosion in the United States as a whole. Questions like the following will be useful in developing the study if the children can be fed to formulate them. Government bulletins provide information.



TERRACE PLANTING ON A HILLSIDE IS A COMMON PREVENTIVE MEASURE.

Things to do

- (a) How much more shallow is the top soil now than when the land was first cultivated?
- (b) What kind of soil did the colonists find in America? How did they use it?
- (c) What kind of soil did the pioneers find on the prairies and on the Western plains? How did they use it?
- (d) What conditions in the Nation's life have changed the ways of farming? With what results?

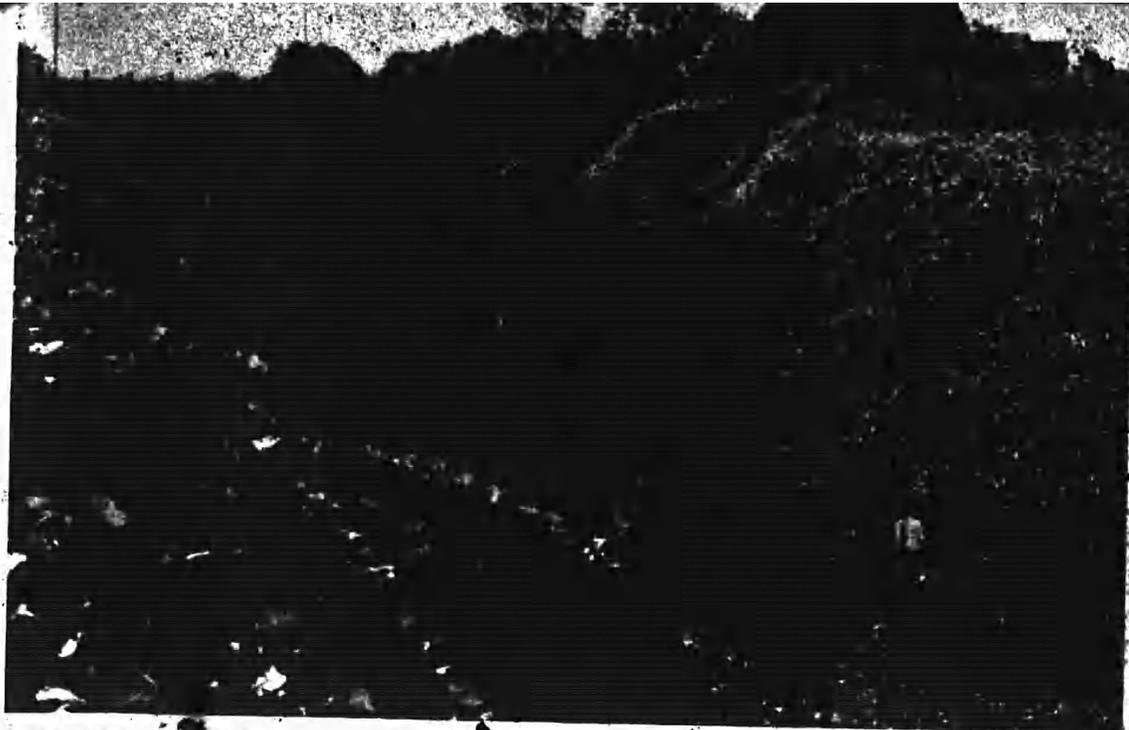
Desirable understandings and observations

In some places from one-fourth to three-fourths of the topsoil has been lost. The colonists found soil with a surplus of plant food that was exhausted in a comparatively short time. When the soil of one farm was worn out, they cut down forests to get new soil. Many acres of forests were cleared.

Pioneers found rich, deep, black soil on the prairies—a soil easily exhausted. Instead of being enriched by leaves as forest soils, this soil was enriched by tangled roots of grass. Settlers on the Great Plains found grasslands.

In pioneer days settlers plowed the prairie lands removing the cover of grass that held the soil and kept the water from running off rapidly.

In World War days the Great Plains were plowed to feed the soldiers of the Allies.



VINES WITH DEEP ROOTS AND CLINGING BRANCHES ARE PLANTED HERE TO KEEP THE SIDES OF THE GULLEY INTACT.

Things to do

- (1) Invention of farm machinery.
 - (2) The World War and the need of more food.
 - (3) The use of the tractor and increased acreage.
 - (4) The apparent beginning of a dry cycle in the Nation's climate.
- (e) What is the Government doing to conserve and restore the Nation's soil?
- (1) Demonstration projects and interstate aid.
 - (a) Demonstration projects in soil conservation, such as the Coon Valley project near La Crosse, Wis.
 - (b) Special conservation and rehabilitation projects, such as the enterprise of the T. V. A.
 - (c) Watershed projects, such as that of the Muskingum Watershed conservancy district.

Desirable understandings and observations

The invention of farm machinery encouraged the plowing of grasslands.

Several years of drought-killed crops left fields bare, and caused much erosion by wind.

It has been estimated that 400 million tons of soil material are washed into the Gulf of Mexico annually by the Mississippi River.

In the entire country, 3 billion tons of soil are removed beyond any further usefulness.

Much experimentation is needed to learn more nearly what conservation methods preserve different kinds of soil.

The Government finances a number of projects in different parts of the country in order to learn what methods are best, and to demonstrate them.

Things to do

- (d) Flood control, similar to that carried on in the Mississippi Valley by the United States Army Engineers.
- (2) Cooperation with Canada and Mexico for international control of floods and water supply carried on by the United States Army Engineers.

Desirable understandings and observations

The Canadian boundary lies on a water system which is relatively free from floods, the Great Lakes-St. Lawrence system. Some cooperation has existed, but the problems calling for cooperation have not been important.

The Red River of the North with its source in the United States sometimes floods the Canadian plain near its mouth. In the lower course of the Rio Grande floods can be controlled only by cooperating with the Mexican Government. Disputes sometimes arise. Shortage of water also brings disputes.

A Canadian-American International Joint Commission provides for settlement of Canadian-United States flood problems.

13. Consider what might happen to the country if people should continue to let most of the soil be washed away. Did such a thing ever happen anywhere?
- (a) Unfertile farms that the children have seen.
- (1) Do the farms look prosperous?
 - (2) How do the houses look—well-kept or poorly kept?
 - (3) Do the horses and other animals look healthy?
 - (4) Is the farm machinery in good condition? Is there much of it?
 - (5) Do the farmers on the poor farms work as hard as those on good farms?
 - (6) What kind of schools are in regions of many farms with poor soil?
 - (7) What kind of churches—are they in good repair?

Unfertile farms frequently have small, poor or dilapidated barns and houses. That is usually because the crops are poor and farmers cannot make enough money to improve their buildings.

On unfertile farms, horses and other animals are usually poorly kept.

Farmers on poor farms need to work harder than farmers on good farms, and even with harder work they make less money.

Things to do

- (b) Unfertile farms in parts of the country that the children have not seen. Children in advanced grades can read about farms in parts of the country in which they have not lived.
- (1) Great Plains swept by duststorms.
 - (2) Barren slopes in foothill regions.
 - (3) Forest areas that should never have been farmed.
 - (4) Swampland unfit for farming.

- (c) Lands in other countries that have lost their soil. Children may be interested in making special studies of different countries. Histories and encyclopedias will be helpful.
- (1) China.
 - (2) India.
 - (3) Western Europe.
 - (4) Ancient Mediterranean, etc.

14. Gathering information about conservation projects carried on in different countries and States and report to classmates.

- (a) Holland.

Desirable understandings and observations

The soil of farmsteads on the Great Plains is often destroyed by wind erosion and the farmers fail. In mountain regions erosion and poor farming have destroyed the soil from the foothills and mountain farms. Forests were cut or burned to clear the ground. It is very difficult for a family to make a living on these farms.

Some farmers are attempting to make a living on swampland that is entirely unfit for farming. Such land should be removed from cultivation.

In parts of China, India, and Europe long ago soil was wasted just as in this country much of it has been wasted. Nations which destroyed their soil either declined altogether or were greatly retarded in their progress.

People of Holland showed great skill in reclaiming the lowlands, and by their example helped teach neighboring countries how to farm well.

Things to do

(b) France.

(c) Denmark.

(d) China.

(e) Southwest Virginia.

(f) Coon Valley, Wis.

(g) Other countries and States which have conserved their soil.

Desirable understandings and observations

By intensive, careful methods of farming, the French have made themselves very nearly self-sustaining. On the farms of Western Europe fertilizer is being poured in increasing amounts in order to maintain productivity.

In Denmark, the number of trees has doubled in the past 75 years.

The first inhabitants of Northwest China found fertile valleys, perennial streams, and forest-covered slopes. The present aridity is not due to change of climate, but to loss of soil through destruction of forests and grasslands. The Chinese are beginning to protect the forests and control floods.

Many practices in erosion control were developed by early Virginia farmers. Washington, Madison, Jefferson observed that destruction of land by washing was serious. Jefferson was one of the first advocates of contour tillage. George Washington has been called the "Father of American Agriculture." He was greatly troubled by washing of soil on his lands and tried to employ control methods, but was unable to have them practiced because of his frequent absence from home.

By poor practices the soil of prosperous Coon Valley was largely destroyed in a few years.

(d) Activities for keeping records and making reports and summaries:

Things to do

Desirable understandings and observations

In the activities of this section, the teacher will probably wish to help the children evaluate and organize their work in such a way that they will have a comprehensive view of the entire unit and thus arrive at the most important conclusions.

1. Discuss with other grades the results of excursions taken by the whole school:
 - (a) Answer questions which intermediate-grade pupils ask regarding the causes of erosion, how the waters of the home community may cause floods in other places, and the like.

Increasing sensitiveness to the home community's responsibility for the welfare of people who live in regions of the same watershed.
 - (b) Show the rest of the group the map of the community watershed and explain the significance of conditions of silting, gullying, and overflow.

Increasing sensitiveness to conditions of erosion.
 - (c) On the map of the United States which the children have made, point out to the rest of the group places where the run-off water goes, important rivers, flooded areas, places of factory or other river-pollution.
2. Supervise the arranging of a soil exhibit which the entire school is making.
 - (a) Suggest explanations to be placed on labels, such as "Sample of soil washed off a hill in 's field and found at foot of slope."

Increasing facility in use of good English.

Increasing sensitiveness to correctness in spelling of the words which are needed in writing about conservation.
 - (b) Help primary or intermediate pupils with spelling or wording of labels.

Increasing sensitiveness to beauty; ideas about arranging a display attractively.
 - (c) Make suggestions to improve the attractiveness of the display.
3. Have charge of pictures, sketches, and articles for the school newspaper.
 - (a) What the Government is doing to prevent soil erosion in our community.

Appreciation of work of Soil Conservation Service.

Increasing ability to organize materials and ideas.

Increasing appreciation of worth of CCC to the country and to individuals.
 - (b) Sketches of dams the children have helped to build to stop gullies, sketches of contour plowing, strip farming, and the like.

Greater ability to express one's self with originality.

*Things to do**Desirable understandings
and observations*

4. Help the primary and intermediate groups entertain CCC boys, a 4-H club or a parent-teacher organization.
- (a) Plan and write play about some problem of erosion, such as, "How Ted's Gully Disappeared."
- (b) Plan games and refreshments after the program.
5. Take special responsibility for certain programs and other activities during Conservation Week.
- (a) Plan what particular conservation problem might be studied by the school each day.
- (b) Review the group's study of soil conservation and plan discussions or other ways of explaining to other groups the significance of the community's activities in soil conservation.
- (c) Plan ways of utilizing services which can be secured from out-of-school conservation agencies, such as CCC groups, 4-H clubs, Future Farmers of America and farm organizations.
6. Write original stories about conservation for middle grades or primary children to read, such as:
- (a) How Jim Saved His Calf from the Dust Storm.
- (b) How the Trees Help Make Our Soil.
- (c) What Became of Bill's Leaf House?
7. Draw or paint a frieze entitled, "The story of soil is the history of America," or any other title the children plan, with consecutive scenes, such as:
- (a) Early Colonists Cutting Trees for First Farms.
- (b) Clearing of Lands for New Farms When Old Farms Wore Out.
- (c) Large Southern Plantations.
- (d) Small New England farmsteads.
- (e) Moving to the Prairie Lands.
- (f) The Covered Wagon Trail to the Great Plains.
- (g) Great Plows and Tractors Break the Plains.
- (h) The People at last Learn That Their Soil is Being Washed Away.
- (i) How We Save the Soil Today.

Increasing ability to organize ideas and express them in good English according to the needs of individual children.

Increasing tendency to help others have an enjoyable time.

Greater ability to organize groups of children and to work with conservation agencies.

Greater ability to organize and summarize new information.

Improvement, according to individual needs, in ability to organize facts and express ideas in good English.

Improved ability to summarize information gained; to express ideas artistically and with originality.

Things to do

8. Construct a large class scrapbook. It can contain pictures cut from newspapers, drawings the children have made, stories arranged to explain the development of erosion; water erosion of different kinds, wind erosion, dust storms, floods. Snapshots can be included in it of gullies or other types of erosion in neighbors' fields. Sketches can be used instead of snapshots. Contrasts are effective in scrapbooks: land well cared for with good homes vs. poor soil and poor homes; gullies badly eroded vs. gullies checked; forests devastated vs. forests scientifically replanted. Whole school should have meeting to decide what responsibility will be taken by primary, intermediate, and advanced groups.

9. Prepare original slogans and posters for store windows, suggesting correct land use, for example:

- (a) Plow around, not up and down.
- (b) Save the silt; it belongs to your grandson.

10. Construct models of gullies, eroded land, forest floors, and the like.

11. Prepare pictorial graphs to show how soil has been depleted since colonial or pioneer days; acres lost and acres badly damaged; value of property lost, and the like.

12. Prepare large charts with sketches to show water cycle. Sketches can be worked out to show how nature's resources, undisturbed by man, approach a self-conserving balance.

13. Prepare a table to show comparisons between crops on poor soil with those on good soil.

- (a) On what kind of soil are the largest plants.

- (b) On what kind of soil are the most plants.

- (c) Below your table write statements to tell why you think plant growth was best or poorest in certain places.

(e) Permanent interests:

- (1) Concern for the soil and the need for preserving it. This leads children to observe and to study soil long after work on the main unit has closed.

Desirable understandings and observations

Increasing ability in organizing ideas. Increased facility in expressing ideas in original ways.

Increasing facility in expressing ideas artistically and in good English according to individual needs and abilities.

Greater ability to express new ideas in original manner.

Greater ability to find and use different media for self-expression.

Increasing facility in the organization of ideas; in inventing ways to express ideas graphically or pictorially.

Review of water cycle as basis for understanding principle of optimum use in conservation of water.

Ability to analyze and compare observations and record conclusions.

Increase in ability to analyze situations and see facts in their relations to one another.

GRASSED WATERWAYS BETWEEN THE CORNFIELDS RETAIN THE WATER AND HELP PREVENT EROSION.

- (2) Interest in Government activities. If the children become interested in various Government activities they will desire to follow accounts of these in magazines and newspapers.
 - (3) Interest in community enterprises in conservation: A study of the conservation of soil is apt to intensify the children's interest in the soil of their own community and its preservation to the extent that they will follow up different farmers' efforts to stop gullies, construct grassed waterways, and the like.
- (f) Leads to other units:
- (1) Studies of the history of the geographical environments of other nations, present or past: China, for example; the Mayan Nation; the ancient Romans; modern France, Holland, or Russia.
 - (2) A general study of Government services. When children read about the services of the Government to farmers who wish to conserve their soil, they will wish to learn more about other activities of the Government.
 - (3) A study of water and its uses. In a study of soil, children learn many things about water, but there are also interesting and helpful things which they can learn in a special study of water and its uses in their homes. They can be led to develop such a study.
 - (4) A study of trees and forests. In similar fashion, an enterprise in the study of forests, in conserving the forest or the trees of the home community or on home farms is appropriate following a study of soil conservation.
 - (5) Studies of natural resources, such as iron and coal, which are useful in industry and which in turn can be used as leads to a study of conservation in industry.

7. Ways of Closing the Unit

At different stages in the study it will be necessary for teacher and pupils to criticize, organize, summarize, and evaluate activities thus unifying work done by individuals or small groups. They will need to formulate standards for improvement. Special investigations should be reported and conclusions made by the class as a whole. Unifying of minor activities usually is accomplished at opportune times during the development of the unit. However, when activities of individuals or small groups are parts of enterprises developed by the class as a whole, it is not sufficient for pupils merely to summarize and evaluate those in which they have been engaged. The entire class should have opportunity to know what different pupils have done and whether or not they have fulfilled responsibilities undertaken for the group. Suppose all the children have decided to compare the types of erosion control carried on by individual farmers with those of different organizations or groups in the community. Suppose several committees or individual pupils have assumed responsibility for the investigation. The conclusions which these pupils arrive at working individually or in committees should be discussed by the school as a whole. In this way each child is benefited by the work of others and receives an understanding view of the major problem.

Perhaps one committee discovers that contour plowing is an individual practice followed by different farmers without the necessity of consulting with other farmers. Another committee finds that a certain gully extends through fields owned by different farmers. The pupils learn that it is necessary for these farmers to cooperate in filling the gully, or else the trees, shrubs, or dams provided by one farmer will be washed out because farmers above him have done nothing to check the flow of water in their part of the gully. Another committee learns that a program of crop regulation affecting the Nation is under supervision of the Federal Government. For example, suppose it is desired that more cotton or wheat be grown, or that the country needs less production of these crops and greater production of other crops. For regulation of this kind the assistance of the Federal Government would be necessary, or of some cooperating group of farmers large enough to unite the efforts of those who produce a single crop in many different States. Some of the children may have studied about projects undertaken by the

State government, such as an irrigation project covering a large part of the State and of benefit to many people in the State. Before leaving the study, the entire class should have a chance to compare different types of erosion control and discuss the reasons why both State and Federal Governments must help as well as individuals.

With the entire school working on the problem, all pupils can have a part in summarizing and drawing conclusions; can contribute something to complete the investigation. Practices of erosion control which are to be discussed will need first to be described, and intermediate-grade pupils can be asked to do this. Primary pupils can contribute by showing pictures which they have collected of different methods of controlling erosion.

A good closing activity affords opportunity for the pupils to raise important problems in such a way that each child in discussing them will feel their significance with respect to the major activity. Planning an exhibit of different kinds of soil is an example; the children will gain information by observing critically all the different samples which have been collected by different small groups in the class or school. They must decide which are the most appropriate for the exhibit. Perhaps two samples are exactly alike. Only one is needed. Perhaps two are only slightly different. Children must find the difference and label the samples to show it. Some samples have produced strong plants. Children will decide why and mention the fact on labels. There are many samples of different colors. On the labels pupils can tell where each sample was found.

There are many interesting things to do in closing units. A discussion meeting or forum is often useful in closing a study on soil conservation, because so many debatable questions arise. For this, children will need to decide on a program of questions. They will have to review a number of the problems involved in the study and understand each. They may wish to invite C. C. C. boys or Future Farmers of America to participate. A class or school play is always a fascinating closing activity and it is usually very profitable because the children review with interest many phases of their study in order to have interesting material to use in planning and writing the various scenes. Other useful closing activities are programs of speeches, illustrated lectures, discussions, exhibits, and collections; puppet plays in which farming in pioneer or colonial days is compared with modern

farming; original pageants portraying soil problems of the Nation or of the world.

For successful programs or entertainments, the children should be so enthusiastic about their study that they are eager, not just to entertain, but to extend to each member of the audience a message that is very near their hearts. Their standard will be, not "What will best entertain the audience?" but rather, "How can we help our guests to understand the important things we have learned? If they want to help us, how can we best show them what we have done so that they can help us understand what to do next?"

Pupils' discussion of closing activities should include necessary arrangements for continuing those that cannot well be dropped when the major enterprise is closed and other major problems solved. Some activities which should be continued are whole-school projects such as those suggested on page 40. Others are persistent interests like those mentioned on pages 48, 59, 81, 82, which individuals or groups have developed during the progress of the enterprise and now desire to follow further.

8. References¹

For Primary Grades

ATWOOD, WALLACE W., and THOMAS, HELEN G. *Neighborhood stories*. Boston, Ginn and Company, 1934. 218 pp, illus.

Contains discussion of the production of food, clothing, and shelter which can be used to help children learn to regard the soil as the main source of livelihood and thus appreciate it and desire to conserve it. For grades 3 and 4.

¹No attempt is made to include in this reference list all the books and bulletins which can be used for units on the conservation of soil in different parts of the country. Materials have been listed which were consulted, quoted, or adapted in connection with the development of suggestions in this section. In addition to information which can be adapted for study of soil conservation, many of the books listed also contain the general material which their titles indicate, and can be used for development of units on other phases of conservation. Some are the usual textbooks on geography, history, and science. Recommended grade placement is based both on reading difficulty and on the type of contribution which each book makes to the study. Teachers should write to the United States Government Printing Office, to the Soil Conservation Service and to the United States Department of the Interior, Division of Motion Pictures, for lists of current bulletins and visual aids on the conservation of soil.

BEATY, JOHN Y. Story pictures of farm foods. Chicago, Beckley-Cardy Company, 1935. 192 p., illus.

Both pictures and text help city children understand for what soil is useful. For grades 2 to 4.

CRAIG, GERALD S., and BALDWIN, SARA E. Out-of-door Boston, Ginn and Company, 1932. 269 p., illus. (Pathways of science II. A course for elementary schools.)

Includes three sections on the formation and erosion of soil which provide a basis for understanding the importance of erosion control. For grades 2 and 3.

FAIRBANKS, HAROLD W. Home geography. Boston, Educational Publishing Company, 1926. 276 p., illus.

Based on things children can observe daily—how soil is made, what plants need, where water comes from and how it works for us. Vocabulary and sentences are easy, and ideas are related to children's interests. Although written for fourth grade, it might be used by some children in third grade.

MARTIN, CORA M. New stories and old. New York, Charles Scribner's Sons, 1934. 288 p. (Real life readers)

Contains: Early days on the prairie, Uncle John's ranch, Winged peoples of the desert, Pioneers, Pioneer life; and other stories with conservation implications. For grades 3 to 5.

PENNELL, MARY E., and CUSACK, ALICE M. The children's own readers. Book three. New York, Ginn and Company, 1936.

Includes a few stories such as A day in the desert and Vacation time in Holland which can be used to help children understand how amount of moisture can affect ways of living. For grades 3 to 5.

PERSING, ELLIS C., and PEEPLES, ELIZABETH K. Elementary science by grades. Book two. New York, D. Appleton and Company, 1928. 244 p., illus.

Includes helpful chapter on water. Suggestions for things to do and observe. For grades 2 to 3.

STORM, GRACE E. Neighbors and helpers. Chicago, Lyons and Carnahan, 1936. 332 p. (Guidance in reading series)

Includes a section on camping in the north woods—a collection of stories from which concepts can be drawn about the value of forests in protecting soil. For grades 2 to 4.

Middle and Advanced Grades

Textbooks in geography, history, science, and reading included in the reference list are illustrations of the type of general text-

book in which pupils and teacher often can find varying amounts of interesting and pertinent material useful in understanding the underlying principles of conservation. Such books frequently are in the school library. Each annotation below is limited to sections which have material appropriate for studies of soil conservation, and is intended to indicate the type of material which can be adapted.

Geography

ABRAMS, ALFRED W., and THURSTON, ERNEST L. World geography. Syracuse, Iroquois Publishing Co., 1933. 317 p., illus (Iroquois geography series.)

Contains sections on grazing, forests and their use, soils and plant food, and reclamation of land by irrigation and drainage. For grades 6 to 8.

AITCHISON, ALISON E., and UTTLEY, MARGUERITE. Across seven seas. Indianapolis, Ind., The Bobbs-Merrill Company, 1931. 316 p., illus. (Bobbs-Merrill Geographies Series.)

Contains sections dealing with effect of amount of rainfall and natural resources on ways of living. Can be used as background for understanding of reasons for a program of conservation. Such topics as Gardeners and shepherds in the northern Sahara, Across the seas to other lands, and Pioneer farmers in the prairies of the United States, are particularly applicable. Contains stimulating questions for activities of the study type. For grades 3 to 6.

North America by plane and train. Indianapolis, the Bobbs-Merrill Company, 1937. 404 p., illus.

Treats geography by areas instead of by political divisions, and affords an intelligent background for understanding the use and waste of natural resources and the truth that natural environment is the basis of material prosperity. Among topics of value for a study of soil conservation, are the land of cotton, forests of the South, flood plain and delta farmers behind the Mississippi levees, cattle ranches, sheep ranches, water power. Factual questions after sections. For grades 5 to 8.

AKER, HOMER F.; HILTON, EUGENE; and AKER, VANZA N. America today and yesterday. San Francisco, Calif., 1935. 586 p., illus.

Includes discussions of conservation of parks, water, forests, and soil. For grades 6 to 8.

ATWOOD, WALLACE W. New Geography. Book Two. Boston, Ginn & Co., 1929, 304 p., illus. (Frye-Atwood Series.)

Emphasizes study of facts that influence life and activities of the people. Includes discussion of Central Plains and Great Plains; natural resources of the United States; relief maps showing drainage and maps showing distribution of vegetation are useful for conservation studies. For grades 6 to 8.

ATWOOD, WALLACE W., and THOMAS, HELEN GOSS. *The earth and its people. Nations beyond the seas. Book Three.* Boston, Ginn & Co., 1930. 344 p., illus.

Natural regions are presented as stage setting for activities of people in all parts of the world. Includes discussion of eroded regions of China. For grades 7 to 9.

——— *Home life in far-away lands.* Boston, Ginn & Co., 1933. 206 p., illus. (*The earth and its people. Book One.*)

Includes material on nomads of the desert, polder farmers of the Netherlands, farming in China. For grades 4 and 5.

BARROWS, HARLAN H., and PARKER, EDITH P. *United States and Canada.* New York, Silver Burdett Company, 1936. 296 p., illus.

Contains some material on different farming regions which can be used to develop understanding of the need for conserving soil. Mentions value to land of rotation of crops, "mixed" farming, control of floods, saving forests. For grades 6 to 8.

BODLEY, GEORGE R., and THURSTON, ERNEST L. *North America and South America.* Syracuse, Iroquois Publishing Co., 1932. 247 p., illus.

Deals with natural regions and how these regions influence the lives and activities of the people who dwell in them, and includes discussion of reclamation in Florida and geography of Great Plains area. For grades 6 to 8.

BRANOM, FREDERICK K., and GANEY, HELEN M. *Our land and far lands.* New York, William H. Sadler, Inc., 1932. 186 p., illus.

Contains discussion of natural characteristics of desert life (Sahara and the Nile), and living in hot, moist lands (central Africa). From this material, children can form conclusions about relation of ways of living to absence or presence of moisture. Variety of fairly life-like activities and child-like questions. For grades 5 to 7.

BRATTON, SAMUEL TILDEN. *Geography through people.* A source book for upper elementary grades and junior high schools. Columbia, Mo., Lucas Brothers, 1931. 509 p., illus.

Includes material about farming in the valley of Hwang Ho with some emphasis on droughts and floods; and Japan's climate, products and intensive farming.

CARPENTER, FRANCES. *Our little friends of the Netherlands.* New York, American Book Company, 1935. 201 p.

The story of a land that has been conserved from the sea can be adapted if it is desired that children include a study of conservation in other lands. For grades 3 to 5.

CARPENTER, FRANCES. Our little friends of the Arabian desert, Adi and Hamder. New York, American Book Company, 1934. 232 p., illus.

Useful for helping children understand how lack of moisture affects ways of living. For grades 3 to 5.

Our neighbors near and far. New York, American Book Company, 1933. 222 p. illus. (Our world and ourselves).

Tells how people in other lands use their lands and other natural resources. The Amazon Valley is discussed as a hot, wet land; the Sahara, as a hot, dry land; Egypt, as a country made productive by irrigation; China, as a land where people especially must make the most intensive use of their land. The book has conservation implications and affords a basis for understanding different problems in land use which call for conservation. For grades 4 and 5.

GASNER, MABEL B., and PEATTIE, RODERICK. Exploring geography. New York, Harcourt, Brace & Co., 1937. 481 p., illus.

Among the units most appropriate for study of soil are: Influence of waters upon man; Fertility of soil affects a nation's growth. For grades 7 and 8.

DAVIS, DOROTHEA H. How the world supports man. Chicago, Thomas S. Rockwell Company, 1931. 112 p., illus.

Can be used as background for helping children realize what the earth's resources mean to man and the need for conserving them. Discusses such topics as Necessities of Life, Rainy Jungles, and Man on Mountain and Plain, which have conservation implications. For grades 6 to 8.

DODGE, RICHARD; LACKY, EARL; and GRADY, WILLIAM E. United States. New York, Rand McNally and Co., 1934. 220 p. (City of New York Geographies.) illus.

Contains some material on agriculture, grazing in Western Texas, plains, deserts, lowlands. For grades 5 to 8.

HUNTINGTON, ELLSWORTH; BENSON, C. BEVERLY; and McMURRY, FRANK M. Why countries differ. New York, The Macmillan Co., 1932. 506 p., plus plates. (Living Geography, Book Two.) illus.

Includes a phase of agriculture in each of several units with a few conservation pictures such as contour cultivation and irrigation, affording a geographical background for conservation instruction.

MIRICK, GEORGE A. Home life around the world, An introductory geography. Boston, Houghton Mifflin Company, 1929. 185 p., illus.

Certain topics such as, jungle life, tropical gardens, and desert life can be used to give children an idea of the influence which a great or small amount of water can have upon ways of living. For grades 6 to 8.

MCCONNELL, WALLACE R. *Living in different lands.* Chicago, Rand McNally and Co., 1935. 218 p., illus.

Deals with lands of little water, hot, wet lands, terraces in Switzerland. For grades 4 and 5.

——— *The United States in the modern world.* New York, Rand McNally & Co., 1934. 305 p.

Discusses water power of the United States with possibilities of development, and land forms. Should be helpful in supplementation of children's study of soil. For grades 6 to 8.

SMITH, JAMES R. *Human use geography. Book One.* Chicago, The John C. Winston Co., 1936. 482 p. plus appendix. illus.

Contains background material for study of conservation. Children can use index to find specific items, such as planting of trees to prevent erosion, pictures showing land destroyed by deforestation and plowing, conservation of moisture by dry farming. For grades 5 to 8.

——— *Human use geography. Book two.* Chicago, The John C. Winston Co., 1936. 516 p., plus appendix, illus.

Tells about a great desert and its oasis, and a rich valley in China that some times has droughts and at other times, severe floods. For grades 7 and 8.

STULL, DEFOREST, and HATCH, ROY W. *Our world today.* A textbook in the new geography. Boston, Allyn and Bacon. 1932. 704 p. plus appendix., illus.

Includes discussion of natural resources of the United States, how forests conserve the soil and hold water, the importance of forests in early days, uses of forests today, forest regions of the United States. Activities largely of the study type. For grades 7 to 9.

Science

CALDWELL, OTIS W., and EIKENBERRY, WILLIAM L. *Elements of general science with experiments.* New York, Ginn and company, 1926. 600 p.

Has a discussion of soil including the following topics: How rock becomes soil; structure of soil; amount of water used by crops; reclamation of swamp lands; erosion and sedimentation; life in the soil; the plant covering of the earth. For grades 7 and 8.

DORLAND, GEORGE W.; and WOTICKY, EDWARD. *My science book. Seventh year, first-second half.* New York, Rand McNally and Company, 1929. 289 p., illus.

Includes suggestions for experiments with water and soil, forms of water cycles, uses of water which are helpful as a background of information on which knowledge of conservation of the soil may be based. For grades 7 to 9.

FISHER, ELIZABETH F. Resources and industries of the United States. New York, Ginn and Company, 1928. 246 p., illus.

Discusses topics such as how soils are made, kinds of soils, plant food in soils, soil as the principal source of man's food and shelter and of part of his clothing. Helpful for children to read as a background for understanding problems of soil erosion. Pictures clear, informative, interesting. Statistics in tables are not recent, but the tables may suggest to children ways of compiling recent numerical facts themselves. Maps of climate, rainfall, topography. For grades 5 to 8.

HOWE, FRANK W. Farm economics. New York, American Book Company, 1926. 221 p., illus.

Contains chapters which discuss how to know good soils, plant food in soil, value of growing grasses, how soils may be renewed, and other topics in the conservation of soil. For grades 7 to 9.

HUNTER, GEORGE W.; and WHITMAN, WALTER G. Teachers' manual and key for problems in general science. New York, American Book Company, 1931. 249 p.

Forces that work in changing the surfaces of the earth, how soil is prepared for plant life, how water serves man, and other topics useful for a study of soil, and practical suggestions for experiments. For grades 7 to 8, or teacher.

MILLER, ALBERT H. Science for the grades. Oak Park, Ill., 511 Bonnie Brae, 1919. 145 p., illus.

How soil is formed, characteristics of top soil and subsoil, experiments, and other topics. For grades 5 to 8.

PATTERSON, ALICE J. Science for the junior high school. Normal, Ill., McKnight & McKnight, 1929. 360 p., illus.

Deals with uses of water and has experiments to help pupils understand the properties of water, tells how rocks are formed and how soil is made, and gives suggestions for observing rocks and soil. Conservation emphasized and activities suggested in which children may help conserve. Additional references for study of different units. Pictures and sketches. For grades 6 to 8.

PAYNE, ENOCH G., BARROWS, HENRY R., and SCHMERBER, LOUIS J. Elementary science readers. Fourth book. New York, Benj. H. Sanborn and Company, 1908. 197 p., illus.

Tells what rivers, lakes, and other inland waters do to the land and soil, discusses the protection of our water supply, reasons for protecting forests, and uses of forests. For grades 4 to 6.



TRAFTON, GILBERT H. Science of home and community. A textbook in general science. Rev. ed. New York, Macmillan Company, 1926. 578 p., illus.

Includes discussion of water supply, shade trees and forests and ways of saving them, effect of forests on soil erosion, and similar topics. Contains specific suggestions for things to do and talk about. For grades 7 to 9.

VAN BUSKIRK, EDGAR F.; SMITH, EDITH L., and NOURSE, W. L. The science of everyday life. Boston, Houghton Mifflin Company, 1931. 620 p., illus.

Discusses the way soil is made and the relation of water and soil, gives suggestions for things to do and observe, and contains sketches, pictures, and maps. For grades 7 and 8.

WEED, HENRY T., and REXFORD, FRANK A. Useful science. Book one. Philadelphia, John C. Winston Company, 1933. 257 p., illus.

Includes discussion of importance of water, relation of land to water, the water cycle, soil and the way it is made, how soil texture is improved. Gives suggestions for observations and experiments. In the development of the foregoing unit on soil, the book is most useful for its discussion of water and the uses of water. For grades 5 to 7.

Readers

ANDERSON, CHARLES J. Hand in hand. V. New York, Laurel Book Company, 1936. 320 p. (The good companion books.)

Articles containing information on conservation of soil are: Farming by irrigation, An acid test, A western wheat ranch. For grades 4 to 8.

— The Land of Gold. VI. New York, Laurel Book Company, 1936. 336 p.

Contains *The Story of a Stone, An Inch of Rain, A Talk About Weeds, Buffaloes and Scouts*, and other stories which might be helpful as background for study of soil conservation. For grades 5 to 8.

COLEMAN, BESSIE B.; UHL, WILLIS L., and HOSIC, JAMES F. Pathway to reading. New York, Silver, Burdett and Company, 1928. 432 p. (Seventh reader.)

Contains an article *In the Desert* that can be adapted to teaching the conservation of soil. For grades 7 and 8.

FREEMAN, FRANK N., and JOHNSON, ELEANOR M. New York, Lyons and Carnahan, 1928. 480 p. Fifth reader. (Child-story readers.)

Includes *Buffalo Bill and the West*; can be used in helping children understand the changes which were wrought by machines. For grades 5 and 6.

LEWIS, WILLIAM D., and ROWLAND, ALBERT L. *Scouting through*. Book VI. Philadelphia, John C. Winston Company, 1930. 464 p. (The new silent readers.)

Opening the Great West will be helpful as a background for understanding Great Plains problems. For grades 6 to 8.

STONE, CLARENCE R. *Treasure chests*. A basic fifth reader. St. Louis, Mo., Webster Publishing Company, 1935. 469 p. (The Webster readers.)

The Story of Progress in Harvesting Grain will be helpful as a background for children's understanding of the breaking of plains and prairies. For grades 5 to 8.

History

CASNER, MABEL B., and GABRIEL, RALPH H. *Exploring American history*. New York, Harcourt, Brace & Co., 1937. 481 p., illus.

Among the units most appropriate for study of soil are: Influence of waters upon man; fertility of soil affects a Nation's growth. For grades 7 and 8.

KELTY, MARY G. *The story of the American people*. Boston, Ginn and Co., 1931. 663 p., illus.

Contains section on saving our natural resources, with special mention of Theodore Roosevelt's interest in conservation. For grades 6 to 8.

KNOWLTON, DANIEL C., and HARDEN, MARY. *The development of our Nation*. New York, American Book Co., 1934. 658 p. Index and appendix. illus.

Contains chapter on the range and the cattle kingdom—the Great Plains before the arrival of sheepmen or the plow. For grades 6 to 8.

— *Since we became a nation*. New York, American Book Co., 1934. 655 p., appendix and index, illus.

Sections on Theodore Roosevelt and the Forest Service, the Public Lands Commission, Inland Waterways Commission, and the National Conservation Commission. For grade 8.

RUGG, HAROLD O. *The conquest of America*. Boston, Ginn and Co., 1937. 563 p., illus.

Discusses the TVA as an experiment in conservation of resources, power, and people. For grade 8.

RUGG, HAROLD O., and KRUEGER, LOUISE. *The building of America*. Boston, Ginn and Co., 1936. 508 p., illus.

Includes discussion of exploration and settlement of the land west of the Mississippi River, geography of the Great Plains, raising cattle on the Great Plains, the coming of sheepmen and farmers. Discusses the effect of inventions and machines on frontier life, and contains a section on the geographical regions of the United States useful in understanding the type of problems to be met in conserving resources. Grades 5 to 8.

TYRON, ROLLA M.; LINGLEY, CHARLES B., and MOREHOUSE, FRANCES. *The American People and Nation*. Boston, Ginn and Co., 1936. 683 p., index and appendixes. illus.

Contains a brief discussion of Theodore Roosevelt's interest in conservation. For grades 7 and 8.

THWAITES, REUBEN G., and KENDALL, CALVIN V. Rev. by Paxon, Frederick L. *A history of the United States*. Boston, Houghton Mifflin Co., 1936. 596 p., illus.

Contains short section discussing attitude of Theodore Roosevelt toward conservation of our natural resources. For grades 7 and 8.

WEST, WILLIS M., and WEST, RUTH. *The American people. A new history for high schools*. Boston, Allyn and Bacon, 1934. 693 p., illus.

Tells about Roosevelt's interest in conservation, creation of forestry service, government reclamation of dry lands. For grades 8 and above, and teacher.

Supplementary

BENNETT, HUGH H., and CHAPLINE, W. R. *Soil erosion a national menace*. Washington, U. S. Government Printing Office, 1928. 36 p., illus. (U. S. Department of Agriculture, Circular no. 33).

Discusses annual soil losses, various aspects of wastage, erosion in different parts of the country, relation of erosion to flood control, flood damage, ways of checking and controlling erosion, and other topics. Large number of clear-cut instructive pictures showing types of erosion, lands that should not be cultivated, and the like. Written on level of reading ability for grades 7 and 8, but useful for middle grades through the pictures.

BUILDING AMERICA. Vol 2, no. 7, April 1937. *Conservation*. 32 p., illus.

Includes discussion of the problem of erosion as brought sharply to attention by duststorms, droughts, and floods. The magazine gives figures to show losses, employs many pictorial graphs, and uses pictures profusely to show types of erosion, methods of control, forest waste, destruction by floods. Contains annotated bibliography. Teacher's guide suggests activities for study. Reading level of grade 8, but useful in middle grades through its pictures.

BURGES, AUSTIN E. Soil erosion control. Atlanta, Ga., Turner E. Smith and Company, 1936. 187 p., illus. diag. tables.

Represents the United States as having come to a day of reckoning with respect to husbandry of the soil, with the ledger showing losses. Discusses causes of erosion and methods of control, including details familiar and interesting to children. Explains technique used in building terraces and employing other methods of soil control. Each chapter is followed by a section on field practice which affords first-hand activities for pupils in sixth grade and above.

BUTLER, OVID, *Ed. and comp.* American conservation in picture and in story. Washington, D. C., American Forestry Association, 1935. 144 p., illus.

A story of the Nation's natural resources and the part they have played in the development of the country, beginning with earth changes in prehistoric times, including the colonial heritage, the forests, soil, water, and ending with an account of important governmental policies for conserving our present resources. Selected bibliography classified in such a way that the reader may quickly find sources of material on the major aspects of conservation and natural resources. Profusely illustrated. For teacher and for grades 7 and 8.

CHILCOTT, E. F. Preventing soil blowing on the Southern great plains. Washington, U. S. Government Printing Office, 1937. 28 p., illus. (U. S. Department of Agriculture, Farmers' Bulletin No. 1771).

Discussion of soil blowing and its causes and controls, implements useful in preventing soil blowing, strip cropping, planting beans and cowpeas, shelter belts, regrassing, and other topics, with a number of pictures. For eighth grade and teacher.

CONSERVATION. Cornell rural school leaflet, vol. 29, no. 3, January 1936. 32 p., illus.

Soil, and water, rocks, use of land, value of woodland, and other topics that might be useful in developing concepts about conservation of soil. General activities such as making photographs, plastic casts, drawings, plays. For grades 4 to 8.

FAIRBANKS, HAROLD W. Conservation reader. Yonkers-on-Hudson, World Book Company, 1920. 216 p., illus.

Written with the philosophy that enthusiasm for conservation must reach children if it is to attain its fullest effectiveness. Tells how first people used the earth's resources and how needs of civilized people today are different, requiring greater utilization of all resources. Regards soil as the most important gift of nature. Discusses ways of protecting soil with vegetation and tells how people all over the world are suffering because they have not obeyed nature's laws with respect to soil. Appropriate and applicable collection of poems. Apt illustrations. Although out of print, the book is available in libraries, and teachers will find it worth reviewing, because of its contribution to curriculum content. For grades 5 to 8.

Future of the Great Plains. Report of the Great Plains committee. Washington, U. S. Government Printing Office, December 1936. 194 p., illus.

Fairly exhaustive discussion of the settlement, use, and misuse of the Great Plains: physical characteristics; undesirable tendencies in land use and tenure; lines of Federal, State, and local action in readjustment and development; readjustments in farm organization and practices, and the like. Reading level for grade 8 with guidance of teacher, but pictures instructive in lower grades.

GEIB, H. V. Strip cropping to prevent erosion. Washington, U. S. Government Printing Office, 1931. 6 p., illus. (U. S. Department of Agriculture, Leaflet no. 85).

Strip cropping as a means of preventing erosion, adaptation of stripping to different crops, benefits from strip cropping, and other topics. For grades 7 and 8 and teacher.

HARRIS, GARRARD. Elements of conservation. Richmond, Va., Johnson Publishing Company, 1924. 214 p., illus.

A conservation book that should be interesting to children because discussions as well as the suggestions for things to do and the questions are based on children's experiences. Contains three chapters on soil, dealing with the composition of soil, difference between poor soil and rich, ways in which soil loses its richness, and ways of controlling erosion. For grades 7 and 9.

KELLOGG, CHARLES E. Soil blowing and duststorms. Washington, U. S. Government printing office, 1935. 11 p., illus. (U. S. Department of Agriculture, Miscellaneous publication no. 221.)

Discusses cause of duststorms, effect on different types of soils, development of tillage methods, use of pasture and sod crops, and other topics on soil erosion. Several pictures and references to other publications. For grades 7 and 8, and teacher.

PERSON, H. S. Little waters. A study of headwater streams and other little waters, their use and relations to land. Rev. 1936. Washington, U. S. Government printing office, 1936. 82 p., illus. (Soil Conservation Service, Resettlement Administration, Rural Electrification Administration.)

Simple detailed background for study of soil erosion by water. Discusses natural circulation of water; drainage, removal of forest cover and of sod covers in the rush of waters to the sea, social loss from washing away of soil, lines of action to be taken in preventing erosion, what small communities can do, work of county, State, and Federal governments, and other subjects helpful in a study of soil conservation. Pictures and pictorial graphs of the type that appeal to advanced pupils, and tables containing facts which children can use in making tables of their own. For teacher and grades 7 to 8.

Save the soil. Cornell rural school leaflet, vol. 29, no. 4, March 1936. 31 p., illus.

Discusses apparatus for study of soil, experiments in understanding soil conservation, nature of soil erosion, factors in protection of soil against erosion by waves, winds, and washing, part played by animals in soil conservation, role of wasteland in soil conservation, and other soil topics with suggested list of erosion-control plants in New York State. For grades 4 to 8, and especially useful for teacher.

Scholastic, vol. 29, no. 2, September 26, 1936. 31 p., illus. Conservation number.

An entire issue on conservation. An article by Stuart Chase, *When the Crop Lands Go*, gives a readable story of erosion. Pictures show practices in control of erosion, and a story, *Two Days from the South*, gives a vivid description of a duststorm. Suggestions for drawing maps, taking excursions, and other activities. Bibliographies, cartoons, graphs, and pictures. For teacher and grades 7 and 8 on high-school level.

SHEPARD, WARD. Forests and floods. Washington, U. S. Government printing office, 1931. 24 p., illus. (U. S. Department of Agriculture, Circular no. 19.)

Discusses forests as a soil and water holder, deforestation and erosion, different kinds of erosion, cumulative effect of erosion on large rivers, losses from fire, practices of lumbering, suggested forestry program for the Mississippi Basin, public forest ownership, and other topics on the relation of forests and floods. Contains pictures of forests and of denuded areas. For teacher and grades 7 and 8.

TENNESSEE VALLEY AUTHORITY. Development of the Tennessee Valley. Knoxville, Tenn., Tennessee Valley Authority, 1936. 15 p., illus.

General discussion of the activities of the TVA with clear-cut pictures. For grades 7 to 8, and teacher.

TERRACED FIELDS ARE EFFECTIVE PREVENTIVES OF EROSION.

UHLAND, R. E. Controlling small gullies by bluegrass sod. Washington, U. S. Government printing office, 1936. 12 p., illus. (U. S. Department of Agriculture Leaflet no. 82.)

Simple discussion with a few pictures. For grades 6 to 8, and teacher.

— The use of bluegrass sod in the control of soil erosion. Washington, U. S. Government printing office, 1936. 12 p., illus. (U. S. Department of Agriculture, Farmers' bulletin no. 1760.)

Discusses ways of securing bluegrass stands, sodding, grassed waterways, and other topics in control of erosion, with a few pictures and sketches. For eighth grade and teacher.

United States Department of Agriculture. Lost! Tons of fertile California soil by erosion. Washington, D. C., Soil Conservation Service [n. d.], 16 p., illus.

Contains stimulating questions about soil erosion, information about different ways of controlling "man-made" erosion, useful explanations of wind erosion, sheet erosion, gully erosion, map showing soil erosion control projects in the United States. Special discussion of war against erosion in California. Pictures and suggested slogan: Keep the raindrop where it falls. For grades 6 to 8, and teacher.

— — Soil, the nation's basic heritage. Washington, U. S. Government Printing Office, 59 p., illus. (U. S. Department of Agriculture and Tennessee Valley Authority.)

Pictorial bulletin with discussion of soil erosion and methods of control. Contains charts and useful diagram of the natural cycle. For grades 6 to 8.

WHITE, OWEN. P. All washed up. Reprinted from Collier's magazine. Washington, U. S. Department of the Interior, September 29, 1934. (Soil Erosion Service.)

Tells how Uncle Sam's topsoil, his richest possession, is being squandered. Figures are given to show losses, and the discussion presents a bird's-eye view of erosion in the entire Nation. For teacher and grades 7 to 8.

C. For Teacher¹⁰ And Curriculum Worker

- ARIZONA TEACHER, vol. 24, no. 2, October 1936. 60 p.

Entire issue devoted to accounts of lesson units chiefly on soil, stressing importance of planned protection and scientific land management. One article presents the story of soil formation for Navajo Indian students. Others contain questions and plans for conservation activities formulated by children in different Arizona schools, both 1-room and graded. Helpful especially for teachers who wish to introduce the subject.

- BARTON, THOMAS F. The Great Plains tree shelter belt project. *Journal of geography*, 35: 125-36, April 1936.

Refers to project described in *The Forestry News Digest*, September 1934, maintaining a tree belt from Canada to Texas, scientifically located with proper variety of trees on correct soil for creation of wild-life havens, prevention of soil erosion, conservation of moisture. Progress for first 12 months of a 10-year period.

- BATES, C. G. Soil erosion in the Mississippi Valley. *Journal of forestry*, 31: 88-96, January 1933.

River control and its close connection with soil conservation stressed. Mississippi River Commission, measuring soil material near mouth of river, estimates soil brought to the mouth of the river annually to be 300 million cubic yards. Gives other concrete examples of losses. Discusses humus as a great preventive of erosion, mechanical means of checking erosion terraces used in the United States and in Japan, and the like.

- BENNETT, HUGH H. Waste by wind and water. *Scientific monthly*, 42: 172-76, February 1936.

Deals with number of acres destroyed or greatly injured, spread of erosion, recurrence of floods, plans of Soil Conservation Service. Informative, fairly detailed, simple, helpful for teacher and exceptional pupils. Useful for curriculum specialists.

¹⁰ See also books for middle and advanced grades, page 86 to page 99, and bibliography, page 122 to page 125. Any of the material listed will be of use to the teacher in preparing to teach the conservation of soil. Many of the books contain other conservation topics. Although no effort has been made to give an extensive selection of material especially useful for curriculum workers, attention has been called to items which have particular value for them. Exceptional pupils in advanced grades will be able to use some of the materials listed below.

BENNETT, HUGH H. Wildlife and erosion control. *Bird lore*, 38: 115-21, March-April 1936.

Considers erosion and reduction of wildlife to be symptoms only; the real malady, the denudation of the soil, through stripping of protective vegetation. Estimates annual loss of good soil to be 200,000 acres. Advocates a program of soil conservation on a technical knowledge of wildlife requirements and a policy of "close cooperation between farmers and landowners, businessmen, educational institutions, experiment stations, and all agencies of the States and the Government having any concern with the . . . proper conservation of the land and the creatures that live on the land." For teachers and curriculum specialists.

BERCAW, LOUISE O.; HANNAH, A. M.; and COLVIN, ESTHER M. Bibliography on land settlement with particular reference to small holdings and subsistence homesteads. Washington, U. S. Government printing office, 1934. 492 p. (U. S. Department of Agriculture, Miscellaneous publication no. 172.)

Annotated bibliography of subsistence homesteads, small holdings, and land settlement as relief for unemployment in United States and in foreign countries. Background of information for curriculum worker.

BRISTOW, WILLIAM H., and COOK, KATHERINE M. Conservation in the education program. Washington, U. S. Government printing office, 1937. pp. 10-36. (U. S. Department of the Interior, Office of Education, Bulletin, 1937, no. 4.)

Contains descriptions of educational activities, some of which have suggestions for teaching conservation of soil. Lists sources of available material. For teacher and curriculum worker.

CHASE, STUART. Rich land, poor land; a study of waste in the natural resources of America. New York, McGraw-Hill book company, 1936. 361 p.

A compact discussion of waste and suggestions for conservation on topics such as the following: Our primeval continent, forests and forest losses, grasslands and their spoliation, erosion, dust storms, floods, Tennessee Valley, Government agencies, examples of waste and conservation in other countries. For teacher and curriculum worker.

CLARK, NOBLE. Will back-to-the-land help? *Survey graphic*, 22: 455-57 September 1933.

Six definite reasons why back-to-the-land will not help, generally, to solve problems of unemployment and depression.

COYLE, DAVID C. Waste: the fight to save America. Indianapolis, Bobbs-Merrill company, 1936. 96 p.

Americans are squandering rich natural resources and manpower, the strength of the nation, and saving money, bonds, and life insurance for posterity, when a heritage of natural resources is more desirable. Contains chapters on mud, dust, water, land, minerals, human erosion. Emphasizes need of study by experts along many lines of conservation.

DAVIS, CHESTER C. Lost acres. American magazine, 121: 63, February 1936.

Story of soil waste in United States with statistics given in such a way that they can be used for children's graphs and discussions; and examples from all parts of the United States. Helpful for curriculum specialist and teacher.

DOVERY, MARIE. A unit on soil erosion. As worked out by 1C and 1B children. Menlo Park School, Tucson, Ariz. Arizona teacher, 25: 70-73, November 1936.

Children take excursion to observe effects of rain on the soil in the school ground and the street near them. They discuss washing of soil; the "way rain got into the sky"; the experiences of individual children with floods. The account shows how a subject frequently taught in advanced grades may have values also for primary pupils. For teacher.

Early home seekers of America and how they lived. Life in the colonies. (Grade 5.) Allegany County, Md., 1931. 102 p. (mimeographed).

Suggestions for development of a unit. Contains sections on production and conservation of food by the early colonists, the clearing of land, and what the Colonists learned from the Indians with respect to land and forests, helpful in correlating conservation with colonial history. Bibliographies and suggestions for activities. For teacher and curriculum specialist.

EVERETT, MARCIA A. Progress toward integration in a rural county. Educational method, 15: 179-88, January 1936.

Contains a report of the use of a CCC camp project as a means of integration, telling how a unit of study grew out of a trip which two schools took to observe CCC workers change the course of a river. The article includes the children's questions and reports of activities, with examples of children's records. For teacher and curriculum worker.

FAULKNER, HAROLD U. American economic history. New York, Harper and brothers, 1931. 795 p.

Deals with economic aspects of colonization from the standpoint of natural resources. Discusses the first frontier, the westward movement at the close of the revolution, steady cropping of land without renewal, inefficient labor in the beginning of the 19th century, and economic and social results, improvement of use of land with undue emphasis upon increased production, last frontier, agrarian revolution, present need for a scientific economy and land use. For teacher and curriculum worker.

FOLLETT, MINNIE. Conservation. *In Organization of curriculum for one-teacher schools.* Washington, D. C., National education association, Department of rural education, February 1933, p. 16.

Children of third, fifth, seventh, and eighth grades in a 1-room school began a study of conservation through interest in flowers, covering plants on school ground in autumn and removing cover in spring. Study of conservation of flowers was followed by conservation of other resources including physical well-being and industries. For teacher.

4-H Soil conservation club. I—Know your soil. Columbia, Mo., University of Missouri, College of agriculture, and the United States Department of agriculture, cooperating, May 1936. 38 p. (4-H club circular 47).

Helpful in suggesting activities which can be used in schools in communities where few pupils belong to 4-H clubs. Contains experiments which children can make to compare plant growth on slopes and level, to determine effect of drainage on plant growth. Suggests studies of the effect of soil texture on plant growth, of different kinds of soil erosion, of soil depleting and soil enriching rotations, and the like. Tells how to prepare a soil exhibit.

HARTWIG, LESTER H. *The American mercury*, 36:102-4, January 1936.

Discusses soil losses, origin and kinds of erosion, erosion, ancient Mayan civilization, and China, and tells how Public Works Administration has established erosion-control demonstration areas. For teacher and curriculum worker.

HENDERSON, CAROLINE. *Letters from the dust bowl.* *Atlantic monthly*, 157:540-51, May 1936.

The article contains letters from wife of an Oklahoma farmer to a friend in Maryland and is useful for the point of view it presents. For curriculum worker.

HIBBS, BEN. *Dust bowl.* *Country gentleman*, 106:5-6, March 1936.

Realistic story of duststorms, showing how loess deposits in Kansas, Nebraska, Iowa, and other central States, tells geological story of erosion. Duststorms of present day are compared with early duststorms which were responsible for these deposits in middle States. Author believes Great Plains area is not becoming another Sahara and resents references to western farmers as despoilers. Sympathizes with determination of many farmers to retain their homes and farms. Useful because it suggests a certain point of view. For curriculum worker and teacher.

LOGAN, WILLIAM N. The elements of practical conservation. Indianapolis, C. E. Pauley & Company, 1927. 236 p.

Treats conservation as wise use of resources rather than complete restraint from use, conservation and thrift, original forests compared with present forests, future of forests, our land resources and their conservation. For curriculum worker.

LOWDERMILK, WALTER C. Manmade deserts. Washington, U. S. Department of agriculture, Soil conservation service, 1936. 8 p. (mimeographed).

So devastating seems man's occupation of land that, with a few exceptions, a desert condition anywhere is associated with his life in that region. The bulletin tells a brief story of the deserts of early times and now: Countries, causes, destructive effects, remedies. For curriculum worker.

MYER, WALTER E. The Tennessee Valley looks to the future. The Journal of the National education association, 23: 233-48, December 1934.

Detailed article telling significant facts about the Tennessee Valley Authority and its undertaking. Contains such topics as: Reasons for T. V. A., the valley at present, regions included in the valley, industries and resources, forests, soil, power, electrification, government, industry, future of valley. A flexibly organized study unit follows the pages of information. For teacher and curriculum worker.

NATIONAL RESOURCES BOARD. A report on national planning and public works in relation to natural resources . . . Washington, U. S. Government printing office. 1934. 455 p.

Authoritative report on state of natural resources and need for planning. Contains helpful maps, among them being a map showing extent of erosion in the United States. For teacher and curriculum worker.

NATIONAL RESOURCES COMMITTEE. State planning programs and accomplishments. (Supplementing State planning report of 1935). Washington, U. S. Government printing office. 1936. 128 p.

Contains list of State planning boards and regional planning agencies. May be interesting to teacher and to pupils who can read well and who desire to learn the kind and amount of planning done by their own State in the conservation of natural resources. Bibliography of State and regional planning publications and reports.

OKLAHOMA. DEPARTMENT OF EDUCATION. Course of study for elementary grades, 1932. 403 p.

Social science unit II, page 303, tells how the lives of people of Oklahoma are influenced by conditions under which they live. Problem 2, Soil, has teaching suggestions dealing with the way soil is made, what we get from it, why all soil is not good for raising crops, how soil may be kept in good condition; to become familiar with different kinds of soil in Oklahoma; to be able to distinguish good soil from poor; to develop ability to make comparisons, to know something of conservation of soil. For curriculum worker.

PARKINS, ALMON E., and WHITAKER, J. R. Our natural resources and their conservation. New York, John Wiley & sons, inc., 1936. 650 p.

"Man has it within his power to retard or to stop the destruction of resources, or even to restore certain of them, provided that he wills to do so." Deals with such subjects as the conservation movement in general, soils in the various sections of the United States, erosion and its prevention, grasslands, forests, floods, flood control, and other topics related to different phases of conservation. Specialists have contributed different chapters. Reliable and authoritative book for teachers and curriculum maker.

SEARS, PAUL B. Deserts on the march. Norman, Okla., University of Oklahoma press, 1935. 231 p.

Discusses kind of soil discovered by early settlers along the North Atlantic Coast and in the Southeast, methods of farming followed by early settlers, settlement of the Middle West and the dark prairie soil found there, the Great Plains and their destruction by the plow; American deserts. Tells about medieval Europe and its problems of soil erosion, soil problems of Europe today, soil problems of ancient and modern China, India, Egypt, and northern Africa.

TIFFANY, ROSS K. Irrigation, a national problem. Civil engineering, 1: 1081-86, September 1931.

Discusses important factors in irrigation projects—cost of future projects, water supply, justification of Federal irrigation, feasibility of developing Columbia River watershed—with pictures, tables, and graphs, presenting useful facts and affording suggestions for ways in which children can present information. For teacher.

UNITED STATES DEPARTMENT OF THE INTERIOR. The natural resources of our public lands. Washington, Geological survey, November 1, 1936. 5 p. (mimeographed bulletin)

Suggested as an example of mimeographed general reports which are revised from time to time. Helpful for teacher and curriculum worker who desire to understand the immense present and future value, particularly of minerals and water power, in our public lands.

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UNITED STATES DEPARTMENT OF THE INTERIOR. OFFICE OF EDUCATION. Soil conservation. Outlines of instruction for educational conservation corps camps. Washington, U. S. Government printing office, 1935. 191 p. (Civilian conservation corps, Vocational series no. 14).

A bulletin "prepared for the general information of corps area educational advisors, commanding company officers, camp educational advisors and instructors, camp superintendents and foremen, and others who may be in any way responsible for teaching students in soil conservation courses. Contains suggestions for study of soil with ideas for activities. Curriculum worker can use for suggestions.

VAN HISE, CHARLES R., HAVEMEYER, LOOMIS, *and others.* Conservation of our natural resources (based on Van Hise's *The Conservation of natural resources in the United States*). New York, The Macmillan co., 1930. 551 p.

Reliable and authoritative background for teacher in helping children criticise, organize, and summarize their own investigations. Problems to be considered in conservation of water, soil, forests, minerals, wildlife, and human life with tables and maps helpful to advanced pupils in making tables of their own; also a section on land policies and conservation. Helpful also to curriculum maker.

Water and its work. Units of instruction. Utah educational review, 30:31-33, September 15, 1936; 30:89, October-November 1936.

Suggestions for development of unit of work based on an activity unit developed in New Rochelle, N. Y., schools by Gladys Jacobson, and published by W. F. Quarrie, Inc., Chicago, Ill. Includes suggestions for experiments with water and soil to show erosion and deposition, suggestions for activities that might be carried on in classroom or assembly, and for visual aids, and bibliographies designed for teachers and children.

WIELAND, LILLIAN H., *and* HENDERSON, JUNE. Bibliography on soil conservation. Washington, U. S. Department of agriculture, Soil conservation service, July 1936. 179 p.

"Most of the references . . . pertain directly to (1) processes of erosional behavior under varying conditions of soil, topography, and land use; (2) geographic distribution of eroded and eroding areas; (3) methods of preventing or controlling erosion; and (4) the effect of the products of erosion on the silting of stream channels and reservoirs and the covering of lower slopes and alluvial plains." Unannotated. Contains help for curriculum worker.

APPENDIX

THE STORY OF EROSION AND ITS CONTROL

Supplementary information¹ for the teacher

Of the Nation's several problems in conservation of natural resources, that of accelerated soil erosion has startled and perplexed people most. To see the effects of erosion, one need not travel to China nor even to the borders of the United States. He can take a drive in his own community—virtually any community in the country—observing the plants from which his food is prepared and examining the land where these plants grow.

Erosion begins at home

Covering the slope on the right, perhaps, the traveler sees a field of July corn. At the foot of the hill, the crop is a rich healthy green. The stalks are as high as a man's waist. Half way up the slope, yellow sickly-looking leaves stir feebly in the breeze. The stalks are much shorter than those of the strong corn in the hollow. A walk into the field reveals suffering soil. It is dry and hard, or perhaps too finely pulverized. Scratching away the surface exposed another dry layer. Further digging brings one to the end of the dark or loamy topsoil to a less mellow clay layer. In the hollow where the healthy corn grows, the soil probably is darker, deeper, and more porous. Underneath, it seems moist, even when there has been no rain for some time. One can dig down 7 or 8 inches or a foot in places without coming to the end of it. Near the fence the grass grows through soil that looks as though it recently had been scattered there. Even

¹ The following books and pamphlets, which contributed substantially to this summary are suggested for the teacher's further study (for complete entries see Bibliography, pages 122-125:)

Sears, Paul B. *Deserts on the march.*

Parkins, Almon E, and Whitaker, J. R. *Our natural resources and their conservation.*

Van Hise, C. R. *Conservation of our natural resources.*⁴

Topsail: its preservation.

Soil, the Nation's basic heritage.

Person, Harlow S. *Little waters. A study of headwater streams and other little waters, their use and relations to the land.*

Save the soil. Cornell rural school leaflet. Vol. 29, March 1936.

Burges, Austin E. *Soil erosion control.*

White, Owen P. *All washed up.*

in the field at the bottom of the slope one sees drifts of the better soil.

The poor land on the slope, the sickly corn, the drifted loam in the hollow are the results of erosion, the movement of loosened soil. The drifts are formed of silt which came from the hill where the yellowish corn grows. On the hill the earth has lost the soil and the nourishment needed to produce a rich crop. How was the soil carried from the top and sides of the hill to the slope at the bottom? Why is the ground more moist at the bottom? These are questions that require thought and study. The traveler jots them down in a mental notebook for future reference and returns to the car. Often there are other effects of erosion to be seen in the home community. Perhaps a plot of waste land appears. A great ditch extends through the center, reaching nearly to the highway. How can the roadbed support itself? Will not the road slide into the gully—for a gully the great ditch is one of the most advanced and obstreperous types of erosion. As a matter of fact, gullies have swallowed pavement, barns, and houses. A farm which harbors drifts of silt, growing gullies, and poorly producing soil seldom has a comfortable, attractive house or a well-kept barn. Usually fences are in poor repair, shingles loose, and gates hanging by single hinges. If erosion is allowed to increase, production must decrease year by year, and it is only a matter of time until the farm yields too little to pay for labor or even to maintain a meager livelihood for the farmer and his family.

Erosion causes still other kinds of devastation. Driving on, perhaps, one reaches a level stretch dotted here and there by swamps, mounds, and hillocks of dry earth. Reeds and tall grass grow over the waste. "Why, it's just a dried up lake," he thinks. "There have been no spring rains in this region for the past 3 or 4 years, and the lake dried out." But drought is not the only cause of the water's disappearance. On the surrounding hills and slopes, the few rains that fell washed away the soil from plowed fields and from too closely cropped pastures. The soil collected in the lake. Drought and excessive erosion together caused the lake to vanish. Perhaps the pastures are so closely cropped that the bare and dusty earth shows through to be blown away in severe wind storms. A trip over the same territory just after a heavy rain reveals the hillside nearly dry and, in the hollow, inches more of fresh wet soil. In the case of young

crops the plants are often smothered by the additional mud washed off an eroding hillside. All such conditions are signs that erosion has been at work—signs that the soil is being washed and blown away and that the water is being carried off the hills and out of the valleys.

“It is only hills here and there in our community that are being affected. We lose only a little soil and it can soon be restored,” perhaps one says. But do many believe that with proper plowing and fertilizing the farmer can build new soil to replace that which was blown or washed away? Can anyone say that this is only one little community; that it is of relative unimportance in the life of the Nation?

In terms of plant food it has been estimated that the Nation is losing by erosion 126 billion pounds of plant food every year. This is 21 times the amount of plant food removed by crops. “The latter loss can be replaced by manures and fertilizers, the former means a complete loss of the soil itself.” It has been prophesied³ that 100 million acres of valuable land will be greatly impoverished if erosion is not checked. If the present erosion is allowed to continue, the area of fertile land will be reduced to not more than 150 million acres as compared with the 450 million acres we now have. One-third of the present area will undoubtedly be insufficient for maintaining a satisfactory standard of living in the future.

Erosion Threatens the Nation

Here are a few facts:

The soil-erosion specialists tell us that the duststorm of May 11, 1934, swept 300 million tons of fertile topsoil off the great wheat plains; that 400 million tons of soil material are washed annually into the Gulf of Mexico by the Mississippi River; that generally water and wind erosion together each year remove beyond use 3 billion tons of soil.

They find that 100 million once-fertile acres of farm land—equal to Illinois, Ohio, Maryland, and North Carolina combined—have been essentially destroyed for profitable farming; that another 125 million acres are seriously impaired; and that another 100 million acres are threatened—all belonging to the best farm lands of the United States.

³ Op cit., p. 76-77.

And further, that the present annual money loss to landowners and to the Nation is not less than 400 million dollars each year; that the annual rate has been increasing; that the cumulative loss may be conservatively stated as already not less than 10 billion dollars; and that, if the wastage is not stopped, in another 50 years the cumulative loss will reach the staggering figures of 25 to 30 billion dollars, equivalent to a loss of \$4,000 on each and every farm in the United States.

This is not a loss of income the flow of which can be resumed, but of assets that cannot be recovered, for it takes Nature centuries to make the equivalent of the topsoil which has been swept away—at the rate in some places of 3 to 6 inches in a single season.³

Not all communities are seriously or irreparably damaged by erosion. Proper treatment in time will save many. Others are tragically affected. If one would see for himself some of the worst effects of erosion, let him drive through a region injured by many gullies. Here is one scene after another like that in the picture on page 52. The land in that picture was once cultivated. Now, after only 25 years, it has been completely ruined by erosion. The topsoil is entirely gone. Since from 400 to 1,000 years is required to build a single inch of topsoil,⁴ this land probably cannot be restored by man.

Considering the Nation as a whole, much farm land is ruined by removal of the topsoil at a rate too rapid to be replaced by nature's own soil-building capacities. With the topsoil goes not only the water-holding capacity of the land, but food for plants as well. How much soil has been lost? The figures are astounding. It was estimated in 1930 that 15 million acres of formerly tilled soils had been totally destroyed by erosion in the United States. Certain localities have lost nearly all of their farming land in this way.⁵ Control of erosion is needed on something like 75 percent of the present and potential cultivated area of the Nation.⁶

³ Little waters. Washington, U. S. Government printing office, 1936, p. 1-3. (Soil Conservation Service, Resettlement Administration, Rural Electrification Administration.)

⁴ Our soil, its wastage, its preservation. *Op. cit.*, p. 1.

⁵ Van Hise, Charles R., Havemeyer, Loomis, and others. Conservation of our natural resources. New York, The Macmillan Co., 1930. pp. 361-62.

⁶ Parkins, Almon E., and Whitaker, J. R. Our natural resources and their conservation. New York, John Wiley & Sons, Inc., 1936. p. 77.

Many square miles have lost all the topsoil. The loss of crops is enormous. It affects not only the present generation but generations to come. The following adapted table shows areas within which more than 25 percent of the land has been affected as indicated:⁷

1. Practically all topsoil lost; severely gullied and unsuited for further tillage. Includes much abandoned land	Acres 50,000,000
2. Practically all topsoil lost. That part still under cultivation generally of low agricultural value. Includes much abandoned land and much sub-marginal land inefficiently farmed	87,000,000
3. From one-fourth to three-fourths topsoil lost. Approximately 50,000,000 acres—mainly patchy areas—very severely damaged	470,000,000
4. Moderate to serious wind erosion on cultivated area	56,000,000
5. Greater part essentially ruined for further tillage by wind erosion	4,200,000

In badly eroded regions, farmers who sense the situation are bewildered by it. Almost unnoticed, insidiously, erosion ate into their farms. Sheet erosion stole tons of soil without detection. Wind erosion took its share. The type of erosion which convinces everyone of the power of running water is gully erosion, more spectacular but not more serious than the other types. Gullies are very small at first—just tiny streams running here and there through the topsoil in the field or away from the dripping eaves of farm buildings. If they are not stopped they often form wide ditches which break the surface of the land and carry away barrels of water and tons of soil. Yet beginnings of gullies often were taken as a matter of course. Enlargement of gullies can be detected chiefly by farmers who retained and farmed their land from year to year. On farms which changed ownership each year, new owners as a rule knew only the size of the gullies they were unfortunate enough to buy. Two years of severe drought blinded some to the decreasing productivity of their soil.

The farmer's inherent optimism kept him looking forward to better times, and he made the mistake of explaining his low production entirely by drought instead of decreasing fertility and erosion. "Next year we'll have a normal crop," he always hoped as he mourned the emptiness of his granaries. When the rains came, there were less vegetation and fewer correctly plowed acres.

⁷ Ibid.

to prevent torrents of muddy waters from carrying the precious soil to the Gulf of Mexico; to the lower valleys of other watersheds. Even with the normal rains, in many places, insufficient water remained to produce normal crops because the soil that formerly held the moisture was gone.⁸

Example of the Piedmont

One of the most severely eroded areas in the United States is the Piedmont Plateau,⁸ extending north from Alabama nearly to New York City. From 10 to 40 percent of this region has lost three-fourths⁹ of its topsoil, which, two centuries ago, consisted of a sandy loam from 7 to 15 inches deep. Underneath this mellow loam lies a red subsoil capable of producing crops, except that gullies usually render it unfit for them. Through rivers once clear and abounding with sturgeon, red mud now runs thickly. Clogged with debris, these streams overflow after every heavy rain and deposit more debris. In the southern Piedmont over half the bottom lands are now uninhabited, nontillable swamps. And these are the lands about which an early inhabitant wrote: "The land brings forth corn spontaneously without the curse of labor and so wholesome that none who have the happiness to eat of it are ever very sick, grow old, or die."⁹

There were conservationists in this region in the latter part of the eighteenth century—Washington, Jefferson, and Madison. They rotated their crops, avoided overplanting corn, which they considered soil-exhausting; Jefferson practiced contour plowing. They were unable to convert either their neighbors or the overseers on their own farms. Conservation practices were not followed by the majority of farmers as long as there was new land to clear. By the time there was no more new land, a large portion of the lower part of the region was worn out or gullied.

Today the Soil Conservation Service, with the assistance of the Civilian Conservation Corps, has established in this region dozens of demonstration areas. Whole watersheds of small streams are sometimes chosen for experimentation. Soil-conservation programs are set up and adapted to the amount of erosion, the slope of the fields, the use of the land, and the physical and chemical

⁸ Rowalt, E. M. *Soil defense in the Piedmont*. Washington, U. S. Government Printing Office, 1937. U. S. Department of Agriculture, Farmers' Bulletin 1767.

⁹ *Ibid.*, p. 12.

characteristics of the soil. For every farm a 5-year program is decided upon by the farmer and a Government specialist. Many old as well as new conservation practices are followed. Rotations are planned suited to soil characteristics, degree of slope, and susceptibility to erosion. Small grains or legumes or other soil-binding crops are used for the steeper slopes and cotton and corn assigned to the more level land to be alternated with strips of soil-binding crops. Demonstration areas are maintained which afford examples of methods by which erosion can be controlled, in order that farmers may profit by them.

Example of the Great Plains

There are serious soil problems in the Great Plains region. This region was opened to settlement after the war between the North and the South in what happened to be a series of years with a fair amount of rainfall. Gradually the Government sold the land for a small price to settlers who would homestead it, just as, for example, the British Government in earlier days arranged for grants of land in different colonies to be given to groups and to individuals on condition that they make certain improvements,¹⁰ thus building a new country as a colony for the old. At first, according to the Homestead Act of 1862, a citizen who was the head of a family might become the owner of 160 acres of Government land by making certain improvements and living on the land for 5 years, or by paying a small sum of money to the Government. Then, as it became evident that 160 acres was too small for a profitable farm in the Great Plains, larger farms were authorized, the latter with the provision that they be devoted to grazing.¹¹

Prospects were good for the new lands until around 1886. Then droughts set in. Until then, cattle could be grazed satisfactorily on what was left of the Government land in the Public Domain. Very gradually, of course, the settlement of the Great Plains took place. Not so gradually the years of drought appeared. Each year farmers planted crops or planned herds with the hope and expectation that there would be the moisture of past times. And each year the drought returned. But there was nothing for the farmers to do but to keep on as they had done and

¹⁰ Faulkner, Harold U., *American economic history*. New York, Harper and Brothers, Publishers. 1931. p. 55.

¹¹ *Ibid.*, p. 431-32.

try to get results for their investment. There were wet and dry years, but on the whole the climate remained dry rather than wet.

The inventions of farm machinery brought new problems for the farmers to solve. They could plow and care for more land with the new machinery, but they needed cash to buy it. Wheat was the best cash crop. It could be harvested and sold, bringing money more quickly than grass, which must be fed to cattle. Two or three years were required to realize money on the cattle, so vast stretches were sowed in wheat.

The World War changed the situation again. At first the price of wheat rose. Farmers were urged to increase their acreage as a patriotic duty. After the war, the price collapsed. The farmers now had their machinery, but were in debt for it as well as for the land. The natural thing to do, when the price of wheat was low, was to plant more wheat to try to make up for the lowness in price. They could see error in this from the beginning, but it was natural to make a desperate effort to save themselves from financial ruin—from loss of the homes into which they had put so much money, hard work, and hope.

Millions of acres of wheat were sowed. Thousands of plows and hundreds of great combine harvesters stripped the dry soil of its covering of grass or crop and exposed it to the winds. Severe duststorms set in, blowing away the soil. Even the longed-for rains, when they came at last, wrought only destruction. They washed the bare loosened soil before them into the creeks and small streams and through the creeks and small streams into the rivers, in great muddy torrents that swept death and destruction along with them.

Around and around the vicious circle of circumstance the farmers and landowners were dragged. Wheat on the depressed market depressed it the more. Prices went lower and lower because there was no demand for the wheat which the thirsty acres produced. Sometimes the cost of shipment was greater than the amount of money the farmer realized through the sale. And the lower prices went, the greater grew the tendency to sow more wheat. At last the farmers here and there could hold out no longer. The worthless crops were abandoned, the farms sold or allowed to revert to the State because of unpaid taxes, and the barren land left to the mercy of wind and rain.

Controlled vs. Uncontrolled Erosion

The general story of accelerated erosion is the same throughout the country. The same general methods, scientifically adapted, may save the land. In uncultivated land, erosion is controlled by nature. Grass, weeds, and forest floors cover much of the level land. They absorb a large part of water that falls as rain and keep it clear, so that it can penetrate the soil. Gentle rains usually result in little loss of soil. However, man upsets the balance of nature. He plows soil that nature once covered with grass, on slopes so steep that ungrassed soil cannot remain. This loose soil freed from the binding roots is easily blown or washed.

The first step in serious soil erosion is poor farming. Some farmers practice extractive farming by continuously planting crops which take fertility from the soil. They fail to rotate these with other crops such as grass and clover which replenish the soil. Later comes tenant farming. Lastly the tenants leave, because the land is no longer able to keep them alive.

Man cuts trees and deprives the earth of its blanket of leaves and forest roots which hold the soil in place. When rains come they wash away soil which, if nature had her way, would be retained. With the grass and leaves removed, the surplus water rushes away to the sea loaded with precious soil. A downpour, especially one which follows a long season of drought, may carry away tons of rich earth. Man plants crops in rows, which provide ditches in which water finds an easy path toward the ocean. He plows his furrows up and down instead of round and round.

Where nature is unmolested, there are forest floors or grassy soils into which the surplus water sinks. This water moistens the surface near the roots of plants. It may seep down to the level of the underground supply, and raise it high enough for long roots of trees to draw on when rainfall is scarce.¹²

Ways of Controlling Erosion

Not all the good soil of the Nation has been lost. In many regions through good methods of farming, the fertility and the depth of the soil have been conserved and retained. The United States still has greater wealth of soil than any other Nation. Land that has not suffered too greatly can be restored. While soil still remains, good methods of farming will save it. Even after erosion

¹² Van Hise. *Op. cit.*, p. 359-64.

has begun, an intelligent farmer can reclaim his land in time to reap profit. His chief problem is restoring nature's balance to remedy the harm he has done.

There are many remedial measures. Deep gullies frequently can be filled in various ways from the building of concrete dams to the planting of black alder bushes and locust trees. Steep slopes whose soil has been plowed and whose trees have been cut should be planted in grass or reforested. Where land has been cleared which should have remained in trees, and where woodland pastures have been over-grassed, the grass and the woods should be restored wherever soil seems inadequate to produce good crops. Good methods of controlling erosion, of course, differ as types of land are different. In arid lands the infrequent rains come down in torrents. Since the soil has been dried and loosened by drought the washing is extreme. On such lands grazing should be well controlled, and overgrazing avoided. The method of contour furrowing is effective. Furrows, short distances apart, are plowed around the slope on a horizontal line. The flow of water which runs off the grassland is checked and held by the furrows till it is absorbed into the tangle of roots and soil which covers the hill.

Corrective methods of cultivation can be used to control erosion which takes place in arable land.¹³ Deep plowing invites water to soak down into the ground. Cultivating the soil around the hill for crops instead of along the slope is important because if furrows made by plow or disk, run up and down the hill they form channels through which the water can run off instead of remaining and soaking into the soil. Furrows across or around the slope check the flow of water. Terraces constructed on hillsides prevent washing.¹⁴ Many farmers are using the method of strip-cropping to prevent erosion. Strip-cropping consists of alternating strips of close-growing grain with strips of cultivated crops like corn or cotton. The strips are arranged at right angles to the slope. Soil which running water gathers as it flows across the cultivated strip is retained by the strip of close-growing crop. Cover crops also help reduce erosion losses. These consist of crops like lespedeza which are plowed under while green. The organic matter thus added to the soil increases its porosity and

¹³ Van Hise. *Op. cit.*, p. 366-68.

¹⁴ Some of the pictures illustrate types of erosion control that are being carried on by progressive farmers in different parts of the country.

consequently its water-holding capacity. Land should not be left fallow: Instead, for erosion control, unused land should be protected winter and summer either by a growing crop or by the roots or stubs of a crop previously grown.

The structure of the soil is very important in the control of erosion. Its porosity, induced by the presence of plant and animal matter, increases its water-holding capacity. If a soil can absorb and retain rain water that falls in spring or winter, it can nourish a crop for weeks even in drought years. It is important to preserve and frequently renew the fertility of the soil. Not only does conservation of the soil's organic matter reduce the loss from erosion, but it also insures better crops. One way of replenishing the soil's fertility is to rotate crops. This means planting one kind of crop one year and a different kind next year or the year after. It is important that a crop which adds nutritive matter to the soil should follow one that exhausts it. Clover and alfalfa are examples of good restorative plants, especially if they are plowed under while green. The green crop is more quickly decomposed and changed into humus than dry plant material. The salts which the plants have taken from the earth are realized again in the soil. Commercial and barnyard fertilizers contribute greatly to the restoration of soil. Some land is so poor that it probably never will produce crops in sufficient abundance to pay for the labor required. This land, submarginal in type, can well be set aside for Government ownership in order that it can be properly conserved.

Difficulties in the Conservation of Soil ¹⁵

Conserving soil is not as simple as the mere building of dams and gullies, contour plowing, the terracing of crop lands and the like to control erosion, or the application of fertilizer to renew exhausted soil. A terrace, for example, must be adjusted to the percentage of slope, the nature and condition of the topsoil and the subsoil, the climate, and the amount of litter, because all of these things affect run-off. If one will note the variety of slopes in a small community or on a single farm, the different soil textures, the type of litter, he will have an inkling of the complexity of the problem. Not only must these physical factors be considered, but human variables as well. The training, experience, intelligence, and business ability of the farmer enter into the

¹⁵ Largely adapted from Parkins and Whitaker. *Op. cit.*, p. 79-80.

situation and help determine results. In the United States there are thousands of different soil types, all with varying percentages of slopes, amounts of rainfall, and standards of farm management to be considered in so simple an activity as the building of terraces. In similar manner all the other methods of controlling erosion must be expertly adjusted to particular situations. The restoration of exhausted soil is equally complicated. Worn-out soil cannot be immediately restored by any means whatsoever. Soil is not merely a substance or a mixture of useful chemicals, but a phenomenon of the utmost complexity, whose delicate balance is easily disturbed and whose complete interpretation is yet far off.¹⁶

An important thing for the Nation to remember in trying to resolve its agricultural difficulties is this:

The inexorable laws of cause and effect operate in the production of food from the soil just as in every other realm of physical experience. No man, no Nation, can spend resources faster than they are built and escape the inevitable reckoning. It is impossible here, as elsewhere, to get something for nothing, and supreme folly to trust to the future for our errors to right themselves.¹⁷

The field of erosion control is broad. Many new studies are needed. Persistent and kindly effort is required to secure the confidence of the farmers, through whom the work must be done; and to equalize for them the burden of loss while experiments are being made, crops reduced, and submarginal lands evacuated. Notwithstanding the difficulties, an effective beginning has been made in the control of erosion.

Irrigation and Drainage

While control of erosion is one of the most urgent soil problems, it is not the only one with which the Nation is confronted. In sections of the western part of the United States, prosperity is determined largely by the success of various irrigation projects.¹⁸ The climate is favorable for good crops and the soil contains valuable plant food. The element lacking is moisture. With sufficient moisture these lands are capable of producing two or three crops or more in a single year, especially of alfalfa and certain vegetables and fruits.

¹⁶ Sears, Paul B. *Deserts on the march*. New York, Simon & Schuster, 1936, p. 36.

¹⁷ *Ibid.*, p. 36.

¹⁸ Van Hise. *Op. cit.*, p. 142.

Large irrigation enterprises sometimes failed because the supply of water was overestimated. Farmers bought land and planted crops only to find that available water was not sufficient to maintain the farms.

In the face of general overproduction of farm crops, there is a question as to how much arid land should be irrigated. The present supply of food, the price, and the amount which can be produced on the present acreage are factors which should be carefully considered before additional land is placed under irrigation. This does not mean that individual farmers or small groups of farmers, either in arid regions, in subhumid, or in humid regions should not develop small irrigation systems. In subhumid regions where spring rains stimulate crops and where later months are too dry for these crops to mature, irrigation is often helpful. Sometimes in humid regions it is helpful. It has not been widely developed because of the expense.

The problem of drainage is important in soil conservation. Not all swampy land that might be drained has sufficient soil constituency for raising crops, and cannot profitably be reclaimed. Some land has the kind of soil that can be made to produce well if drained. This should be reclaimed. One of the most striking drainage enterprises is in the Everglades of Florida.¹⁹ There an overflow from Lake Okeechobee formerly kept the land wet most of the time. Drainage ditches now carry the surplus water into the Atlantic Ocean, and the land has great productivity.

The problem with respect to reclamation of wet lands by drainage is the same as that of reclamation by irrigation, namely, that of bringing new land into competition with old lands and thereby reducing prices. One remedy for the situation suggested by Van Hise²⁰ is the adoption of a Federal land policy by which reclaimed lands would be reforested when not needed for production of other crops. Another remedy would be the cultivation of only enough reclaimed land to afford homes and subsistence for farmers removed from submarginal lands taken out of cultivation.

Government Service in the Conservation of Soil

The Federal Government maintains a number of agencies active in the conservation of soil or in learning more about it.

¹⁹ Van Hise. Op. cit., p. 173.

²⁰ Ibid., p. 174.

In many communities, as in the Piedmont and the Great Plains, the Civilian Conservation Corps is engaged in tasks related to conservation of the soil. Other groups of young people through 4-H clubs and Future Farmers of America are learning more about conservation, particularly the saving of soil.

Throughout the Nation, the Federal Government through a number of specific services carries on soil conservation experiments, or demonstration projects. These agencies work with the farmer in planting soil-building crops; they arrange for payments to farmers who will refrain from using their land for an oversupply of soil-destroying crops such as corn or cotton, help farmers who have failed on submarginal lands to get new starts with financial backing on better land, and assist in the planning of crops and in the management of farms. The United States Forest Service employs people to carry on reforestation and fire prevention and to preserve grazing land in the National forests. The Government has made regulations which enable private agencies, which are said to own about 70 percent of the country's forest, to engage in scientific cutting and replanting. The Reclamation Service in the United States Department of the Interior administers irrigation projects as far as the 110th meridian. The Tennessee Valley Authority (T. V. A.) was organized to experiment with the restoration and preservation of the soil, along with other conservation services, with a view to demonstrating to other communities the possibilities of such activities. What the T. V. A. is trying to do for the people of the Tennessee Valley, the Farm Adjustment Administration is trying to do for experimental communities in many parts of the country. Through this Government agency money is advanced to help families who have lost their funds in submarginal lands to begin again in new homes on better lands.

In addition to the Government organizations just mentioned which engage more or less directly in the conservation of soil, there are other organizations, such as the Geological Survey, the Reclamation Service, and the National Park Service in the Department of the Interior, which contribute to research or other work helpful in conservation of soil whenever this is related to services assigned to them or undertaken in the regular discharge of their duties.

Soil Problems of Other Lands

All countries have had erosion problems resulting from a disturbance of the natural balance of water, soil, forests, and plant

life. From the very beginning of civilization people have had two modes of living—the wandering life in dry lands and the settled life in humid regions. Both have exploited the soil. In both modes of living nature's balance has been upset. Through failure of their land to produce sufficiently rather than through physical weakness or mental incompetence of their citizens, glorious ancient nations have succumbed to starvation, disease, and flood. Exhaustion of the soil and the deterioration of agriculture were factors in the decline of fine old Mediterranean nations. In China, a nation with the ability to build a civilization of longer duration than that of any other, hundreds perish every year, because the country's soil cannot provide food for all of the people.

The United States should take warning from the examples of these older nations and restore her soil before it is too late.

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