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TREES AS SUPPLEMENTARY MATERIAL IN THE
ELEMENTARY SCHOOL CURRICULUM IN ART,
SCIENCE, AND RESOURCE USE

by

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CHAPTER I

INTRODUCTION

Significance of the Problem

The need for out-of-school material to integrate with in-school material is recognized by many elementary school teachers. Gerald S. Craig emphasizes this need when he declares that thinking in terms of subject matter is being eliminated in favor of thinking in terms of certain areas of experience which contribute to the pupil's development in directions useful to himself and to society. He affirms that the end of teaching is no longer the mastery of content but the total growth of the child as a result of his interaction with his environment.¹ Consequently, the teacher is obligated to go outside the schoolroom and make use of those factors which will meet the demands of the curriculum.

In keeping with this point of view, there is a trend to use current pertinent problems.² Such problems are defined as those which arouse the child's curiosity and call for a solution.³ Tree study is one area of these

1. Gerald S. Craig, Science for the Elementary School Teacher, New York: Ginn, p. 3.

2. William H. Kilpatrick, "Psychological Bases and Their Implications for the American Curriculum", Teachers College Record, Vol. XXXVIII, (March, 1937), p. 494.

3. Craig, op. cit., p. 4.

problems. The trees are ever present and adaptable to curriculum use. There are as many as seventy-five common trees in Piedmont North Carolina. They have a true setting in the way of life in this section and are of unquestionable significance to the well being of the locality.

Trees give an aesthetic quality to the mode of life in any locale. Where there are trees, there is a certain fullness of nature not experienced in lands barren of trees. Much consideration was given to this aesthetic value by Anna Botsford Comstock, the great American naturalist of fifty years ago. She conceived nature-study (tree-study) to be an aesthetic experience as well as a discipline. She imagined it to be an opening of the eyes to the individuality, the ingenuity, and the personality of each of the unknown life forms (tree-forms) about us. To her nature-study meant a broadening of the intellectual outlook, an expansion of sympathy, and a fuller life.⁴ In like manner, to-day, it is not inconceivable that one might have his intellect broadened, his sympathies expanded, and his life enriched by studying the trees.

To go into the forest has always been an adventure. While the remote great grand parents went of necessity to seek sustenance, thousands of people go now purely for pleasure.⁵

4. Anna Botsford Comstock, "Publisher's Foreword", Handbook of Nature Study, Ithaca, New York: Comstock, 1947. p. vii.

5. Martha Bensley Bruere, What Forests Give, Washington, D. C.: United States Department of Agriculture, Forest Service, 1940. p. 68.

Walking among the trees on a carpet of crunching leaves with a shadowy tent overhead is an experience which has lured millions of people. Seasonal changes in trees have also always interested people. The shape of the tree, the enormity of it, the quality of its fruit, and the color of its leaves or flowers are problems current and pertinent to North Carolina boys and girls. Also tree homes for wild life are another area for understanding and appreciation.

The economic value of the forest in Piedmont North Carolina is tremendous. Both conservation benefits and monetary considerations are contributing factors to the well-being of the population. The forests afford windbreaks and control the water situation of the locality. Leaves on the ground contribute to the steady flow of streams; for example, they help prevent water from being absorbed before it reaches the stream and also help prevent the rapid running off of water. The shade of trees and the windbreaks check evaporation, and the root systems and ground cover prevent erosion.⁶ Nearly 5,000 industrial plants depending directly on the forest for raw material were reported in the state in 1947. The value of the primary forest products for that year approached \$150,000,000. In 1944, the forest products industries reported 49,000 workers in the state. The wood products industries rank next to textiles as a source of employment in manufacturing. The Piedmont Plateau embraces

⁶.United States Forest Service, Division of Information and Education, Living and Forest Lands, Washington, D. C.: United States Government Printing Office, 1940. p. 9.

about one third of the area of the state; one half of this land is timbered. The section receives its proportional benefits from the forest products and the forest industries. The growth of the furniture industry, situated largely in the Piedmont, stimulates the manufacture of veneers and plywood, dimension stock, and excelsior and gives employment to thousands of people.⁷ By careful management, the owners of small forests are able to secure frequent profits. Among hundreds of reports, in 1946, to the government, there was an instance of a Burke County (Piedmont North Carolina) man who was able to pay for his land ahead of time with income from his forest and have trees left for more income in the future.⁸ Three crops of timber off the same woodland might well be expected over a period of forty years. Since the whole economy of the Piedmont is involved in the forests, the schools have an obligation and should make their contribution by using the trees as a subject for material in art, science, and resource use. Through this study the child is given a lasting sense of his responsibility in the protection and conservation of the trees.

7. W. K. Beichler, North Carolina Forest Resources, Raleigh, N. C.: North Carolina Department of Conservation and Development, 1949. pp. 1-9.

8. Norbert H. Sand and Milton M. Bryan, Compilers, Managing the Small Forest, Farmer's Bulletin No. 1989, Washington, D. C.: United States Department of Agriculture, 1948. p. 1.

Statement of the Problem

The purpose of this study is to discover the possible use of trees as the source of supplementary material to enrich the North Carolina state curriculum in art, science, and resource use. The study required answers to the following questions:

I. What are the opportunities for the use of trees in art, science, and resource use?

II. What are the common trees that can be used for this purpose?

III. What methods, projects, and procedures may the teacher use to utilize these trees for supplementary material in the curriculum?

Scope of the Thesis

This study is confined to the elementary school curriculum. It is limited to Piedmont North Carolina and to the common trees of the section.

Method Used

To make this study valid, certain practices acceptable in research work were carried out. A search for related material and collateral studies was made by consulting the following references:

United States Library of Congress. A List Of American Doctoral Dissertations. Washington, D. C.: Government Printing Office, 1930-1938.

Doctoral Dissertations Accepted by American Universities. Compiled by the National Research and the American Council of Learned Societies by the Association of Research Libraries. New York: The W. H. Wilson Company, 1934-1949.

Good, Carter Victor. "Doctors' Theses Under Way in Education". Journal of Education Research, January, 1931-May, 1948.

Gray, Ruth A. "Recent Theses in Education". School Life, October, 1945-June, 1950.

The Bibliographic Index. A Cumulative Bibliography of Bibliographies. New York: The W. H. Wilson Company, 1938-1949.

Education Index. A Cumulative Author and Subject Index to a Selected List of Educational Periodicals, Books, and Pamphlets. New York: The W. H. Wilson Company, 1938-1949.

Second, a careful study of the North Carolina courses of study in art and science, and also of the literature on resource use in education was made. Opinions of national and state forestry experts were obtained through correspondence. A survey of both government and forestry bulletins was conducted. Next, the practices of better teachers were investigated through interviews with those known to be outstanding in the use of trees in the curriculum. Finally, distinctive curricula from other states and cities were examined and a complete survey of numerous standard works was made to discover information on trees and their uses in the elementary school curriculum.

Related Studies

Only one thesis was found relating to the use of trees in the curriculum of the elementary school.⁹ This reported the findings in a study of thirty-eight pupils in the eighth grade in regard to the motivation of oral and written English by the use of trees in the curriculum. The results showed that the pupils not only acquired better skills in English composition, but also took an active interest in trees and that the community took an interest in the project.

The need for out of school material, the prevalence of trees in the locality, the pertinency of tree study, and the amount of material available would seem to indicate that one could make a satisfactory study of trees as supplementary material in the elementary school curriculum in art, science, and resource use.

⁹. Anna K. Gill, A Study of Trees as an Integrated Activity, Master's Thesis, Peabody, 1937.

CHAPTER II

TREES IN RELATION TO THE STATE CURRICULUM

The North Carolina course of study makes certain references to trees in the curriculum in art and science, while the resource-use program which involves many fields, establishes certain principles which imply the use of the forest in elementary education. It is the purpose of this chapter to point out these references and implications.

Trees in Art

To find suggestions for the uses of trees in the curriculum an examination of Art in the Public Schools was made.¹ This revealed that themes for art expression may be found in every phase of activity in which living is going on and that the first source for art topics should be from the child's personal interests and experiences. From lists of experiences which children in grades one through eight have had and enjoyed, the following references to the use of trees were found: illustrations of impressions of a field trip; designs for playhouse wallpaper, for curtains, for napkins; color appreciation; illustrations of how people make a living, considering such work as logging and saw-milling; landscape (art for art's sake); illustrations of

1. Julia Wetherington and others, Art in the Public School, Publication No. 238. Raleigh, N. C.: State Superintendent of Public Instruction, 1942. pp. 39-81

conservation as in the forest. Certain other activities were noted in which trees might be used: The "my" illustrations for young children, my mother, my pet, my (tree); part of the illustration for a story about a visit to a farm; the wind and ways objects (trees) behave in it; story representations; designs for book covers; illustrations of personal experiences; pictorial maps; sketching; and illustrations for poems.

These activities have been listed to give teachers ideas of the types of things which children have been interested in and are capable of doing. They should be performed only when they become purposeful to a particular group in their own living. The above suggestions should in no way limit the teacher, should she find other uses for trees in art.

Trees in Science

In order to determine the uses of the trees in the curriculum in science, examination was made of Science in the Elementary School.² This study indicates that the first source for science study should be drawn from the child's immediate surroundings. The work in the lower grades should begin with the child's interest in his own home area and widen to his community, his county, his region, his country, and other countries. Consequently, his interest in trees

2. Julia Wetherington and others, Science in the Elementary School, Publication No. 227. Raleigh, N. C.: State Superintendent of Public Instruction, 1941. pp. 26-106.

might begin with the trees in his home yard and school yard and spread to the trees in the community and then to the trees in the particular locality. The following topics were listed under suggested units for grades one through seven: Protection of our local wild flowers and trees; trees most common in our locality, in North Carolina; conservation of our plant life and forests; conservation in our community, state, and nation; soil erosion, animal life, and plant life. In addition to these topics, the following units which include the trees were suggested: The autumn season - the changes we see in plants; the spring season - the changes we notice; seeds starting new plants; methods of scattering seeds; the nature of plants about us; and the balance that nature maintains in all living things.

Trees in Resource Use

To establish the meaning of resource use and to find the place of trees in the curriculum in resource use education, a careful study was made of an article by Richard Weaver, program director of the North Carolina Resource use Education Commission, in which he gives an account of the state program. Weaver points out that our resources are natural, social, and human, and that resource use is a sort of healthy interaction among these three factors. He says:

One resource develops simultaneously with another. Plants and animals are produced for the benefit of people; people are educated to the inter-relationships of their environment and develop and conserve resources while using them; institutions are strengthened by rededicating themselves to the services of mankind and the perpetuation

of the resources on which all civilization and living depends.

The concept of resource-use education is so large and important that it should be an integral part of the education objective of every community. Children should be led to understand the problems and opportunities of their community, state, and nation and should be equipped to develop and use their resources. Resource use should be taught throughout the schools to all the children and should be integrated with the regular school subjects according to the needs of the children and the resources available. In discussing how resource use should be taught, Weaver explains:

Resource use therefore becomes an emphasis which strengthens our educational objective; at the same time it enriches our teaching with pertinent, interesting, colorful, and dynamic subject matter. Frequently these are lost when the information must be closeted in national texts. This places a premium on such resourceful teaching techniques as films, observations, field excursions, demonstrations, community surveys, experiments, group discussions with resource people, and local sources of materials, reports, and facts.

Classroom and school projects which are problem-centered around important needs of people and communities then become the focal point around which texts, references, films, and trips can be centered. Children learn to work in smaller groups, leadership emerges, interest is heightened by the spirit of research, and the scientific method becomes a reality and an important tool for learning.³

This implies that trees should be used in the curriculum in Piedmont North Carolina to strengthen teaching in the elementary school in all fields. Tree study may enrich

3. Richard Weaver, "A Grassroots Birth", Reprint from North Carolina Education (December, 1948-January, 1949). Raleigh, N. C. 4 pp.

the curriculum in English, art, science, social studies, and mathematics. The use of the trees in the curriculum exemplifies the principles of the resource-use program. The pupils' learning is enriched by the use of the trees, the trees are protected for the benefit of the pupils, and the schools are strengthened in the process.

CHAPTER III

COMMON TREES OF NORTH CAROLINA

In presenting the subject, Trees in the Elementary School in Art, Science, and Resource Use, it is important to consider which trees are available for use in the schools. For this reason, a list of common trees of Piedmont North Carolina has been compiled for this chapter. This list includes the more important, the less important, and native and foreign trees which over the years have become common in this locality. All categories have been listed together because children in the elementary school, beginning at home and school to observe trees, often come in contact with the less important and the foreign trees before they meet the forest in general. For example, one might meet a pin oak, a large leaf magnolia, or a mimosa before he meets a post oak or a short leaf pine. A second reason for listing all the trees together is that one kind is more important or more abundant in one section, while another is valuable and plentiful in another locality. For example, the hemlock is rather plentiful on the fringe of the mountains but is never found on the border of the coastal plain; on the other hand, the Carolina ash is not found farther west than the edge of the coastal plain. It has not been considered necessary to list the botanical names of the trees for this study.

Fruit trees are not included in this list.

No teacher will want to use all the trees listed, but each will select those for study which she judges most appropriate for the particular needs of her curriculum. She will most likely be guided in her selections by the help of her pupils who will indicate to her their interests and preferences and assist her in discovering which trees are growing in the community.

Three sources of descriptions of trees for the use of the teacher are listed below.

Trees of the Southeastern States¹

Guide to Southern Trees²

Common Forest Trees of North Carolina³

While there are many other tree books and guides, it seems that the above selection is most suitable for Piedmont North Carolina. Nor does the teacher have to depend upon books alone as a source of her knowledge of trees. She will, for example, meet many people who will share with her their first hand experience with trees, and also she will be able to make many observations as she travels over the area.

1. W. C. Coker and H. R. Totten, Trees of the Southeastern States. Chapel Hill: The University of North Carolina Press, 1937. 417 pp.

2. E. S. Harrar and J. G. Harrar, Guide to Southern Trees. New York: McGraw, 1946. 712 pp.

3. J. S. Holmes, Common Forest Trees of North Carolina. A pocket manual. Raleigh: Department of Conservation and Development, 1944. 87 pp.

The Trees

White pine	Swamp chestnut oak	Carolina red maple
Shortleaf pine	Blackjack oak	Staghorn sumac
Pitch pine	Water oak	Yellow buckeye
Scrub pine	Willow oak	Basswood
Table Mountain pine	Pin oak	Dogwood
Hemlock	White elm	Sourwood
Red cedar	Winged elm	Black gum
Black walnut	Slippery elm	Persimmon
Bitternut hickory	Hackberry	Silverbell
Scaly-bark hickory	Red mulberry	White ash
White hickory	Yellow poplar	Red ash
Pignut hickory	Carolina poplar	Carolina ash
Black willow	Lombardy poplar	Aspen
Weeping willow	Sassafras	Chinquapin
Hornbeam	Ironwood	Sweet bay
Beech	Sweet gum	Pecan
River birch	American holly	Catalpa
White oak	Sycamore	Mimosa
Post oak	Service-berry	Chinaberry
Overcup oak	Hawthorn	Paulownia
Chestnut oak	Wild cherry	Rhododendron
Northern red oak	Red bud	Box elder
Southern red oak	Silver maple	Honey locust
Black oak	Red maple	Black locust
Scarlet oak	Black haw	Magnolia

CHAPTER IV

METHODS, PROCEDURES, AND PROJECTS

Introduction

In order to consider the best methods, projects, and procedures involved in the curricular use of trees, it was necessary to bring together certain factors relating to the study. Opinions of state and national forestry experts in regard to tree education in the elementary school and suggestions from the United States Office of Education for forest study were obtained. Practices of better local teachers were investigated, and ideas from distinctive curricula from other states were collected. Furthermore, various standard works were reviewed, and forestry bulletins and materials suitable and available for teachers and children were examined.

Robert W. Shaw, Director of Information and Education, Division of Forestry, North Carolina Department of Conservation and Development, has this to say about the use of trees in the elementary school curriculum:

It is my belief that the elementary school teacher should understand "forest education" and "forestry education". I think by dividing the two aspects of work as such, it helps to prevent confusion on the part of the teacher as to what forestry really means. Forestry in general is the art and science of growing trees. That program has little place in the elementary school. Therefore, I like to think of the elementary program in terms of forest education or the appreciation of the forest and the things it contributes to our life.

I think that if the elementary teacher would devote her time to teaching appreciation of all living things, and show the children how these living things of nature benefit their lives, these children will then grow up with the proper attitudes and concepts for further higher level forestry teaching.¹

Homer A. Lassiter, Adviser in General Education, North Carolina Resource-Use Education Commission, has expressed the following opinion in regard to conservation concepts being taught in the school:

A majority of educators agree that some conservation concepts should be integrated into the school program throughout the schooling of all the children. It is my feeling that resource education should not be taught as a separate unit but should be integrated with the regular subject matter fields being taught. This can be implemented by relating our teaching to real problems and needs of the children and resources available.²

Charles W. Mattison, Forest Service, United States Department of Agriculture, after analyzing many sound and detailed objectives of forest conservation education which appear in teaching units, textbooks, and courses of study, and after talking with numbers of school teachers, school administrators, and foresters, and with other conservationists, offers certain objectives for forest conservation teaching. He prescribes information that the forester believes youngsters should have about the forest and declares that giving this information should be the aim of the schools.

1. Letter from Robert W. Shaw. Department of Conservation and Development, State of North Carolina. August 15, 1949.

2. Letter from Homer A. Lassiter. North Carolina Resource Use Education Commission. August 2, 1949.

He emphasizes that this teaching should be done through integration and not by special courses, and since forests are only one part of our natural resource conservation, he points out that teaching about them should be correlated, when necessary, with instruction on soils, water, and wild life.

From the investigation, Mattison found the general agreement to be that the ultimate goal of forest conservation education is action by the American people to conserve our forests through protection, wise use, and cultivation. He affirms that there is little good in trying to develop conservation attitudes unless there is action on the part of the people to conserve the forests. Therefore, he states that every one, young or old, has a responsibility in the matter and points out five major steps toward the attainment of the goal.

First, there should be an understanding of what the forest really is. Success in teaching forest education will be achieved when people learn that a forest is not just a group of trees; it is not just a natural resource; but it is a community of plants and animals living in close association and in varying degrees of interdependence. It is dependent upon the soil, the water, and the wild life within it; it also depends upon human beings; and furthermore, all natural resources are dependent upon one another. Also one should know how a tree lives and grows and how its seed are scattered. He should know that trees increase the fertility of the

soil and protect watersheds. He certainly should know that trees fight for survival, and that well-stocked and well-managed forests grow the best lumber. He should learn that the forest is not inexhaustible and that it should be handled with regard for future productivity.

The second step toward our ultimate goal requires an understanding of how the forest serves us. No matter who he is or where he lives, every citizen is concerned with the things the forest gives. The newspaper, the water from the spigot, the common every day things we take for granted, in many instances, come from the forest. Forests provide the raw materials for countless products essential to modern living. Houses, furniture, books, magazines, radio cabinets, baseball bats, rolling pins, toys, turpentine, plastics, photographic film, and rayon all come from trees. Railroad ties come from wood and all our transportation is in one way or another dependant upon wood. The forests protect our water supplies, help reduce floods, and save soil. They afford homes for wild life, provide beauty, and offer recreational opportunities for millions. They furnish employment for our people. As a result, where the forests have been cut out, living standards are low. All this the people should know.

The third step is a consideration of the enemies to the forest. Children should know that fire is the greatest enemy to the forest and that man's carelessness is the most common cause of the fire. They should know that insects and

disease destroy many trees. They should also know that drastic action is necessary to keep forests productive.

In the fourth place, there must be an understanding of what conservation is. Conservation is not merely sentiment for saving; such sentiment must be backed by action based on facts. Inventory and research are both necessary to the wise use and renewal of forests. Inventories furnish appraisals of present supplies and establish a basis for anticipating renewal requirements, while research discovers better use of forest products, better methods of protection, and better means of renewal.

Mattison's fifth and last step requires a knowledge of how forest conservation can be achieved. Forest conservation can be achieved through intelligent, concerted action on the part of the people. They can insist on adequate fire protection, even though it mean more taxes. They can help to create an interest in, and a need for, more public forests to assure better management of land unsuited for private enterprise. They can also support proposals for public control of forests, as of other commodities, to insure its wise use.³

The United States Office of Education has produced several publications in the field of procedures and curriculum materials for conservation education. It is the policy of the office to provide aid to elementary teachers in the selection,

3. Charles W. Mattison, The Objectives of Forest Conservation Education. Washington, D. C.: United States Department of Agriculture. April, 1948. 6 pp. Mimeographed.

adaptation, and organization of materials suitable to their localities. The attitude of the commission toward resource-use education in the elementary schools has been expressed by Bess G. Goodykoontz, Assistant Commissioner of Education, in the foreword to Teaching Conservation in the Elementary School.

That which education fails to accomplish many times 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.⁴

Organization of content, introduction of conservation, and development of conservation units have been explained in the bulletin already mentioned. This literature is broad in its implications. While soil conservation has been selected for special treatment, the suggestions have been designed to be applicable to the use of teachers who wish to put other phases of resource use in the curriculum. The time has come when citizens must use the forests wisely or lose them. In other words, they must understand and practice forest conservation or they will have no forests. Every child should become aware of the importance of conserving the trees. Activities should be varied and interesting and should be such as the child uses in his normal living. Conservation education does not consist in mastering sets of facts found

4. Effie G. Bathurst, "Author's Foreword", Teaching Conservation in the Elementary School, Bulletin, 1938, No. 14. Washington, D. C.: United States Government Printing Office. 1940. p. v.

in books; to the contrary it consists in acquiring certain attitudes and practices which one uses in his every day living. It seems to follow that the trees should be introduced into the curriculum in such a manner that the child learns about them, enjoys them, and protects them because of his interest in them.

This instruction has been attempted by various methods: by integration with existing programs, such as art and science, by introduction as a separate subject, by integration with the social studies, or by teaching through activity and experience units, related or unrelated to other subjects. A scarcity of material suitable for children is evident, and until many simple and inexpensive materials suitable for children are available, it is important for the teacher to develop bibliographies and collections of bulletins, charts, and similar aids.⁵

Organization

It has been found that tree study or any other phase of resource use cannot be confined to any one field or limited to any single series of units. However, there are three general principles offered for consideration in the organization of conservation units. These are flexibility, coordination, and differentiation. Any plan of content should be flexible enough to allow for change to meet the needs of classes, of individuals, and of unforeseen interests.

5. Ibid. pp. 1-5.

Flexibility may be developed in the project by wise study of the possibilities of content, of the needs and interests of the children, and of the materials available in the community. To insure modification, should the occasion arise, each item should be broad and general, more items should be included than can be used in any one class, and each should be varied in type and difficulty.

Two principles of coordination, one regarding activities and the other respecting grades and schools, should be considered. The first principle may be introduced, at least, in part, by an analysis of the activities of the children of a particular group and the proper adjustment of the desired content to them. This is in keeping with the conviction that integration of home and school activities is necessary to lasting resource use education. The second principle applies to grades in the same school or to schools in the same community. Activities of different grades and of different schools should be coordinated in order to strengthen the total learning of all the group. For example, if a grade decides to plant trees on the school ground, all grades might like to take part, or if a school should decide to reforest certain areas, other schools of the locality might like to undertake the same project.

The final consideration is differentiation among grades. Curriculum material should be adapted to children so that they will not repeat the same work as they pass from grade to grade. Content should broaden as the child

progresses. Very young children can learn to identify a few trees, learn how trees grow, and how they keep the soil from being washed away. As they grow older, pupils are better able to acquire concepts and generalizations, and as they progress still more, they are better able to understand the Nation's responsibilities for its natural resources and the individual's responsibility for conserving the products of nature for future generations. Again, primary children are not expected to gain ideas they cannot experience first hand; however, intermediate children may be expected to think about problems in other lands and other times similar to those already experienced. Advanced pupils may satisfy their curiosity and attempt solutions to their problems by references to history and comparisons to other countries. Each school should plan a program so that the children will have fresh, interesting, and growth-promoting activities in resource-use education each year.

In activities of conservation, tree study or otherwise, it is also important that challenges be found in normal situations and that pupils participate in home and community activities. In order to establish an effective tree project, the teacher must have a first hand knowledge of the trees in the community and also the cooperation of the parents, other responsible people, and possibly certain organizations or agencies. She may get the assistance of others through direct contacts or through the pupils. While it is true in the main that resource use is an integrated subject, it

should be kept clearly in mind that such teaching should never be done casually. Teachers, after studying the material that they are required to teach, should decide on certain conservation (tree) activities and relate them to the required material.⁶

Initiation of Tree Study in the Curriculum

Trees may be introduced into the curriculum by the principal, the supervisor, or the teacher with the approval of the principal or supervisor. Sources of help for the teacher are the county agent, Future Farmers of America, 4-H Club members, farmers organizations, and sometimes other organizations. These agents often supply material and stimulate the work by visiting the grade and participating in activities. Government and individual agencies, both civic and industrial, provide materials helpful to the teacher in making plans and preparations. The teacher needs to think through the situation before initiating a plan for using trees in the curriculum. She should get all the information she needs to teach the subject, collect materials from which the children can answer questions which arise, and consult with the principal to secure his full cooperation. She should survey the community for possibilities of relating curriculum content to normal experiences, and she should know the community and community attitudes toward the problem in hand.

6. Ibid. pp. 5-23.

Some teachers plan in detail, while others believe that planning is a part of the child's education and restrict their own planning to making lists of references, gathering material, and reading for information on particular subjects. However, it would seem that careful planning is necessary. By carefully formulating her method of attack, the teacher is able to incorporate ideas and activities from many sources. By diagnosis, the teacher may anticipate and avoid many hindrances to the child's progress, and she may be better prepared to take care of his needs and interests. The making of a flexible outline of procedure may be facilitated by the use of several sources of helpful ideas. Talks with other teachers and teachers' experiences found in professional magazines and other publications are often very helpful. Other published aids, such as books and government and industrial bulletins, are available. In addition to these, the state course of study offers many suggestions.

Two kinds of planning have been found helpful, the long time plan and the daily plan. The long time plan should be adapted to the children's needs and abilities. It should be clear and purposeful; it should be made long enough in advance to allow the teacher full preparation before initiating it. It should be flexible enough to permit deviations, should this become necessary. Long time plans vary, obviously, according to the type of school. A teacher in a one-teacher school must plan for all ages at all grade levels, while a grade school teacher has only the various levels in

one grade to care for. If several grades are working on the same unit, teachers should help one another by planning together. The following is a list of suggestions for initiating trees or any other natural resource in the curriculum:

1. A natural situation or two 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.

3. Significant topics and problems which will be necessary if the enterprise 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 do with profit. These should be both school and out-of-school activities.

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 can be directed.

6. A list of needs of individual pupils and ways in which the project can help them.

7. A bibliography.

8. A list of inexpensive materials for which the children can write.

9. A few permanent interests which the children can develop. Tree study should be continued from time to time during the year.

10. A few suggestions jotted down as leads to further activities when they can be brought to the children's attention.

The teacher will find that the long time plan is not sufficient. Unanticipated questions and activities will arise; consequently daily planning will be necessary. This must, of necessity, be brief and can not be done far in advance. Possibly the best time to make the daily plan is at the end of the day when the needs of the children are fresh in the teacher's mind. The following is a list of items which might be included in a daily plan:

1. A list of things that need to be done next in furthering the enterprise.

2. Deviations from the 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.
5. Materials the teacher must secure and contributions she must make to next day's lesson.
6. The special part of the enterprise in which each group or committee will be engaged.
7. Points of interest to all groups and difficulties which can be met by class instruction.
8. Suggestions to aid groups who work independently while the teacher works with a single group.
9. Special plans for new activities.
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 that the children will need to investigate.
13. Very brief suggestions for handling new materials with the greatest of ease.

The daily schedule plays an important part in the work accomplished in the school room. The simplest type of program and an effective one is to set off a block of time for the various areas of work, including nature study and science.⁷

Development of a Unit on Trees

A curriculum unit in trees may be developed by arranging a situation in which the children become interested in trees, ask many questions, think of many things to do, enter into a wide study plan, and work until the whole activity has become a unified educative process. There is always variation in such a unit. The teacher follows the interests and needs of her pupils and thereby keeps the work

7. Ibid. pp. 24-31.

new. The unit will always be new, no matter how many times she has used it. No teaching situation can be quite duplicated. If the material, the plan, and the teacher are the same, the children are different and cause variation.

For evaluating her work, the teacher will be interested in the following standards which have been set up as qualities of excellence for a curriculum unit:

1. Normal experience for children in the desired activity.
2. Flexibility in providing for children's activities.
3. Correctness of procedure.
4. Evaluation.
5. Permanent interest.⁸

Nature and Scope of Activities

Variety, freshness, possibilities for giving satisfaction, social significance, potentialities for community participation, and practical relation to future living have been selected as distinguishing points of desirable activities for children in school. Trees as supplementary material in the curriculum will afford experiences conducive to these qualities. Activities required for study in the field of natural resources are varied with respect to the nature of the study and the inclinations and needs of the pupils. In connection with trees in the curriculum, there are many things children can do. Some can read and study about them, others may collect leaves or twigs, while others may want to make first hand observations of the various aspects of trees.

8. Ibid. pp. 32-36

After one phase of study is completed, a child need not repeat it but may go on to another.

Tree study is also variable in that it offers both group and individual participation. Children who like to work alone can engage in creative work, such as drawing, painting, or writing, while others will find work to do in groups. Likewise, activities related to tree study have a freshness or newness which teachers and pupils enjoy. Tree material has not been overdone in books, and no set patterns for using trees in the curriculum have been established as in some other studies, notably the wind mills and tulips of Holland. Besides the trees themselves change throughout the year, which adds newness to the work.

Tree study has definite possibilities for giving satisfaction to the pupil because it is in line with his past experience, his interests, and his capacity for growth. For example, he knows that the leaves turn red, yellow, or orange and fall to the ground, and he gets satisfaction from reading and studying about the processes of nature involved in this.

Furthermore, the use of trees in the curriculum has social significance in that it leads to participation in social problems. Since wise use of the forest is the basis for social security, the child is aiding social welfare when he helps to conserve the trees. At the same time, tree study gives the pupil an opportunity to establish himself as a part of the community by participation in local enterprises. This

is often accomplished through 4-H projects or play ground organizations.

Lastly, an interest in trees has an important bearing on future living. Children who become interested in trees are likely to keep that interest throughout life.⁹

Area of Curriculum Content

As has been pointed out earlier in this thesis, the forest may be taken as an area of curriculum content. The forest may be used in the resource-use program to teach tree conservation and at the same time enrich the curriculum in other fields. Certain understandings of the forest may be developed rather simply in children. All children have had some experience with trees, groves, and woods. They walk under the trees, play in their shade, and call some of them by name. A study adds new meaning to the present experiences. The pupils read about trees and take excursions to make observations; soon the groves and woods are compared to forests and tree study has led to forest study. The children learn that the forests, like the trees, grow slowly and that if the present areas of usable forests should be seriously diminished, they could not be replaced in this generation.

In autumn, colored leaves attract children. They learn early the difference between the trees that shed leaves

9. Effie G. Bathurst, Curriculum Content for Conservation for Elementary Schools, United States Office of Education, Bulletin, 1939, No. 14. Washington, D. C.: Government Printing Office. 1940. pp. 16-21.

and those that do not; they learn to identify trees by their leaves. They like to play in leaves. By utilizing these interests the teacher can lead them to see the good black soil under the trees and teach them that humus is made very, very slowly. Children can observe how trees break the wind and rain and how the roots hold the soil. They can notice that woodland streams are not muddy, while those through open fields are. By comparing run-off water in the woods and in the open fields after a shower, pupils will see that forests absorb water and delay its fast escape into streams. From these observations, it may be learned that trees are a protection from wind and wind erosion and are a factor in soil erosion and water control.

When children see cut-over areas, they should consider whether other trees are taking the place of those that are being taken away. They will come to the conclusion that the failure of many people to practice wise forest principles in meeting the demand for wood is resulting in cutting the forest faster than it is being renewed. A survey of forest products used in every day life and a discussion of forest areas will teach children that less than a fifth of America's original forests are left. By reading and studying, older pupils understand that the forests are rapidly being destroyed, that improved laws are needed, and that areas of forests under scientific management should be increased.

Pupils should be led to consider what can be done about the trees and to realize that there are many ways to

avoid waste. A conclusion may be reached that true conservation does not mean doing without wood we need, but rather in maintaining a supply of new wood equal to the demand.

Interest in the forest integrates naturally with the regular school activities and every day experiences of the pupils. For instance, participation in a forestry club gives experience in carrying out a program, presiding over a meeting, writing minutes, and other activities necessary to any club. English composition is motivated by oral and written reports on phases of the work; also reading and writing poetry about the trees is a result of first hand experience with the woods. Attitudes and continuing interests in the trees are developed through childhood association with them. There is pleasure in knowing the names, characteristics, and habits of the trees seen every day. There is beauty in the trees, inspiration for thoughts that make life more wonderful. By pleasant association with the trees children grow into the habit of loving them and being careful of them.¹⁰

Trees in Primary Education

Methods, procedures, and projects for using trees in the curriculum of the primary grades should be simple and closely related to the child's experiences. Suggestions for integrating trees with the regular school program are available to primary teachers from many sources. Three such sources are presented here: science textbooks, curricula

10. Ibid. pp. 53-63.

from other states, and practices of local teachers.

The Science Textbooks

The science textbooks and the teacher's guide books which accompany them contain excellent material for tree and forest study.

For the lower grade level, Scott, Foresman and Company has published three very attractive picture books for science study. Each of these is provided with a well-planned teacher's edition. Two of these books have suggestions for using the trees as an area of science learning. In the book, Learn and Look, the pictures indicate that trees are plants, and, like all other plants, have roots, stems, flowers, branches, leaves, and seed.¹¹ According to this source, some distinguishing features of trees include flowers, fruits, leaves, and general shape and size. Trees grow and reproduce their kind, and seeds produce the same kind of plant as the parent plant. Some trees provide pleasure, some provide shelter, while others provide food. All Around Us, another book in the primary series, teaches the children to differentiate by various leaf types.¹² The general shape of the leaves, their types of serration, and the rib arrangement help to tell one tree from another.

11. Wilbur L. Beauchamp and others, Learn and Look, Basic Studies in Science: Curriculum Foundation Series, Book B. New York: Scott, Foresman, 1943. pp. 54a, 58-59, 62-64.

12. Wilbur L. Beauchamp and others, All Around Us, Basic Studies in Science: Curriculum Foundation Series, Book C., New York: Scott, Foresman, 1944. p. 65.

The How and Why Science Books, published by the Singer Company, contain an abundance of material on trees. Through the Year, one of the books for the lower grades, makes observations of buds and flowers and little green leaves as signs of spring.¹³ Winter Comes and Goes, another primary book, introduces trees by observation in autumn.¹⁴ Attention is called to the parts of the tree, trunk, branches, leaves, and roots. Consideration is given to the beauty of the tree, the shade, and its uses for man. Evergreen trees (conifers) are carefully considered. Such characteristics as the straight trunks, close branches, cones, needles, seeds, and odor are noted. The use of evergreens for Christmas trees is the culminating point of this study. For spring study, the apple tree served as the subject of interest. First the buds came, then the flowers and leaves, and finally the little apples began to grow. Each apple contained seeds which had possibilities of making new apple trees. The Seasons Pass, the third book on the primary level, describes a trip to the park and teaches that a tree grows up, out, down, and around.¹⁵ This book also explains how water gets through the roots and goes all over the tree. Leaves, twigs, buds, and leaf scars are examined. In addition, food making

13. George Willard Frasier and others, Through the Year, Scientific Living Series. Syracuse: Singer, 1949. pp. 70, 98-99.

14. George Willard Frasier and others, Winter Comes and Goes, Scientific Living Series. Syracuse: Singer, 1949. pp. 36-41, 81-83, 144-145.

15. George Willard Frasier and others, The Seasons Pass, Scientific Living Series. Syracuse: Singer, 1949. pp. 13-31.

in the leaves, sap, and sap disposal are discussed, as well as methods of telling the age of trees. An explanation of why the leaves change color in the fall is made. The shapes of various trees are also noted.

The style of writing and the colorful illustrations make the Craig series very beautiful. Science All About Us, a book for the lower grades, contains pictures of the home and its surroundings for each season of the year.¹⁶ These pictures indicate seasonal changes in trees. Science Through the Year, another lower grade book, describes a walk in the woods in autumn this way:¹⁷

The children like to take walks.
They like to look at the trees.
The leaves are changing color.
They are yellow and brown.
The leaves are falling, falling,
They are falling to the ground.

During a walk in the winter attention is called to the fact that deer have homes in the forest. However, the tree secures major consideration among the plants that live all year. Buds, new leaves, falling leaves, and evergreen trees are noted. The usefulness of the forest to animals and people is discussed. Science Every Day, the last of the primary books, considers animal homes in trees.¹⁸ The nests of squirrels, woodpeckers, eagles, and crows are described.

16. Gerald S. Craig and Agnes Burk, Science All About Us. New York: Ginn, 1946. pp. 5, 15, 25, 35, 151-153

17. Gerald S. Craig and Etheleen Daniel, Science Through the Year. New York: Ginn, 1946. pp. 17, 80, 94-95, 211-221.

18. Gerald S. Craig and Sara E. Baldwin, Science Every Day. New York: Ginn, 1946. pp. 112-114, 236-241.

A detailed description of a tree growing up is also included in this book.

The following list of tree activities are suitable for primary grades:¹⁹

1. Examine pictures and real live trees.
2. Observe the trunk, branches, and foliage.
3. Examine the bark.
4. Use such words as bark, woody, twigs, and roots.
5. Observe that the roots anchor the tree, the trunk supports the branches, and the branches hold the leaves in the sun and air.
6. Visit a saw mill to see how lumber is made.
7. Collect and observe tree flowers and tree seeds.
8. Examine buds in late winter.
9. Force some twigs.
10. Discuss the value of shade trees for people, animals, and plants.
11. Observe how the shape of each tree differs from the others, and how the shape of each leaf differs from the others.
12. Make a leaf collection, using the leaves for books or posters.
13. Observe and list the trees found in the schoolyard or at home.
14. Draw pictures of local trees.
15. Make a chart of tree plantings in the schoolyard or at home.
16. Plant a tree.
17. Make charts combining wood samples, leaves, and pictures of trees.
18. Make blue prints of leaves.
19. Make plaster plaques of leaves.
20. Discuss ways in which trees are useful to man.
21. Examine fruit trees, noticing the general shape of the tree and the leaf.
22. Examine a fruit tree when the blossom is falling and note the formation of fruit.
23. Cut an apple or pear apart and find the seed.
24. Sprout orange or grapefruit seed.
25. Visit an orchard to observe spraying, pruning, or harvesting.
26. Discuss fruit as a diet.

¹⁹ Wilbur L. Beauchamp, Guide Book for Look and Learn, Basic Studies in Science: Curriculum Foundation Series, Book A. New York: Scott, Foresman, 1943. pp. 33-34.

Distinctive Curricula from Other States

A study of distinctive curricula from other states revealed certain methods, procedures, and projects for using trees as supplementary material in art and science in the primary grades.

From Delaware (Wilmington Public Schools) comes an art curriculum bulletin, which offers suggestions for using trees, together with other forms of nature, to enrich the art program.²⁰ Trees were utilized in a unit, "How Art Contributes to the Enjoyment of Nature", for primary grades.²¹ The integrating ideas are these: Nature provides many forms and dramatic changes for art expression and nature may be realized through art experiences. The significance of these ideas as related to trees is evident. The skillful teacher uses trees as a source of material for creative art and thereby leads the child, because of his enjoyment of the trees in art, to a fuller realization of their importance in his environment. To attain this objective the following procedure was recommended:

1. Take the children for a walk, observe trees, and discuss the observations in class.
2. Follow this by providing the pupils with many colors in crayons, paints, and paper and letting them experiment with these materials in interpreting their observations of the trees.
3. Continue tree education, at intervals, through the year and make note of how the trees behave in different seasons and in different kinds of weather.

20. How Art Contributes to Our Daily Living. Wilmington, Delaware: Wilmington Public Schools, 1945. 68 pp.

21. Ibid. p. 24.

The State Department of Education in California has published a comprehensive plan for science education in the elementary schools.²² From this literature, one learns that trees and shrubs are recommended for the science curriculum on the primary level. Every child is acquainted with trees wherever he lives, and a primary child should know at least six trees. Children should be taught particularly those trees and shrubs that need protection; the reason for protecting them, and something of the state laws giving protection to them.

To guide the teacher in planning for tree education, five desirable outcomes are listed:

1. Knowledge of the distinction between evergreen and deciduous trees.
2. Ability to recognize a few of the trees most common to the area.
3. Knowledge of the usefulness of trees and shrubs to man.
4. Appreciation of the beauty of trees and shrubs, both in the native state and when planted around homes, in parks, and along roads.
5. The beginning of an understanding of a need for the conservation of trees and shrubs.²³

The teaching of a unit on the home is suggested as a method for introducing trees into the primary curriculum. In such a unit, the children find trees to be interesting and useful plants and become eager to learn more about them.²⁴

22. Science in the Elementary School. Sacramento, California: California State Department of Education, 1945. 418 pp.

23. Ibid. p. 80.

24. Ibid. pp. 97-98.

The Science education bulletin for the elementary schools of Ohio offers suggestions for using trees, together with other living things, in the primary curriculum.²⁵ In a study, "What Changes Do We See as the Seasons Pass?", activities, experiments, and basic understandings to be discovered are suggested for autumn and spring.²⁶

The autumn work is listed as follows:

1. Observe the trees near the school. When do the leaves first start to change color? When do the leaves first begin to fall? Which trees lose their leaves first? When are the trees completely bare?
2. Make a collection of bright-colored autumn leaves—maple, elm, oak, etc.
3. After the leaves have fallen, look at the twigs and branches of a tree. Find the buds for next year.
4. Select a tree near the school to be observed during the year. Make a book about the tree. Draw pictures to show what happens to the tree in the fall. Write a story about the tree. Add to the tree book in the winter and in the spring.

The basic understanding to be discovered from these activities and experiments is this: Many trees lose their leaves in the fall but some trees called evergreens do not.

Activities and experiments selected for spring include the following:

1. When the last days of winter are passing, bring in some twigs or branches of cherry, plum, peach, forsythia, etc. Place the branches in water. Watch them come into bloom long before the same kind appear out-of-doors.
2. Take frequent trips to observe the changes that are taking place out-of-doors.
3. Observe trees near the school. When do buds begin to swell? Do trees bloom? When do the leaves first begin to appear? Bring in some tree flowers and leaves.

25. Science Education for the Elementary Schools of Ohio. Curriculum Bulletin No. 3. Columbus, Ohio: State Department of Education, 1945. 192 pp.

26. Ibid. pp. 48-51.

The basic understandings to be discovered are these:

1. Flowers and leaf buds on trees will begin to come out as soon as it is warm enough.
2. Many trees bloom before their leaves come out.
3. Trees may be identified by their leaves.

Practices of Local Teachers

An investigation of practices of local teachers revealed varied and enriching methods, procedures, and projects for integrating trees with the regular school program in the primary grades. The fact that trees have not been put in a hidebound, standardized category is proof enough that they have a place in the curriculum, and it may be observed that the flexibility of tree study permits the teacher to exercise individuality in her attack on the problem. The following experiences of classroom teachers are illustrative of the use of trees in the lower grades:

Miss Mary Fogleman, first grade teacher at Alamance School, Guilford County, uses trees in art and science. She takes her pupils on field trips on the school grounds, to observe and identify trees. (This school is fortunate in owning several acres of woods.) The children gather leaves and make crayon leaf prints, which are put in a large class book. Each child is encouraged to gather leaves at home to bring to school and print for the book. A major part of the work is done in the fall when autumn colors are beautiful, but the interest runs high through the year. Miss Fogleman thinks that young children should be able to identify the more common trees and should know their simple habits and

some of their uses. She teaches this material through science stories, conversation, and direct observation.

Mrs. Kate Hunt Kirkman, first grade teacher at Pleasant Garden School, Guilford County, uses trees to motivate conservation with her young pupils and to instill in them an interest in, and understanding of, their environment. By considering trees, she begins to acquaint the children with basic human activities and concepts of American culture. She establishes basic ideas of living by helping the children examine the uses of trees for the home, for fruit, for beauty, and in poetry and art. A typical lesson on trees in Mrs. Kirkman's room is as follows:

Mrs. Kirkman: Let's sit and talk for a little while. We will think about the chairs we are sitting in, the other furniture in our room, and our furniture at home. Who can name some furniture in his home?

John: There is a table at my house.

Bobby: We have a bed.

Mary: Mother has a cedar chest.

Mrs. Kirkman: What is our furniture made of?

Bill: Lumber.

Mrs. Kirkman: What is lumber made of?

John: Lumber is made from trees. I know where there is a saw mill.

Mrs. Kirkman: What kind of tree is Mary's mother's cedar chest made from?

Sally: It is made of walnut.

Mary: Oh, no, it is not. It is made of cedar.

Sally: Oh-----.

At other times the trees are used in art. First grade pupils like to draw individual trees, particularly Christmas trees. Mrs. Kirkman uses poems about the trees quite often in her curriculum. This year her pupils combined art and poetry by making a step-by-step drawing of "Green Grass Growing All Around".

Trees in the Middle Grades

Valuable methods, procedures, and projects pertaining to trees in the curriculum of the intermediate grades were discovered in the science textbooks, curricula from other states, and practices of local teachers. This material was arranged in such order as to insure continuity of learning initiated in the primary grades and to provide for growth throughout the school period.

The Science Textbooks

For the intermediate grades, Scott, Foresman has included material related to tree study in two of the textbooks. In Discovering Our World, Book I, attention is called to the fact that trees have flowers and seeds as well as leaves, and while some of the flowers are practically obscure, others are large.²⁷ Some seeds are very large; for

27. Wilbur L. Beauchamp and others, Discovering Our World, Basic Studies in Science: Science for the Middle Grades, Book I. New York: Scott, Foresman, 1947. pp. 40-43, 200-201, 207.

example, those which we call nuts and eat. The information teaches that trees grow taller by growing out from the ends of the twigs and that the roots get longer by growing out at the ends. The stems get thicker by putting on layers on the outside. Conservation education is introduced in this book. From the second book, Discovering Our World, Book II, one learns that trees, in addition to giving us lumber, also serve as a check to winds and a preventive for both dust storms and floods. Our forests should be protected from insects and disease and from fire. Replacements should be made of all the trees used for man's good or wasted by his carelessness. This book teaches about the natural processes of the tree. Water and minerals enter the tree through tubes in the roots, trunk, and branches, and air enters through openings in the leaves. Food is manufactured in the leaves and is stored all over the tree in the roots, the fruit, and the bark. Some tree food is eaten by people and animals. Nuts and fruits are the most common examples of this.

For the intermediate grades, the Singer books repeat some of the material concerning twigs, buds, falling of the leaves, and leaf scars given on the primary level. However, there is new material too. The How and Why Club, the first of the intermediate books, teaches the identification of

28. Wilbur L. Beauchamp and others, Discovering Our World, Basic Studies in Science, Science for the Middle Grades, Book II. New York: Scott, Foresman, 1947. pp. 34-35, 38-41, 209-215.

trees by the leaves.²⁹ In How and Why Experiments, the second of the intermediate books, the interrelation of trees, other plants, insects, and animals is considered. A conservation lesson is planned around the forest. The forests hold water, provide wood, help make soil, prevent erosion, and furnish homes for wild animals; therefore, they should be conserved and used wisely. The National Forestry Service and the work of the forest ranger are described. The seriousness of forest fires is discussed.

The Craig science textbooks also provide material for tree study. Exploring in Science contains stories on nature gardens.³¹ Because each has its needs met in such a place, a group of trees, small shrubs, ferns, wild flowers, mushrooms, and puffballs live well together in the forest nature garden. Animal homes are also there because they too find conditions suitable to their needs. Conservation of the forest is taught by stories about timber as a crop, forests and the ax, our forests, the forests save the soil, and the Forest Service. Working with Science furnishes information about the formation of buds and the growth of twigs and leaves.

29. George Willard Frasier and others, The How and Why Club. Syracuse, New York: Singer, 1949. pp. 271-281.

30. George Willard Frasier and others, How and Why Experiments. Syracuse, New York: Singer, 1949. pp. 107, 246-251, 292-303.

31. Gerald S. Craig and Beatrice Davis Hurley, Exploring in Science. New York: Ginn, 1946. pp. 218-219, 279-295.

32. Gerald S. Craig and Katherine E. Hill, Working with Science, Our World of Science. New York: Ginn, 1946. pp. 60-67, 301-303, 292, 364-365.

The falling of leaves is also explained. The formation of the seeds of the cone family is described in an understandable manner. Next, the formation of the fruit following the flower on the fruit trees is explained. Finally, the protection of trees by wise use is encouraged. In the book, New Ideas in Science, the work of trees in saving the soil is noted.³³

Distinctive Curricula from Other States

The art education program for the schools of Wilmington, Delaware, utilizes trees in a unit, "How Art Contributes to the Understanding of Nature", for intermediate grades.³⁴ The integrating ideas which have already been considered are the same as those for the primary grades. Namely, nature provides many forms and dramatic changes for use in art expression, and nature may be realized through art experiences. However, at the intermediate level the art activities become more advanced. Children have happy contacts with trees, and this affords an opportunity to develop relationships of color and mood, expressive line quality, and variations of color tone. Nature experiences also motivate appreciation for the great paintings of Van Gogh, Cezanne, and others. Wilmington educators have found that nature experiences are of continuing interest to children. Hence, opportunities for becoming

³³. Gerald S. Craig and Margaret O. Hyde, New Ideas in Science, Our World of Science. New York: Ginn, 1946. pp. 317-318.

³⁴. How Art Contributes to Our Daily Living. Wilmington, Delaware: Wilmington Public Schools, 1945. p. 40.

familiar with the relationships between art and nature are offered at intervals throughout the school year.

The suggested procedure for using trees in art in the intermediate grades is a continuation of methods begun in the primary level plus certain other activities. At this level, children begin to relate personal feelings to nature moods; falling leaves and sadness, or wind and excitement are good examples. These feelings and moods are expressed in appropriate forms and materials. Certain aspects of trees around the school yard are observed and interpreted in various art forms. Leaf and tree patterns are appropriated for decorative pieces for the school and home, such as wall plaques or window curtains. The California science bulletin offers information relating to trees and shrubs in the curriculum of the intermediate grades.³⁵ It suggests that children learn to identify more trees than they have become acquainted with in the primary grades. Attention should be given to trees unique to California. However, interest should not be limited to native trees but should include the planted trees, no matter what their origin. A start should be made in learning tree associations or affinities and distribution as related to altitude, rainfall, and other natural factors. The relation between climate and the type of tree may be considered too, and the economic importance of the forest should be noted.

³⁵. Science in the Elementary School. Sacramento: California State Department of Education, 1945. pp. 128-129.

Desirable outcomes of tree study on the intermediate level include:

1. Ability to recognize and name the common native and introduced trees and shrubs.
2. Acquaintance with the characteristic tree and shrub associations of the local area.
3. Understanding the importance of forests.
4. Knowing the regional source and uses of a few common woods.
5. Knowledge of some of the uses of trees and shrubs by man.
6. Knowing something of governmental activities in connection with trees and forests.

As an approach to tree education for the intermediate level, a unit on the westward movement is suggested. This might take into account the ways pioneers used trees for shelter, furniture, medicine, and dye. Appropriate activities, such as building a log house or visiting a very old one, are recommended.³⁶

Two projects relating to tree study on the intermediate level were found in the Ohio science bulletin. For a unit, "What Can We Do to Improve the Appearance of Our School Yard?", the following activities and experiments were suggested:

1. Make a careful study of the school yard to determine whether it is as attractive as it could be. Is it well-drained? How can the lawn be improved? Does it need additional seeding? Do dandelions and other weeds need to be removed? Do leaves and other rubbish need to be removed?
2. Make a large map showing your school building, the lawn and the yard, and nearby streets and roads. Locate the trees and shrubs on the map.

³⁶. Ibid. p. 181.

3. Use a tree and shrub guide to get the correct names. Make name plates to be placed on or near the trees and shrubs so that all the boys and girls in school can learn the names of those growing near the school. Do additional trees and shrubs need to be planted?

4. Write to O. A. Alderman, State Forester, Wooster, Ohio, for information concerning a school forest.

The basic understandings to be discovered as a result of this study were these:

1. Plants of various kinds contribute much to the attractiveness of the school ground.
2. Trees and shrubs can be selected and planted for different purposes on the school grounds.³⁷

For the second unit, "What is the State of Ohio Doing to Insure Conservation of Wild Life?", the following activities and experiments were recommended:

1. What is the work of the Division of Conservation and Natural Resources of the State of Ohio?
2. Make a map of the state of Ohio.
3. Interview the caretaker of a park to learn what care he gives the trees. What suggestions does he have for sightseers and picnickers?

The basic understandings to be discovered here are:

1. The state of Ohio is carrying on an active program of conservation.
2. Many recreational facilities are available at state owned lakes and parks.
3. Ohio is rich in historic, cultivated, and scenic resources.
4. Each one can help in the state program of conservation.³⁸

In a tentative course of study for Virginia, one finds a unique procedure in integrating trees with the curriculum. In this plan, centers of interest have been selected

37. Science Education for the Elementary Schools of Ohio. Curriculum Bulletin No. 3. Columbus: State Department of Education, 1945. p. 69.

38. Ibid. p. 70.

to serve as major limitations for each grade. Four criteria were employed as a basis for establishing these centers of interest. These were: The center of interest should have a significant influence on social life, numerous objects and activities of the centers of interest should have meaning for the pupils, adequate instructional materials should be available, and provision should be made for maximum growth of desirable concepts and for opportunity for pupil participation in social undertakings. Certain pivotal points of group living, designated as major functions of social life, indicate points to be emphasized in developing the centers of interest. The greater part of the work with trees is found in the sixth grade, where the large center of interest is the effect of machine production upon living. The major social function considered here is that of protection and conservation of life, property, and natural resources. The particular aspect of the project is how machine production leads to the conservation and to the waste of life, property, and natural resources, with emphasis on the forests.³⁹

It is advised that units of work grow out of interests and experiences of children being taught. However, suggestive materials are given to show relationships of pupil experiences and pupil activities which might normally be expected.

³⁹. State Board of Education. Tentative Course of Study for Virginia Elementary Schools. Richmond: Division of Purchase and Printing, 1937. pp. 15-17.

Some experiences related to trees which the children will quite likely have are these:

Fishing	Building fires	Trapping animals
Seeing a flood	Camping in the woods	Gardening

The following are suggested activities for carrying on the project:

Reading about and discussing the reforestation movement in the United States.

Writing articles about reforestation programs.

Reading about and comparing the original forest areas of America with the present areas.

Discussing the causes and effects of forest fires and methods of prevention.

Discussing ways of identifying trees and taking field trips for the purpose of identifying them.

Reading about methods of protecting forests from parasites.

Using sand table to show how arid lands are irrigated to develop forests.

Reading about and discussing the effect that the destruction of the forest has on soil erosion.

Discussing and taking a trip to a nursery to observe various kinds of trees, methods of planting them, and a demonstration of tree surgery.

Reading about and discussing the importance of spraying trees.

Collecting and preserving leaves, fruit, twigs, wood, and bark for an exhibit.

Writing letters asking for materials on conservation.

Arranging a bulletin board to show reforestation projects.

Participate in Arbor Day programs.

Desirable outcomes of the project and procedures for evaluating the work are included in the plan for the benefit of the teacher. The activities have been planned to teach the pupils the extent of the forests, the wasteful methods of using them, and the efforts now being made to conserve them. The pupils should understand the importance of the trees and feel a responsibility for conserving them. The teacher may see to what extent these aims have been realized by testing and by noting the general interest and attitude of the class.⁴⁰

This Virginia plan should be of particular interest to any teacher wishing to use the forest in connection with the social studies program.

Practices of Local Teachers

An examination of the practices of certain local teachers indicates that trees may be useful to enrich the curriculum of the intermediate grades in composition, literature, social studies, art, science, and other areas.

Mrs. Lillian White, fourth grade teacher at Jesse Wharton School, Guilford County, uses trees to enrich the curriculum. She feels that probably the greatest benefit

40. Ibid. pp. 182-185.

fourth graders get from trees is pure enjoyment. The beauty and grandeur of the trees and their luscious shade on a hot day are things every child should appreciate and will appreciate under proper guidance. Incidentally, Mrs. White motivates written and oral composition by experiences with trees. She also uses the science stories and tree poems to impart information and to give pleasure in tree study.

Mrs. Margaret Wall, former teacher and present principal of Caldwell School, Greensboro, has used trees in connection with the social studies in North Carolina in the fifth grade. Her group began by studying plants in the environment and learning that trees were plants with interesting possibilities for further study. Each child took one tree for special study. The relation of each tree to wild life was observed; birds, squirrels, and insects were found to be the most frequent inhabitants of the trees. Uses of the wood of each tree was studied. The children put their information, gained from much reading and observation, into story form and shared it with the class. Each made enough ink prints of the leaf from his tree to share with every other member of the class and booklets were made containing prints of all the trees studied.

For a number of years, Miss May Fields, fifth grade teacher at Sumner School, Guilford County, has used trees in the curriculum. In the fall, the unit is started and the interest lasts through the year. She uses the trees to enrich art, language, and science. The pupils learn to

recognize trees by leaves, bark, shape, and fruit. The usefulness of the tree is considered with respect to houses, food, paper, tanning, homes for wild life, shade, beauty, and conservation. The needs of the trees are learned and such phenomena as falling leaves and rings around trunks are studied. Original descriptions and poems are written and shared with the class. The science textbooks are used and many tree poems are learned. Some of the activities include making tree charts showing wood, twigs, and leaves, making leaf prints, drawing single trees, sketching landscapes, and making booklets. At least four trees on the school ground are selected for observation throughout the school year. As a culminating event for the fall tree study, the grade gives a chapel program.

Suggested Activities

Several supplementary activities for the middle grades seem valuable and are included here for the benefit of both teacher and pupils.

The Tentative Course of Study for Virginia gives these suggestions for taking a field trip.⁴¹

The teacher and pupils should make all plans together. Ways of identifying trees should be discussed and an outline made to use on the trip. A good hand book or tree guide will be useful. An outline may include the following points: Name, shape, size, method of branching, description of wood, its uses to man, color and kind of bark (rough, smooth, scaly), position of buds on twigs, leaf scars, arrangement, shape and coloring of leaves, flower when it blooms, fruit (its uses for man and

41. Ibid. p. 402.

animal), and habitat of the tree (hillside, swamp---).

The children should group themselves around the tree so that each can see and hear. Each child should make notes on each tree using a separate card for each tree. Each should consult his guide freely.

Many teachers will find the following instructions for making tree charts useful in the curriculum:

Different kinds of exhibits may be made from tree products. Individual or group books may be made of blue prints, ink prints, spatter prints, or kodak pictures of leaves and trees. A chart may be made that will show significant things about a tree, including a sample of a twig, wood, leaf, bark, sketches, and pictures. Both charts and books should have significant legends under the mountings.

To make a tree chart, the children should select the tree from which they will get materials for the chart. This tree should be observed closely and notes and specimens taken at intervals to show the kinds of bloom, fruit, twigs, kind of bark, shape of the tree, kind of lumber and its uses.

The cross section of the wood should be taken from a limb that is from one to two inches in diameter and about one-fourth to one-half inch thick. It should be sawed carefully and the side that is to be exhibited should be sandpapered until it is smooth. Shellac or clear varnish should be put on the surface.

Twigs should be about the size of a pencil and should be cut from the end of the branch to show typical buds and scars. Twigs should be about eight inches long and should be shellaced or varnished.

Specimens of bark should be taken from a dead tree of the same species as the one being studied if it can be located. Cut the bark in pieces from two to four inches square and shellac or varnish.

The fruit of the tree may be sketched and a mounted ink print of it placed on the poster.

The wood and the bark should be fastened from the back of the mounting board by means of screws or nails. Furniture glue may also be used for mounting specimens.

All the objects on the chart should be well-balanced. The writing or lettering should be neat and plain; this should form a pleasing effect with the other materials.

To make twig charts, follow suggestions in making tree charts for collecting and shellacing the twigs. Twigs should be taken from a variety of trees. They may be fastened to the board as directed above. The labels under the twigs should give characteristic facts.

To make wood and bark charts, follow the above directions for collecting and shellacing the wood and bark. Use cross-sections of different trees. The bark of the same tree should be placed under the specimen.

Longitudinal sections of the tree may also be shown. These sections, which should be about eight inches long and two inches in diameter, should be split down the middle. These charts may be made according to the above directions.⁴²

Some teachers will be interested in making leaf plaques according to the following instructions:

Use a small greased plate; place a greased leaf in the bottom; fill the plate two-thirds full of plaster of Paris and tap gently to remove the air bubbles. When the plaster has set, take it from the pan and remove the leaf. The leaf impression can be painted if desired. To make it possible to hang these plaques, imbed the ends of a small loop of wire in the moist plaster leaving the loop free.⁴³

The Nature Study class at Woman's College of the University of North Carolina, Greensboro, N. C., makes leaf prints in the manner described below.⁴⁴ Materials needed for the project are:

1. A smooth surface on which to work.
2. Mimeograph ink, green or black.
3. Rubber roller or brush to apply paint.
4. Turpentine to thin ink and clean tools.

42. Ibid. p. 183-184.

43. Wilbur L. Beauchamp and others, Guidebook for All Around Us, Basic Studies in Science: Curriculum Foundation Series, Book B. New York: Scott, Foresman, 1944. p. 42.

44. Mr. Hollis J. Rogers, Assistant Professor of Biology, Woman's College of the University of North Carolina.

5. Mimeograph paper.
6. Newspapers for pressing.
7. Pan for ink and small board or glass for inking.
8. Leaves.

Thin the ink a little with the turpentine and ink the leaf by using a paint brush on the under side or by rolling it with the rubber roller which has been inked. Place a clean sheet of mimeograph paper on several folds of newspaper, place the inked leaf right side up on the paper (putting the inked side next to the white paper), cover with several more folds of newspaper, and press hard with the hands. Remove the newspaper and the leaf carefully. Allow to dry for a few minutes. This makes a permanent print.

Printers ink or paints may be used and other types of paper are adaptable, but it seems that the above mentioned materials have proved most satisfactory.

Trees in the Upper Grades

Science textbooks, curricula from other states, and practices of local teachers revealed information on methods, procedures, and projects for using trees in the curriculum of the upper grades. Again the material was arranged so as to insure continuity of learning begun in the lower grades and to provide for growth throughout the school years. An examination of these sources indicates that less consideration is given to trees in the upper grades and that teaching in these grades becomes more formal and technical.

The Science Textbooks

The Scott, Foresman series, Science Problems, Book I, contains tree material, and declares that trees are the largest and oldest things living.⁴⁵ This book shows how the trees are examined under the microscope, how stems are put in colored water, and how the water-carrying tubes are found. The tubes which carry the water upward can be seen in the wood just underneath the bark, and the cells that carry the food over the tree can be seen in the bark right next to the wood. Food is manufactured in the leaves from water and minerals from the soil and carbon dioxide from the air. The fact that no one has yet been able to explain this phenomenon is considered a matter of consequence at this time when scientists have discovered so many secrets of nature. The final emphasis on tree study is an explanation of decay of wood and leaves and of the relation of decay to the soil.

For the upper grades, the Singer book, How and Why Explorations, considers the forest in summer.⁴⁶ Different types of forest fires are described, and methods of fire fighting are explained. Information about parts of the tree and tree growth given in previous grades is repeated in more detail, using, in a number of instances, scientific terms.

45. Wilbur L. Beauchamp and others, Science Problems, Basic Studies in Science: For the Junior High School, Book I. New York: Scott, Foresman, 1946. pp. 274-275, 284, 321, 325, 383-384.

46. George Willard Frasier and others, How and Why Explorations. Syracuse: Singer, 1949. pp. 82-107.

Such words as chlorophyll, xylem, phloem, cambium, pith, and medullary rays are introduced. Wood preservation is also considered.

Science Curriculum from California

The science curriculum for California elementary schools offers extensive plans for teaching science in the upper grades. Trees, shrubs, forests, and their products are studied at this level.

California offers a rare opportunity for getting acquainted with life zones, which are expressions of climatic influence. Trees are the most reliable source of identification for a life zone because they are conspicuous and because they stay in one place and are easy to observe. Children may learn how climatic conditions in one belt differ from conditions in an adjoining belt and how these cause differences in plant and animal life. It is worthwhile for children to learn that lumber from broadleaf trees is called hardwood and lumber from cone-bearing trees is called softwood. They should know of all the synthetics made from wood and should understand that the making of synthetics has greatly increased the demand for timber and, consequently, has led to the exploitation of the forest. Some knowledge of National and state parks and how to use them is also advisable for upper grade children.

Desirable outcomes for tree study on the upper grade level were listed as follows:

1. Ability to recognize a few of the woods used in

industry.

2. Understanding of the significance of trees as indicators of life zones.

3. Some knowledge of the sources and uses of synthetic materials.

4. Some knowledge of the location and character of the principal forest belts of North America.

5. A general understanding of man's dependence on trees and shrubs for many useful things.

6. Full appreciation of the recreational value of wooded or forested lands.

7. Some knowledge of the measures needed to conserve our resources in the form of tree and shrub covered lands.

A study of lumber is suggested as a project for tree education in the curriculum at this level. This study is not an end in itself but has possibilities for furthering interests in many related topics. Air, birds, domestic animals, the earth's surface, electricity, flowers, heat and cold, insects and diseases, machines, seeds, soil, trees and shrubs, water, weather, seasons, and wild animals are all revelant to the lumbering industry.⁴⁷

Practices of Local Teachers

Local teachers in the upper grades, as well as in the primary and intermediate grades, have found trees useful and interesting in their school programs. The following reports show examples of tree education on the upper grade level.

Clingman Howell, principal of Union Hill School, Guilford County, uses trees for science in the sixth and seventh grades. Mr. Howell teaches the inter-relationship between trees and other plants and trees and animals. He

⁴⁷. Science in the Elementary School. Sacramento: California State Department of Education, 1945. pp. 172-174, p. 181.

insists that upper grade children should know the basic needs of the trees and their importance to our economy. He is interested in having the children understand the different processes that go on in the tree, such as circulation, breathing, and food manufacturing. Mr. Howell uses the science text books and first hand observations.

Mrs. Blanche Owens, eighth grade teacher at Oak View School, Guilford County, helped her grade organize a science club last fall. The first major project of the club was tree study. During the whole period of study there was considerable correlation with other subjects, particularly with English. For example, Mrs. Owens had to teach letter writing in preparation for securing literature. This was done at the suggestion of the group. The literature in the project consisted of works from the local library, science textbooks, Boy Scout manuals, personal books of the teacher, and pamphlets and charts from many sources. After much reading and deliberation, the following topics were selected for study: Ages of trees, structure of trees, deciduous and non-deciduous trees, seeds, fruit, and flowers of trees, uses of trees, and identification of trees.

As an aid to identification, an electric leaf chart was made; this will be described in the next section of this study. Collections of leaf prints and pressed leaves were also made. The concluding event of this project was a formal program to which several guests were invited. Oral reports were given. A wire recording of these was made and played back to the club.

The whole project contributed to the enrichment of the eighth grade curriculum at Oak View.

Suggested Activities

Children in the upper grades will profit by the activities listed for the intermediate grades. An additional activity, making an electric tree chart, is offered here.

The electric tree chart is a device to aid in the identification of trees by pictures or leaves. One uses the chart to match names and pictures. Materials needed:

1 large sheet of stiff cardboard or corrugated paper; this may be any size.

1 box of brass brads.

1 set of leaf or tree pictures, or real leaves which have been pressed.

1 dry cell battery.

1 door bell or buzzer to operate on the battery.

1 or 2 yards of insulated copper bell wire.

1 spool of fine insulated coil wire.

1 large sheet of colored paper the size of the cardboard or tempera paints to paint the cardboard.

Paste or glue.

Directions for making:

Glue colored paper to cardboard or paint the cardboard and affix pictures of trees or leaves to the board in formation desired. List the names of the trees in two columns on a plain piece of paper and paste to center of board. Place one brass paper fastener beside each name and one

beside each picture. Be sure that pictures and names are not in the same order. Attach the fastener beside the name to the proper picture by using the fine wire on the back side of the cardboard. Be sure that the end of the wire has insulation removed so that the bare wire makes contact with the brass fasteners. Connect the battery and bell, leaving long ends of the bell wire. Draw the long ends of the bell wire through two holes punched in the cardboard so that about 18" of the wire hangs free on the front side of the chart. Battery and bell may be placed in a small box in the rear of the chart.

Chart is now ready for use. Place the exposed end of one wire beside a picture and the end of the other wire beside the name you think is correct for that picture. If you are right, the bell will ring. If it does not ring, try again.

Directions for the Tree Chart were given to Guilford County teachers by Mrs. Margaret Wall.

Sources of Materials for Teachers and Pupils

Sources of ungraded materials for the teacher and the pupils were discovered in the study of the uses of trees in the elementary school curriculum. The forestry bulletins, certain educational publications, and poetry relating to trees have been considered here for the benefit of any teacher in any grade who might find in them suitable materials for herself or her pupils.

Forestry Bulletins and Other Free
or Inexpensive Material

Many forestry bulletins, leaflets, posters, and other free or inexpensive materials have been examined. Those that were found to have special bearing on the use of trees in the curriculum of the elementary school have been selected for review here. An attempt has been made to give the general content and to indicate whether the material is suitable for pupil or teacher use. This literature has been divided into four groups. Group one describes the publications of the United States Department of Agriculture; group two gives the publications of the Department of Conservation and Development, State of North Carolina; group three gives an account of the industrial bulletins and posters; and group four reviews miscellaneous materials. The arrangement has been made alphabetically, according to titles.

Publications of the United States Department of Agriculture include:

All Aboard the Forestry Special! The Forest Service. 1945. 5 pp.

A playlet in rhyme for sixteen or more characters. Intermediate grades.

An Outline for Teaching Conservation in the Rural Elementary Schools. Soil Conservation Service. 1945. 21 pp.

This outline is divided into eight major sections, one for each grade level in the elementary school. Objectives are stated, topics for study are listed, activities are suggested, and references are given for each unit. The material

is broad and flexible. While the main emphasis is on water and soil, trees and other resources have their share of attention. There are suggestions for integration with English, public speaking, debating, and arithmetic. References on curriculum building and teaching methods, visual teaching aids, and general library materials are listed. Teacher.

Arbor Day, Its Purpose and Observance. Farmers Bulletin No. 1492. 1936. 24 pp.

General information about Arbor Day. Gives the origin, considers the spread of the observance, indicates the time of observance in the various states, and relates the day to conservation practices. Illustrations in black and white. Teacher or upper grade pupils.

"Bill Scott - Forest Ranger". Forest Service.

A description of a series of six transcriptions for radio programs designed to teach forest conservation in the upper grades and junior high school. Instructions for securing the material is given, together with helpful hints for classroom activities in connection with the broadcasts. Teacher.

Conservation Pledge. The Forest Service. Leaflet.

One side of the leaflet bears the Conservation Pledge with space for signatures. On the other side are suggestions for keeping the pledge. Pupils.

Forest Regions of the United States. The Forest Service. 1948.

A two-color map showing the forest regions of the United States with a description of each region and a list of the principal trees in each. Very good for room display.

Forest Service Films. The Forest Service. 1949.

11 pp.

This booklet lists and gives brief descriptions of twenty-nine forestry films available on loan for educational purposes and tells how to borrow them. Teacher.

How a Tree Grows. The Forest Service. 1946.

A graphic study of how the crown, trunk, and roots of a tree grow. Two-color (12"x 18") poster. Pupils and teacher.

Know Your Watersheds. The forest Service. 1949

13 pp.

This bulletin was written for all who are water users. It tells what we can do to insure safe and dependable water supplies. Interesting illustrations in black and white. Pupils.

Living and the Forest. Miscellaneous Publication No. 388. 1940. 48 pp.

This publication was prepared especially for the adult interested in the social and economic aspects of the forest. It discusses how the forest affects our way of living; where forests grow and why; how the forests help our daily activities; how industry becomes more dependent upon the forest; what part forests play in commerce; how forests afford gainful employment; how farm forests are

likely to increase in importance; how forests serve in study and leisure; who owns and manages the forests; and how forests can be used and maintained. Suggestions for classroom activities and questions and informative tests are included. Teachers will find this bulletin a source of inspiration as well as a source of information.

Logging and the Production of Lumber. Forest Service.

3 pp.

Steps in the preparation for logging and the actual operations in the forest are described in the first part of the leaflet. The second part explains various types of sawmills, the actual operations in making lumber out of logs, and the curing and marketing of the lumber. Upper grades and teacher.

Making Paper from Trees. Forest Service. 1946. 4 pp.

This informative leaflet gives the history of ancient paper making, the history of the pulpwood industry, in the United States, the relative value of the pulpwood industry, the origin of ordinary paper, and the pulping process. Twenty-one softwoods and hardwoods used in papermaking are listed with a discussion of their values for the industry. Upper grades and teacher.

Managing the Small Forest. Farmers' Bulletin No.

1989. 61 pp.

This pamphlet is especially for the layman interested in owning a forest. It informs one on silviculture, planting trees, protecting the small forest, measuring the forest,

cutting the timber, and selling the lumber. It is inspirational material for boys and girls of the upper grades as well as a source of information for the teacher.

Materials to Help Teach Forest Conservation. Forest Service. 4 pp.

Very helpful for all teachers interested in using the trees in the curriculum. A list of transcriptions, films, posters, maps, bulletins, leaflets, and miscellanea for teaching forest conservation. Directions for ordering with an order blank for convenience are included. Teacher.

Our Forests: What They Are and What They Mean to Us. Miscellaneous Publication No. 162. 38 pp.

The introduction says:

If we were to be totally deprived of our forests we would suffer economically, physically, and ethically. In fact it is doubtful if we could survive as a nation; it is, therefore, important that we know how to handle our forest wealth so that it may be used to fill our countless needs and at the same time continue a permanent natural resource.

From this view point the pamphlet has been prepared to teach the ways of trees, what forestry is, and what the practice of forestry means to the American people. These topics are discussed: What the forest is, forest regions of the United States, how our forests serve us, enemies of the forest, forestry in the United States, and timber, a vital natural resource. There are black and white photographic illustrations. Upper grade pupils and teacher.

Protect Hardwood Stands from Grazing. Leaflet No. 86. Revised 1941. 8 pp.

A profusely illustrated leaflet showing the harm in too much grazing in the woodlands. Pupils and teacher.

Ranger 'Rithmetic. Forest Service. 1948. 9 pp.

Twenty-two illustrated arithmetic problems about the forest suitable for sixth grade. Very attractive. Teacher.

Smoky Bear. Forest Service.

Forest fire prevention poster (14" x 20") in color. Animal motif appeals to children of all grades. Very attractive, good for schoolroom display.

Some Plain Facts About the Forests. Forest Service. 1945. 22 pp.

Seventeen questions and answers based on information secured through surveys, studies, and analyses made by the United States Forest service. General topics concern adequacy of timber, timber growth and timber drainage, tree planting, forest ownership, the meaning of forests, and plans for the future. Teacher.

Suggestions for Integrating Forestry in the Modern Curriculum. Forest Service. 1940. A.

A chart with suggestions for integrating forestry into the curriculum on the elementary level and on the junior high and senior high school levels. Each of the basic human activities or persistent problems of living are considered. Making a home, earning a living, performing the responsibilities of citizenship, conserving and improving material conditions, expressing spiritual, aesthetic, and emotional impulses, and engaging in recreation all are areas in which

the forest may be integrated to the enrichment of the school program. Valuable for teachers.

The Work of the United States Forest Service. Miscellaneous Publication No. 290. 1945. 32 pp.

Basic information about our national forests. Numerous activities and responsibilities of the Forest Service are emphasized. History of the National forests, conservation movement, acquisition of the forest lands, guiding principles of administration, management of timber resources, range resources, protecting watersheds, recreation facilities, conservation of wildlife, receipts from the national forests, reforestation and reseeding, fire prevention, control and fighting, and insect and tree-disease control are discussed in the first section of the pamphlet. The second section describes the Service in cooperation with the states, private owners, and forest industries to insure a perpetual supply of timber and other products for our many needs. Teacher.

Timber Crops for Southern Farmers. Forest Service. 1949.

Explanation of how careful management enables the farmer to make money regularly from his timber lands. Very attractive cartoon illustrations, also photographic illustrations. Upper grades and teacher.

You and Forest Fires. Forest Service. 1948. 16 pp.

A dynamic little pamphlet on forest fires. Shows the effect of fires on the individual, points out that ninety percent of the fires are caused by man's carelessness, and tells how to prevent them.

Visual and Auditory Aids for Teaching Conservation.

Forest Service.

Emphasis is put on first hand observation of the resource being studied. Eleven guides for conducting a field trip are given, and other aids are considered, such as films, filmstrips, moving pictures, photographs, posters, charts, cartoons, maps, topographical models, and the radio.

Water and Our Forests. Forest Service. 1946. 29 pp.

This bulletin emphasizes the importance of the forest in regulating and maintaining the flow and quality of our water supply. It deals with the following topics: Water, the lifeblood of civilization; too much water; too little water; how soil, forest, and water are related; results of ruling or abusing the mountain; denuded watersheds; greater protection for our watersheds; need for engineering works; forestry to conserve all watershed values; and safeguarding the nation's watersheds. There are many photographic illustrations in black and white. Older pupils and teacher.

What Forests Give. Forest Service. Revised 1940.

79 pp.

This small volume is dedicated to the boys and girls of coming generations. It tells what the forest is and what the forest meant to the pioneer. Chapters are devoted to these products of the forest: Plywood, woodpulp, tanning, sugar, and naval stores. One section tells about ethyl alcohol, aniline, furfural, molding powder, unbreakable glass, rayon cellophane, motion picture film, and many other

chemical products derived from wood. Mention is made of the fact that all the chemical possibilities of wood have not yet been discovered. Later chapters explain how forests serve nature in controlling erosion, floods, and wind. The last part of the book depicts the forest as schools, playgrounds, and cities. The happy conclusion is that the forests of the future may give more and more to the pleasure and security of the people. Older pupils and teacher.

Why the Leaves Change Color. Forest Service. 1945. Leaflet.

This leaflet gives three valuable bits of information: Reasons why the leaves change color, values of fallen leaves, and directions for making leaf prints with oil paints. Upper grades and teacher.

Wood, the Material of a Thousand Uses. Forest Service. Leaflet.

A fantastic account of the uses of wood, emphasizing the fact that people are growing into the uses of it rather than away from it. The importance of conservation by wise use is explained. Teacher and upper grade pupil.

The next four publications listed were published by the North Carolina Department of Conservation and Development:

Common Forest Trees of North Carolina - How to Know Them. Department of Conservation and Development. Fifth Edition, 1944.

This manual describes seventy-five common trees, giving both popular and scientific names. The locality is

given and also the general appearance with detailed description of the bark, leaves, cone, flowers, or fruit. There are illustrations showing the leaves, twigs, and fruit or flower. There is a supplementary list of seventy-three less important trees with scientific names, regional distribution, and approximate occurrence. There is also a list of exotic (foreign) trees which have escaped cultivation and which may be found over the state. Pupils and teacher.

Forest Tree Seedlings and How to Plant Them. Department of Conservation and Development. Circular No. 26.

This circular tells how to order, care for, and plant seedlings. There are five simple diagrams showing how to handle and plant the young trees. Pupils and teacher.

North Carolina Forest Resources. Department of Conservation and Development. 1949. 9 pp.

General information concerning forest resources in North Carolina, together with factual data emphasizing the importance of these resources. The significance of forest land in relation to agriculture, industry, employment, finance, transportation, public water supplies, and electric power is noted. Geographical sections of the state are each briefly considered. Forest-products industries are mentioned, suggested conservation practices are set down. There are seventeen factual statements and three tables. Teacher.

Ten Lessons in Forestry. Department of Conservation and Development. 1948. 55 pp.

This pamphlet contains ten lessons in forestry

arranged to give a clear and concise picture of our forests. Content material, lists for word study, review questions, and suggested activities are given with each lesson. There is a list of references for teachers. At least a portion of this material should be put in the curriculum of each of the elementary grades. Teacher.

A number of the forest industries have published interesting bulletins. Some of these are listed below:

How Money Grows on Trees. International Paper Company. 15 pp.

A "funny book" which tells the story of a crop that grows eighty feet high. Very good. Intermediate and upper grades. Pupils.

Educational Material on Forestry and Forest Products Available from Industry Sources. American Forest Products Industries, Inc.

Booklets, pamphlets, posters, motion pictures, slides, and slide films prepared by twenty-five different companies are listed. Descriptions of the material and directions for ordering are given. Teacher.

Keep North Carolina Green. American Forest Products Industries, Inc. Leaflet.

A dramatic, pictorial account of the devastation of forest fires. Two-color illustrations. Pupils and teacher.

Products of the American Forest. American Forest Products Industries, Inc.

A 36" x 27" three-color poster, showing literally

hundreds of products of the American forests. Bulletin board.

The First Business in America. American Forests Products Industries, Inc. 29 pp.

Twenty-seven attractive two-color titles and pictures with short paragraphs about the first business in America, the forest industry. Questions based on the information are given at the back. Intermediate and upper grade pupils.

Trees of Tomorrow. American Forest Products Industries, Inc. 62 pp.

This book may be used for a basic text in forest instruction. It deals with the history, nature, extent, and ownership of the forests, describes how lumber, plywood, pulp and paper, rayon and other products are made, and explains how fire prevention and good forest management are making possible the continuance of this renewable resource. There are attractive two-color illustrations. The pamphlet is available in classroom quantities for sixth grade or above.

Wood Is a Material of Vast Importance to All of Us.

A 12" x 18" colored chart showing the versatility of wood. Pictures and legend show forest industries, lumber, plywood, wood chemistry, and paper to be renewable resources based on the soil. Bulletin board.

School Bibliography, Forests, Their Use and Conservation. American Forests Products Industries. 1949-50.

A comprehensive list of forest education material from the various industries with order blank for the teacher's convenience. Teacher.

The miscellaneous publications listed here are excellent sources for the teacher interested in teaching any phase of conservation education:

Curriculum Content for Conservation For the Elementary School. United States Office of Education. 1940.

This bulletin contains valuable suggestions for putting trees in the curriculum of the elementary school. This material has been used on pages thirty-one and thirty-three of this thesis. Teacher.

More Outdoor Education. Cornell Rural School Leaflet. September, 1947.

In the chapter, "Know Your Environment", one learns how to help children have rich first hand experiences with the woods. Advice given here is very effective. Teacher.

Teaching Conservation in the Elementary School. Office of Education. 1940.

The material in this booklet has been used on pages twenty-one, twenty-two, twenty-five, twenty-eight, and twenty-nine of this thesis.

Trees in Poetry

The aesthetic value of, and human interest in, trees is evidenced by the incidence of tree subjects in children's poetry. The Index to Children's Poetry contains many references to poems about groups of trees, individual trees, forests, forestry, lumbering, and leaves.⁴⁸ Five anthologies

48. John E. and Sara W. Brewton, Index to Children's Poetry. New York: The H. W. Wilson Company, 1942. 965 pp.

have been examined and a list of fifty-seven poems has been compiled. The anthologies are listed in the bibliography.

The following chart shows information found in the poetry index:

General topic	Number of references
Trees	108
Apple trees, apples, apple blossoms	48
Forests and forestry	31
Leaves	31
Pines	24
Lumbering	21
Willows	21
Cherry trees, cherries	19
Oaks	13
Poplar	11
Holly	10
Elm	8
Plum	8
Birch	7
Beach	6
Pear	5
Walnut	5
Peach	4
Chestnut	4
Hawthorn	3
Magnolia	2
Sumac	2

General topic	Number of references
Locust	1
Mountain laurel	1
Sassafras	1

This list is not an attempt to name all the tree poems in children's literature but is merely suggestive of the vast number of such poems which could be used.

"The All Alone Tree".....	F. O. Gallagher
"An Apple Orchard in Spring".....	William Martain
"An Apple Tree Rhyme".....	Traditional: English
"The Arrow and the Song".....	Henry W. Longfellow
"Autumn Fancies".....	Anonymous
"Autumn Leaves".....	Margaret P. Sutphen
"Autumn Song".....	Clarence Stedman
"Autumn Woods".....	James S. Tippet
"Be Different to Trees".....	Mary Carolyn Davies
"Birch Trees".....	John R. Mooreland
"Come, Little Leaves".....	George Cooper
"A Comparison".....	Jon Farrar
"The Fate of the Oak".....	Barry Cornwall
"Freddie and the Cherry Tree".....	Ann Shawkshawe
"Forest Fire".....	Edna Davies Roming
"Forester's Song".....	A. E. Coppard
"Gathering Leaves".....	Robert Frost
"The Green Grass Growing All Around".....	Folk Rhyme
"Hail on the Pine Trees".....	Basho
"A Happy Child".....	Kate Greenway

- "How the Leaves Come Down"..... Susan Coolidge
 "I Meant to do My Work Today"..... Richard Le Gallienne
 "Johnny Appleseed"..... Rosemary and Stephen Vincent Benet
 "The Little Green Orchard"..... Walter de la Mare
 "Loveliest of Trees"..... Alfred Housman
 "Moonlight Apples"..... John Drinkwater
 "O, Fair to See"..... Christina Rossetti
 "The Oak"..... Mary Elliott
 "The Oak and the Beech"..... Thomas L. Peacock
 "Our Trees"..... Marchette Chute
 "Parenthood"..... John Farrar
 "Pine Needles"..... William H. Hayne
 "The Pine Tree"..... Heinrich Heine
 "Plant a Tree"..... Lucy Larcom
 "The Planting of the Apple Tree"..... William Cullen Bryant
 "Plum Trees"..... Ranko
 "Poplars"..... Edward Bliss Read
 "The Poplars"..... Theodosia Garrison
 "Pussy Willows"..... Mary E. Plummer
 "Salute to the Trees"..... Henry van Dyke
 "Song of a Tree"..... Edwin Markham
 "The Spirit of the Birch"..... Arthur Ketchum
 "Stopping by the Woods on a Snowy Evening".... Robert Frost
 "Strange Trees"..... Elizabeth M. Roberts
 "Tapestry Trees"..... William Morris
 "The Tree"..... Bjornson
 "Trees"..... Bliss Carman

"Trees".....	Sara Coleridge
"Trees".....	Joyce Kilmer
"A Tree at Dusk".....	Winifred Welles
"Tree on the Hill".....	Unknown
"Two Apple Howling Songs".....	Old English
"Under the Greenwood Tree".....	Shakespeare
"What Do We Plant?".....	Henry Abbey
"The Whispering Pine Tree".....	Mrs. S. Van Rensselaer
"Who Has Seen the Wind?".....	Christina Rossetti
"The Willows".....	Walter Pritchard Eaton
"Willows in the Snow".....	Tsuru
"The Wonderful Pear Tree".....	Frances Carpenter

Three Valuable Books

The books described here are recommended to any teacher interested in tree education for herself or her pupils.

Comstock's Handbook of Nature Study has been found to contain nearly a hundred pages of material for the elementary teacher interested in including trees in her curriculum.⁴⁹ In the first chapter one learns that nature (tree) study gives the child practical knowledge, cultivates his imagination, develops in him a love of the beautiful, and instills in him an abiding love for the out-of-doors. One also learns how nature (tree) study is a help in school discipline, what to do with the uninterested child, how to keep a field note

49. Anna Botsford Comstock, Handbook of Nature-Study. Ithaca: Comstock Publishing Company, 1949. pp. 1-24, 618-692.

book, how to take a field excursion, and how to correlate nature (tree) study with language, art, geography, history, and arithmetic.

One entire section of the book is devoted to tree study. Carefully planned suggestions for seasonal work beginning in autumn and going through the year are given. More emphasis is put on individual tree study than on the forest as a whole. Such trees as elms, oaks, hickories, willows, poplars, ashes, apples, pines, dogwoods, and mountain laurel commonly found in Piedmont North Carolina are treated individually. There is factual information, together with twenty lesson plans. The content is so varied, broad, and flexible that any teacher in any elementary school grade will be able to find information and suggestions adaptable to her particular situation.

A Guide to Southern Trees describes about 350 species native to southern states.⁴⁸ The first part of the book introduces the names and classifications of trees and explains features of leaves, flowers, fruits, twigs, and bark commonly used in identification. This material is valuable to the teacher who needs review or who needs a source for information of this kind. The second section is devoted to the conifers, and the third section deals with the broad-leaved trees of the South. In conclusion, there are glossary and selected references.

⁴⁸ E. S. Harrar and J. G. Harrar, Guide to Southern Trees. New York: McGraw-Hill, 1946. 712 pp.

The descriptions, using simple language, are clear and cover such items as historical significance, habit, habitat, leaves, flowers, fruit, twigs, distribution, and importance and use of the trees. Both botanical and common names are used. The plates show foliage, flowers, fruit, leaf scars, and other identification points.

This book has been successfully used by the author with intermediate and upper grade children for identification work.

Trees of the Southeastern States includes a list of 239 native trees and about twenty foreign trees which grow wild in the southeast area.⁴⁹ One of the most interesting and helpful features of the book is the information concerning localities of the trees. Definite locations in the various states are given for each tree. Further description includes general appearance, bark, leaves, fruit, flowers, seed, products, habitat, and other significant facts. This book also contains a glossary and bibliography.

49. W. C. Coker and H. R. Totten, Trees of the Southeastern States. Chapel Hill: The University of North Carolina Press, 1937. 417 pp.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

To summarize this study of the use of trees as supplementary material in the elementary schools of North Carolina in art, science, and resource use, the following statements seem adequate. Authoritative literature on the subject indicated that trees have a significant place in the curriculum of the elementary school because they help to fulfill the need of the teacher for out-of-school material adaptable to in-school experiences. Many opportunities for using the trees are in evidence, and a sufficient number of common trees are available and suitable for use. Both the literature and the practices of certain local teachers reveal methods, procedures, and projects for the guidance of the teacher who wishes to include tree education in her school program.

The study was organized to show: Opportunities for using trees in art, science, and resource use; common trees that may be used; and methods, procedures, and projects for tree study in the curriculum. An attempt was made to show different levels of activities and experiences for the primary, middle, and upper grade groups. Lastly, ungraded source materials for both teachers and pupils were included.

Conclusions

From the findings of the study, certain conclusions seem justifiable in regard to the use of trees in the curriculum of the elementary school.

Since the whole economy of Piedmont North Carolina is involved in the forest, the schools have an obligation and should make their contribution by using the trees, together with other natural wealth, to teach conservation principles. Moreover, the curriculum makers should use the trees in art, science, resource use, and any other field to enrich the school program.

Possibly the most effective method for using the trees in the curriculum is by integration with other subjects. This should be carried out throughout all the years of the child's school life.

Procedures for tree study may be organized with reference to the principles of flexibility, coordination, and differentiation. The activities should be so arranged as to grow in difficulty as the child grows in learning and ability.

Tree study may be introduced into the curriculum by the principal or by a teacher with the cooperation of the principal.

Should the teacher desire to teach trees as a separate unit, a project may be developed by leading the children to become interested in trees, to ask many questions, to think of many things to do, to enter into a study plan,

and to work until the activity becomes an educative process.

The nature of tree education activities should be such as to provide for freshness, variety, possibilities for satisfaction, potentialities for community participation, and improved habits for future living to the experiences of the child.

The scope of the activities should be such as to offer interesting and beneficial work to the slowest, the brightest, and all the in-betweens.

The forest as a whole may be taken as an area of curriculum content to teach conservation practices and to enrich the curriculum in many ways. On the other hand, the woods or individual trees may be used for various purposes.

The science textbooks in current use in the schools afford information on trees. Other educational publications, such as nature study books and tree guides, may be used to supplement the science books.

Trees are widely used in literature, particularly in poetry. Literally hundreds of tree poems may be found in the numerous children's anthologies.

The United States Department of Agriculture, The North Carolina Department of Conservation and Development, various industrial concerns, and certain miscellaneous agencies have published many bulletins, pamphlets, posters, and charts suitable and available for use in the elementary schools. A limited number of visual aids and radio scripts are also available.

Recommendations

In view of the conclusions of this study, it is recommended that:

1. All the children of all the people should be given education in matters pertaining to the woods and forest.

2. Teachers should become interested in forest education and should use the trees to enrich the total school program.

3. Tree study, together with other nature study, should, in many instances, be integrated with the regular curriculum.

4. Tree education should never be undertaken without careful planning on the part of the teacher.

5. The teacher should have first hand knowledge of the trees.

6. The principal should encourage the use of trees in the curriculum. He may initiate the work in case the teachers are not already interested.

7. The teacher who desires may teach a tree unit independently of other subjects.

8. Considerable care should be taken in selecting activities appropriate for each individual child.

9. Teachers should become acquainted with the literature on tree education.

10. Teachers should make bibliographies of forestry materials.

11. Teachers should make collections of forestry

materials.

12. Wise use of the forest should be studied and practiced by every teacher and pupil because of the pertinency of such action to our well-being in terms of aesthetic values, conservation benefits, and monetary considerations.

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