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New York State College of Agriculture and Life Sciences,
A Statutory College of the State University, Cornell University

4-H Leaders'
Guide L-5-4

Nature Trails: Guides to Environmental Understanding

by James R. Fazio

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Projects in environmental education present today's youth leaders with both challenge and opportunity. Understanding and teaching the basic principles of ecology and the subtleties of environmental interrelationships is indeed a challenge. In the end, however, this provides the leader with an excellent opportunity to channel youthful ambition into creative and meaningful action projects. The area is an ideal outlet for youngsters who want to do things to help build a better world. In addition they will develop teamwork, will learn about ecology, natural history and resource management, and will acquire various craft skills while involved in a public service project.

The overall objective of the project described in this leaders' guide is to foster environmental awareness and understanding in young people by involving them in the development of a self-guided nature trail. Although member *involvement* is the key to accomplishing these project goals, carefully planned guidance is vital also. This leaders' guide will help you provide the necessary guidance and encourage your groups' involvement through participation.

To start the project, an area must be identified as suitable for the trail. Once the site has been chosen, the next steps include marking the trail route, selecting objects and concepts to interpret, gathering information about the selections, writing the interpretive messages, constructing signs or devices to convey the messages, and completing the trail.

The author was an Extension Specialist in Natural Resources at the New York State College of Agriculture and Life Sciences when this guide was written.

Boy using a tree finder.

The entire project has been done in 5 days (2–3 hours per day) by 4-H groups at Cornell's Camp Arnot. Undoubtedly that is the minimum time needed to do a good job, but from planning to completion, trail development can be modified to meet *any* desired time schedule, such as periodic 4-H work sessions for several months or a weekly period in school for a semester. The important thing is to plan the time sequence, organize carefully for each session, and move along on schedule.

When actual construction ends, there is no need for the project to end. In fact, it shouldn't! Teachers may want to dismantle the trail when the school year ends and repeat the project with the next year's class. In 4-H work, the trail should become a permanent club project. The club should be responsible for replacing damaged or missing signs, for changing the trail periodically, and for general maintenance. Participants in the project can be guides for the trail.

The Characteristics of a Good Self-Guided Nature Trail

To be of the most value, a nature trail should interpret the visitors' surroundings. The process of interpreting the environment can be explained to young people by comparison with the interpretation of a foreign language. If you don't understand French, a Frenchman's speech is meaningless to you. An interpreter who understands French and can translate it into English is needed. On an interpretive trail, signs and other devices should explain the unfamiliar surroundings to the visitor. Even in familiar surroundings, interpretation can make the unknown known in terms visitors can understand.

The listing of information does not necessarily fulfill the interpretive function. Interpretation is *revelation* based upon information. For example,

Information:	White ash (*Fraxinus americana*)
Interpretation:	Ash is an ancient Norse word for "man." The branches are opposite each other and look like arms reaching out. Can you see the "man" in this tree? Your baseball bat is probably made of its wood.

Interpretive trails should encompass more than plant and animal sign identification. Include things such as land uses, management, environmental problems and solutions, historic values, interrelationships with other plants and animals, and aesthetic appreciation.

The kind of trail you make will depend on your area, the interests of your group, and the visitors who will use it. You may want to make a general trail, like the one shown in this leaders' guide, or you may want to tailor the trail to highlight a special subject or theme, such as:

- — Conservation practices (erosion control, wildlife plantings)
- — Forestry (thinning, pruning, aesthetic logging practices)
- — Agricultural practices (fence rows, crop demonstration plots, pasture management)
- — Historic sites (an abandoned farm site, an old mill)
- — "Name It" trail (*how* to identify plants, signs of animals, geologic features)
- — Ecology (food chains, *why* certain trees and plants are in a particular location)
- — Aesthetics (fall colors, unusual natural designs)

Where Should the Trail Be Located?

An interpretive trail does not require a large area of land. With some imagination, an area as small as an acre can be used. Use whatever land is available and convenient, but ideally, the more natural and topographic variety present on the site, the better. The first step is to gain the cooperation of the owner or manager of the area if you do not own it. Some suggested locations follow.

Public land: Parks and recreation areas are the traditional locations for nature trails. These areas often receive the most visitors, and the visitors have leisure time to spend. Unfortunately, they are also most susceptible to vandalism in some parts of the country.

School property: Many schools have fields or a small woods on an unused hillside or corner of the property that are often suitable for a nature trail. The planning, construction, use, and maintenance of the trail make an excellent class project. Trail markers or even the trail itself can be changed from year to year to provide new opportunities for each class. If no teacher has the time or interest to pursue the project, a 4-H club might seek permission to use the land. Also, the project could be an opportunity for a cooperative venture between 4-H and the school.

Commercial campgrounds: What better place for a nature trail than on the edge of a rural campground? This location provides an excellent experience for campers, and also gives the owner an opportunity to further good public relations. In addition to benefitting campers, the trail could be made available to school, scout, and other community groups.

Churches: Stewardship of natural resources is an important part of most religions. Churches with land of their own or those that adjoin a parcel of unused land should be willing to foster nature trail projects for their youth groups.

Industry: Many industries with land and existing or potential public relations programs involving public tours may find nature trails suited to their purposes (see reference entitled "Good Will Toward Men," page 19).

Tree farms: The reference listed above describes how a paper company made an interpretive trail to help inform the public about forestry practices used on its land. Similarly, owners of Christmas tree plantations, nurseries, and other horticultural enterprises could benefit from self-guiding trails on their land.

Other private land: Perhaps you, someone you know, or someone with land near your club or school would be willing to have a trail established on part of the property. In such a case, a sign acknowledging the owner's generosity is appropriate.

What Features Can Be Interpreted?

Interpretation opportunities are limited only by imagination. Much depends on the purpose or theme of your trail, but anything from soil profiles to air pollution information can be incorporated into interpretive messages.

Using the schematic drawing on page 5, let us take a look at some of the features on "Woodland Trail" and how they are interpreted. Remember, this illustration has been planned to show as many features as possible in one picture. Naturally, your trail may have only a few of these items and can have others not shown here. Also, the points of interest on your trail will be further apart. A description of the items shown in the illustration follows.

A. *Entrance sign*: This is the "cover of your book." It should identify the entrance, entice the visitor, and be appropriate to the setting. It may be the largest sign since it should be visible from the parking lot. On the sign, you can identify your organization and acknowledge the landowner.

B. *Bulletin board*: This is quite optional depending on the type of trail. It offers the opportunity to post current information, an area map, rules and regulations, and a box for dispensing trail maps or brochures. Its maintenance may require more attention than your group can give.

Note the bike rack next to the bulletin board. An appropriately worded sign can tell visitors of various restrictions, for instance, whether or not the trail is off limits to bicycles, motorized travel, and horses.

C. *Geology wall*: It has been said that all life owes its existence to rainfall and a 6″ layer of soil on the globe. When interpreting your area, do not overlook the importance of soils and geology in determining what trees and plants grow there, and, consequently, what animals and what historical and cultural features are found in the area.

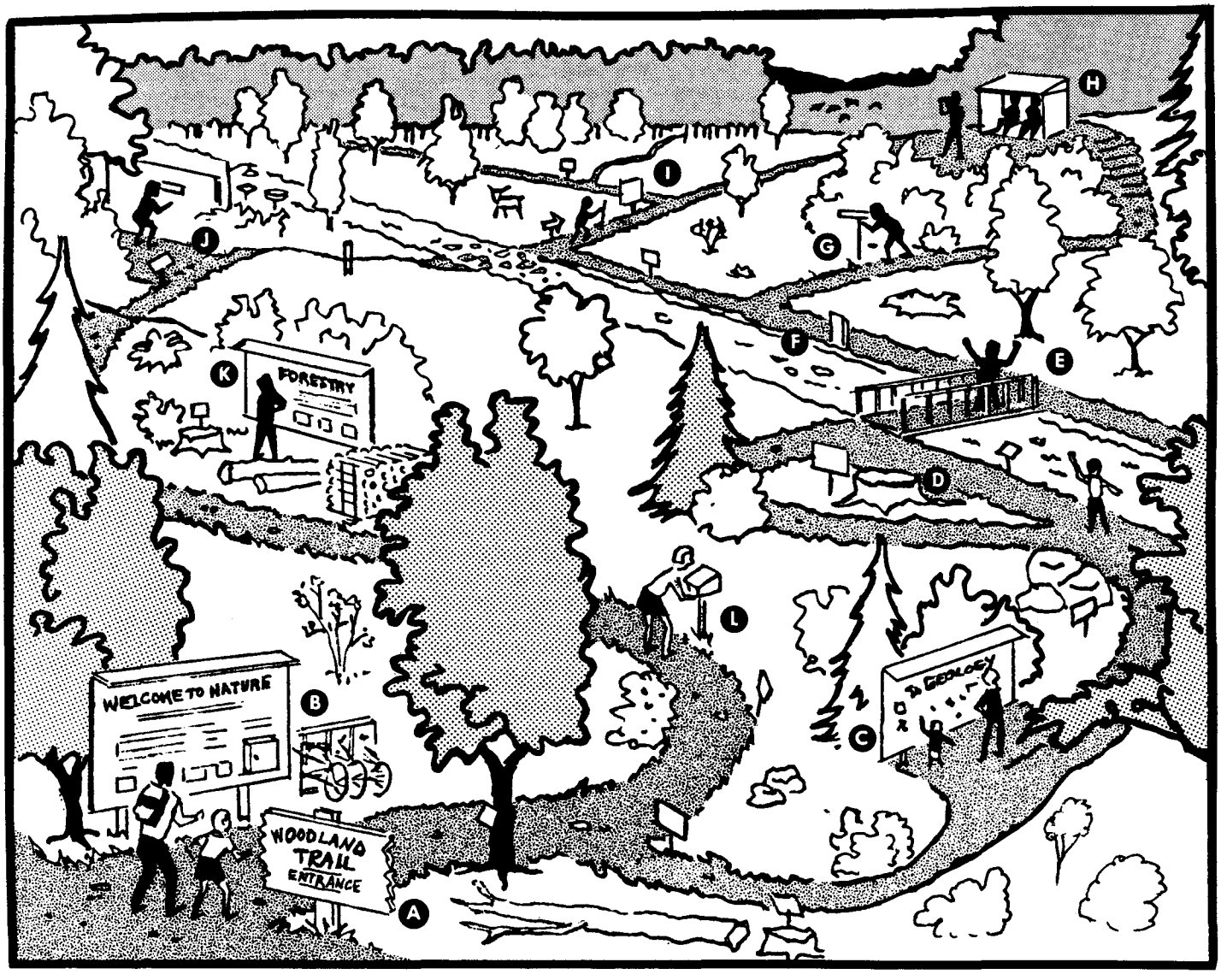
A geology wall can be constructed by mounting sample rocks on a bulletin board or by building a low rock and cement wall and embedding rocks and descriptions in a smooth cement top.

Stories in stumps: Both children and adults are fascinated by tree rings. Stumps from logging or an occasional tree cleared for trail construction will provide the opportunity to interpret tree rings. Age, growth characteristics, springwood (lighter) and slower growing summerwood (darker), disease and insect attacks, and earlier damage are all reflected in stumps. Sources of more information about tree rings are listed in the reference section.

E. *Bridge*: Bridges over creeks, ditches, and other wet areas are practical and add adventure for the young. The bridge in the illustration is neatly constructed of wood. Upstream, carefully placed rocks are used. Sometimes a split log is satisfactory. Whatever is used should blend into the surroundings as well as provide *safe* crossing.

F. *Aquatic interpretation*: Those fortunate enough to have a creek, marsh, or pond should take advantage of it through interpretation. These resources can present an opportunity to discuss the problem of water pollution. Publications to help you are listed in the reference section.

General Nature Trail Features



Bank stabilization can be necessary when trails are next to water, but this, too, is an interpretive opportunity. Also, don't overlook wing dams for fish habitat improvement in streams, beaver work, fire protection uses of ponds, and similar information. (Caution: state laws govern alteration of stream beds. Always consult local state officer before beginning work.)

Short cuts: Just after "F" on the diagram is a short cut trail. These are useful, especially to permit older people to shorten their walk or to avoid a hill. If a trail map is not used, a small explanatory sign should be placed at this point.

G. *Peep pipe*: A peep pipe is an easy way to focus attention on a distant object. It is simply a hollow pipe mounted on a pole and set so that a visitor can look through the pipe at some distant object being pointed out for interpretation. The object may be a fire tower, smokestack, plantation, building, or just about any distant fixed feature of interest.

Provide a rock or other step for youngsters to stand on while looking, and don't make the pipe too low for the oldsters.

H. *Rest stop*: Rest stops are especially useful on trails used by older people. They need not be elaborate — in fact, the one in our drawing violates an important keep-it-simple rule — and should be placed about half way around the trail. A simple bench or log is quite suitable.

If possible, the rest stop should be placed in an attractive spot. It is a good place to post thought-provoking quotes such as the samples shown on pages 7 and 8. You may want to put a litter container here.

Steps: Note the steps just before the rest stop. Where a sharp change in terrain cannot or should not be avoided because of some feature, steps are needed. They should be firm and safe, but rustic and unobtrusive.

I. *Side trip*: At this point the visitor can take a side trip through a forest management area. A sign should explain the length of the spur trail and what may be seen.

Side trips offer the opportunity to actually have two trails with differing themes. For example, the main trail may be gen-

eral or miscellaneous while the spur trail interprets certain forestry practices or an especially good wildflower area.

J. *Walk-in blind*: A walk-in blind is a solid wooden fence or wall made of screening material that has viewing holes. Placed off the trail and next to a marsh, bird feeder, natural salt lick, or other active wildlife area, it provides an excellent way to observe wild creatures without frightening them away.

It should be painted natural green or a dull color to blend with surrounding vegetation. An appropriate sign would include instructions to watch quietly, and information about what to watch *for.*

K. *Forestry exhibit*: How many of us know what the terms "a cord of wood" and "a board foot" actually mean? A trailside exhibit can be easily constructed to explain these and other unit measures used by conservationists.

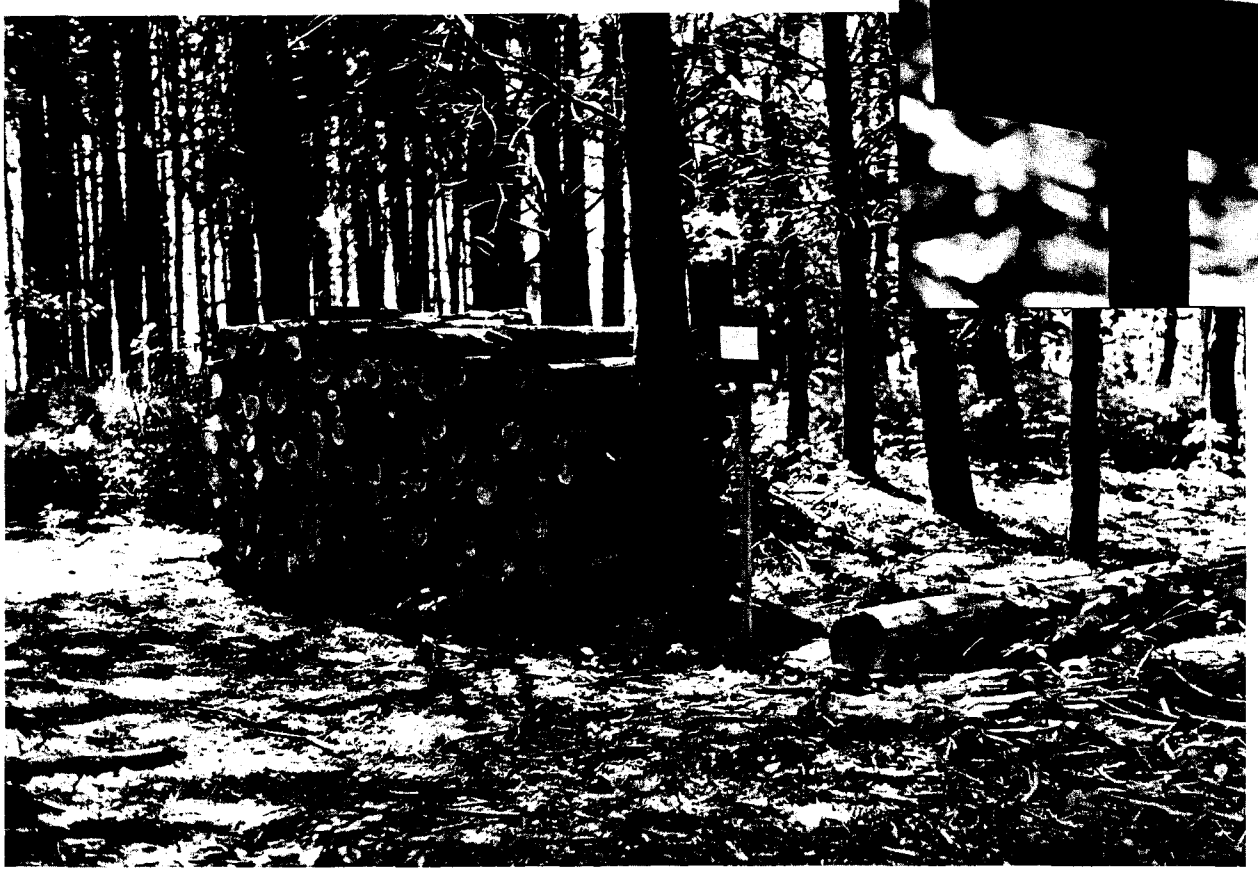
In the diagram, a bulletin board type of sign is used to explain the diameter of the stump and logs on display, and how board foot volume is calculated from the logs. On the right is one cord of pulpwood ($4' \times 4' \times 8'$) *securely bound* by cables and end posts. Wood preservatives will help prolong the life of this exhibit.

L. *Sniff box*: If there are plants in your area that have characteristic odors that aid in their identification, why not try a sniff box? Such plants include sassafras, spicebush, mints, red cedar, and others. The interpretive device can be merely a closed box mounted on a pole with openings on the top large enough to allow the fragrant odors to escape.

Since the materials (leaves, cut up twigs) need to be replaced at intervals, it is wise to locate this device near the trail entrance or other spot that is easily serviced. The interpretive sign can be placed directly on the box.

Just as developing and maintaining the interpretive trail is a tool for creating environmental awareness in boys and girls, the finished trail should do the same for visitors. Therefore, the trail should include some philosophical and ethical messages. These are most effective at overlooks, rest stops, spots of exceptional beauty, and at the trail's end. Inscriptions burnt on a rustic piece of wood or cross section of tree trunk are especially attractive and appropriate for this type of sign. Quotations can also be included in trail guide booklets.

The message should be appropriate to your trail and the setting. Some examples are shown on pages 7 and 8.



Solitude
is as needful
to the imagination
as society
is wholesome for
the character

James R. Lowell
(1819-1891)

Step softly, step like a whisper,
but do not speak
Or you will never see
The forriness curled within
the hollow tree,
The shadow-dance
upon the wilderness creek

Stephen Vincent Benet

LOVE OF NATURE

Open your eyes and ears to nature's beauty. Notice the abundance of various types of life forms - the striving ferns and growing grasses, and myrtle; even the mosses on the less fertile areas.

Listen to the birds singing in the tree tops and the crickets chirping from beneath the rocks.

As you walk through this area, try to count the young trees several inches high that shall inherit the forest. Listen for the burbling creek in the valley.

Interpretive message written by
a 4-H boy from a city background

PRAYER OF THE WOODS

I am the heat of your hearth on the cold winter nights,
the friendly shade screening you from the summer sun,
and my fruits are refreshing draughts quenching your
thirst as you journey on.

I am the beam that holds your house, the board of your table
the bed on which you lie, and the timber that builds your boat.

I am the handle of your hoe, the door of your homestead,
the wood of your cradle, and the shell of your coffin.

I am the bread of kindness and the flower of beauty.

Ye who pass by, listen to my prayer: harm me not.

An ancient verse used in forest reservations
of Portugal for more than a thousand years.

"I went to the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not, when I came to die, discover that I had not lived."

Henry David Thoreau

The water in this creek is very clear. It has no garbage, sewage or detergents to spoil it. If all our creeks, rivers and oceans were this clear, our world would be a much nicer place in which to live.

Won't you do your part for clean water ?

Written by a young girl attending 4-H leadership camp at Cornell's Arnot Forest.

Making Interpretive Signs and Devices

Interpretive signs for your trail can range from temporary, hand-printed 3" × 5" cards wrapped in cellophane to elaborate plaques with movable parts. An interpretive sign should never be shoddy, nor should it be so large or elaborate that it detracts from the object being identified or interpreted. Uniformity in signs should also be discouraged. Instead, as in the entire interpretive process, encourage self–expression and creativity.

Some suggestions and samples to guide you in planning this important phase of the project follow.

Preparing the Message

When preparing interpretive signs, the basic rules of good grammar, spelling, and visual communication apply as in anything else intended for public use. In fact, for most youngsters, this project will be the first time that their writing has been put to actual use and has reached an audience larger than parents and teachers. This, in itself, is a lesson in real life!

Aside from the basics, the main points to be stressed are: keep it *short, informative* and *conversational.* Always write for your audience. Consider the age level, interests,

and background (city or rural environment and the cultural experiences) of the people who will be using the trail.

Legibility

DO NOT CAPITALIZE AN ENTIRE TEXT, DO NOT CROWD IT WITH INADEQUATE-MARGINS, AND DO NOT USE THE SOLID BLOCK FORM. SUCH SIGNS ARE VISUALLY UNINTERESTING, AND THEIR TEXTS ARE HARD TO READ. UPPER AND LOWER CASE LETTERS MAKE SENTENCES AS WELL AS PROPER AND PLACE NAMES MORE DISTINCT. PARAGRAPHS, INDENTED OR NOT BUT WITH EXTRA SPACE BETWEEN THEM, MAKE A LONG TEXT EASY TO READ, MORE PLEASING TO LOOK AT.

Now, having read the above message, how much do you remember? If it were on a different subject and out on a trail, would you stop and wade through it? Probably not, yet buried in the blob of text is some excellent advice. Look at the difference in the sign shown below:

Do not capitalize an entire text. Do not crowd it with inadequate margins, and do not use solid block form. Such signs are visually uninteresting and their texts are hard to read.

Upper and lower case letters make sentences, as well as proper and place names, more distinct.

Paragraphs, indented or not, but with extra space between them, make a long text easy to read, more pleasing to look at.

Finally, use a positive approach, even when talking about negative subjects such as water pollution. Note the wording of the sign on page 8. It doesn't preach or condemn but does appeal to one's sense of appreciation and responsibility. This is especially important in dealing with prohibitions. Which of the following messages about the white birch is likely to be more effective?

WHITE BIRCH
Do not peel off the bark.

WHITE BIRCH

This beautiful tree grows only in openings, often finding its spot in the sun along the edges of lakes and streams.

The woodland Indians used the bark of birches for canoes, various utensils, and for starting fires in rainy weather. Today its greatest value may be in the beauty it lends to our northern countryside.

Peeling the bark destroys the beauty of birch and opens it to disease and death.

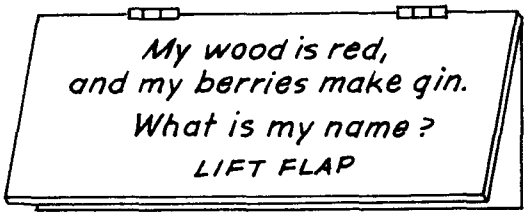
Wooden Signs

Wooden signs offer limitless opportunities. A simple wood-burning pen can be used to inscribe messages and designs (leaf shapes, and the like) and is epecially good when a rustic effect is desired. Be sure to lightly outline the art and copy directly on the wood with pencil before starting to burn. Provide metal or foil trays to hold the hot pens immediately after use.

Lettering on wood can also be done with oil-based paints or even with press-on (transfer) letters. A heavy coat of marine varnish will finish the job, giving protection to both the lettering and the wood. Unless your trail will be used in the winter, it is best to store signs in the fall to reduce vandalism, weathering, and damage by squirrels, rabbits, and other animals.

Finally, be sure to use outdoor-grade plywood, both for the signs themselves and as backing for other materials. Three-eighths-inch wood is satisfactory, and sanded sheets are worth the small additional expense. Your group can cut the sheets into desired sizes and shapes.

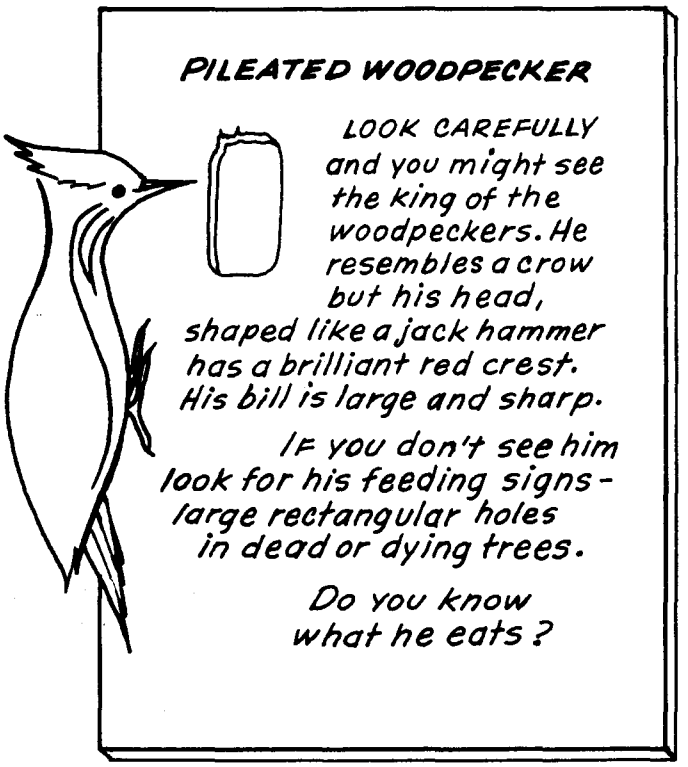
Signs that actively involve the visitor are always the most popular on a trail. It is hard to ignore a sign that reads:



The simple tasks of lifting a flap, feeling bark texture, sniffing, turning a handle, or other physical involvement not only attract attention, but also increase retention and the learning potential. Wooden signs are best suited to this use, and solid wood should be used instead of plywood.

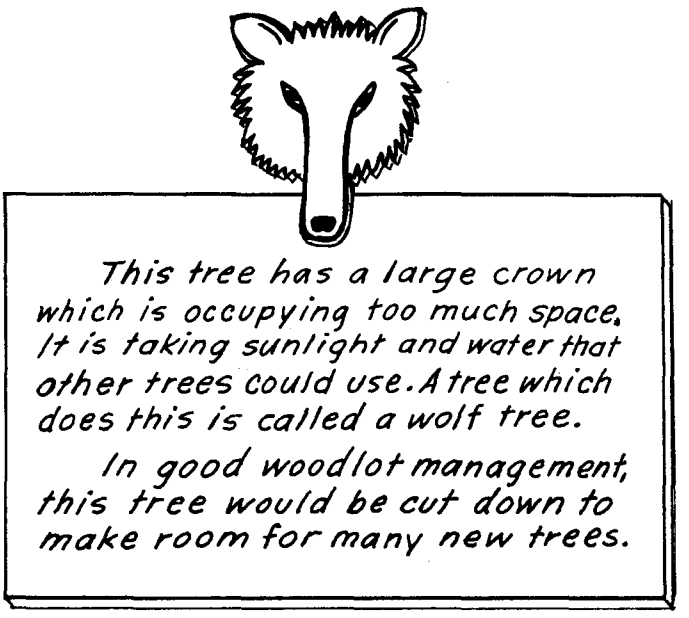
Samples of Wooden Trail Signs

Most of these illustrations are based on actual wooden signs constructed by environmental education students at Cornell University. Their instructor, Professor Richard B. Fischer, has used design and construction of trail signs as an effective teaching technique.

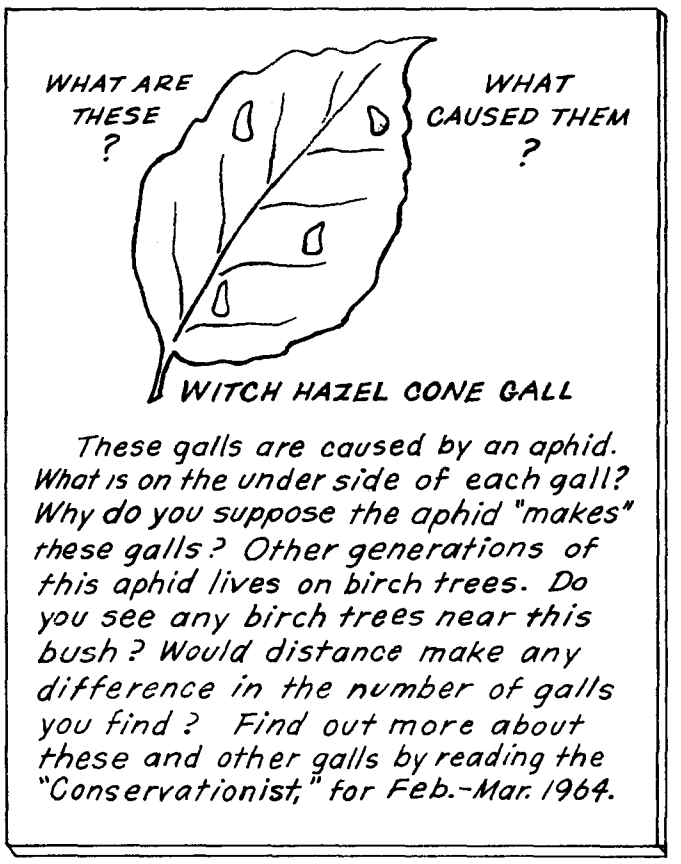


Members with artistic abilities can create signs that show birds, insects, or other animals that move too often to be studied like trees or rocks. In this case, a realistic hole was drilled in the signboard.

This sign is especially effective when placed above trash receptacles.

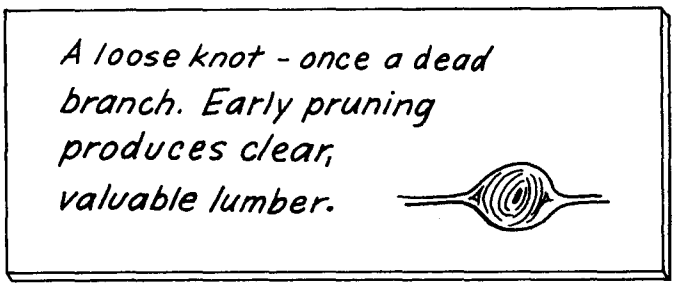


The base of this clever sign is a rectangular piece of wood. The wolf outline was cut from another piece and glued to the base with furniture glue. The sign is natural wood, protected with marine varnish, and the lettering is black.



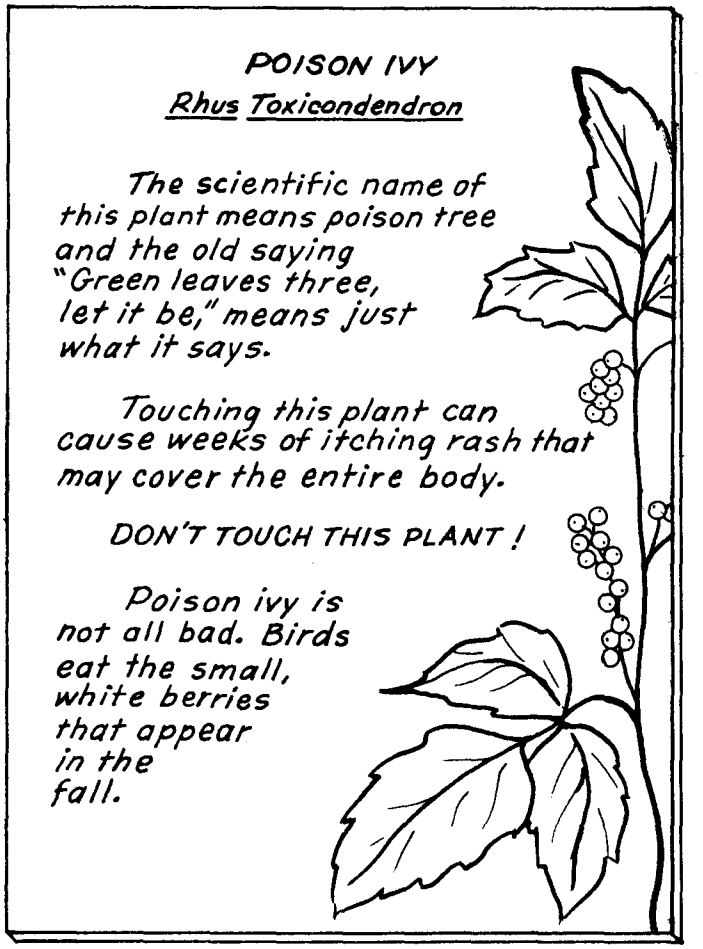
In this sign, a green leaf with red galls is painted on the board. The entire sign is coated with marine varnish.

Signs that ask questions can be used to best advantage at campus or on school grounds. The appropriate reference information should be readily available on a reading table or in a nature corner at the school or the interpretive center.

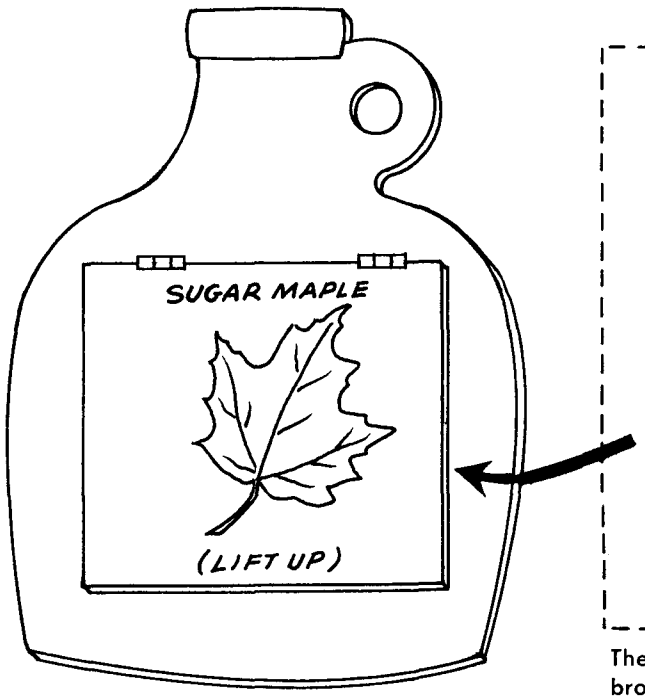


This sign is made from a piece of varnished natural wood. The lettering is black and the knot is real.

The leaves on the sign at the right can be cut from the top of the same piece of wood that is used for the sign, or cut separately and glued on with furniture glue. They are painted green with black veins (wood-burned veins would give a nice effect). The lettering is black on a natural wood background.



The ivy plant and berries are painted in green and white on this sign.



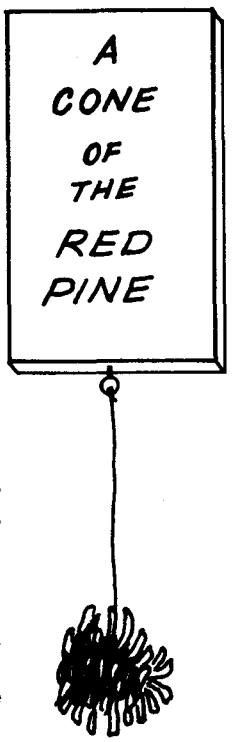
SUGAR MAPLE

The shape of this sign tells you what the sugar maple is most famous for - syrup. Because it is very hard, the wood is used for floors and bowling pins. It also makes beautiful furniture.

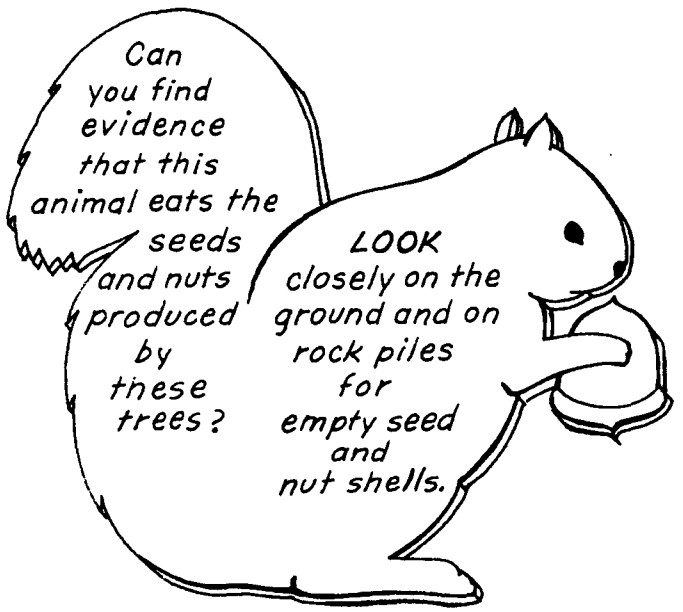
Don't forget to note the characteristic leaves, bark, and twigs of this beautiful and useful tree. What do you think the advantage of the propeller blades on the seed is ?

The bottle shape was cut out on a jigsaw and painted brown. The top flap is painted white with black lettering and the square under the hinged flap is painted white and also has black lettering. The maple leaf is painted in green. Use a real leaf and trace the shape.

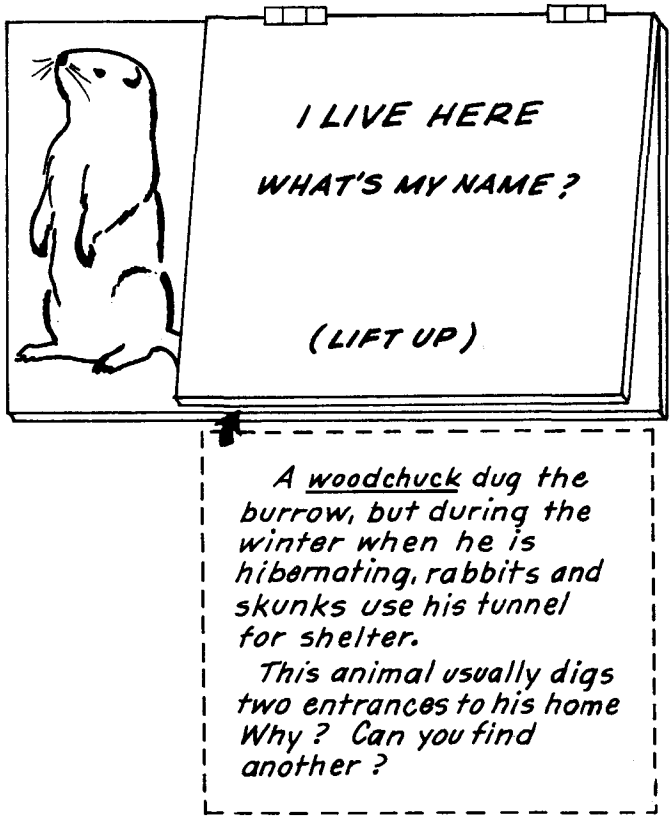
Leaf-shaped signs like the one at the left are very effective. This one is painted green with black lettering.



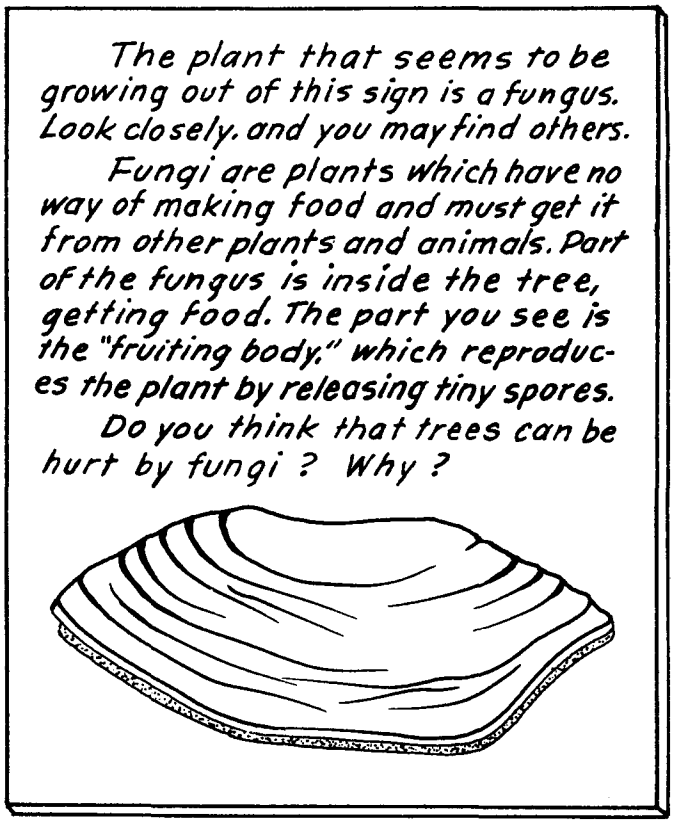
Red lettering on natural wood protected with varnish is used for the sign on the right. A real pine cone is hung on a wire so that it can be handled. The screw-eye allows easy replacement.



To make this sign, a squirrel's outline was cut out of wood. The lettering is black. The acorn in the squirrel's paws is painted brown and the entire sign is heavily varnished.



This is an involvement or participation sign. The hinged flap lifts to reveal the answer. An interesting feature is to use this type of sign on several trees at the end of a trail to quiz visitors on species described earlier along the trail.



The large shelf fungus is fastened to this sign with strong glue. Long screws inserted from behind the sign make it even more secure.

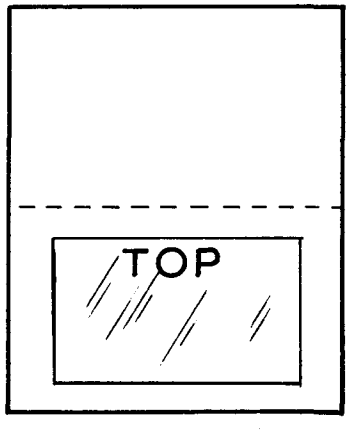
Rocks, fossils, pieces of limb with lichens, and other materials can be similarly displayed.

Lamination

The process of lamination consists of sandwiching a paper sign between two layers of transparent, weather resistant material. Although the service is offered commercially in many places, the method described here is quick, easy, and inexpensive. The finished product can last at least two summer seasons, but is probably most useful for a temporary display of about one or two semesters' duration.

Here are step-by-step directions for laminating a sign using a clear, self-adhesive plastic (Con-Tact is one familiar brand):

1. Cut a piece of the plastic that is more than twice the size of your sign (so that there will be a 1" or larger margin when it is finished).
2. Peel off the backing and lay the plastic in front of you, sticky side up.
3. Carefully place the sign *face down* on the bottom half of the plastic sheet leaving the margins as shown. (If a crease develops during the next step, it will be on the back of your sign where it won't show. Be sure that the top of your sign is near where the fold will be.)
4. Carefully fold the plastic over the sign.
5. Press firmly, especially along the fold, so that no rain can enter.
6. Trim the outside edges of the side and bottom margins.



The laminated sign can be mounted on a plywood backing with rustproof tacks (painted thumbtacks). Leaves, maple seeds, locust pods, or other relatively flat objects can also be laminated, as can maps, large visual aids for field use, or many other items.

Flat Embedment

Embedding signs in polyester casting resin gives the most durable and weather resistant protection. The technique is also fascinating to both young and old and can open a whole new hobby world to interested individuals.

Typed or hand-lettered paper signs, illustrated with actual leaves and twigs or with pictures cut from magazines, can be given a professional look by embedding them in polyester casting resin. After the sign and the artwork are coated with protective spray, they are sandwiched in Fiberglas, which dissolves when the resin is poured, but adds strength. The finished mat can be shaped with a fine-toothed saw, and holes can be drilled in it for fastening to a post or plywood backing.

Fiberglas is available at marine stores and some auto parts outlets; the other materials can be secured at art supply stores and most hobby shops. Mylar, a necessary material, is used in the manufacture of electric motors; donations can sometimes be secured from such a source. Mail order purchases of most supplies can be made from supply houses such as those listed below. Catalogs will be sent on request, and Castolite offers a variety of "how-to" publications.

The Castolite Corp.
Woodstock, Illinois 60098

Lee Wards
840 N. State St.
Elgin, Illinois 60120

Directions for Making Flat Embedments

Materials:

1. Polyester casting resin and catalyst (the catalyst, or hardener, comes with the resin)

2. Heavy (.005″) mylar sheets, also called laminating film (can be used many times)

3. Fiberglas mat (heavyweight type; "angel hair" type optional for top layer to provide greater visibility)

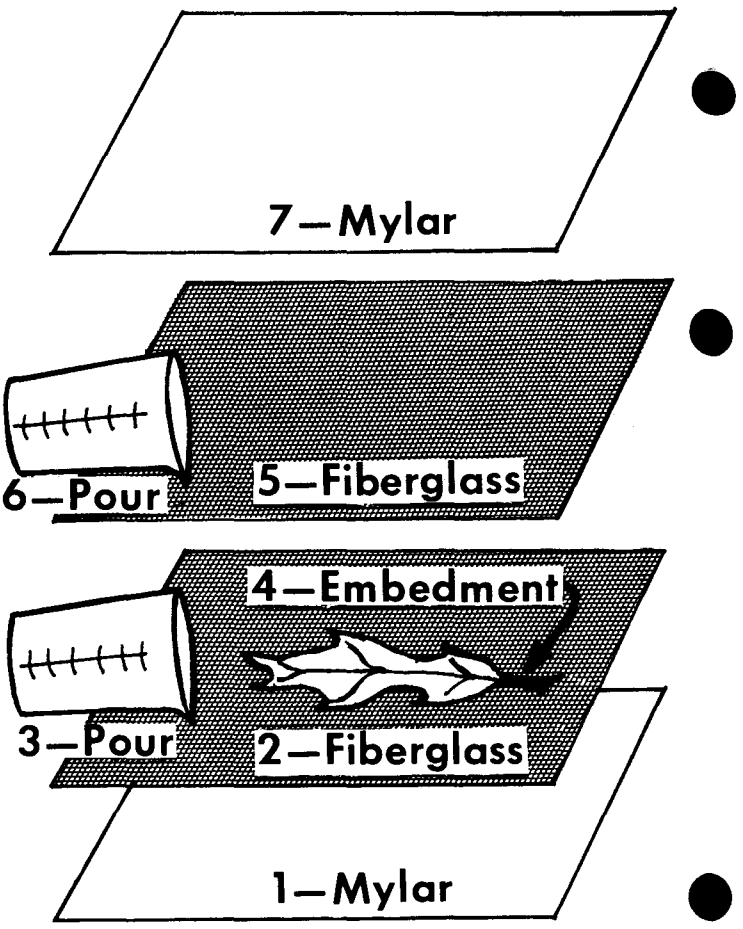
4. Graduated paper measuring cups (or any paper cup with marks added at ounce intervals)

5. Stirring sticks

6. Old rolling pins (round jars can be used)

7. Embedments: Signs can include small dried flowers, dried moths, insects, leaves, pictures (be sure there is nothing on the back because it will show through), fish scales, buds, or nearly any other object that is relatively thin and flat. When lettering, remember that felt-tip marking pens and some other inks and paints run.

8. Clear, quick drying preservative spray (the type used on drawings)



Flat mat embedment

Procedure:

1. Spread old newspapers to protect table top (see step 12).

2. Two sheets of Mylar serve as the mold and should be at least 6″ larger on all sides than the sign and its Fiberglas. Lay down the bottom sheet.

3. Cut 2 pieces of Fiberglas to the size and shape of your finished product. (For paper signs, the Fiberglas should extend beyond the edges of the paper by at least 1 inch.)

4. Lay one piece of Fiberglas on the bottom sheet of Mylar.

5. Add catalyst to the necessary amount of resin and *mix thoroughly* for at least 1 minute. Directions for how much catalyst to add per ounce of resin usually come with the supplies. Ten drops per ounce is often recommended, but it varies with brands and conditions. A 5″ × 8″ card used as the sign will require about 4 oz of resin per layer of Fiberglas (total of 8 oz).

6. Make your first pouring onto the bottom layer of Fiberglas. Snake it back and forth, and it will flow together.

7. Carefully lay sign or other embedment (face *up*) in place on top of first layer of Fiberglas. If several embedments are to be included, it is best to make the design first and then transfer it, position for position. *Note*: Typewritten and hand-lettered copy must be coated with protective spray before embedment to prevent running. Clear protective sprays for artwork are

Rolling bubbles out of the mat while making a flat embedment.

available in art supply stores. Two light coatings can be applied and will dry in minutes.

8. After embedments are in place, cover with second layer of Fiberglas. (For greater visibility of sign copy, you may want this layer to be veil or angel hair Fiberglas. This is also less expensive, and the loss of strength in the sign is negligible.)

9. Repeat step 5 and cover the Fiberglas with resin. Slightly more resin is usually desirable on this side (front of sign).

10. Cover with second sheet of Mylar.

11. With some type of round roller, gently roll from center out until all bubbles are removed and mat is uniformly flat and covered with resin.

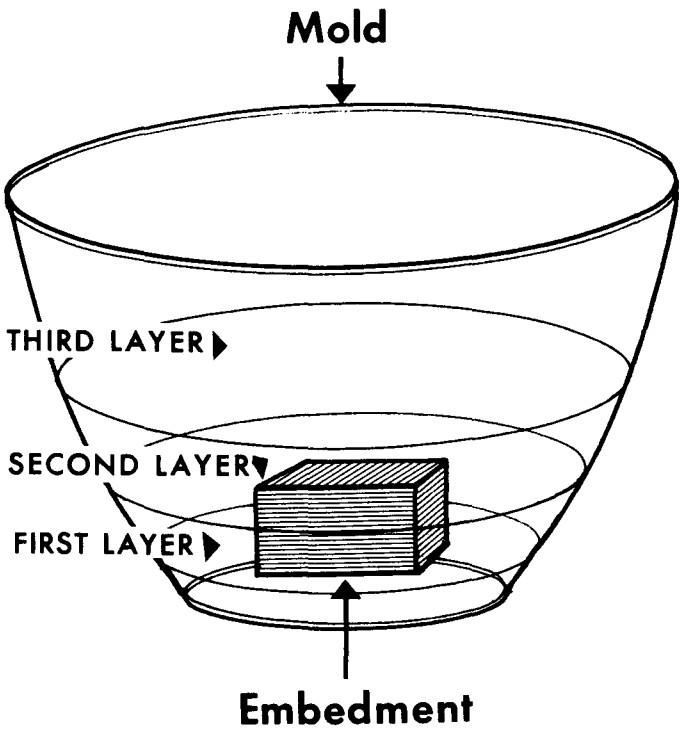
12. At this point, it is best to allow the mat to remain undisturbed, at least overnight. If it must be moved to cure elsewhere (to a garage or side of the room perhaps), the entire process should be done on a large piece of stiff cardboard, which can then be picked up without disturbing the mat.

13. Drying will usually be complete by the next day. The Mylar sheets can then be peeled off easily and stored for future use.

14. Using any fine-toothed saw, trim to desired size and shape. Sand edges with fine to medium sandpaper. Holes can be drilled for mounting on post or plywood backing.

Mold Embedment

Mold embedments are commonly used for novelty items such as paperweights and pen holders. They are of little use in interpretive trail development and therefore will not be considered here in detail. Essentially, however, the process is the same as that used in making flat embedments except that Fiberglas is not needed and the mold is a glass cup or other suitably shaped container. Also, the pourings are made in layers, each after the preceding one begins to harden, and smaller amounts of catalyst are used to prevent damaging heat buildups. Booklets are available from many sources for those interested in these techniques. Exploration of this craft should certainly be encouraged, as the products have a wide variety of uses, ranging from



Mold embedment

gifts and novelties to preserving delicate specimens for use as visual teaching aids.

Whether you are working with flat embedments or molds, the secret to success is to experiment and keep notes of what works best for you. Variations can be caused by different brands of resin, room temperatures, and many other factors. Some materials, such as the ink from felt tip pens, run or react with the resins and quickly fade in sunlight, others hold fast. You cannot find the combinations and sources of materials that *you* should use without experimenting. Working with polyester resins can be fun and will produce excellent trail signs, but be sure to experiment and practice by yourself *before* doing it with your group.

Mounting

A visitor to an art museum would be horrified to see the identifying label of a painting attached directly to the artwork. Instead, it is placed on the frame, and the frame itself is designed to blend with and enhance the picture. So it should be on an interpretive trail. Instead of nailing a sign to a tree, position a sturdy but unobtrusive post in front of the tree or object being interpreted. Then, affix the sign to the post (screws allow easy removal for storage, cleaning, or repainting).

The posts can be made from any available material. Ripped slabs from sawmill waste can be used, or perhaps a lumber yard would donate 2″ × 2″ lumber. Another possibility is to use saplings cut from the trail route or nearby

woods, especially if they can be obtained as part of a group effort to thin a woodlot or plantation.

Experience indicates that a demonstration in how to plant a solid post is needed before putting your group to the task. Wobbly posts can quickly undo the work of many sessions and can mean a sad end for the best of signs!

Some Other Considerations

Preprinted Signs

Preprinted signs are available in a set called *Instant Nature Trail.* About 75 items are interpreted on heavy paper cards and can be purchased for $1.00 per set. Since the primary educational value of this project is in individual interpretation, these signs are not recommended for group use. However, they do have considerable value as background reference for leaders and as a source of ideas. Sets are available from:

John Focht
Cooperative Extension
87 Maple Avenue
New City, New York 10956

G. Andrew Larsen
Lakeside Nature Center
Spring Valley, New York 10977

Similar cards have been prepared by the Boy Scouts of America and are available for $4.00 per set. These sets are regionalized; be sure to mention your state. The address is:

Boy Scouts of America
National Supply Division
North Brunswick, New Jersey 08902

Involve the Senses

The more senses involved in a learning process, the greater the retention. Take advantage of this in developing your trail. Children, especially, have a tremendous urge to touch. Go along with their desire to feel things, smell things, and taste them. Invite visitors to compare the rough feel of black cherry bark with the smooth weave of white ash. Will their ears hear the singing of pines if you don't point it out? Who can forget the smell or taste of sassafras? In fact, some excellent trails have been developed exclusively for blind people. That in itself could make an outstanding 4-H project.

Interpreting Temporary Features

Temporary features such as wildflowers can be identified by little tags on stiff wires which can be placed as the flowers bloom and then removed easily. Attention is required almost daily at some times of the year, but may be well worth the effort in some situations.

Another way to interpret temporary features is to call attention to them on a sign or bulletin board or in a pamphlet without attempting to point out specimens along the trail. Don't overlook mushrooms, insects, galls, and common animal tracks.

Leaflets and Maps

The technique of keying numbered signs to booklets can be used on many interpretive trails. This method is applicable in some situations, especially if vandalism is uncontrollable or if your group would be more interested in producing a publication than in making signs. However, for providing optimum involvement in the project as well as producing a unique trail, the number-booklet technique is not recommended. On the other hand, a booklet as a supplement to interpretive signs does offer opportunities to provide more information than a sign. It can serve as a souvenir, and as publicity and future reference material. Also a booklet can be used in fund raising and can present different messages for different audiences. The disadvantages of the number-booklet system include printing expenses; keeping copies available for trail visitors; burdening visitors with something to carry instead of freeing their hands to touch the earth and natural objects so unfamiliar to many; and littering.

Vandalism

There is no sure way to prevent vandalism, but this in itself will be a lesson for the young trail makers. It will expose them in a very real way to the frustrating problems faced daily by the administrators of parks, historic monuments, and other public facilities.

In some places vandalism is a serious problem and prevents any use of trail signs other than just numbers or names that are fastened securely to trees or posts and keyed to brochures. In other areas, vandalism is no problem at all. For more information, see the appropriate refer-

ence in the last section of this booklet. It includes some of the following tips:

— The best prevention for vandalism is good public relations with local youngsters and trail users.
— Foster community pride in the trail.
— Encourage use on a reservation basis and supervise all use.
— Constantly maintain trail and signs.
— Have duplicate signs for immediate replacement of those that are damaged or stolen.
— Crosspieces on the buried ends of posts prevent easy removal.
— Because littering is visual vandalism, it is included here. This blight can be reduced by providing strategically placed litter cans and emptying them regularly, making maps or brochures attractive and useful, and charging a nominal fee for maps or brochures.

Tips on Trail Design and Construction

1. When planning the exact trail location, use plastic flagging, cloth strips, or tissue paper. Never use blaze marks, as they are permanent and invite vandalism.

2. Be sure to clear the trail, removing exposed roots, protruding rocks, stumps, and other potential hazards. Sometimes part of the trail can use existing woods roads or hiking trails.

3. Remove dead, overhanging limbs. Avoid hazards such as traffic and the edges of cliffs and steep river banks.

4. *Length*: A long interpretive trail is about one mile. Some trails are only one-quarter mile long. Although situations vary, short trails with a walking time of less than one hour will reduce fatigue and keep interest high. Loop trails are most convenient.

5. *Width*: Trails used primarily by individuals or families should be 2–4 feet wide. For groups and school classes, 4–6 feet is suggested. For the latter, be sure to provide sufficient space in front of an object so that the group can gather to study it. Prune vegetation back by an arm's length on both sides of the trail and overhead.

6. *Surface*: A natural tread is both practical and least objectionable from an aesthetic standpoint. In muddy areas, board walks, half-logs, wood chips, or a stretch of "corduroy" made from cleared trees add comfort and are interesting.

7. Experts don't agree on how many marked features a trail should contain. Some suggest 15–18 per half mile, but other believe that this is not important or that you should always be able to see the next sign. (In this project, the number of features will depend on the size of the group.)

8. Avoid straight-line approaches. A winding, one-way trail affords a sense of seclusion and offers an opportunity for surprises.

9. Take advantage of scenic views. It may be necessary to clear a section of trees or brush to expose a view.

Project Plan

The following six-part sequence has been designed to guide the development of an interpretive trail from start to finish. It could be accomplished in six two- or three-hour sessions, but should be modified to meet *your* needs and circumstances.

Step 1: Introduction

The Concept and Overall Plan

1. Introduce the concept of interpretation and the subject of the public's need for environmental education. Discuss self-guiding trails as a tool of environmental education.

2. Introduce the project in its entirety: what it involves, what the group members will do, and what time schedule is planned.

3. Talk about interpretive techniques used on self-guiding trails; show examples of various signs and devices; and use slides, if possible, to illustrate both the steps in developing a trail and a finished trail in actual use.

The Trail Area

1. Identify a suitable area for the trail (often there is an obvious location; in other cases it may require some thought and investigation).

2. Visit the trail area and lead a nature walk, familiarizing the group with the highlights of the property (including its history) and the ecology. (If you do not feel qualified, ask a biology teacher, extension agent, or other local resource person to lead the excursion.)

3. Lay out the trail route, flagging it with strips of cloth or plastic tape. (Route selection may best be accomplished by the leader alone rather than by the group).

Step 2: Research and Planning

Outdoors

1. Divide the trail into as many sections as there are members. Adjust the flagging or use a different color flag to mark the beginning and end of each section.

2. Walk around the trail, asking for a volunteer for each trail section.

3. For each section, assign the following responsibilities:

a. Alone, quietly examnie the trail section and become acquainted with its features.
b. Select a first and second choice of features to interpret.
c. Decide how, in general, the features can best be interpreted, what kind of sign or device to make, and exactly where to position it.

4. When the last section has been assigned, go around the trail again, this time listing the selections of each member, taking care to prevent duplication.

Indoors

1. Following the selection and approval of the feature to be interpreted, the interpreter's job is to find out all he can about the object or process. If possible, provide reference materials for this purpose. Otherwise, the research can be done independently at a library.

2. Each member should then condense the information into short, concise, and interesting interpretive messages. Ask that plans be prepared, using the form on page 21 as an example. Some interpretation can be done largely with devices rather than written messages. Even so, a plan will help to guide the effort.

3. Review each plan, checking for spelling, grammar, and technical accuracy. Make notations for suggested improvements, if any. The plans will also show what quantities of materials will be needed to construct the sign.

Step 3: Sign Construction

1. Return plans to be used as guides for actual sign construction.

2. *Demonstrate* the use of lettering equipment and the use of other materials, including polyester casting resin and self-adhesive plastic.

3. Assist as needed as the group prepares the sign copy and the artwork. Let each individual work at his own pace.

4. Assign an assistant to supervise resin pourings. It is also advisable to designate separate areas of the room or building for woodworking, resin work, typing, and other activities.

5. Cut and varnish necessary sign backings; paint posts with a preservative. (Each member should be completely responsible for preparing his own materials.)

Step 4: Sign Completion and Installation

1. When dry, polyester signs should be cut to shape, sanded, drilled, and mounted by attaching to the backing with small screws.

2. All signs and devices should be completed.

3. Demonstrate how to plant a post firmly.

4. Assist members as they erect posts and signs on their sections of the trail.

5. Each member should be responsible for preparing a section of the trail including clearing brush, carefully pruning overhanging branches, ledging if the land slopes steeply, and the like. (Stress the importance of aesthetics and a natural appearance.)

Step 5: Review and Plan for Maintenance

1. Review each sign as a group, discussing points covered previously both about the area's ecology and the interpretive technique developed.

2. (Optional). Have each member list the three best signs or devices (based on imagination, effectiveness, and workmanship). Present the winners with a small token such as a *Golden Nature Guide* booklet.

3. Discuss maintenance needs that are sure to arise (limbs across the trail, erosion, damaged or missing signs, storage, and similar problems). Develop specific plans for maintenance by dividing duties and assigning members to check the trail on a scheduled basis. (Perhaps members can be responsible for the section of the trail that they prepared.)

Step 6: Plan and Practice for a Trail Walk Service (optional)

1. Ask for volunteers who would be willing to serve as trail guides for groups.

2. Review the techniques of leading nature walks or invite a local conservation educator to present a program on this topic.

3. Have the volunteers develop their own field presentations for the trail (the signs can serve as outlines upon which they can expand).

4. Practice with the group.

5. Publicize the service through local newspapers, radio, and direct mail to local schools, churches, scout groups, and other interested organizations.

Miscellaneous Assignments

This project is designed to provide maximum involvement for each individual regardless of his level of ability. However, there will be a few youngsters who will not be motivated toward interpretation as such. These members can still be involved in one of several ways: (a) as general assistants; (b) to build steps, rustic bridges, benches, or other non-interpretive facilities; (c) to design and make the entrance sign and directional signs for forks in the trail, short cuts, and the like; (d) to prepare a trail sign crediting the group that developed it and the property owner; (e) to take photos and prepare publicity or trail maps and booklets if they are to be used.

Sources of Additional Information

Trail Design and Construction

Developing the Self-Guiding Trail in the National Forests. U.S.D.A. Forest Services, misc. publication 968, Sup. of Documents, U.S. Government Printing Office, Washington, D.C. 20402. 18 pp., 1964. (20).
Written for U.S. Forest Service personnel; contains many helpful suggestions.

Directory of Interpretive Materials. Compiled by Grant W. Sharp and Robert K. Searles. The Association of Interpretive Naturalists, 6700 Needwood Rd., Derwood, Md. 20855. 24 pp., 1969. ($1.00).
A valuable reference to sources of products and suppliers.

Easy-to-Use Lettering Methods and Materials. Victor R. Stephen. Dept. of Communication Arts, N.Y.S. College of Agriculture and Life Sciences, Cornell University, Ithaca, N.Y. 14850. 4 pp., 1968.
Synopsis of various techniques and materials for lettering signs, exhibits, and other visual aids. Well illustrated with photographs.

"Get Double Duty from Nature Trails." James R. Fazio. *The Communicator,* Spring, 1972.
Detailed description of nature trail development project as tested on 50 4-H youngsters at Camp Arnot.

Guide for Developing Nature Trails, A. Cooperative Extension Service, University of New Hampshire, Durham, N.H. 03824. Extension folder 66. 11 pp., 1968.
General, contains some good trail feature ideas.

Handbook of Skills for Preparing Trail Signs and Exhibits. John A. Weeks and Ed Morse. Rogers Conservation Education Center, N.Y.S. Dept. of Environmental Conservation, Sherburne, N.Y. 8 pp., 1971.
A how-to for constructing trail signs using various techniques.

"How to Lay Out a Nature Trail." Leroy F. Irving. *The Conservationist,* June-July, 1968.

Nature Downtown. U.S. Dept. of the Interior, Sup. of Documents, U.S. Government Printing Office, Washington, D.C. 20402. 12 pp., 1970. (20¢).
Concentrates on how elements of aquatic life can be brought into cities at nominal cost. Illustrated; good trail sign ideas. Some information can be adapted to other situations.

Techniques to Reduce Vandalism on Nature Trails. Compiled by George J. Knudsen. Available from 6700 Needwood Rd., Derwood, Md. 20855. 9 pp., 1967.
Mimeographed synopsis of Association of Interpretive Naturalists (AIN) meetings on these topics; good information from those who know the problem best.

Trail Planning and Layout. Byron L. Ashbaugh. National Audubon Society, Nature Centers Division, 1130 Fifth Ave., New York, N.Y. 10029. 104 pp., 1967. ($3.00).
Probably the *most* helpful publication available on the subject.

Natural History

Cornell Science Leaflets. N.Y.S. College of Agriculture and Life Sciences, Cornell University, Ithaca, N.Y. Contact Cooperative Extension agent in your county or write for the free *Extension Bulletin Catalog.*
Many subjects covered: written primarily for teachers. Booklets 32 pp., available for 10–25¢ each.

Fieldbook of Natural History. E. L. Palmer. McGraw-Hill Book Co., New York, N.Y. 666 pp., 1949.
Perhaps the most information in this field under one cover. Data and ecological information on most common species of flora and fauna.

Golden Nature Guide Series. Golden Press, New York, N.Y.
Elementary and well illustrated; available on a variety of subjects at about $1.00 each.

Handbook of Nature Study. Anna B. Comstock. Comstock Publishing Associates, Ithaca, N.Y. 14850. 937 pp. 1939.
Wide variety of natural history information plus teaching techniques.

Know Your Trees. J. A. Cope and F. E. Winch. N.Y.S. College of Agriculture and Life Sciences, Cornell University, Ithaca N.Y. 14850. Cornell 4-H Club Bulletin 85. 71 pp., 1964. (50¢).
Summer and winter keys plus simplified data on 50 of New York's most common trees.

Life of the Pond, The. William H. Amos. McGraw-Hill Book Co., New York, N.Y. 232 pp. 1967.
One of the best of many books on aquatic life.

Living Earth. Peter Farb. Harper and Row, 49 E. 33rd St., New York, N.Y. 10016. 178 pp. 1968. ($1.60).
"We live on the rooftops of a hidden world."

Peterson Field Guide Series. Houghton Mifflin Co. Boston, Mass.
Thorough and well illustrated; available on variety of subjects (wildflowers, insects, birds, seashells, and others) at about $5.00 each.

Trees Are History Books. Charles E. Mohn. Audubon Nature Bulletin, Series 21, No. 6.
An account of the amazing tales that can be told by studying tree stumps.

Miscellaneous

Conservation Study Area, A. Pamphlet available from U.S.D.A. Soil Conservation Service, Washington, D.C. 20250.
Suggestions for using school grounds as an outdoor laboratory.

"Earth is Our Home, The." N.Y.S. Dept. of Environmental Conservation, Division of Conservation Education, Albany, N.Y. 12201.
Selected reprints from *The Conservationist.*

"Good Will Toward Men." James R. Fazio. *The Northern Logger and Timber Processor.* December, 1968.
Describes how a paper company uses interpretive trails in its public relations program.

Leading a Field Trip. Kathleen Redmond. Dept. of Natural Resources, N.Y.S. College of Agriculture and Life Sciences, Cornell University, Ithaca, N.Y. 14850. 3 pp. 1971.
Many useful tips on planning and guiding field trips or nature walks.

Manual of Outdoor Interpretation, Edited by Joseph J. Shomon. National Audubon Society, Nature Centers Division, 1130 Fifth Ave., New York, N.Y. 10038. 104 pp. 1968. ($3.00).
General coverage of outdoor interpretation: philosophy, techniques, and excellent illustrated examples.

Nature Hike Themes. George J. Knudson. Association of Interpretive Naturalists, 6700 Needwood Rd., Derwood, Md. 20855. 22 pp.
Seventy themes for naturalist-led hikes; suggestions for material to include in each hike.

Sand County Almanac and Other Essays on Conservation, A. Aldo Leopold. Oxford University Press, New York. 269 pp. 1966. ($7.50).
A classic in the philosophy of land ethics. The essay "Odyssey" is an invaluable lesson in ecology.

"Trails that Tell Stories." Ellsworth R. Swift. In *Outdoors, USA,* 1967 Yearbook of Agriculture, U.S.D.A. Sup. of Documents, U.S. Government Printing Office, Washington, D.C. 20402. ($2.75).
This chapter in an outstanding book cites several examples of trails that were developed by various schools and other organizations.

Bibliographies

Conservation Books. Catalog from The Interstate Printers & Publishers, Danville, Ill. 39 pp.
Includes many books appropriate to nature trails and other interpretive activities.

Conservation Circular Index and Price List. Dept. of Natural Resources, College of Agriculture and Life Sciences, Cornell University, Ithaca N.Y. 14850. Available from the Cooperative Extension agent in your county.
Lists natural resource topics covered in past 10 years of this quarterly.

"Conservation Library." Informational leaflet from *The Conservationist.* N.Y.S. Dept. of Environmental Conservation, Albany, N.Y. 12 pp.
Comprehensive list of natural history reference books by subject. Addresses, descriptions, recommendations by authorities.

Selected Sources of Information for Interpretive Naturalists. Compiled by Martha D. Glascock, Nancy E. Christie, and Clifford E. Knapp. Association of Interpretive Naturalists, 6700 Needwood Road, Derwood, Md. 20855.
One of the most valuable references available for locating additional sources of information.

Periodicals

Communicator, The. The quarterly journal of the N.Y.S. Outdoor Education Association. Membership, $5.00/yr. Elizabeth Dunford, Chrm. of Membership. 4122 Makyes Rd., Syracuse, N.Y. 13215.

Conservationist, The. $2.00/1 yr.; $5.00/3 yrs. N.Y.S. Dept. of Environmental Conservation, Albany, N.Y. 12201.

Environmental Education. $10.00/yr. Dembar Educational Research Services, Inc. Box 1605, Madison, Wisc. 53701.

Additional Information

The best source of information and ideas is other trails and interpretive centers. Something can be learned from every trail you visit. Visit some of these trails with your group and take notes of the techniques that you feel could be used effectively on *your* trail. Modify the ideas gleaned, either from reading or visiting, to your particular situation, and never be satisfied until your trail is the best possible.

One of the outstanding interpretive centers in New York State is Rogers Conservation Education Center at Sherburne. Located on New York State Route 80, about 50 miles south of Syracuse and north of Binghamton, the center features a variety of natural and agricultural settings. Consequently, there are several trails and other interpretive opportunities.

Directories of other interpretive centers can be purchased from the National Audubon Society, 950 Third Avenue, New York, N.Y. 10022 and the National Science for Youth Foundation, 145 E. 52nd Street, New York, N.Y. 10022. Another directory, entitled *Nature Centers of New York* (Conservation Circular, Dept. of Natural Resources, N.Y.S. College of Agriculture and Life Sciences, Spring, 1971) is available from your Cooperative Extension office.

A table-top exhibit with trail sign samples is available on a reservation basis from the Department of Natural Resources at Cornell for teacher workshops and similar *leader* training sessions. Contact the 4-H agent in your county. There is also a slide set with a script.

APPENDIX A

Name: F. H. Member

Club: Pika Conservation Club

County: Dogpatch Co.

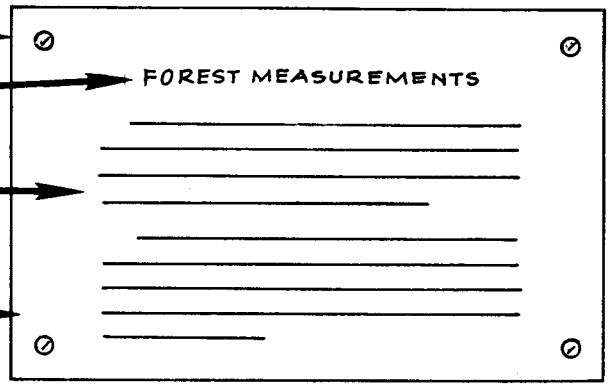
Date: February 15, 1972

List of materials and methods:

(Draw connecting lines to parts of sign each will be used for)

1. 5" x 7" white card
2. Press-on letters
3. Message to be typed
4. Sign embedded in polyester resin

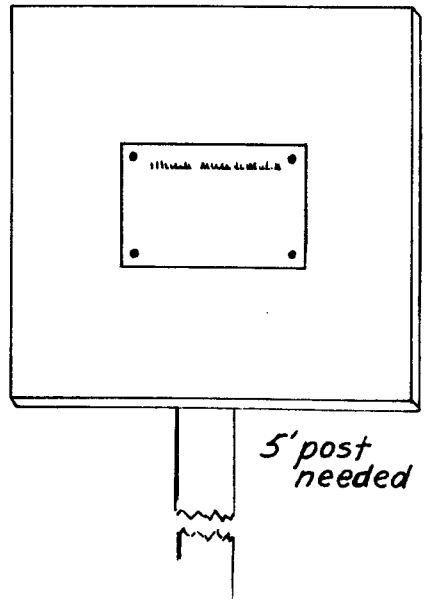
Sketch interpretive sign:



Describe how you will mount your sign (make a sketch if it will help):

Sign will be screwed to 1" x 12" x 12" board. (This will demonstrate "board foot" mentioned in message.)

Color will be left natural, but I will coat with clear varnish.



(over)

On this page, print or type your interpretive message exactly as you plan for it to appear on your sign:

FOREST MEASUREMENTS

A cord is a standard measure of pulpwood just as a bushel is for apples. Each cord is 4' x 8' x 4'. An example of this is the pile of wood to your left.

Lumber is bought by the board foot. One board foot is 1" x 12" x 12". The backing for this sign is one board foot. The log on your right contains 65' board feet.

APPENDIX B.
Project Materials

Much of the following equipment and material is optional. Its use depends on the trail and interpretive plans of its developers.

_____ wood scraps (miscellaneous sizes)
_____ 3/8" outdoor-grade plywood, sanded
_____ posts (type depends on what is preferred and what is available)
_____ nails (various sizes; aluminum for those on face of sign or device)
_____ rustproof screws
_____ small hinges
_____ painted thumbtacks
_____ saws (including fine-tooth saw for shaping polyester signs)
_____ vice
_____ hammers
_____ screw drivers
_____ paint brushes
_____ sand paper
_____ plane
_____ square
_____ drill
_____ pliers
_____ scissors
_____ rulers
_____ hand cleaner (Lava soap or similar product)
_____ old newspapers
_____ woodburning pen(s)
_____ self-adhesive plastic
_____ 5" × 8" white index cards
_____ Mylar sheets
_____ polyester casting resin and catalyst
_____ Fiberglas (heavy duty mat; "angel hair" optional)
_____ paper cups
_____ rolling pins or smooth, round bottles
_____ stirring sticks
_____ press-on letters
_____ letter guides
_____ typewriter
_____ India ink, pens, color pencils
_____ preservative spray
_____ oil paints
_____ marine varnish or similar clear paint
_____ wood preservative (for posts)
_____ Other. _____
_____
_____

APPENDIX C.
Project Costs

It is difficult to estimate costs because much depends on available material and equipment, potential donations, the size of the group, the length of the trail, and the amount of interpretation planned. However, $1.00 per member would probably be a reasonable cost estimate for most situations.

The following tables are based on experience with 4-H campers at Cornell University's Arnot Forest.

Table 1. Cost Comparison of Consumable Materials for Three Types of Interpretive Signs Approximately 5" × 8" in Size

Materials	Sign Type: Wood burnt	Clear, self-adhesive plastic	Polyester resin
Posts*	no cost	no cost	no cost
Plywood (3/8" sanded, outdoor grade)	6¢	7¢*	7¢*
Self-adhesive plastic	—	8¢	—
Heavy Fiberglas mat	—	—	23¢
Polyester resin	—	—	39¢†
Press-on letters (if used)	—	<75¢	<75¢
Other (ink, fixative spray, paint, etc.)	5¢	9¢	14¢

*In most cases, reusable for several projects.
†Prices range from $7.00 to $15.00 per gallon depending largely on quality. Low quality hobby type is satisfactory for signs and is used in this calculation. A 5" × 8" sign uses approximately 8 oz of resin.

Table 2. Approximate Costs of Reusable Materials needed to Develop Interpretive Signs Described in This Manual

Material	Approximate cost
Mylar sheets (molds for polyester signs)	$3.20 per 25" × 20' roll (enough to make about 5 signs)
Fine-tooth saws	$1.00 each (or less)
Woodburning pens	$2.00–$3.50 each
Other tools and material	(depends on what is needed to supplement supplies on hand)

4-H leaders may obtain free copies from their county extension office. No free distribution to others. Single copies 35 cents each.

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