

4-H FORESTRY PROGRAM -- UNIT B

FORESTS



member's manual

Contents

The 4-H Forestry Program 3

I. B-1 Introduction To Forest Values 3

Meeting:

 1. Finding out About Forests 3

 2. Why Forests are Valuable 4

II. B-2 The Forest Ecosystem 4

Meeting:

 3. What Forests Do 4

 4. How Climate, the Land and Soil Affect Forest Growth 6

 5. How Animals and Insects and Plant Factors Affect Forest Growth 10

III. B-3 Forest Development and Forests Regions 11

Meeting:

 6. How Forests Age 11

 7. Forest Regions and Cover Types 14

IV. B-4 Forest Management 16

Meeting:

 8. Gathering the Facts 16

 9. Management Practices 18

V. B-5 The Dollar Value of Forests 21

Meeting:

 10. Forests Employ People 21

 11. Earning Money from the Forest 22

 Conclusion 23

 Glossary 24

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The 4-H Forestry Program

Educational Aids in the National 4-H Forestry Program consist of three parts. Unit A—Trees—explains what trees are, how they grow, why they are important and what characteristics identify them. Unit B—Forests—is about trees as part of the forest ecosystem, what values people hold for them, and how they are managed. Unit C—Forestry—is concerned with how people manage trees and other forest resources which provide wildlife shelter, recreational areas and wood for soil and water supplies. The most logical way to use this program is to start with Unit A and take the sections in order through Unit B. Then select those subunits of Unit C in which you have the most interest. More advanced members may start with Unit B—Forests—and refer to Unit A—Trees—as necessary.

Be sure to complete all sections of Unit B before you attempt to advance in the program. Do not try to crowd all the material in this manual into one year's time. Rather, work at a pace that will enable you to fully understand the basic concepts of forests as they are presented here. There are five natural divisions within the text—the Introduction plus the four major topic areas. These divisions will allow you to take a break at the end of the year and then resume with another topic area next year. If you do this, you will find that the study of forests will be more interesting, and you will be better prepared to advance into the various subject areas within Unit C.

B-1 Introduction to Forest Values

Meeting 1

Finding Out About Forests

Have you ever walked into a forest, stopped for a moment and looked around? If so, you probably sensed that forests are wonderful places. You didn't have to read about forests to realize this. Now, however, you may want to study forests in more detail to find out why they are so wonderful.

In Unit B you will observe things that happen in a forest. You will find out why forests are valuable and why people are glad we have them.

We sometimes think of the forest as simply a group of trees and other plants covering a given area of land. As you work in this unit, you will begin to think about the forest as something more than just trees growing together. You will see the

interaction of plants, animals, soil and other things in the forest. You will learn why this interaction is so important to people. So begin thinking about all that a forest contains.

The workings of the forest are complex and require careful study. But there are fun ways to find out how a forest works. Get a notebook, and keep a neat and accurate record of all that you do in your 4-H forestry project. Write down the dates when you begin, what you do and how your tasks turn out. Become a scientist and investigate how a forest works!

Make plans to visit a forest. Find a wooded area that you like and begin to spend some time in it. The area does not have to be large. It can be a park, state or national forest, a farmer's woodlot, a few trees near a stream or even a grove of trees in the city. Try to visit this area at least once during your study. If possible, go again in a different season of the year. You will see some amazing changes!

Use this manual to help you think about what to look for in the forest. Before you go, make a list of things that you would like to study. Then take a friend along and talk about what has happened and what is happening in your forest.

Begin asking questions about how your forest grows. Think as a real scientist would. Use the glossary in the back of this manual to help you with words or phrases that are not clear. Check references in handouts, books and encyclopedias, too. Since one forest can be very different from another, facts you gather about your forest may vary from the information on other forests that you find in references. In your scientific work you can examine and describe what exists at the time of your visit. These bits of information will become the information that you will work with. Each of the "Things You Can Do" covers some important part of the study of forests. Complete as many as you can. You may work as an individual or as a team member. Remember to write down what you have learned after you make your observation. You may want to repeat some activities at different times and places. Your results may show surprising differences. Any scientific measurements or observations made at different times and places may produce new results that differ from your original results.

Things You Can Do

1. Find a forested area that you can study. The area does not have to be large. Just make sure to find one that you will be able to visit several times during the course of your participation in Unit B of the 4-H Forestry Program.

Meeting 2

Why Forests Are Valuable

In Unit A you learned that trees, whether small or large, have value. When they group together to form the basis of a forest, trees have special value. Forests provide us with watershed protection, oxygen, recreational opportunities, windbreaks, noise and vision buffers, and forest products. Some forests are valued simply for their beauty.

We are lucky to live in a land with such vast forest resources. Although most countries have forests, few compare to those of North America either in size or value. The forests in Eastern North America were used by the early settlers for homes, heat and transportation. Forests were used by the settlers to build our country's cities, railroads, farms and factories. Forests have played an important part in our nation's history.

Here are some reasons why forests are valuable to us today.

1. **Water:** Forests have spongy surfaces that soak up water and help to control soil erosion and water runoff. They help supply our water needs, especially in the critical summer months. Forests help to slow the melting of snow in winter and stream runoff in warmer months.

2. **Oxygen:** Growing forests produce oxygen, which we need to live. Also, they remove carbon dioxide from the air, which is harmful at too high a level. An acre of a vigorous young forest can produce three tons of oxygen each year. This is enough for the requirements of 18 people.

3. **Recreation:** Most people enjoy the beauty and sense of peace that a forest offers. As a result, the forest serves as a recreation area for hiking, camping, hunting, studying or resting.

4. **Forage:** Livestock may find grass and other nutritious vegetation in a few forest types. Although overgrazing can be bad, moderate grazing may remove plants that compete with trees in the forest understory.

5. **Windbreaks and Shelterbreaks:** These slow down the force of the wind on buildings and land. They are planted in three or more rows at right angles to the direction of the prevailing wind, they protect land from wind erosion and topsoil loss. The leaves of forest trees intercept dust particles in the air, and so reduce air pollution.

6. **Noise and Vision Buffer:** Forests and groves absorb noise made by automobiles and other sources, especially in the city. They also screen out unpleasant views from roadways and in residential areas.

7. **Forest Products:** Forests provide many products, including lumber, plywood, pulp and

paper. They also provide seed cones, floral greenery, fuelwood, resin and turpentine, berries and bark. Some of these products can be harvested each year while the trees are growing.

Things You Can Do

1. Try to remember the last time you visited a forest or wooded area. Write down what you saw, heard, smelled and touched. Make a record of what you liked and disliked in the forest. Draw a picture or find a photograph of what you think were the most interesting plants and animals. As you proceed through this manual find out why your favorite plants grow where they do, and where your favorite animals live. Make a drawing or take a photograph of what you see.

2. Make your own list of reasons why the forests around you are valuable. Is there now more or less land in your area in forests than 10 years ago?

3. Start making a list of what your forest area contains, such as forms of wildlife and insects. Also list things like trails, fences and other objects that people have put into the forest. Begin making a division between what is natural to the forest and what has been done by people. Keep adding to this list each time you think of something else that should be included. By the time you finish this manual you should have a long list.

4. Consider starting work on an exhibit of city landscapes showing how trees and shrubs are planted to provide shade and beauty while reducing air and noise pollution.

B-2 The Forest Ecosystem

Meeting 3

What Forests Do

Forests, grasslands, oceans, rivers, lakes and deserts are the major ecosystems in the world. The word "eco" is from a Greek word meaning "house", or place to live. An ecosystem is an environment where different plants and animals interact with each other and with other parts of nature. In a forest, trees interact with other plants, the soil, wildlife, the air, water courses, micro-organisms and other animals. All of these things interacting together make up the forest ecosystem.

Trees play a major role in the forest ecosystem. They affect how well all other organisms in the forest live. Trees give food and shelter to many wildlife species. Trees bring minerals from the subsoil, and change them into useful fertilizer that

is left on the forest floor for other plants. Trees such as the alder and locust help to change the nitrogen in the air into a form that plants and animals can use. They give oxygen, food and shelter to many wildlife species.

On the other hand some trees can limit the growth of plant and animal populations. For example, a natural chemical from the roots of the eucalyptus and black walnut trees limits the growth of other tree species nearby. Some trees have leaves or fruit that are poisonous. Trees use these features to compete with other plants for survival.

Many relationships exist between tree species and other forms of life in the forest. Although we are continuing to learn more about these relationships through scientific research, many of them are still unknown to us. Since we still have a lot to learn about forests, we must be very careful whenever we change the forest ecosystem.

If a forest contains many types of plant and animal species, it is more complex. One small change does not change the whole forest. But in any forest where most of the trees are the same species, a small change can have a huge effect. A forest of mostly jack pines can be seriously damaged by insects called sawflies. These insects eat the needles of the jack pines. If a few extra warm days come in the spring when the insects hatch, their numbers greatly increase. Their effect

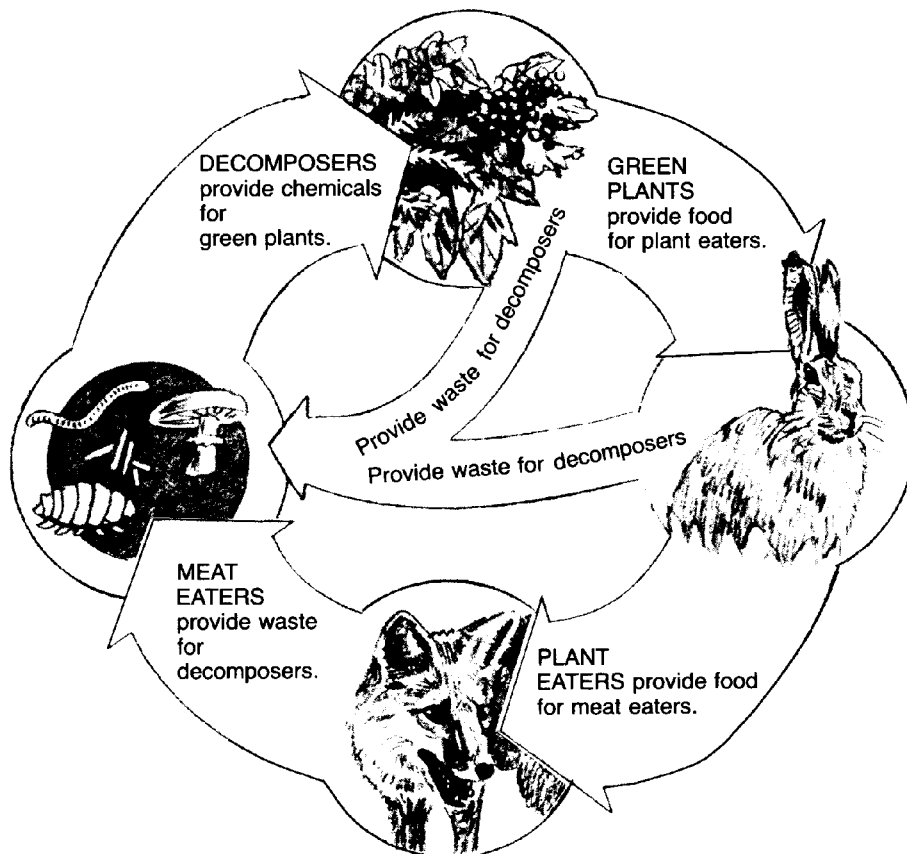
on the jack pine is then drastic, and a large part of the forest can be destroyed due to those few extra days of warm weather.

Food Chains

We hear a lot these days about people recycling glass, tin, aluminum and other materials. In the past we threw such things away. The forest does not throw anything away. In the forest all the organisms are interconnected, and everything is recycled.

We know from Unit A that plants in the forest get their food through photosynthesis. They use the sun's energy to make food from water, soil nutrients and carbon dioxide. Meanwhile animals and insects feed from the plants. These include herbivores like the deer and rabbit, and insects such as the gypsy moth, ladybug and sawfly. These animals and insects in turn provide food for other animals and insects. Carnivores such as the wolf and the mountain lion hunt the deer, and predator insects eat the leaf feeding insects. A predator may become prey for other predators. An insect-eating bird may be eaten by a hawk, or a fox by a bobcat. Some animals, such as foxes and bears, as well as people, eat both plants and animals, and so are called omnivores. This process of organism feeding upon another organism is called a grazing food chain.

Food Chain



Another food chain is called the food chain of decay. All dead organic matter returns to the soil to change into simpler matter. A dead tree on the forest floor rots, or decomposes. When an animal dies, its flesh and bones become part of the soil. Animal and plant material is broken down by tiny bacteria, fungi and small animals in the soil. These organisms, called decomposers, change the dead organic matter into substances that plants can use again as food. In the meantime, the carbon dioxide held in the tissues of the decomposers is released into the air. To complete the cycle, plants use the minerals, nutrients and carbohydrates for food.

In drier climates where the ground is not so moist, fire often takes the place of decomposition in returning dead material to the soil.

The Water Cycle

Another cycle that takes place in the forest is the water (or hydrologic) cycle. When rain or snow falls in the forest, what happens to it? We already know that some of it is used by plant leaves in photosynthesis. More is lost as it goes back into the air through evaporation. Another part becomes runoff into streams or rivers above the ground. Some of the water soaks into the soil and heads toward the water table, the level of water underneath the ground. And some is taken from the soil by the plants.

How much water does a forest hold? In heavy rainfalls or deep snow, a forest has a lot of water. If one inch of rain would reach the forest floor at a time, the forest would have 27,000 gallons of water for each acre, or 250,000 liters per hectare. Trees build about 50 pounds (21½ kilograms) of water into 100 pounds (43 kilograms) of wood. At the same time about 1,000 times that amount is lost through their leaves into the atmosphere.

All of this moisture raises the humidity level in the forest. The water that has passed back to the atmosphere through evaporation can be used to bring more rain and snow, and again the cycle is completed and ready to repeat.

At what time of the year does the forest floor receive most of its water? In what season do trees in the forest grow the most, and why?

Things You Can Do

1. Learn more about the *Food Chain of Decay*. Find a piece of rotting wood in your forest. Look at it carefully. What is happening to it? Turn it over so you can see underneath. Do you see any soil animals or other creatures at work? Feel the wood as it is being broken down into soil. How does it feel?

2. Tracking the "*Wild Raindrop*". Most people don't realize all the things that happen to a raindrop from the time it lands on a plant until it reaches a stream. Go out on a rainy day. Enjoy the different colors, sounds, smells and feelings. Try tracking a "wild raindrop". To be comfortable, wear a good raincoat, rainhat and boots. Take along paper and a pencil in a clear plastic bag to record where the raindrop goes.

Find the answer to the following questions:

a. What is the raindrop's trail downhill through the stands of different tree species?

b. Where does the raindrop go after it reaches the leaves on the forest floor?

c. Are any raindrops lost through evaporation along the trail?

3. There are other cycles operating in the forest besides food chains and the water cycle. As a forest scientist you will want to know about them as well. Ask your leader or other forest authority about the carbon, nitrogen and oxygen cycles. You may want to draw pictures of these cycles, complete with arrows showing the interconnecting parts.

4. Begin thinking of your own imaginary forest. Give it a name, and place in it your favorite animals and plants. You will be making more use of this forest in later meetings.

Meeting 4

How Climate, the Land and Soil Affect Forest Growth.

Imagine a forest thousands of years old, or a tree growing so high that you could not see its crown. Or imagine a cool pine grove in the desert. These are very unlikely, with a few important exceptions. Most forests are prevented from growing so old, to such heights or in such harsh places. Their growth is controlled by ways that we call limiting factors. The main limiting factors for forest growth are climate, soil and land forms, animals, insects and plant factors.

Climate

Climate is the most important factor in determining where trees can grow. Climate controls how much warmth and moisture a forest receives. Most trees need at least 16 inches of rainfall (40 centimeters) a year to grow. Certain trees grow best in climates with heavy rainfall. Others grow in climates with many days of bright sunlight. Some trees grow in climates where few other plants can grow, because they have adapted to conditions in such places as along windy seacoasts or high in the mountains where the air is colder.