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DISCOVERING PRINCE WILLIAM FOREST



UNIVERSITY OF GEORGIA

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Prince William Forest Park, in Virginia 32 miles south of Washington, D.C., is a recreational area administered by National Capital Parks, National Park Service, U.S. Department of the Interior.

Text by Bill Perry

Drawings by Betty Fraser

DISCOVERING PRINCE WILLIAM FOREST

THE STORY OF A WATERSHED

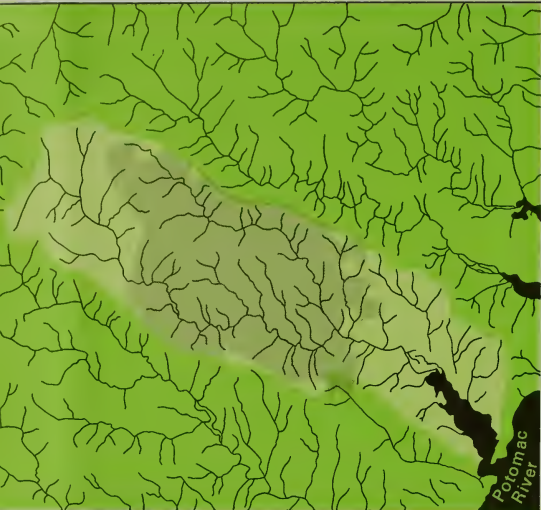
When you walk the trails of Prince William Forest Park, you are retracing the steps of Indians who dwelt here centuries ago. This forest sheltered the Indian and provided him with most of his food and clothing; in fact, it was the source of almost everything he required. He did get fish from the Potomac River—but he used dugout canoes fashioned from the trunks of tall yellow-poplars that grew in this forest (and still do), and constructed his fish traps with poles cut from the forest. Those dugout canoes were also used in trading with other Indians to obtain some things he could not find or produce here.

The forest was the home of wild animals, too: deer, bear, elk, cougar, and many smaller creatures. Even the woodland bison, close relative of the plains bison, or “buffalo”, is believed to have lived here.

But in the 17th century the white man arrived. Pushing the Indians back, he began to turn this land to his own uses. The forest was cleared, the soil was plowed, and crops such as tobacco and corn were soon being grown in great quantity. Farm products and lumber and fur were shipped far and wide through the port of Dumfries, which grew to become the second largest on the Atlantic seaboard, surpassed in importance only by New York.

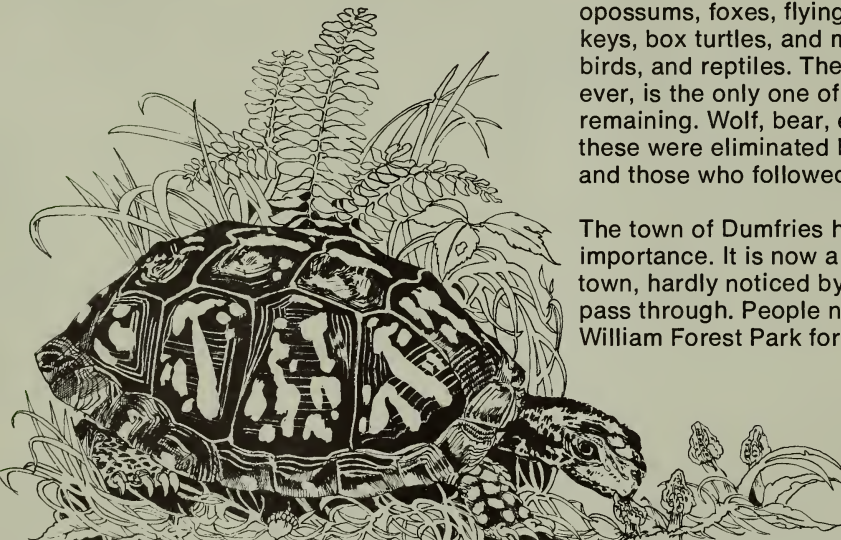
Dogwood, an understory tree of Prince William Forest.





Quantico Creek Watershed

Box turtles, strictly land dwellers, feed upon insects, snails, earthworms, berries, mushrooms, and many other items.



By 1900, the scene was quite different. Ships no longer visited Dumfries, and farms lay idle in a land stripped of its forests and fertility. The Indians had long ago been driven from the region.

Eventually most of the Quantico watershed (the land that drains into the Potomac through Quantico Creek) became the public park you see today. But the park's woodland is not the same forest the Indians roamed. You will find few of the giant trees under which they stalked the whitetail deer. Bare rock shows in many places that once were covered by a mantle of soil. And some of the trees and other plants you will find here were not known to the Indians. They were planted by the farmers or brought into the area accidentally.

There is still wildlife here. In Dumfries marsh great blue herons and other wading birds fish where formerly a deepwater harbor sheltered sailing ships. The park is home to opossums, foxes, flying squirrels, wild turkeys, box turtles, and many other mammals, birds, and reptiles. The whitetail deer, however, is the only one of the larger animals remaining. Wolf, bear, elk, cougar—all of these were eliminated by the early settlers and those who followed.

The town of Dumfries has lost its fame and importance. It is now a quiet residential town, hardly noticed by the motorists who pass through. People now come to Prince William Forest Park for recreation.

THREE PIONEERS

The virgin woodland found by the Europeans who came to this land was part of a vast forest that extended from Hudson's Bay to the Gulf of Mexico. The pioneers harvested the forest's products—lumber, fur, and game—with no thought for conservation. Many trees were felled and burned just to make way for crops. Slopes were plowed to plant corn and tobacco—and these do not have the soil-building and soil-holding properties of forest trees. Grown year after year, these two crops removed minerals from the soil—minerals that were not replaced through scientific application of fertilizer. Much of the soil was washed down the steep slopes by rain and carried by the streams into Dumfries harbor. Gradually the mantle of soil became thinner and poorer, the productivity of the farms decreased, and one by one the farmers aban-



doned their holdings. The harbor became so clogged with silt that ships could no longer enter it, and the seaport died.

By the early 20th century the Quantico watershed was a ruined land, with rundown farm buildings, badly eroded fields, and a sparse population eking out a bare existence. The seaport was no more; its silted-in harbor had become a marsh. In 1933 the Federal Government took over this exhausted land, in an attempt to help nature heal its scars.

When you visit the park today, it will not look to you like farmland. With removal of the eroded land from cultivation, wild plants quickly returned to the fields, and in time forest again covered most of the watershed. The story of this change from bare, eroded fields, with scattered farm woodlots and orchards, to a forest populated with wild animals is much like a jigsaw puzzle. It is a story that has been repeated over and over in the eastern part of this country, as man has stripped the land and then moved away, leaving nature to restore it. You can piece it together, with a little help in finding the clues. That is the purpose of this booklet.

When a farm is abandoned by its human inhabitants, nature immediately begins to reclaim it. If the land has not been completely denuded of topsoil, the first spring finds plants we call "weeds"—crabgrass, horseweed, etc.—growing in the fields that formerly produced crops. By summer these plants have created a new environment. The soil is protected from wind and rain; this

Oaks and hickories are the dominant trees in the hardwood forest.



Forest of Eastern North America in 1700

- Boreal (northern) coniferous forest
- Eastern hardwood (deciduous) forest

slows down the erosion that occurred when row crops grew there. The ground is shaded, making it more favorable (moister and cooler) for animals. Insects, reptiles, birds, and rodents and other mammals move into the field this first summer to feed upon the plants and upon each other.

Exploration: Can you explain how the seeds that produced these plants got into the field? Were any of the seeds left from the previous summer? (Note: one pigweed plant growing in a cornfield the year before could have produced six million seeds.) How do seeds travel? What is a "hitchhiking" seed?

The second year, the plant cover is different—for conditions now permit plants that need more moisture and shade to grow. Consequently, the plants that occupied the field the first summer are now being crowded out by other weeds.

The third year an even bigger change takes place, for now, besides grasses and other soft-stemmed plants, we find shrubs coming in. Scattered among these are the first seedlings of Virginia pine. Because these pines are the first trees, and will create such a greatly different environment that they will bring about a totally new plant community, we call them "pioneer trees." (Sometimes, in this region, we will find other trees, such as big-toothed aspen and sassafras, coming in as pioneers.) The field will not be entirely taken over by the pines in these early years. Each year, however, as the pine's grow taller and produce more shade, they make it more difficult for sun-loving plants to survive. By about the end of the second or third decade a young pine forest grows where bare fields have been. But the pine forest is already threatened by a new group of plants that will some day replace it.

The pines, with about the life span of a man, will form a mature forest for one-half century or more. But by the time they have reached old age the forest is no longer a pure stand of tall pines. Young pines will not thrive in the shade. Here and there, where a pine has been felled by a storm or other

cause, a broad-leaved (hardwood) tree has grown up to take its place in the forest canopy. About 100 years after the farmer abandoned his fields, the pines have been replaced by hardwoods. In Prince William Forest these are chiefly oaks and hickories.

Since it is easy to estimate the age of a pine (see diagram), you can get some idea of how long ago certain parts of the park were farm fields newly abandoned to nature.



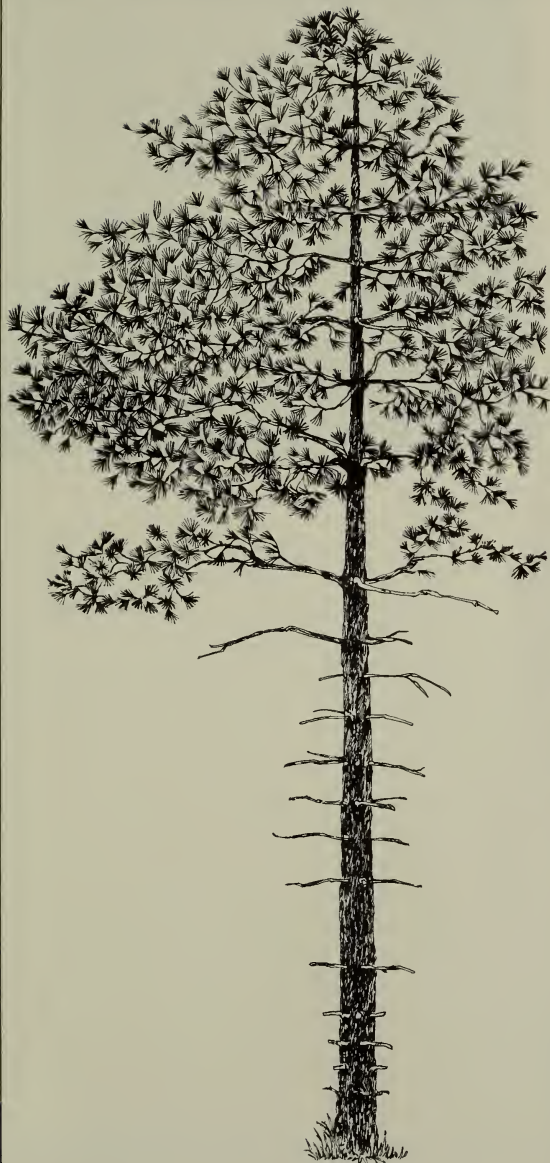
Furrows of a former cornfield can be seen in this pine forest.

Exploration: What can you discover for yourself that helps explain why the Virginia pine is a pioneer tree here? Some clues: Where do you find young pines growing? In the deep forest? Along roadsides? In forest openings?

What kinds of seedling trees do you find in the pine forest? In the hardwood forest? Do they have needles or broad leaves?

How do pine seeds travel? Do animals help spread oaks and hickories? How?

The oak-hickory forest, which also contains yellow-poplars (tulip-trees), beeches, dogwoods, and other large and small trees, will not be replaced by a new plant community (unless fire, logging, or disease destroys it). Because the oak-hickory forest is the last of a series of plant communities, we call it a *climax* community. Climax communities do not create conditions that enable other plants to take over.



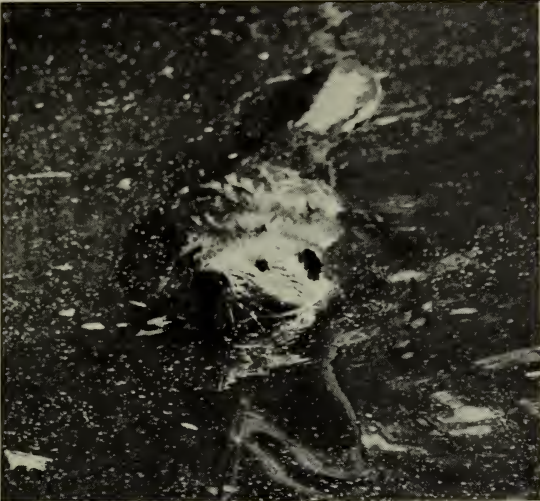
Exploration: Is there such a thing as a “succession” in your home community? Have you seen one type of land use, such as agriculture or single homes, replaced by a shopping center, a highway, or apartment buildings? What might be a “climax” community in your city?

This pine tree grows where a cornfield formerly existed. Estimate how long ago the field was abandoned to nature. (To determine the age of the pine, count the whorls, or layers, of branches, including the stubs and scars on the lower part of the trunk.) Refer to the succession diagram on page 12.

Exploration: Learn what you can of the role of the short-tailed shrew in the plant-and-animal community. Is it prey or predator? How does it affect the populations of other animals? Is the shrew (the smallest mammal in the forest) or the whitetail deer (the largest) more important in the community? (Be careful how you answer this!)

The insects, rodents, birds, and other animals that thrived in the weedy field the first few summers were gradually replaced as the plant community changed. The insect-eating meadowlark, which nested in the field for a few seasons, left when the shrubs took over. The seed-eating cardinal came in almost as soon as the meadowlark left, and remained while the area continued to change. It is still there in the mature oak-hickory forest, for this bird can find its food and nesting habitat under a wide range of conditions. The short-tailed shrew, one of the most adaptable of all animals, has been a resident throughout; it came in with the first weeds and is still a part of the forest community a century later.

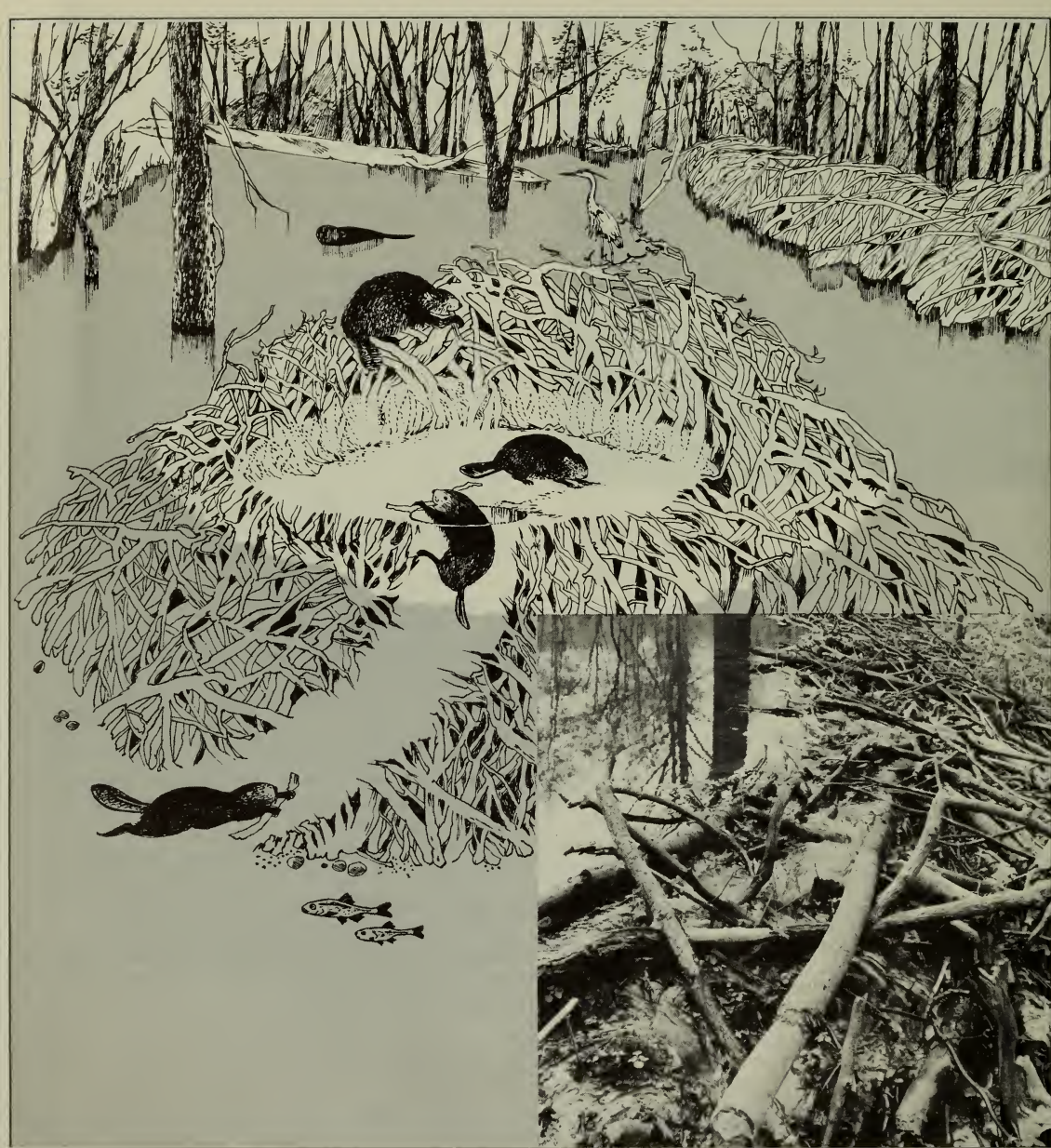
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Prince William Forest has another pioneer—a builder of canals, dams, and ponds; a harvester of timber; a creator of wildlife habitat. Unlike the pioneers from Europe who settled the region three centuries ago, however, this woodland engineer, the beaver, makes changes that bring about a much richer forest community.

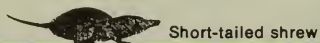
These big rodents were abundant in Virginia when the Europeans came—in fact, they were common over most of North America's forested lands. But by the beginning of this century they had been exterminated from Virginia—trapped for their fur or made homeless by destruction of the forest. After the park was established and the forest came back, beavers were brought in again; now they are much a part of the wildlife community. It would surely be a less varied and less interesting community without them!

When beavers move into a new area, they begin cutting down trees, building structures, and making a new kind of habitat. The pond, backed up by a dam built by the beavers, serves them in several ways: as a storage place for winter food supplies, as a place of refuge from their enemies, and, along with the canals, as a transportation and escape route. The beaver pond is also very important to the rest of the forest community. It provides a habitat for a variety of aquatic animals—insects, fish, turtles, ducks, etc.—and hunting grounds for land-dwelling animals such as the raccoons that find prey along the pond shore. Feathered fishermen such as the osprey may visit the pond from some distance away.

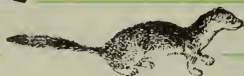


Exploration: Keep a notebook or make pictures of signs of animal activity in the beaver pond area. Look for beaver cuttings, woodpecker holes, plants that have been browsed by deer, etc. Remember to make a record of where each sign was found. (Tip: one thing you can take away from the park is animal tracks—in the form of wax or plaster casts.)





Short-tailed shrew



Long-tailed weasel



Field sparrow



White-tailed deer



Cardinal



Striped skunk

Great horned owl



Cottontail rabbit



Red fox

Grasshopper sparrow



Meadowlark

Grasshopper



Meadow vole

1st year:
Horseweed dominant;
crabgrass, pigweed.

2nd year:
Asters dominant;
crabgrass.

3rd to 18th year:
Grass scrub community:
broomsedge grass;
pines coming in
during this stage.

19th to 30th year:
Young pine forest.

30th to 70th year:
Mature pine forest.
Understory of young
hardwoods.



White-footed mouse



Gray fox

vi



Pine warbler



Red-eyed vireo

Red-tailed hawk



Wood thrush



Raccoon



Gray squirrel



70th to 100th year:
Pine to hardwood
transition.

100th year plus:
Climax oak-hickory
forest.



This long-abandoned farmyard, part of the Environmental Study Area in Prince William Forest, still contains an apple tree and some persistent garden flowers.

This diagram of wildlife succession in the Quantico Creek Watershed shows how certain species appear and disappear as the vegetation changes. The red fox, for example, is a resident only during the shrubby and beginning-forest stages (although, like the great horned owl and red-tailed hawk, it may visit the area during earlier stages when hunting for food).

When you visit “beaver valley” in Prince William Forest Park, you will find not just one but several beaver ponds in a string along the creek. And you will find ponds that are not in use, for, like the farmer who abandons a worn-out tobacco field, beavers leave when the supply of trees is depleted. The trees furnish almost everything the beaver needs for survival—the twigs, buds, and bark on which it feeds, and the materials it uses to build its dams and its lodge (which provides protection from weather and enemies and a home for rearing its young).

When the beaver pond is abandoned, a process of succession begins. With no beavers present to make repairs, the dam does not long hold back the water and the pond is drained. Silt that has been deposited on the bottom of the pond now provides rich soil for the establishment of a meadow, which will be green with grass and wildflowers next summer.

Exploration: See if you can discover the rest of the succession story from beaver pond to climax forest. In the park you can find ponds where beavers are actively working, ponds recently abandoned, and the sites of former beaver colonies that are now grown up to trees. What kinds of trees make up the oldest forest you can find on “beaver lands”?

This image shows a single sheet of white paper with horizontal blue or grey ruling lines, typical of notebook paper. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

A FOREST PROFILE

— 80 ft.

Canopy—mature hardwood trees

— 40 ft.

— 20 ft.

Understory

Shrub layer

Herb layer

Forest floor



Red maple



Mockernut
hickory



Yellow-poplar



American beech



Southern red oak



White oak



Chestnut oak

A forest community is something like an apartment building—it has different residents living in different layers, or stories. In the mature hardwood forest at Prince William, for example, you can distinguish several layers, each with its own group of animal dwellers. If you are looking for warblers, you will have to search the upper story, or *canopy*, where these tiny birds are quite hard to see among the leaves and branches of tall trees. Growing in the shade of the oaks, hickories, yellow-poplar, beech, and others are the trees of the *understory*—species such as holly, dogwood, red-cedar, and the shrubby mountain laurel. The red-eyed vireo, perhaps the commonest bird of American forests, nests and finds most of its food (insects) in this layer.

Beneath the understory is the *shrub layer*, made up of shrubs, vines, and thornbushes, speckled alder (on the streambank), green-briar, poison ivy, and Japanese honeysuckle. The lower part of the shrub layer is sometimes considered a distinct story, the *herb layer*. (Herbs, unlike the woody-stemmed shrubs, have soft stems; but they often grow several feet high.) Here are the ferns, wild-flowers, grasses, and mushrooms. In the shrub-herb layer, insects, spiders, and other invertebrates abound, and are fed upon by many vertebrates that visit from other layers.

The *forest floor* includes: the accumulation of dead leaves, acorns, cones, needles, and branches; bones, fur, feathers, droppings, other animal matter, and anything else that falls from the upper stories; plants such as mosses that form a carpet on the ground; and the topsoil itself, which is partly made up of the decayed remains of these things.









This layer teems with living plants and animals. The plants we call mushrooms and toadstools are actually part of the soil layer; the umbrella-shaped structures we see growing up into the shrub-herb layer are merely the fruiting bodies of fungus plants that spread like a network of roots under the surface. A tremendous variety of spiders, beetles, bugs, ants, and other invertebrates inhabits the forest floor, along with vertebrates such as salamanders, moles, and shrews that feed upon these small animals.

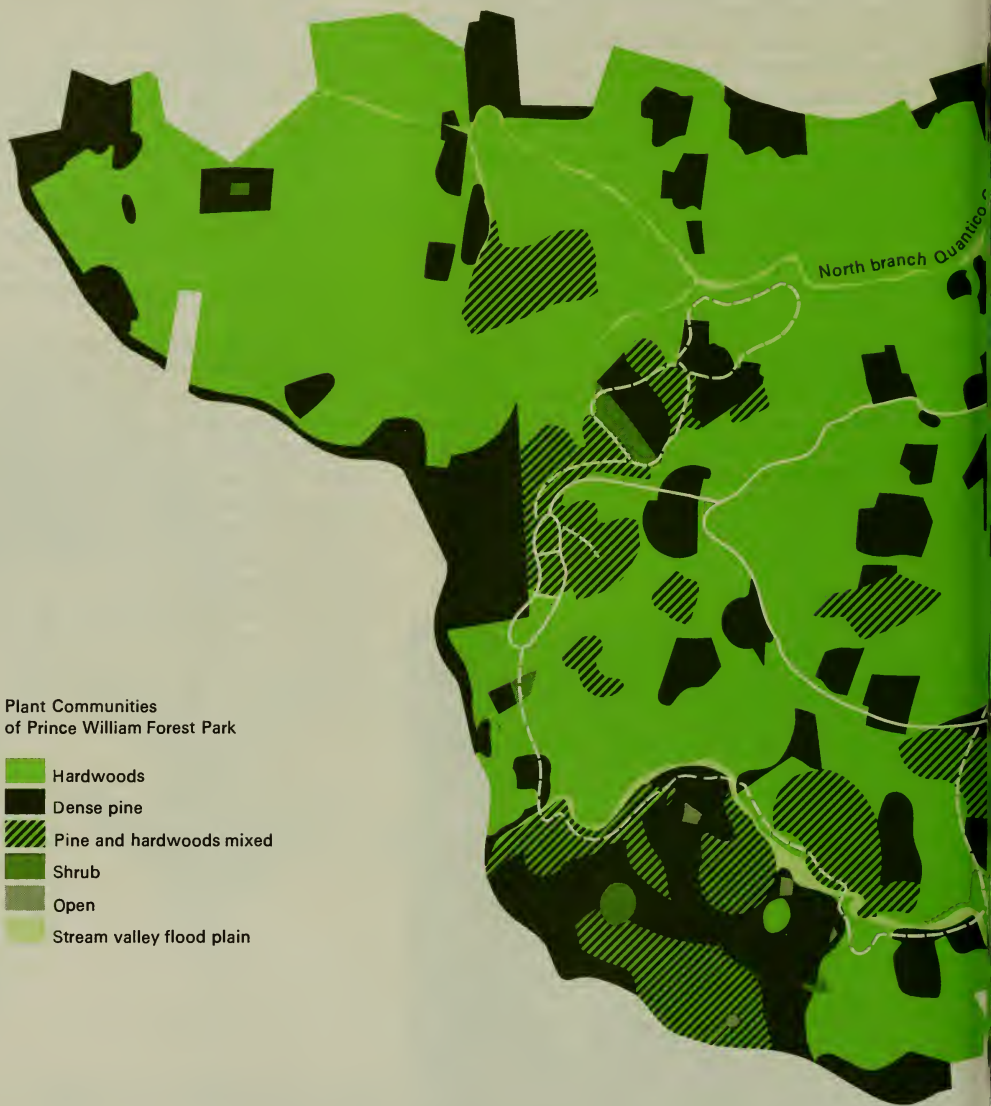
Some of the animals that nest in other stories of the forest spend much time here in search of food. The oven-bird, a warbler, builds its nest on the ground. But although you will surely hear this very common forest bird, with its “tea-CHER, tea-CHER” song, you are less likely to see it or its almost invisible, oven-shaped nest. The chipmunk spends most of its life in this layer, though you will often spy it on a rock, log, or stump. Where would you look for the chipmunk’s cousins, the gray and flying squirrels? Where would you expect to see the park’s biggest bird, the wild turkey? (Find out what its diet is.)

The forest floor (the soil, and the debris that decays to help form it) is so important that its role in the forest community needs separate discussion.

The floor of the hardwood forest contains a greater variety and abundance of life than any of the other layers.

Plant Communities
of Prince William Forest Park

-  Hardwoods
-  Dense pine
-  Pine and hardwoods mixed
-  Shrub
-  Open
-  Stream valley flood plain

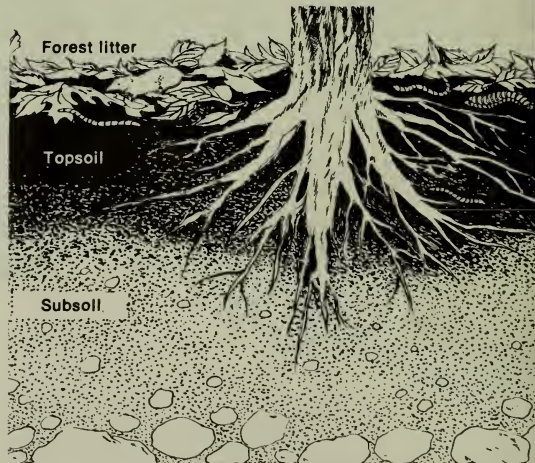




Exploration: Collect all the debris from a square yard of the forest floor. List what animals you find in it, then weigh the dead material. From this, estimate the amount of debris that has fallen in an acre of the forest. **Tip:** an acre contains about 1613 square yards.

THE ROLE OF SOIL IN THE FOREST COMMUNITY

Although the Indians had lived here for many centuries without seriously damaging the land, it was quickly ruined by the farmers who settled here. The most serious effect was the wearing out and loss of the soil, through cultivation of the slopes and through failure to replace minerals used up by the crops. The returning forest, however, slowed down the eroding action, and slowly but steadily nature is renewing the soil. Look around you, and see how soil is being made in the forest. What is happening to fallen leaves and other dead plant and animal matter? How many kinds of plants and animals are helping to break down the logs and leaves? (Some of them, such as bacteria, are too small for you to see.) In what ways do the following organisms help build soil (you shouldn't have to look *all* the answers up in a book!): *mushrooms*, *earthworms*, *whitetail deer*? Can you find any examples of how man's activities are still causing loss of soil? (Pay particular attention when the trail leads you down a steep slope.)



Exploration: Choose a spot in the forest and sit quietly for a while. Then draw a profile of the plant-and-animal community you see, like the diagram on page 15. Which layer, or story, seems to have the most animal life?

FOOD CHAINS IN THE FOREST

Everyone knows that beavers cut down trees, and that they use the branches to build their lodges and dams. But not everyone realizes that the trees also provide the beaver with the bark that forms its chief diet. Beavers (young ones, at least) are in turn food for stronger animals, such as the gray fox. We can show this relationship between the beaver, its food, and a predator as a chain with three links:

green bark → beaver → fox

Most food chains have more links, but they always start with plant food and end with a species of animal that is not eaten by any other animal in the community. For example, a five-link food chain in the beaver pond is: algae → water boatman (a bug) → minnow → large fish → osprey

Now see if you can finish this simple, three-link food chain:

grass → cow (beef or milk) →

When you have become familiar with the park, you should be able to make up food chains for other communities—the pine forest, the old farm, the hardwood forest, and the stream.

THE WEB OF LIFE

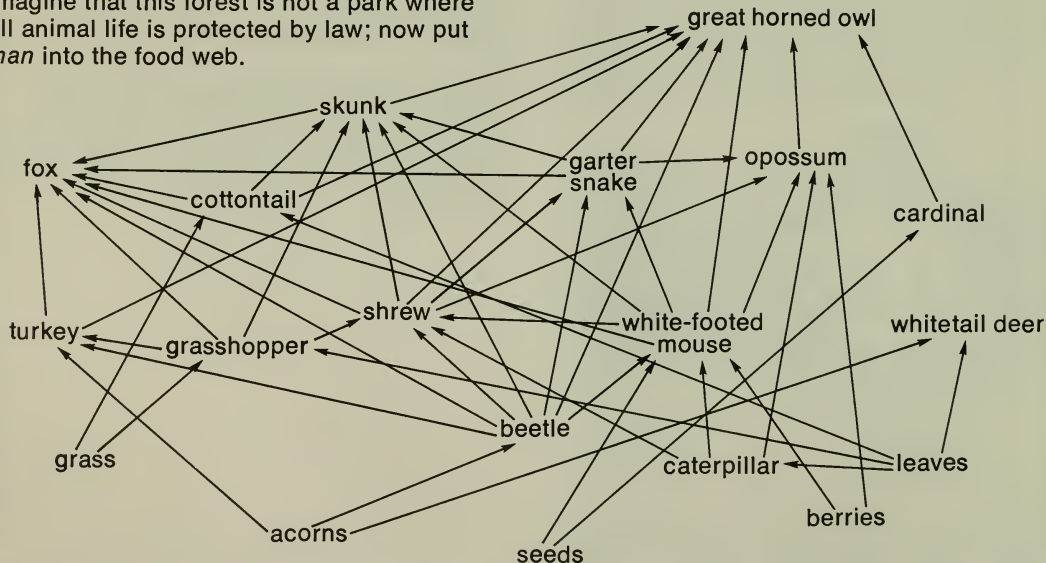
There is a great difference in the food habits of animals. The short-tailed shrew eats insects of many kinds and preys upon mice and other animals larger than itself. The opossum eats not only many plant foods, but insects, mice, snakes, and almost anything else it can overpower, as well as dead animals. But the osprey eats only fish. How, then, do you explain the statement that "every animal depends upon green plants for its food"?

Of course, since most animals of the forest eat several different foods and themselves are preyed upon by several other animals, a simple food chain doesn't tell the whole story. If we put a lot of food chains together, as in the diagram below, we have a "food web." (Each arrow leads from a plant or animal to an animal that eats it.)

Imagine that this forest is not a park where all animal life is protected by law; now put *man* into the food web.



The flying squirrel is a fairly common resident of the forest in this park; but, because of its nocturnal habits, it is seldom seen.



If all the living things in a community are interrelated, then what might be the effects when we destroy or remove one of the plants or animals of the web? Or when we add to it an animal that doesn't belong in it? There are some interesting stories (see "Some Books to Read") of how man upset the "balance" in a natural community by interfering with one of the links in the food web.

Exploration: Draw a food chain that ends with YOU. Then connect it with other food chains to make a food web that includes part of your home community.

THE PYRITE MINE

Have you ever heard of "fool's gold"? This mineral, which is really *pyrite*, or iron sulfide, occurs in such quantity in Prince William Forest that it has been mined here. An easy hike will take you to the site of the old pyrite mine, on the east side of the park. This operation was abandoned more than one-half century ago, before the park was established. But though nature has tried to heal the scars, you will see that the signs of man's activity are not easily erased when the soil is removed or is covered with mine wastes.



Timbers of the abandoned pyrite mine are visible on the hillside overlooking the waste area.

The pyrite was mined for its sulfur content, which was used in the manufacture of sulphuric acid. (Does this give you any clue to the present condition of the soil and of the water in the creek flowing through the mine site?)

What do you think might be the effect on vegetation when ores are brought to the surface and spread over the ground? When you visit this mine site, note the ways that the mining operation has apparently changed the environment. Are there signs of erosion? How does the vegetation differ from that of the surrounding area? What is the pioneer tree here? Does it seem to be successfully reforesting the area after 50 years? What kinds of life can you see in the creek? Look for deer in this area; even if you don't see any, you will probably find their tracks.

Exploration: Stake off an area 10 feet square and count the young pines in it. How tall are they? How old? How old are the largest pines growing on the mine site? Examine pyrite crystals with your hand lens. How do you suppose this mineral got the nickname, "fool's gold"?



A stunted 8-year-old pine tree struggles for existence on the site of the old pyrite mine.

WOODLAND MANNERS

The National Park System was developed to preserve for the American people their heritage of natural and historic treasures and to provide opportunities for recreation in unspoiled surroundings. Prince William Forest Park was established especially to serve the people of this region; all who visit it are obligated to use it in such a way that others who come after them will have the same opportunities. Actually, this is mostly just a matter of good outdoor manners—consideration for future visitors and for the animals and plants that live here. But there are a few special do's and don'ts to keep in mind.

1

Collecting of specimens—rocks, live animals, parts of plants—is not permitted. Please leave the wildflowers growing wild.

2

Leave everything as you found it. For example, when you turn over a rock or log to see what lives under it, turn it back carefully. If you find that an earlier visitor has left his initials on a beech tree, don't add your own.

3

Don't take shortcuts when following trails. (Can you see how shortcutting might lead to erosion on steep slopes?)

4

Be careful with knives and other cutting tools—and of course with fire!

5

It's best to leave your pets home; but if you bring a dog, keep it on a leash.

SOME BOOKS TO READ

The books listed here will give you information on forest life, the balance of nature, succession, and other things discussed in this booklet.

The Balance of Nature,
by Lorus and Margery Milne, Knopf; 1960.

Life of the Forest,
by Jack McCormick, McGraw-Hill; 1966.

Our Threatened Wildlife,
by Bill Perry, Coward-McCann; 1970.

Understanding Ecology,
by Shelly Grossman; Lancer

The Web of Life,
by John H. Storer; Devin-Adair; 1960.

A Field Guide to Animal Tracks
by Olaus J. Murie, Houghton Mifflin; 1954.

Your teacher or librarian can help you find these books.

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National Park Service
U.S. DEPARTMENT OF THE INTERIOR