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NATICK
NATURAL
SCIENCE
PARK



"The Museum in Life"

GUIDE MANUAL

(Pocket Edition)

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NATICK NATURAL SCIENCE PARK MANUAL

Pages below tell story that goes with post.
The letter on the post shows the subject.
The number shows the parts of the subject.
(The parts should be treated in order).

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ANIMALS A1

Since the nature of animal life is its movement, it is difficult to place posts where you are sure to see animals. This post has been placed here next to the swamp because one is more likely to see animal movement here than anywhere.

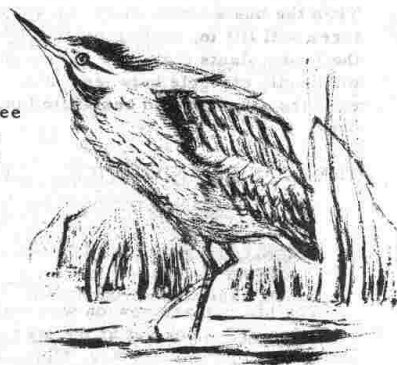
I. Birds

Many red winged black birds are in this swamp during the spring.

In the maple tree above, you can see the neat round door to a flicker's nest. If you watch from back in the grove, you can see him.

Pheasant and grouse live in the woods here.

A large bird, the bittern, usually makes his home in the swamp. His hollow, booming call sounds like a bull frog.



II. Pond Life

About three different kinds of turtles can be found along this shore.

Careful watchers have seen muskrats swimming in the lower pond.

An inch long frog, called a spring peeper, makes the swamp a noisy place on spring evenings.

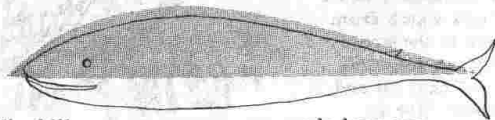
III. Mammals

Grey squirrels, muskrats, rabbits and mice are about the only mammals left in the park.

WATCH THIS SPACE B1

In June 1954, a bulldozer cleared the ground which lies in back of this post. It was scraped down to bare gravel. Already the forest has started to take over. In many years this square will become a part of the forest which one cannot tell from the rest. Look for the grasses, ragweed, and poison ivy to take over first. Then the bushes will cover the square. Finally trees will fill in, cutting off the light from the lower plants that grew before them. And so the deadly struggle between plants continues until the stronger and best-fitted ones take over.

THE GLACIER AND NATICK L1



The hill you are now on was made long ago by a glacier. Look out at the view and make a picture in your mind of ice, hundreds of feet thick, covering the land. It moves toward the south but only a few inches a day. Ice covers the hill where you are standing. In the ice are carried hundreds of tons of dirt and rock scraped up from the ground. In some places the glacier dropped the stones and sand until a hill was built up, shaped like the back of a whale. We call these whale back hills drumlins. You are standing on one now. Another drumlin can be seen on the horizon by looking through the groove on top of the post. Our hill looks the same from there. Drumlins point in the direction of the glacial flow (see L3). The whole surface of the land you see in front of

you was shaped by the glacier. The gushing waters from the melting ice washed sand and clay from one place to another. Small valleys were dammed up making pools of water. One can often tell a glacial area by its many lakes and ponds. Another sign to be found everywhere is the rocks and pebbles worn smooth by the passing glacier.

So we find two moving forces have shaped our land lately:

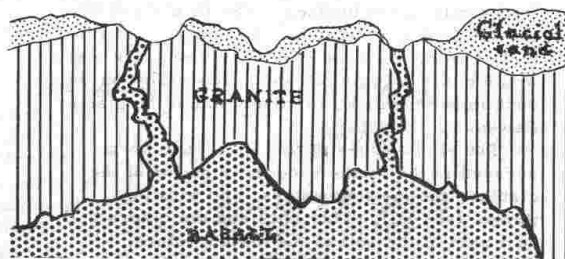
1. The moving ice.
2. The rushing waters.

What will this land look like after the next glacier?

THE OUTCROP L2

Everywhere under the soil of the earth is a solid rock we call bedrock. The outcrop you see in front of you is a part of this bedrock. The cut made for the old trolley way you are standing in shows a cross section of the rock. This is probably a part of the formation known as Dedham Granite.

Dedham Granite was cooled from the hot magma of deeper earth over 500 million years ago.



That was before life appeared on earth. The rock of this outcrop cooled under the ground and probably took many years to become solid. Look closely at the grain of a freshly broken piece. It is made of crystals of different minerals (quartz, mica and feldspar). The longer a rock took to cool, the more time these minerals had to come together and the bigger will be the crystals.

In millions of years the rock which lay over this granite was worn away into the seas and the land surface came as close to this rock as you see it now.

As you face the ledge, you will notice another darker kind of bedrock several yards to your left. This is a basalt dike which is magma run later into a crack of the solid Dedham granite and cooled at a different rate. Chip off a piece and compare the grain.

THE ERRATIC

L3

This rock was not always here. The way it sits on the ground, "floating" on the soil, tells us that it does not belong here. It is not a part of our park bedrock (see L2). Somewhere to the north there must be a ledge of granite which is just like the granite of the boulder. The flow ice of the glacier (see L1), picked a large chunk of rock from this outcrop and carried it along like a river would carry a grain of sand. The arrow on the post shows the direction from which the glacier flowed.

The sharp edges of this rock have been scraped round by the sandpaper action of the glacier, the melting waters, and growing things (see P3). This rock and the others will be a part of the soil of the distant future.

PLANTS INTRODUCTION-THE FOUR KINDS

In three pages we are going to help you learn to tell the class of any plant in the park. Plants are sorted out into classes depending on how they reproduce (make young plants).

The earliest plants reproduced by growing longer and then breaking off new plants (see P1).

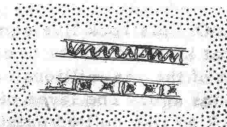
After millions of years of underwater plants in which the simple cell plants were the only ones on the earth, a better plant began to grow, the spore plant (see P2, 3, 4, 5). This plant could make millions of tiny spores. Any one of these might drop to a good spot and begin a new plant.

After millions of more years in which spore plants were to grow as tall as trees, a new plant appeared, the naked seed plant. This new kind placed a tiny plant in a dry seed. It was much easier for plants to grow from these seeds. Today, most naked seed plants grow their seeds in cones.

The last, and best, plant to take over the surface of the earth is the encased seed plant. Most of the plants you see are this kind. The flowering plants, the leafy trees and bushes, and the grasses are all of the encased seed class. These seeds grow most easily since they are protected by a hard shell and surrounded by food for the tiny plant.

ALGAE P1

Look beneath the water and see the scum laced with silky green threads. These are a simple cell plant called algae (al-gee). This algae needs no roots or leaves because each cell of the plant makes its own food from sun-light and takes water in through its sides.



There are several different kinds of algae here and on the walls of the culvert.

Spread some thin on a microscope slide. Each cell can be seen easily.

These plants are interesting because they are like the first plants to appear on earth.

FUNGI (Spore plants) P2

Sprouting from the rotting log behind post P2, you can see the only type of plant that does not make its own food, the fungus. A fungus has no green leaves and so must draw its food from plants that have made food with their own leaves. Fungus is very useful to the world of life because it eats away dead waste just as the shelf-fungus on this log is doing. With the help of fungus and some insects, food stored in the dead log will be returned to the soil to be used again by other plants.

Another fungus, the mushroom, can be seen sprouting on this slope from the dead leaf litter of the forest floor. The spores of a mushroom are carried under the cap of the mushroom.

LICHENS (Spore plant) P3

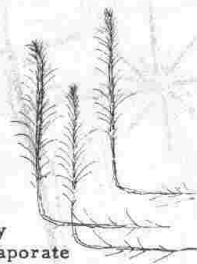
On this rock live some of the first kinds of plants to come out of the sea millions of years ago. The layer of grey, looking like spilled paint, the green fanshaped plant and the black stain on the side of the rock are a



rugged little plant called lichens. A lichen is really algae and fungi living together to make a plant. It sends out small "roots" called rhizoids which eat into the rock and help to break the rock up and turn it into soil. Some lichens (scarlet crested and pixie cup) live amongst the moss and can be seen near post L1.

MOSSES (spore plant) P4

Mosses are among the first kind of plants to hold "leaves" up to the light and air by using stalks. These stalks do not carry water from the "roots" very well and so mosses must grow together in clumps and in shady places so the water will not evaporate quickly from the "leaves".

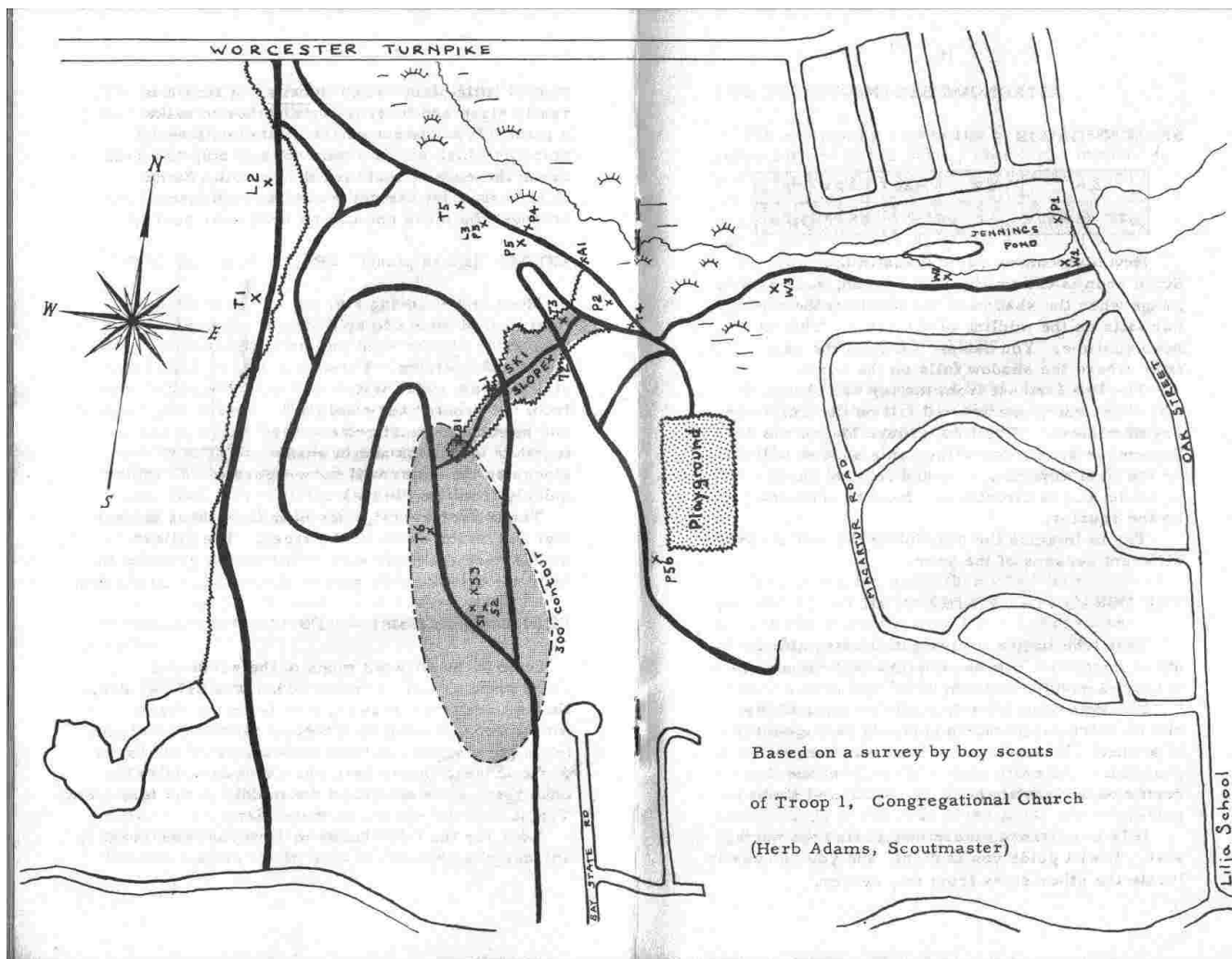


There are several kinds of mosses here at your feet and on the backs of the trees. The tallest mosses are the hairy cap. Thin stalks growing up from the stems carry spores in tiny cases at the top.

FERNS (Spore plant) P5

Once ferns covered much of the earth and some grew as tall as trees. This was before seeds. Now we see ferns growing mostly on the shady forest floor covered by the giant seed trees. Some ferns grow spores in little brown dots on the backs of the leaves. Some have special spore stalks and others grow spores in the middle of the fern stem. Try to find the spores on these ferns.

Look for the fiddleheads or fern sprouts in early spring.



Based on a survey by boy scouts
of Troop 1, Congregational Church
(Herb Adams, Scoutmaster)

ASTRONOMY SECTION

SEASONS GAUGE S1

JAN	FEB	MAR	APR	MAY	JUN
DEC	NOV	OCT	SEP	AUG	JUL

How high can we see the sun in the sky? Since noon is the time of highest sun, read this gauge when the shadow of the notch on the top bar falls on the midline of the scale. This is noon suntime. You can almost read the date from where the shadow falls on the scale.

The line farthest from the top bar shows where the sun's shadow will fall on the first day of winter. The line through March and September shows where the sun's shadow will fall on the first days of spring and fall, at which point the sun is directly overhead to someone on the equator.

Try to imagine the position of the sun at the different seasons of the year.

THE NORTH STAR FINDER S2

This tube is like a gunsight pointing always at the north star. In the daytime you cannot see it but the north star is there all the same.

It seems to us here that all the stars of the sky turn around the north star. Like the center of a wheel, it may turn but it never changes its position. The north star is directly above the center of our earth wheel, the north and south poles.

It is important to learn how to find the north star. It will guide you at night, and you can easily locate the other stars from this center.

THE TELESCOPE S3

The astronomy committee has made a telescope for use in the park. This large instrument can easily pick out surface features on the moon and interesting planetary sights. It may be used in the daytime to project an image of the sun for study of sun spots. The telescope can be borrowed by any responsible group. It is stored at the Lilja School, corner of Oak and Bacon Streets.

TREE SOCIETIES

Starting with an unused field, the forest begins to take over in a series of steps. For each step, a different tree society is in charge until the final or climax forest arrives. The climax forest remains unless changed by climate or man.

CEDAR FIELD SOCIETY T1

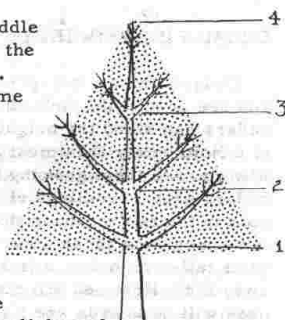
Cedars are the evergreen trees (naked seed) you see across the field to your left. Little cedars can stand the bright sun and dryness of a field better than most any tree. That is why you see them growing here. As these cedars grow, seedlings of other trees will take root in the cooler shade that they provide. After a long time these other new trees will grow taller than the cedars. They will take away their light and kill them. Sharp eyed ones will be able to see a few dead cedars in the dense woods of the rest of the park, showing that the spot was once more open.

This ski slope was cut through a birch society. Why is there a birch society where there normally should be hemlocks? The rings of several sample birches were counted, and it was discovered that they all began growth about 1939. The hurricane of '38 cleaned a path through the tall hemlocks of this hillside shelf. Best fitted to grow in the new light of the exposed soil was a birch. We call these trees pioneers because they, along with pin cherries and poplars, help begin the reforestation of an open area. In sixty years, most of these birches will be gone, crowded out by the trees that can better stand the shade that the birches themselves provide.

WHITE PINE-MIXED HARDWOODS SOCIETY T3

The white pine mixed hardwoods society is a middle group somewhere between the pioneers and the climaxes. Pines (naked seed) and some of the hardwoods (encased seed) you see here grow better in a medium moist soil with a medium amount of light.

Notice how the little pines at your feet are seeding in from the big pines in the back. The young trees are fighting for light and space. Only the best fitted will live. You can tell how old a white pine is by counting the branch groups (whorls), one for each year and one for the top. This society will probably become a hemlock climax.



THE JURASSIC TRIANGLE (ANCIENT FOREST) T4

The grove in back of this post has been prepared by cutting back all encased seed plants. The only plants here could have grown in an ancient forest of 150 million years ago. The pines are the naked seed group. The ferns and mosses are primitive spore plants. One can also find the simple cell algae in the ground and on the bark of trees.

Look into the forest and move back in time. This was a forest home of reptiles. Practically no mammals or birds lived in this quiet forest, for no nuts (encased seeds) were growing. Mammals and birds need the concentrated foods in seeds to help maintain their high body heat.

During spring you will see the only encased seed plant to grow in our ancient forest, the Canada Mayflower. These small green plants cover the brown pine needle floor for two to three spring months.

HEMLOCK (Climax Type) T5

Follow the path straight up the slope for a few yards. You will come to a great, dried stump. Look into the dark forest. Here is a group of evergreen trees called hemlock. These trees are a member of the conifer family. They grow their seeds in cones. They are of the naked seed group.

Notice that there are no seedlings growing under the hemlocks. No sunshine reaches the ground. Most seedlings, even hemlock seedlings need a little sun to start growing.

Now look at the sky above the big stump. Notice that there is a break in the crown of trees which was left by the falling hemlock. Through this break can flow a stream of sunshine.

Now look at the ground around the stump. Seedlings are growing everywhere. See how the floor of the forest changes with a change in the balance of light or water.

When the hemlock trees grow old and fall, other hemlock trees will grow in their place. There will always be hemlocks here unless disturbed by man or weather. That is why this group of trees is called a permanent or climax society.

OAK-HICKORY (Climax Type) T6

To the north of this marker grows one of the most common climax tree societies of south-eastern New England. These oaks and hickories grow well on the drier, sunny top of the hill. Notice that a part of the society is made of small pine trees all about the same height. The tall, covering oaks and hickories have no leaves during half of the year, so enough light reaches the lower forest to grow these pines. They will never be much taller, however.

To the south of this marker you can see that the sizes and kinds of trees change. We could call this "a half way between" society because recently (30 years ago) this area was a field, and it is still working its way toward a climax society. How many pioneer trees can you find still growing?

Notice that many other younger trees are still fighting to place their leaves above the others. This is not a friendly fight, for in this contest, the loser dies. He receives too little light. So even though all seems quiet and peaceful here, the area is a battleground on which the life and death struggle goes on until only the climax trees remain.

WATER ENVIRONMENT

THE POND

The water in this pond is held back by a dam built 100 years ago for Mr. Jennings' grist mill. It is



located on the turnpike, near the Overbrook Market. A pond has its own kinds of plants which line the shore, stand in the water, or grow beneath its surface.

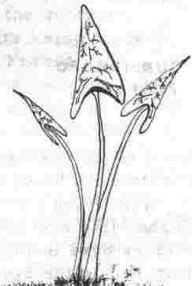
These plants are the same for most ponds of this area. Alders- At the edge of the water near this marker, can be seen a small tree that bears little dark clusters like pine cones. These are the catkins which make it easy to tell swamp alder. They are not cones, for an alder is a tree of the encased seed group. Wherever you see these swamp alders you know there is plenty of water near its roots.

Water Plants- The plants standing in the water here with the arrow shaped leaves are called arrowheads. They are encased seed plants which have a white flower in July and August.

Duckweed- The smallest seed plant of the whole park is the duckweed. Ducks really eat it, too. Duckweed floats in a green mat on the surface of the water. Each plant has two small leaves about a quarter of an inch across and several roots which hang a short distance into the water.

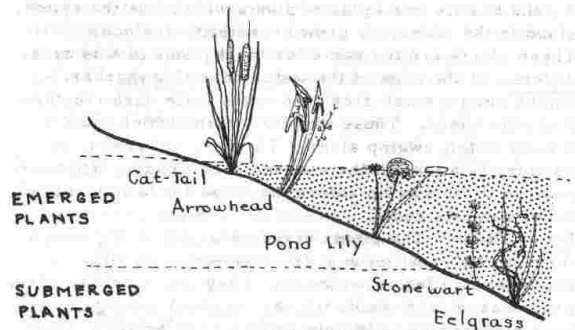
Duckweed is the first to appear in the spring along with the skunk cabbage.

Pond Lilies- The leaves of the pond lily are especially constructed with air spaces to make sure it floats on the surface and with the air breathing on top instead of underneath the leaf. Long stalks connect the leaves and blossom with the muddy bottom.



THE ISLAND W2

At this marker we can look out at the "island" where many trees and bushes grow up out of Jennings Pond. Some of the trees of the island must have been drowned when the water



level of the pond was raised. They now make good homes for the pond birds and insects.

The living plants of the island are swamp loving bushes like wild roses and willows. Watch the swamp maples here in August. Their leaves are the first to turn red as the days shorten.

Plants living and dying in a tangled mass like this, fill up and build up the land so that slowly the pond disappears. As the mat drains and dries, the dry land trees begin to grow and what was once a pond can become simply a flat piece of land.

PONDS REVIEW

Questions

1. Where are alders found? How can you tell an alder? See any here?
2. Find some arrowheads.
3. What evidence do you see that the pond is filling in?
4. Can you find some small floating plants? What are they called?

See NNSP Monograph No. 1, on studies of local climates in the Town Forest. Local climates--sometimes called microclimates--are part of the reason why birds roost in trees (ground level is coldest on clear, still nights); why homes in valleys are not always snuggler (heavy cold air drains from hills into vales on such nights); why one spot is more pleasant than another for picnics (temperature of the air which is two feet above the ground-sitting height- may differ greatly from place to place on a sunny afternoon). Many thermometer readings in shelters at C1 and C2 are being made to study the microclimates of our Town Forest.

As a background to the research on weather and climate, Harvard University has permanently loaned to the Park committees two large maps with plaster hills and valleys. One has lines of yearly rainfall and temperature that show the large scale climates of the entire U.S. The other spreads the face of our Commonwealth over an average living room wall. These maps may be seen by visiting the Natural Science Park headquarters at Lilja School.

The Natick Natural Science Park is a nonprofit organization of people who are interested in education and the sciences.

Interested persons are invited to join the organization or to contribute money or ideas.

It is hoped that the Natick Science Park will serve as inspiration and enjoyment to people of all ages.

Walter Gleason, Director

ACKNOWLEDGEMENT

The Natick Natural Science Park-- including its broad program as a living museum, an outdoor curriculum and a research activity-- owes its existence and its heart to the dedicated efforts of a hundred very human beings, as well as the quiet support of many organizations and the residents of a forward looking town.

In making this pocket manual simple, compact and unified, sciences of the lithosphere-- that is, only of the earth itself and objects attached directly to it --were included. For example, studies of early Indian use of the Town Forest area, involving as they do considerations of sociology and of surrounding areas, will appear in separate publications. Investigations of microclimates--that is, the special climates of tiny localities within the park--will form a special monograph series.

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PURPOSE

The Park is designed as a museum to be the ultimate in the new trend toward "selective display". Instead of bringing exhibits to a building, the Science Park brings the people to the exhibits.

Primarily the Park is to serve the schools in introducing a pattern of study which consists of the pupils' environment. The story of the commonplace is more amazing than the strangest fairy tale.