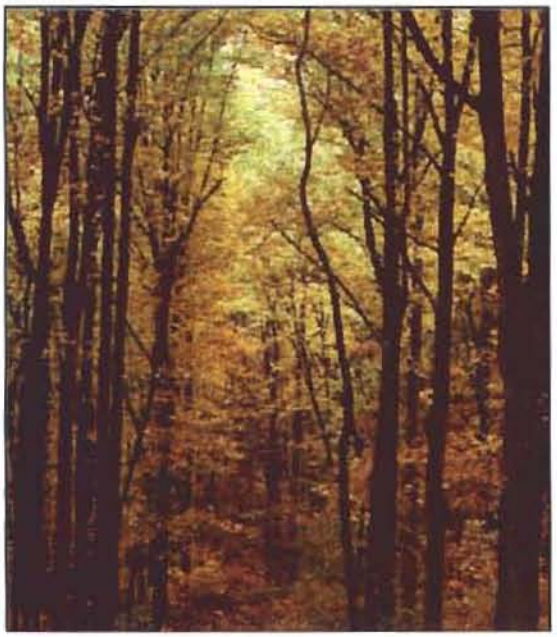
NATURAL HISTORY
TRAIL GUIDE

LUENSMAN OVERVIEW PARK

TOWN OF PORTLAND
CHAUTAUQUA COUNTY
NEW YORK STATE



CHAUTAUQUA COUNTY PARKS
DEPARTMENT OF PUBLIC FACILITIES

in cooperation with

DR. THOMAS ERLANDSON
Jamestown Community College

"Every farm woodland, in addition to yielding lumber, fuel, and posts, should provide its owner a liberal education. This crop of wisdom never fails, but it is not always harvested."

- Aldo Leopold,
A Sand County Almanac

ILLUSTRATION CREDITS

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Dr. Thomas Erlandson
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JOHN R. LUENSMAN

John R. Luensman served as Chautauqua County's Director of Planning and Development for 30 years, from 1960 to 1990. Early in his tenure John worked with the Park Study Committee to recommend a park system to meet the future needs of Chautauqua County. The recommendation of the Park Study Committee, with technical support provided by John in the Planning Department, included the development of the County's overland and waterway trails as well as the acquisition and development of two overview parks. In recognition of John's role in developing the County's park system, the Chautauqua County Legislature passed a resolution on November 20, 1996, naming the overview park on Thayer Road in the Town of Portland "Luensman Overview Park."

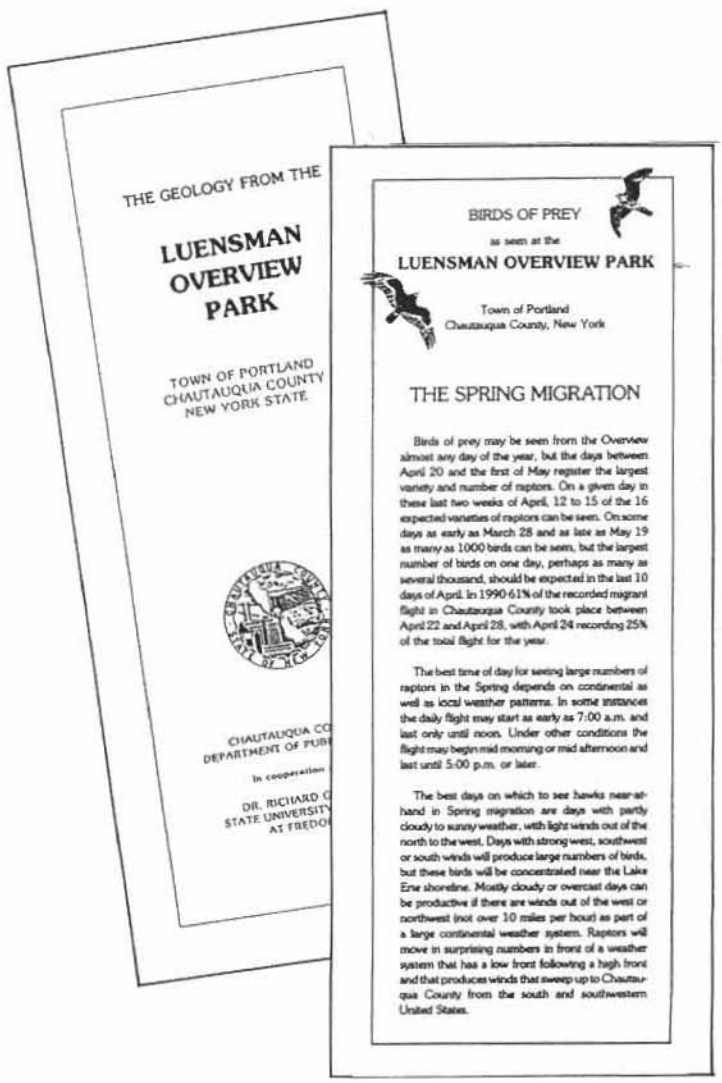
In the unanimously approved resolution naming Luensman Overview Park, the Legislature acknowledged John's instrumental role in creating Chautauqua County's park system, citing also his role in securing funding for the Thayer Road park and in its development. The resolution also praised John's commitment of time in his private life to the benefit of the environment and environmental organizations, such as the Jamestown Audubon Society and the County Parks Commission.

John was Chautauqua County's first Planning Director, serving first under the Chautauqua County Board of Supervisors, then serving under four different County Executives. In 1975 the adoption of the County Charter placed responsibility for the Department of Development in the Planning Department, making John the County's first Director of Planning and Development. John was instrumental in shaping both the County's planning and development functions.

Following his 1954 graduation from the University of Illinois with degrees in landscape construction and architecture, John served in the Air Force from 1954 to 1956, then worked for private sector planning consultants until beginning his employment with Chautauqua County in 1960. During his years with the County and in his retirement, John made his home in Mayville, where he and his wife Nancy raised their family.

NATURAL HISTORY OF LUENSMAN OVERVIEW PARK

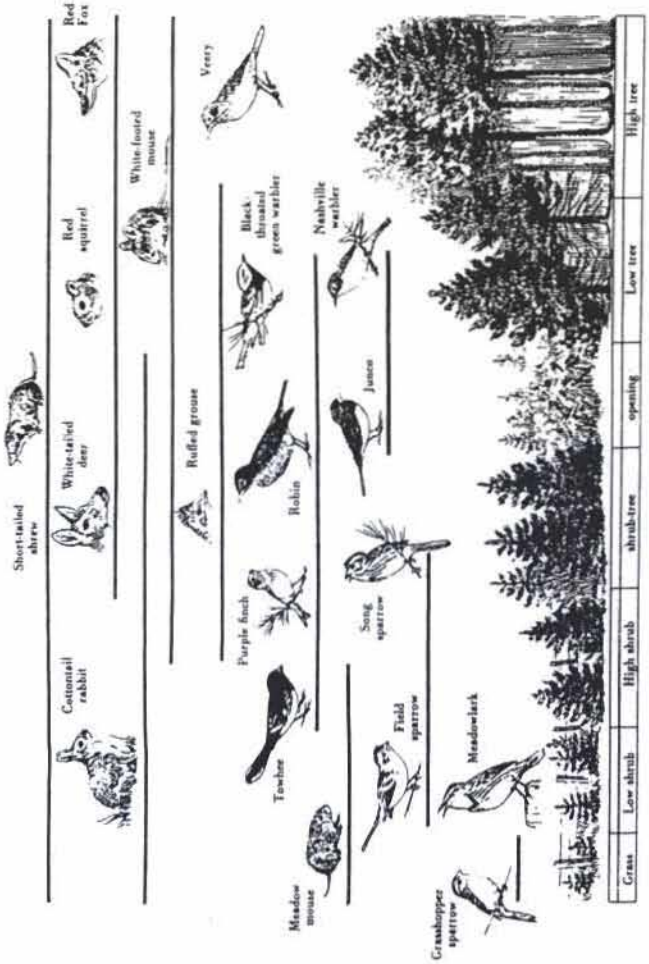
This guidebook begins with station 3. Stations 1 and 2 are located at the observation platforms near the top of the hill, just below the large pavilion. There are two separate pamphlets that present information about stations 1 and 2. The topic for station 1 is raptorial birds (e.g. hawks). The topic for station 2 is the geology of the overlook site and of the view it presents. Be sure that you visit both of these stations and read the pamphlets before you begin the rest of the nature trail.



STATION 3—EDGE EFFECT

You are standing at the edge of a field, where the field meets the woods. To ecologists, the zone where two or more different ecological communities meet and blend is an *edge* or *ecotone*. Edges are very important in the natural world. The great American naturalist, Aldo Leopold, first stated the importance of edges when he said "Game (wildlife) is a phenomenon of the edges....(Wildlife) occurs where the types of food and cover which it needs comes close together, i.e., where their edges meet." Many different species of birds and mammals are found in edge situations because they prefer or require the greater richness of vegetation and diversity of cover types that are found on the edges.

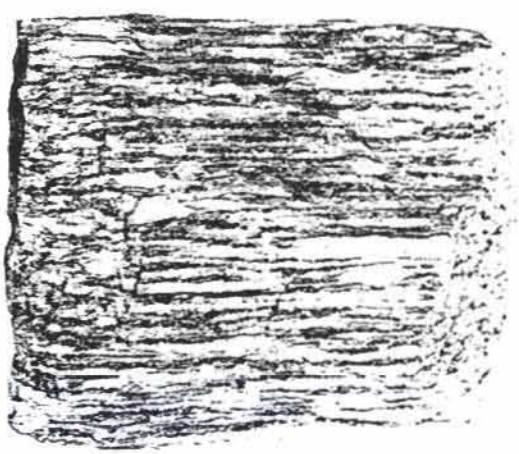
Here, for example, you see the grasses, goldenrod, brambles, and other non-woody plants of the open area merging into the sumacs that are the vanguard of the forest as the woody plants encroach out into the field. Eventually, without human intervention or such natural occurrences as occasional fires, the forest would dominate, and the field would be gone. This gradual process, known as ecological succession, has already taken place on much of this overlook property—look for signs of it as you continue your walk along the trail.



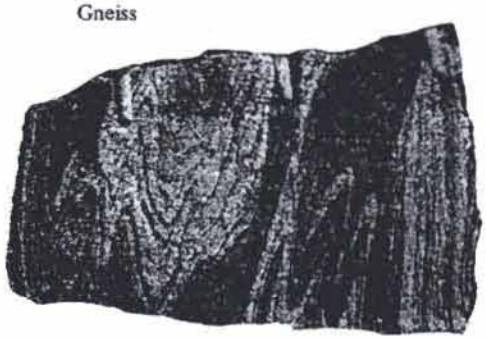
STATION 4—GLACIAL ERRATICS

As you walked along the trail from the last station, perhaps you noticed the large, boulder-sized rocks along the way. A close look at these rocks, combined with a bit of geologic knowledge, would tell you that these are not the native bedrock of Chautauqua County, that is, these rocks did not originally form here. Instead, they are examples of *erratics*, defined by geologists as large pebbles, cobbles, or boulders which have been transported some distance from their source. The abundance of erratics throughout western New York State is evidence that some powerful force was at work in the past, and that force was the glacial ice that covered this site as recently as ten or twelve thousand years ago.

Glaciers are, indeed, powerful forces. As glacial ice slowly moves in response to gravity, it erodes the land over which it flows, picking up and transporting soil and rock material in great quantities. Eventually, either in time or place, the advancing glacier meets warmer average temperatures and the ice melts, leaving its load of soil and rock behind. The glacial erratics of our overlook site arrived here by this method, and a variety of different rock types can be found, including granite, gneiss, and limestone. Whatever the rock type, all of our erratics originated further north. Look for more erratics left behind by the glacier as you continue along the trail.



Gneiss



Schist

STATION 5—TIMBER STAND IMPROVEMENT

Timber stand improvement (TSI) is a term that foresters use to describe various methods used to improve the quality of a forest, especially the quality of the marketable timber tree species growing there. Because this is a managed County Forest, two such TSI methods have been used here in recent years, and you can observe both methods, and their effects, at this station and as you walk along the rest of the trail.

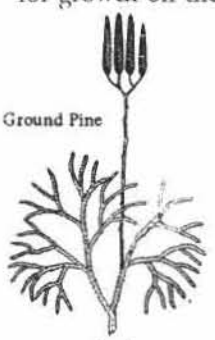
The first method involves killing poor quality, unhealthy, and unwanted tree species by "*girdling*." When a tree is girdled, the bark is removed in a narrow band all the way around the circumference of the tree in to the depth of the cambium layer, or layer of cell reproduction. Because the bark contains the phloem tissue, responsible for conducting sugar from the leaves down to the roots of the tree, the roots receive no nourishment and eventually die. With its roots dead, the tree cannot take in the water and dissolved nutrients needed for its growth, so the entire tree eventually dies. Although the dead tree remains standing for a few years, its leafless crown admits more light to its healthier or more valuable neighbors, enhancing their growth. Also, the roots of the dead tree do not compete with those of its neighbor trees for soil water and nutrients, so the nearby trees benefit in that way, as well. The end result is the enhanced growth of the remaining trees, and a healthier and more productive forest for wildlife, as well as a more valuable forest for its human caretakers.


Frost Grape

The second method seen along the trail is the cutting of grape vines. Chautauqua County is known for its vineyards, especially along the Lake Erie plain at the foot of the escarpment on which you are now standing, and birds have spread the seeds of the grapes far and wide. The "escaped" grapevines grown from those seeds have, in true vine fashion, grown upward toward the light, using native forest trees as supports instead of the posts and wires used by the vintners. A tree so invaded, encased top to bottom by grape vines, often loses in its competition with the attached vines and dies. So, as you walk along the trail, look for signs of TSI by cutting of the grape vines at their base; the cut vines, extending up into the crown of their host trees, are easily visible. You may even be tempted to play Tarzan.

STATION 6—PRIMITIVE PLANTS

The predominant color in a forest is green, and the color green can be seen in any direction. If you look up, you see the green of the leaves of the forest canopy layer formed by the crowns of the tallest trees. If you look around you at eye level, you see the green of the shrubs and younger trees. And, if you look down, you can, in the right kind of forest, see the green of the plants of the forest floor. Some types of forest do not provide the conditions needed for the growth of many ground-level plants. Ahead of you on the trail, for example, you will pass through a conifer woods, where lack of light combined with acid soil prevent the growth of ground plants. Here, however, in the more open woods inhabited by broadleaf trees, several species of small plants find the conditions they need for growth on the forest floor.


Ground Pine

If you look down at the forest floor at this station, you will see many small green plants that resemble young coniferous trees. One of the common names of these plants is , in fact, "*ground pine*," and many people think that these plants will eventually grow up to become tall pines. Not so! Ground pines, also called *club moss*, never do become any larger than you see them here. That does not make them any less interesting, however, because they are a *primitive* type of plant.

What do we mean by "primitive"? To a botanist, primitive plants are those that do not produce seeds as part of their reproductive process but, instead, spread their species by spores. Although all green plants have spores at some point in their life cycle, primitive plants such as ground pines, horsetails, and mosses produce spores in vast numbers, and the spores are carried far and wide by the wind to disperse the species. Because spores are single cells, the wind can transport them great distances. When they land, each spore can develop into a new individual of its species.

If you are a keen observer, you will find three species of ground pine along the trail through this forest. In addition to reproducing by spores, all three species have trailing, horizontal underground stems called *rhizomes*. From the rhizomes, roots grow downward into the soil and the erect stems with their primitive leaves grow upward to the light, as you see them here. The spores are produced in tiny spore sacs, called *sporangia*, that are arranged differently in each of the species. Here you see the sporangia clustered into a narrow club-like *strobilus*, hence the name "club moss." If you come back in October and touch the club, you will see a cloud of yellow spores released to the wind, part of the never-ending cycle of reproduction that is so important to all of nature.

STATION 7-FOREST GROWTH

Like people, trees take a while to grow up. And, like people, trees respond to their environment as they grow. That is the reason for the use of Timber Stand Improvement methods as described at Station 5. If you look around you at this station, you can see three different stages in the growth of the trees of this forest.

First, look to the northwest, up the hill toward the parking area. There you will see the young trees that foresters call saplings and pole-timber. These young trees, along with some older apple trees, suggest that this was once an open area, perhaps once under human cultivation. The apple trees may have been planted by the former human inhabitants, and the saplings and poles received their start by nearby older trees. It will be helpful here to recall the idea of *ecological succession* mentioned at Station 3.

Now look up the trail ahead of you. There you will see pole-timber and small sawtimber, mixed in with evergreen hemlocks. These represent an older stage in succession, suggesting that the area was once logged for timber. Perhaps the hemlocks were not cut, and the hardwoods are now growing back.

Finally, look above and beyond the station signpost to the slight rise of land to the east. There you will see a mature forest, with a stand of timber in a later stage of succession. Perhaps that area was never cultivated, and a former inhabitant used it as a source of lumber as a renewable resource. It is important to remember that, in nature, nothing is forever—change is inevitable, natural, and healthy. The land that you see today is not what it was and is not what it will be. Part of the enjoyment of nature walks involves interpreting the history of the land. Do you have ideas about the history of the land around this station that provide a different interpretation? If so, you may be right!

Deciduous forest profile

STATION 8—CHERRY TREES

Perhaps when you think of cherry trees, you think of the sweet cherry tree that stood in your backyard, the one that provided the most important part of those delicious pies! Or, perhaps you remember being chased out of your neighbor's cherry tree, along with the robins, when the fruit was in season. This station in not about that kind of cherry tree.

Choke Cherry | Pin or Wild Cherry | Wild Black Cherry

Actually, there are several different species of cherry trees. Among the cultivated cherries are the sweet cherries (*Prunus avium*) and the sour cherries (*Prunus cerasus*). The wild cherry species include the fire cherry or pin cherry (*Prunus pennyslvanica*) and the choke cherry (*Prunus virginiana*). At this station, however, we want to call your attention to another native species of cherry, the black cherry, known to botanists as *Prunus serotina*. Before we do, however, note that all cherry trees are members of the same genus, *Prunus*, which also includes the peaches, plums, almonds, and apricots. If you are wondering why that is, your question will have to wait until another time.

Among all of the other trees here, the black cherry is the one with the bark that is described as looking like "burnt cornflakes." Typically, black cherries are medium-sized trees, 50 to 60 feet high, with a trunk 2 to 3 feet in diameter. In the forest they develop a long, straight, clear, cylindrical trunk and a narrow oblong crown. Fruits are produced in abundance yearly, and the seeds housed within the fruit are spread by birds, helping to spread the species, which ranges throughout the eastern United States. Although the fruits are edible, they are not nearly as fleshy or as sweet as the domesticated species, and are not favored by humans.

Black cherry is an important timber species, and is commercially valuable. For example, of all the tree species growing in the Allegheny National Forest, just south of us in Pennsylvania, the black cherry is the primary species for which the National Forest is managed—the combination of soil and climate there seems ideal for black cherry. The wood is one of the most beautiful because of its rich reddish-brown color and luster when finished, and fine furniture is still being made locally from this native forest species. Look for other black cherries as you continue along the trail.

STATION 9—HEMLOCK TREES

This station focuses on one of our most common coniferous trees, the eastern hemlock, *Tsuga canadensis*. Calling this the eastern hemlock implies that there are other species elsewhere, and that is true. The genus *Tsuga* comprises about ten species of evergreen, cone-bearing, trees of North America and Asia, of which four are found on our continent.

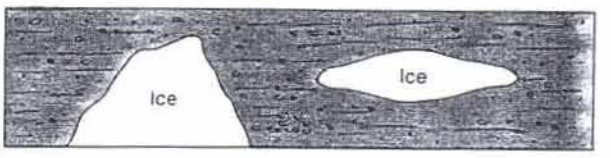
Of the four native American hemlock species, the western hemlock, *Tsuga heterophylla*, is at present the most important timber-producing species. Historically, here in the east, loggers ignored the hemlock in favor of the more valuable coniferous species, such as white pine, noted for its lumber. As a result, many hemlock groves were spared during the early days of lumbering, and some still remain. The author remembers one such grove of very large, old trees that was a favorite camping place in his youth. Unfortunately for today's youthful generation who like to roam the same woods, that grove was harvested a few years ago because hemlock has become an important source of rough-cut lumber used in pole-barn construction, especially by the Amish.

Although hemlock was not an important lumber species during the heyday of eastern lumbering, it was important for a while around the turn of the last century as a source of *tannic acid*, used in the leather tanning industry, and as a source of ash, used in making lye soap. The tanning industry was interested only in the bark, which contains up to 13% tannic acid, and the rest of the tree was often left in the woods to rot. In later years the rest of the tree was burned to obtain the ash.

Hemlocks often grow in groves or in dense woods because they are shade-loving trees. The acid from their fallen needles produces a sour soil which, along with the shade, prevents the growth of many plants on the forest floor. This, as you walk along today, observe that there are not many small plants found in a hemlock grove. Because of their shallow root systems, they are not very wind-firm, and they are often seen as wind-falls. All is not lost, however, because the shallow depression left when a mighty hemlock is blown over soon becomes filled with water as a temporary pond that can become a home for such forest creatures as salamanders and spring peepers, or a source of water for deer and turkeys. In contrast to our own human historical involvement with hemlocks little goes unused in the natural world.

STATION 10—KETTLE POND

This station is located next to a small pond which we think is a "kettle pond." The term "*kettle*" is a geologic term that refers to a hole or depression produced when a chunk of ice, left behind by a retreating glacier, eventually melted. You can recreate that process in miniature if you take an ice cube, partially bury it in a cup of sand, and let it melt. It will leave behind a kettle. Geologically, kettles come in various sizes, depending on the size of the natural ice cube that the glacier left behind. Some are dry, and are simply called kettles or kettle holes, and some are wet, and are called kettle lakes or ponds. The Cassadaga Lakes, not far from here, are kettle lakes. This is a kettle pond. At least that is our interpretation.



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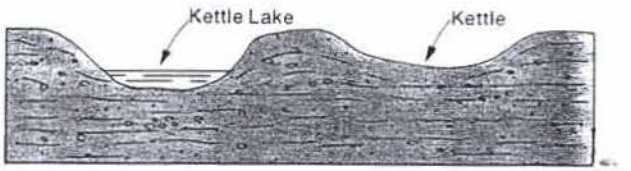

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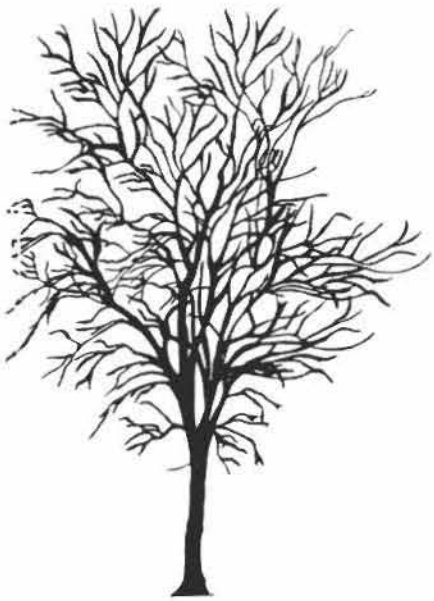
Whatever its origin, this woodland pond is an important part of the local ecosystem. It provides a breeding place for salamanders, toads, and frogs, and a drinking place for many forest birds and mammals. In dry summers, when it becomes nearly dry itself, it continues to provide moisture to nearby plants from its damp soil underground.

A close observer will notice that some of the plants are growing from hummocks raised above the pond and the wet soil nearby. And, some of the trees exhibit a growth habit called "*stump culture*"—they started growing as seedlings in the rotting stumps of former trees, which decayed right out from under them, leaving the present trees seeming to grow on stilts. Do you recognize any of the smaller plants growing here? Spicebush, a shrub, is abundant, as is wood sorrel, a small flowering plant also called sourgrass because of the oxalic acid crystals in its leaves. There is much to see and understand!

STATION 11—HUMAN SIGNS

At previous stations we have mentioned some signs of past human impacts on the land, for example TSI and lumbering. Signs of former human activities are in evidence here, as well. The gnarly old apple trees scattered among the native forest trees may have been an important part of someone's annual food crop. Here, where the trail turns left, you can look up to the right and see evidence of a farm road that may have led to the back pasture down here near the kettle pond—in fact the young age of most of the trees suggest that it has not been too many years since the land reverted to a forest.



If you look closely, however, you will see that not all of the trees are old apples or young hardwoods—there are wolf trees around! A "*wolf tree*" is a very old, very large tree with spreading branches that shade out any young trees that might become established near the old-timer. Among foresters the term has a negative aspect to it; all that shade is not good for future forest development. Also, wolf trees typically branch and spread all over the place, without much straight trunk, and are not much value for lumber even if they are the right species. About all they are good for is shade and a source of seeds, but even their own offspring cannot grow nearby.

With all those negatives, why are wolf trees here, anyway? Someone kept them around—but why? For shade? To mark a fenceline? To attach barbed wire? (Do you see any wire scars?) A nice place for a child's swing? Too big to cut? Whatever the reason, you can see them scattered throughout the woods here and elsewhere, providing a living link with the past. Maybe they are not so bad, after all.

STATION 12—MORE PRIMITIVE PLANTS

Recall that at Station 6 we described *primitive plants* as those that reproduce by single cells called spores rather than by seeds. Here we want to observe another kind of spore-producing plant, the mosses. Moss plants are very common and almost everyone recognizes them when they see them—mosses form what appears to be a soft, bright green carpet on the forest floor, on fallen logs, at the base of trees, and even on some tree trunks. We talk about peat moss, which is (or was) a moss, and reindeer moss, which is not (it is actually a lichen—a bit about those later),

The biology of moss plants is interesting! They are among the first plants to colonize barren ground, providing there is adequate moisture. Moss plants, you see, require a moist habitat and are never very far from water or damp soil. There is a reason for this! Along with reproduction by spores, mosses also reproduce using eggs and sperm, and the sperm need a bit of water in which to swim to the part of the plant containing the egg.

If this sounds too complicated, it isn't, really. A close look at the mosses around you will show that some have two parts, a green, leafy base and a brown stalk with a capsule on top. The brown stalk is sticking out of the green base. What happens is this: the green base produces the egg and sperm, which unite and grow into the brown stalk, which produces the spores. Simple enough! Botanists call the green base the *gametophyte generation* and the brown stalk the *sporophyte generation*, but we won't worry about that. What is important is that you can recognize mosses for what they are—a very common primitive plant. If you ever become lost in the forest, it may also be important to know that mosses grow on all sides of a tree, not just the north side. It is better to carry a compass!

Since we mentioned that reindeer moss was actually a *lichen*, we should say that lichens are also biologically interesting. Lichens are actually two plants growing together, a situation biologists call "*symbiosis*"—living together. The two plants are a fungus and an alga, and it is a great arrangement. The fungus provides a sort of framework in which the alga cells can live and also stores water. The alga, being green, produces food for itself and the fungus by photosynthesis. Moss and lichens often grow in similar habitats, such as on rocks and trees, so look for them together here before you walk on.

STATION 13—MAPLE TREES

Maple trees are very common in the woods of the northeast, and this woods in no exception. The station marker here is midway between two sugar maples, also known as hard maples *Acer saccharum*. Actually, there are several species of maples in our northeastern woods, and you may be familiar with some of the other species: red (soft) maple (*Acer rubrum*), silver (split leaf) maple (*Acer saccharinum*), striped maple (*Acer pennsylvanicum*), and boxedler or ash-leaved maple (*Acer negundo*) are among the most common. None of the others, however, have the same importance to humans as the sugar maple.

Red Maple

Sugar Maple

Why is the sugar maple so important to us? It provides us with its sweet sap for maple syrup and maple sugar. It provides us with a valuable, high-quality hard wood for furniture and such tough products as bowling alleys, bowling pins, butcher blocks, and croquet mallets. The parts of the tree not used for lumber provide us with a superb firewood. Sugar maples make a wonderful shade tree and have provided picturesque beauty as roadside trees and ornamentals.

Box Elder

Striped Maple

Although these two examples of sugar maples are relatively small, the species commonly attains a height of 60 to 80 feet and a trunk diameter of 2 feet. It is a long-lived species, and may attain an age of 200 to 300 years. So, you can return to our overlook and trail for many years to come—these two sentinels will still be here!

STATION 14—FOREST REPRODUCTION

Reproduction is vital to all living things, and that includes the trees of the forest. Biologically, there are two main types of reproduction: *sexual* and *asexual.* Although we have not said so, we have mentioned both of these types at previous stations: reproduction by spores, as with ground pines, is asexual; reproduction with eggs and sperm, as with moss plants, is sexual. In general, sexual reproduction is the rule for trees, although some species commonly use asexual methods as well.

Sexual reproduction involves sperm cells fertilizing egg cells. In conifers, such as hemlocks, this process takes place in the cones, while in flowering trees, such as sugar maples, fertilization occurs in the flowers. Most trees have male and female parts on the same tree, although there are exceptions to that, too. In any event, the fertilized egg develops into an embryo housed within a seed. The seeds are "naked," or unprotected, in conifers, but flowering plants protect their seeds within a fruit, which also aids in seed dispersal (the dispersal of cherry and grape seeds by birds, for example, or burdocks being dispersed in your dog's hair).

Asexual reproduction commonly involves the sequential growth of young plants away from the parent plant by horizontal underground shoots called *runners*. Strawberry plants are a good example of runnering., as are ferns, ground pines, sumacs, and such trees as quaking aspen (popples), *Populus temuloides.*

Look around and you will see abundant evidence of forest reproduction: young cherry, hemlock, and maple trees started from seeds, sprouts from the base of beech trees, and blackberry brambles from runners. As you look for young plants, keep in mind that few of them will survive the competition of the larger, more established plants that produced them. Those that do not survive provide nourishment for other species, so their loss is part of the plan, and populations are kept in check.

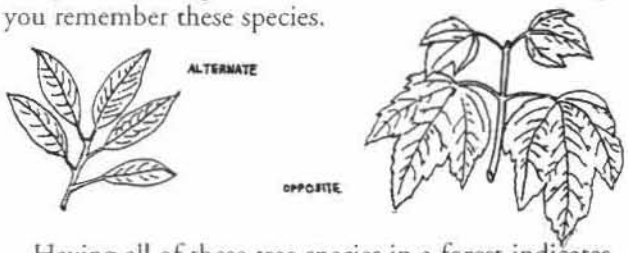
STATION 15—FOREST DIVERSITY

The dominant trees of the forests vary from region to region, depending largely on the local rainfall, but other climatic factors and the effects of human activity are also influential. In our region, the "*temperate deciduous forest*," the dominant trees are the beech, maple, hemlock, white pine, and a variety of other northern hardwoods such as yellow birch, hop hornbeam, and black cherry.

Many species of trees can be readily identified by the texture of their bark. For example:

maple-plates beech-smooth
black cherry—burnt cornflakes
hop hornbeam—flakey
musclewood—muscle-like ridges

Another characteristic useful in identifying trees is the arrangement of their branches. There are two basic patterns of branching: *alternate* and *opposite*. Most tree species display alternate branching, but the maples, ashes, dogwoods, and horse chestnuts display opposite branching. The words "MAD HORSE," (Maple, Ash, Dogwood, HORSEchestnut) may help you remember these species.



Having all of these tree species in a forest indicates a diverse forest community. Ecologically, the more species present in a community, the higher the *diversity*, and a diverse community means that the ecosystem is sound. Parallels can be drawn between ecological diversity and other aspects of life. For example, stockbrokers encourage their clients to maintain diverse portfolios, and the leaders of major corporations advise product diversity because if one stock or product fails, there are others on which to depend. Similarly, in an ecosystem, if one member of the community suffers a population loss, the entire ecosystem is not devastated.

On a worldwide basis there is tremendous difference in the level of diversity from one ecosystem to another. The tropical rain forest community, for example, has as many as 100 species of woody plants (trees, vines and shrubs) per acre, while our northeastern forests, such as this one, typically have only 10 species of woody plants per acre. Despite these differences, it is important to remember that every ecosystem evolved in harmony over long periods of time, and that ecological stability, once reached, is not easily upset. It is equally important to remember that we humans have tremendous power to change and even destroy entire ecosystems. That is both a terrible responsibility and an awesome challenge.

STATION 16—FOREST WILDLIFE

At the last station the topic was forest diversity, and we hope that you don't think that plants are the only component of community diversity. Nothing could be further from the truth, of course, because animals are important, too. In an ecological sense, plants, because of their ability to make their own food by photosynthesis, form the basis of the food web of an ecosystem. The plant-eating animals (*herbivores*) constitute the next step up the ecological ladder, while the *carnivores* occupy the top step. (*Omnivores*, like us, which eat both plants and animals, are in there somewhere.) A high plant diversity usually means a high animal diversity, so it all ties together.

The terms "animal" and wildlife" are often very narrowly interpreted to mean just birds and mammals. To a biologist, an animal is any member of the Kingdom Animalia, and that includes everything from the simple sponges up to complex vertebrates like ourselves. And everything in between. And that includes insects, snails, salamanders, spiders, worms, etc., etc. So, there is room for lots of animal diversity in a forest.

Because the animal diversity ultimately depends on the plant diversity, it is possible to look around at the plant types present and get an idea of what animals might be found in the area. Such a plant inventory at this station will generate quite a list: beech trees, pin and black cherries, hemlocks, and grapes are in evidence. The beeches and cherries provide food, while the evergreen hemlocks provide "*cover*" a place for animals to hide. Also, beech trees often have holes in them, and serve as den trees. Note the three large, old beech trees and count the potential den holes. All of this food, cover, and den space, combined with the stream just down the hill ahead of you, means ideal animal habitat. What animals would you expect to find here? Deer? Turkey? Squirrels? Grouse? Songbirds? Have you observed any of these or other species? Have you seen any indirect signs of their presence? Keep a sharp eye!

STATION 17—DEATH AND DECAY

The topics at the last several stations have emphasized life: reproduction, plant diversity, and wildlife. But life is only part of the picture in a forest community. A look around you at this station will show that, in addition to life, the natural end of life is all around us. Note the very mature, large beech tree (*Fagus grandifolia*) nearby, with its dead branches—it is reaching the end of its life. As with humans, that end may be hastened by various diseases. For example, beech trees throughout the northeast are being infected with fungal disease known as the Nectria Canker, which is shortening their normal 300-400 year life span.

As you continue to look around you, observe the several fallen logs and branches on the ground. Theses are in various stages of *decay* and *decomposition*. The decomposition process is crucial to any ecosystem, because it gradually removes the remains of dead organisms and, at the same time, puts many of their component chemicals back into the soil to be reused and recycled by future organisms. Without the decomposition process, the surface of our planet would be littered with the remains of plants and animals, and the soil would be depleted of nutrients.

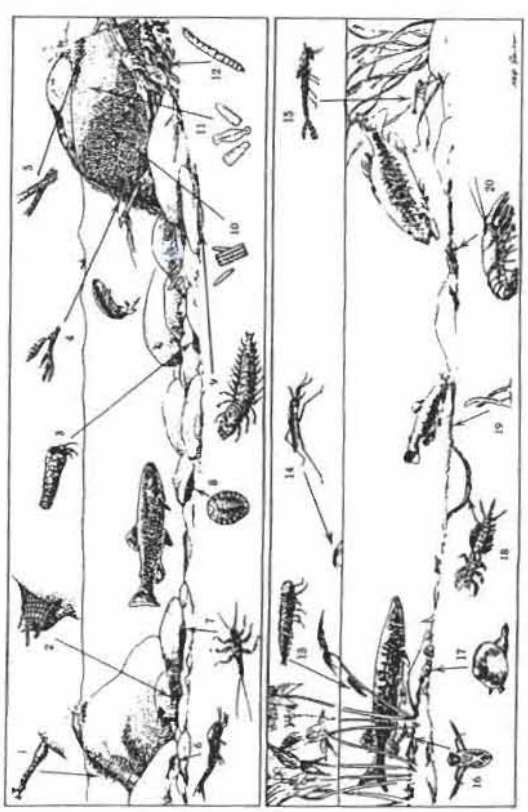
The decay process is interesting and worth watching if you have the time and opportunity. Scavenger animals play an important early part in the process, and such creatures as seagulls, crows, and various insects are important in that role. The champion decomposers, however, are the bacteria and fungi. Bacteria by the billions invade decaying plants and animals, secreting their digestive enzymes outside their cells and absorbing the nutrients made available. The fungal body consists of countless threadlike filaments called hyphae, which penetrate into the plant or animal remains and, like the bacteria, secrete digestive enzymes to provide themselves with nutrients. If you have ever tried to combat household mildew and bread mold, you know how effective the fungi can be.

One type of common woodland fungus is present on some of the still-standing dead trees. This type, known as the *shelf* or *bracket fungus*, sends its filaments into the dead tree tissue, slowly breaking it down while it derives its nourishment from the tree. Look for other fungi on dead trees and logs or on the ground as you continue your walk. They are everywhere!

STATION 18—STREAM BIOLOGY

Watch the nearby stream for a few minutes. Rivers and streams are characterized by continuously moving water, the current. The type of life in a stream is determined to a large extent by the swiftness of the current. In fast-flowing steams, most organisms live in the shallows, called *riffles* where small photosynthetic algae and water moss cling to rock surfaces. Animal organisms such as mayflies, stoneflies, and caddisflies are typical fast-water inhabitants, and serve as important food sources for trout and other fast-stream fish. In streams with slower currents, or in the quiet pools between riffles, a different mix of plants and animals is found, including snails, dragonflies, various fly larvae, smallmouth bass, and even some rooted aquatic plants.

This is a small stream, which means that its inhabitants are small, so do not look for large trout in the riffles or large bass in the pools. In fact, small streams such as this one are often *intermittent* streams, which means that they dry up occasionally when the summer is particularly dry. Intermittent streams also flow right along in the spring when the snow melts, and when unusually heavy rains fall within their *watershed*. A stream's watershed, or *drainage basin*, is the area drained by the stream, and is separated by the adjacent watershed by a *divide*. By walking up and over the hill on the other side of the stream you may enter the watershed of the neighboring small stream. You may also become lost, so it is better to stay on the trail and go on to the next station.

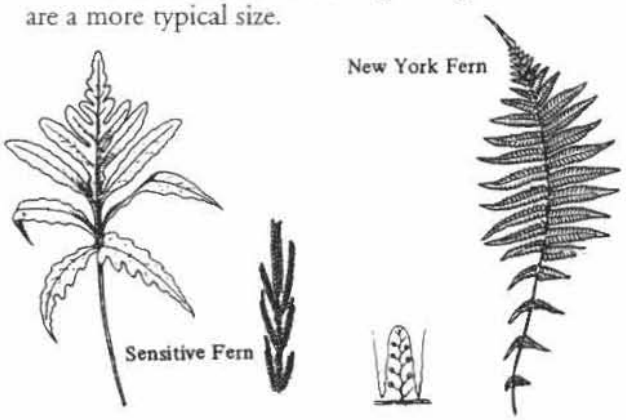


Life in a fast stream compared to that in a slow stream. (1) Blackfly larva; (2) net-spinning caddisfly; (3) stone case of caddisfly; (4) water moss (Fontinalis); (5) alga Ulothrix; (6) mayfly nymph (Isonychia); (7) stonefly nymph (Perla); (8) water penny; (9) heligrammite; (10) diatoms (Diatoma); (11) diatoms (Gomphonema); (12) cranefly larva; (13) dragonfly nymph; (14) water strider; (15) damselfly nymph; (16) water boatman; (17) fingernail clam (Sphaerium); (18) burrowing mayfly nymph (Hexagenia); (19) bloodworm; (20) crayfish.

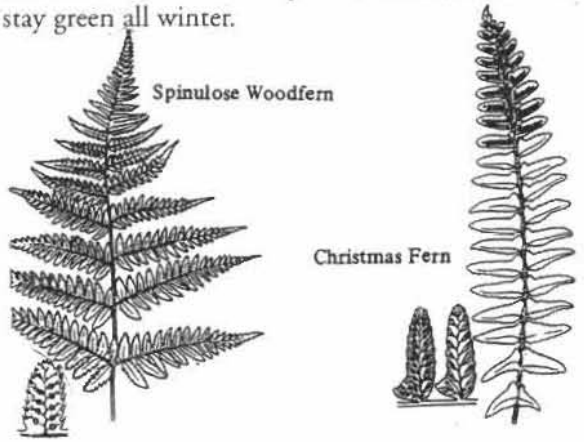
STATION 19—STILL MORE PRIMITIVE PLANTS

By now you should be aware of the basic characteristics of what we have been calling "primitive plants": they are small, reproduce by spores, do not have flowers or cones, and do not produce seeds. So far we have seen ground pine and mosses. Now it is time for the ferns.

Although ferns are the largest of the primitive plants that we have seen along the trail, they are only a fraction of the size that they once were—recall that there were "tree-ferns" in abundance during the Mesozoic Era, know as the Age of Dinosaurs. Their size is much reduced now, and the largest species in our area are about four feet tall. Most species are smaller, however, and the ones growing at this station are a more typical size.



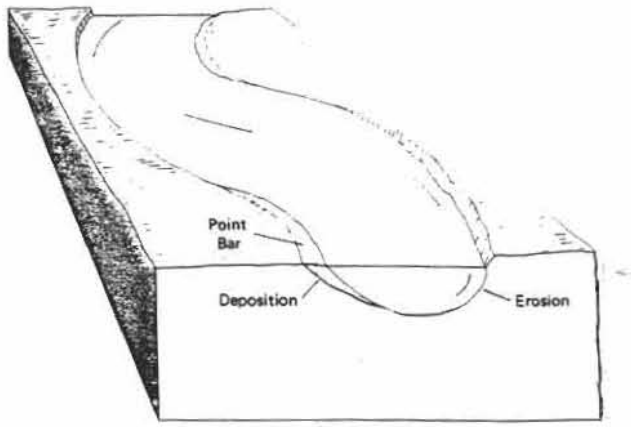
Like the ground pines, what you see of a fern is only the leafy above-ground part, called the *frond*. The rhizome (horizontal stem) and the roots are underground. The fronds of most species die back each fall, but one local species, Christmas fern, does stay green all winter.



The spores of ferns are produced in clusters of spore sacks (*sporangia*) that are grouped into structures called "*sori*" that appear as small dark dots on the underside of the fronds of many local species. The species here does have such sori, and if you gently lift some of the fronds and look on the underside you will probably see them, depending on the time of year that you are here. If you do not see them, then plan a return trip in the future. You won't be sori!

STATION 20—STREAM GEOLOGY

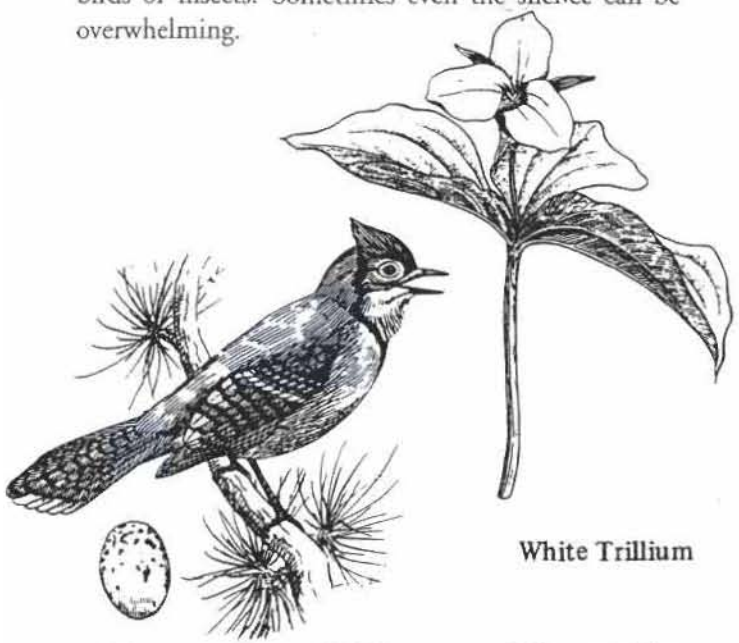
Take a few moments to observe the small stream flowing by this station. Streams mean different things to different people. For those who like to fish, streams provide a place to practice their favorite recreation as they try to outsmart trout or entice smallmouth bass. For children growing up in the country, a nearby stream means a place to wile away some summer hours, perhaps looking for crayfish and cooling off in the process. For the more adventuresome, larger streams provide a place to canoe, sometimes with upsetting results. To geologists and biologists, streams are among the most interesting and dynamic places on earth. Geology texts include entire chapters on the basic dynamics of stream geology and geochemistry. Streams carry out three important processes which combine to have a major impact on our planet: erosion, transport, and deposition.



Erosion means picking up and moving material such as silt, sand, and rocks of various sizes, and moving water is the major erosive force on earth. The effects of erosion are often easy to see: observe the undercut banks and the leaning tree near the stream in front of you. The soil and rock material which has been removed has also been *transported* and deposited somewhere downstream, much of it eventually being carried all the way to Lake Erie. Along with erosion and transport, streams are also agents of *deposition*, which means the settling out of the material being transported. Deposition occurs when the stream current slows down enough for the stream's sediment load to settle to the bottom. In meandering streams, such as this one, deposition usually occurs on the inside curve of the meanders, creating a point bar which you can see here. But, remember, the natural world *is* a dynamic one, and whatever you see here today is only temporary, and may not be here tomorrow, next week, or next year. Be sure to come back and see!

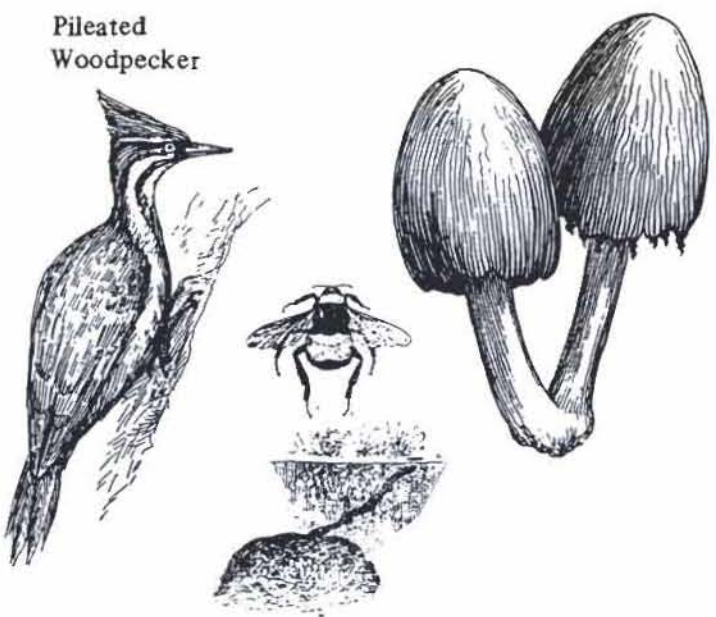
STATION 21—STOP, SMELL, AND LISTEN

At this point along the trail you have come quite a way, climbed some, and have a bit more to climb. It is a fine place for a rest! Thus far, we have asked you to observe many things, but have not asked you to use your other senses. So, as you rest, why not close your eyes and use your ears and nose! What do you hear? Running water? The wind in the trees? The sounds of birds or insects? Sometimes even the silence can be overwhelming.



White Trillium

What do you smell? The scent of flowers? The aroma of the earth itself? We humans have precious little sense of smell left, and using it may take some practice. Go up to a tree and smell it. What does a bracket fungus smell like? Take a handful of leaf litter and take a whiff, but watch for small critters!



Pileated Woodpecker

STATION 22—CLIMATE

When hiking a nature trail, one should include as much of nature as possible. So far we have covered biology and geology fairly well, but have said little about *climate*. We are usually so concerned abut the weather that we forget about the climate. Weather and climate involve the same set of factors (temperature, pressure, humidity, precipitation, winds, and sunlight), but weather is local and short-term while climate is regional and long-term. Considering this, it is climate, not weather, that plays a major role in determining the biology and the geology of an area.

One of the trees at this station is a cucumber magnolia, *Magnolia acuminata*, commonly called the cucumber tree. When people, especially northerners, think of a magnolia ,they usually think of the southern variety, *Magnolia grandiflora*, which is limited in range to the southern states from the Carolinas to Arkansas. Its northern relative, the cucumber tree (OUR magnolia) is a more hardy species, ranging from the southern Great Lakes to the Gulf Coast. What does all this biology have to do with climate? Lots! To be successful, living things must adapt to their environment, and that includes climate. Although cultivated varieties of the southern magnolia are planted as ornamentals in the northeast, they are not a native northern species and do not flourish without human cultivation. The cucumber magnolia, on the other hand, does well here and is, in some areas, an important timber species.

To botanists, magnolias are interesting because of their long evolutionary history. The large number of lower parts, especially the numerous stamens and pistils, indicate that it is a primitive species of flowering plant, and the fossil record supports that premise. Numerous fossils of now extinct magnolia species have been found around the world, dating back to the latter days of the dinosaurs. The fruits are also of interest, being large and cone-like, which gives the tree its common name.

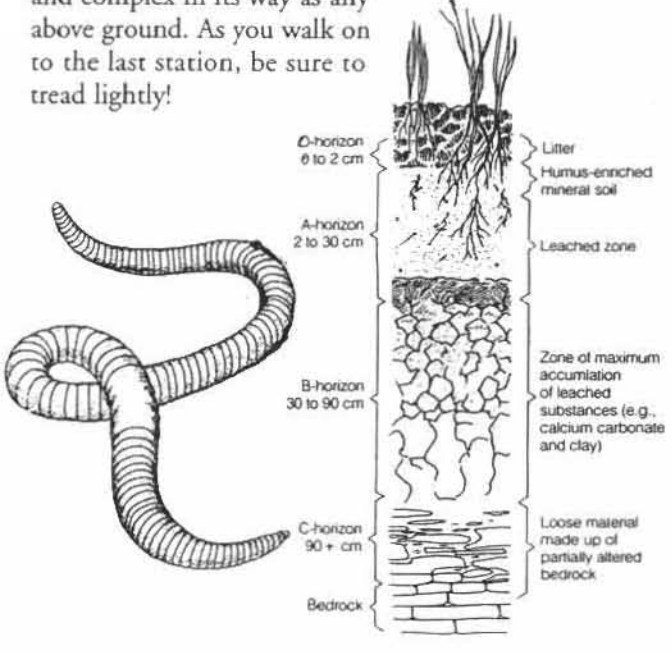
Like plants, animals are also adapted to the climate in which they live. Unlike plants, however, animals can move, and some simply move to escape the seasonal variations that are part of temperate climates such as ours. Many bird species migrate to escape climatic rigors, for example, and frogs, toads, and many mammals spend much of the winter sleeping. Woodchucks go into winter sleep in a big way—they *hibernate*, which involves drastic lowering of body temperature, breathing rate, and heart rate. Such invertebrate animals as insects have adapted their life cycles to our northeastern winters by spending the cold months in either the egg or pupal stage, a distinct advantage when food is scarce. And some animals just tough it out, finding natural foods in an environment largely shut down for the winter. If you have not done so, walk our trail during the cold months and see who is still around.

STATION 23—SOIL

The topic at this station involves another important aspect of nature, soil. To many people, soil is simply "dirt," but soil is actually much more than that! Soil has three major components: minerals, derived from rocks (rocks are the "parent material" of soil); organic matter, including both living organisms and decaying material derived from the decomposition of once-living organisms; and water and air, derived from the atmosphere. Soil is much underrated in importance and poorly understood. It is underrated because it is so vital to every ecosystem on earth. It is poorly understood partly because it is underrated and partly because it is a complex substance. It provides both a place to grow and a source of water and nutrients to rooted plants, which are the basis of all terrestrial and many aquatic food webs. The relationship between the roots of a tree and the soil in which it is growing is the most intimate relationship on earth. Tree species are adapted to certain soil conditions, and do not do well when those conditions are not met. Foresters consider soil as a primary factor to evaluate when considering which trees to plant.

The formation of soil is directly connected with the climate, because it is the climate that weathers the rock, the parent material of soil, into the mineral components that are one of soil's main constituents. The warm, wet climates of the tropics weather rocks much more quickly than the colder climate of our area, and produce the deeper soils of the tropics as a result.

Good soil is rich in living organisms, especially in the near-surface zones. We are all familiar with the ubiquitous earthworm, but are often unaware of the myriad of other small animals, algae, and fungal filaments that are found among the mineral particles and decaying organic matter. Such organisms as mites, roundworms, and a variety of insects and protozoans live out their lives in a microscopic ecosystem as intricate and complex in its way as any above ground. As you walk on to the last station, be sure to tread lightly!



STATION 24—BLACK LOCUST TREES

This is the last station on the trail and, before you leave the woods we want to call your attention to the trees here along the road. Despite the fact that some of the trees have been cut, if you look closely you can see that they seem to be planted in rows. Such a plantation pattern is common for this species, the black locust, *Robinia pseudoacacia*. Many of these trees were planted in past years by area farmers, because the wood is very dense, hard, and strong in bending and compression-ideal for cutting into fence posts. In fact, locust posts can be bought at local agricultural supply stores, and the species still provides an annual cash crop for many rural families. In an earlier era, locust wood was extensively used for wagon hubs and railroad ties. Today, beekeepers prize locust honey, made from the nectar of the white, fragrant flowers that blossom in the spring.

Black Locust

If you are here in late summer, you can tell from the fruit that the locust is a member of the plant family Leguminosae, the legumes or pea family. The flat 2- to 4- inch pods resemble those of peas on a grander scale, and, like peas, contain up to 8 seeds each.

Getting back to the idea of a locust plantation, additional evidence is seen in the openness of the station area. That, combined with other indications of human agricultural activity seen at some of the previous stations, suggests that the site of our Thayer Road Overlook was once a farm. But, as we have said, things change, and the farm has become forest and the forest has become an overlook park.

We hope that you have enjoyed your walk along our nature trail. To return to the parking area, simply turn right when you reach the road, walk up to the top of the hill, and enjoy the view!