D. Patriquin

An Ecological Description of the Woodland Flora at "The Oaks"

A Report to
Edmonds Environmental Services Division,
Edmonds Landscape and Construction
Services Limited,
Halifax, Nova Scotia

by

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Preface

This document is a report to Edmonds Environmental Services (a Division of Edmonds Landscape and Construction Services Ltd., Halifax) on a preliminary study of the species and natural history of the woodland flora at "The Oaks". The Oaks is an old south end Halifax estate which is now part of the campus of St. Mary's University.

The study was carried out in June and July of 1992 by Ann Li Huestis with the collaboration of myself at Dalhousie University and of Edmonds Environmental Services. Financial support was provided by a Sarah Lawson Scholarship held by Ann Li, and material support by Edmonds Environmental Services. The Sarah Lawson scholarship is given by the Department of Biology, Dalhousie University, to support students with botanical interests. Dr. Pierre Taschereau, lecturer in Botany at St. Mary's and Dalhousie Universities, verified identifications, and offered helpful interpretive comments.

The study was conducted in conjunction with a R&D project of Edmonds Environmental Services on Total System Organic Management (TSOM) for Turfs, which was initiated in May of 1992. The project is supported by the Federal/Provincial Sustainable Economic Development Agreement. The Oaks is a site of some of the TSOM turf trials.

It was of interest to study the woodlands surrounding the turfs at the Oaks because they play important ecological functions in relation to the turf, e.g.:

- as windbreaks, they lessen water stress in summer and help to maintain a protective cover of snow in the winter;
- the deep rooted trees draw nutrients from great depths, reducing to an absolute minimum the potential for contamination of groundwater from fertilization of the turf;
- they diversify the habitat, providing a reservoir of natural enemies of turf pests;
- the ecotones between the woodland and the turf are sources of broad leaf plants in the turf.

In addition, the woodland is a garden in its own right. Ann Li's documentation shows how in the past, management of the estate extended into the woodland with plantings of beautiful ground covers, and of flowering shrubs such as rhododendrons in parts of the woodland adjacent to the lawns. There are many interesting (e.g. Indian Pipe, a saprophytic plant lacking chlorophyll) and beautiful (Lady's Slipper Orchid) native plants still residing in the woodland, to say nothing of the magnificent oaks.

There is much we need to learn about managing urban woodlands in order to realize their multiple potentials as aesthetic, recreational, educational and ecological resources. For example, what clearing should be done, what should be removed, what should be left to decay in place? Does human activity need to be restricted to paths in order to maintain some of the ground covers? Should pest outbreaks be controlled?

To answer these questions, we need to know what's there, and something about their ecological functions. Ann Li's report is a first step towards obtaining this information. In addition, her documentation in the appendix of points of interest on plants in woodland at the The Oaks, and her beautiful photographs, cannot help but enhance our appreciation of the value of this urban site.

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January 22, 1993

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INTRODUCTION

The wooded area at the Oaks represents a small stable woodland community on fairly rich soils. It illustrates a clear vertical stratification made up of the canopy, understory, shrub and ground layer (Smith, 1980). It is bordered by a transition zone where plant species from the woods compete with species from its neighbouring habitat of lawn and garden forming an "ecotone" (Kricher & Morrison, 1988). Thus, The Oaks contains a unique blend of native plant species from a temperate deciduous forest community, secondary successional species from the ecotone as well as garden species that were introduced around the vicinity of the woods.

These plant species are able to integrate their activities successfully by utilizing strategies for resource allocation, growth and reproduction. In order to understand the adaptive ecology of the plants at The Oaks, several concepts are presented.

COMMUNITY STRUCTURE

Stratification in a community is determined mainly by physiognomy which in turn influences the interception of solar radiation. This vertical stratification provides the environment in which many plant species are adapted to live (Smith, 1980).

1. The Canopy

The canopy of the woodland at The Oaks consists of both hard and softwood species. Red oak (*Quercus borealis* Michx.f.) and red maple (*Acer rubrum* L.) represent the hardwoods, while white pine (*Pinus strobus* L.) and hemlock (*Tsuja canadensis* (L.)Carr.) make up the evergreen softwoods. The dominant tree species is red oak, in terms of biomass (trunk diameter size, leaves, twigs) and the amount of influence it exerts on the other vertical strata (Smith, 1980). They are found occupying the sunnier and drier areas of the woodland whereas the conifers are found on the cooler and damper sites.

2. The Understory

Saplings of red oak, red maple, paper birch (*Betula papyrifera* Marsh.) and white pine make up the understory layer. Often, red maple form clumps until competition for light, moisture and nutrients results in only one or two young trees surviving. Paper birch, also intolerant of shade, remain small until there is an opening in the canopy due to senescence or death. In the understory are other small tree species like mountain ash (*Sorbus americana* Marsh.) whose bright scarlet red berries are attractive to birds in the fall. Witch-hazel (*Hamamelis virginiana* L.), which also grows in clumps, is the only shrub in Nova Scotia that flowers in the fall producing a woody explosive capsule in the following year (Roland & Smith 1983). Shadbushes (*Amelanchier* spp.), bush-honeysuckle (*Diervilla Lonicera* Mill.) and red-berried elder (*Sambucus pubens* Michx.) further add to the richness of the understory.

3. The Shrub Layer

The shrub layer consists mainly of low-growing heath plants (Family Ericaceae). These plants prefer more acidic and drier situations and are therefore found growing on the exposed sandy areas and rock outcrops. Evergreen species like Teaberry (*Gaultheria procumbens* L.), which is sometimes called wintergreen, and sheep laurel or lamb-kill (*Kalmia augustifolia* L.) have leathery leaves which are adaptations to harsh diurnal and seasonal temperature fluctuations. Also found in this strata are low-growing blueberries (*Vaccinium myrtilloides* Michx.) and huckleberry (*Gaylussachia baccata* (Wang.)K. Koch) which is distinguished by yellow resinous dots on the abaxial surface of its leaf (Roland & Smith, 1983).

4. The Ground Layer

The ground layer is made up of herbaceous plant species and a few ferns. These plants depend on the microclimate created by the tree and shrub canopies and are therefore shade-tolerant. They include wild sarsaparilla (*Aralia nudicaulis* L.), wild-lily-of-the-valley (*Maianthemum canadensis* Desf.), pink lady's slipper (*Cypripedium acaule* Alto.), corn-lily (*Clintonia borealis* (Ait.)Raf.), starflower

(*Trientalis borealis* Raf.),wood aster (*Aster acuminatus* Michx.), lion's-paw (*Prenanthes trifoliolata* (Cass.)Fern.) and Indian-pipe (*Monotropa uniflora* L.). The latter is unusual because it is pearly-white, (it does not posses chlorophyll) and is saprophytic on decayed organic matter on the forest floor (Roland & Smith, 1983).

In areas below canopy gaps, grass species like hair-grass (*Deschampsia flexuosa* (L.)Trin.) are found in clumps, taking advantage of better light transmission. Their hair-like leaves and delicate open-panicled inflorescence add a new dimension to the tapestry of forest floor herbs. On the wood paths, rush (*Juncus tenuis* Willd.) is found growing in small clumps.

The fern species found in this strata are bracken fern (*Pteridium aquilinum* (L.)Kuhn.), growing singly from rootstocks with a three-parted frond, and cinnamon fern (*Osmunda cinnmomea* L.), distinguished by its cinnamon-coloured stipes (Roland & Smith, 1983).

Mosses are few in this layer. Although they enjoy the same microclimate as the fern and herb species, they also take advantage of the microtopography created by rocks, logs and stumps. One example of a moss found here is *Polytrichum.*

The forest floor shows an uneven distribution of leaf litter composed of leaves and twigs from red oak and other smaller deciduous species. Conifer needles make up some of the forest floor litter especially on the cooler and wetter section of the woods. Forest floor litter provides a food substrate for protozoa, earthworms, millepedes, mites, fungi, etc., and is important for the recycling of nutrients that support growth of species in the four strata(Kricher & Morrison, 1988).

FACTORS INFLUENCING STRUCTURE

The canopy has a great influence on the structure of the woods since it controls the amount of solar radiation that falls on the three lower strata. Since the density of the canopy is not homogeneous, the amount of light penetrating to the ground layer is highly variable from place to place, thus affecting species richness and diversity. A

fairly open canopy results in a well-developed understory and shrub layer, whereas a closed canopy discourages the growth of understory, shrub and herbaceous species (Smith, 1980).

The activities of the canopy tree species are responsible for creating the microclimate in the woods by affecting humidity, soil temperature and moisture level. The degree of interception by the canopy varies seasonally as during the winter, the deciduous trees are leafless. The branches and trunks alone absorb 50-70% of the incoming solar radiation. In the summer months, only 1-5% of the light penetrates the canopy (Hicks & Chabot, 1985).

Other factors that affect the nature and distribution of plant species below the canopy are soil nutrient levels, drainage, position and aspect of slope (Smith, 1980; Barbour et al., 1987). In order to cope with these different environmental influences, adaptations are necessary in maintaining the vertical structure of this community.

ADAPTATIONS

Plants make use of certain strategies so as to fully exploit different light intensities, moisture and nutrient levels. These strategies include avoidance or tolerance of stresses imposed by the canopy (Hicks & Chabot, 1985).

Avoidance is usually related to the phenology of the canopy and to the microclimate. Herbaceous plants that make use of this strategy are spring ephemerals that take advantage of the leafless period between snowmelt and canopy closure to complete most of their growth. They have a low-light-saturation-point of 25% full sun. Their growth at that time of the year is ecologically important because they help to conserve nutrients that otherwise would be lost in runoffs. Much of their energy is stored in underground tissues to maximize their chances of survival during the winter months (Barbour et al., 1987; Smith, 1980).

Tolerance, however, involves modifications in structure and function, e.g., leaf area, or photosynthetic and respiration rates. Plants that utilize this type of strategy are categorized as shade-tolerants and shade-intolerants (Smith, 1980, Barbour et al., 1987).

Shade-tolerant plants have lower photosynthetic, respiration and growth rates which result in better conservation of nutrients and energy. Some plants grow well under a dense canopy but reach maximum growth rates when there is a canopy gap. Examples of these are red maple and birches. Shade-tolerant herbs like pink lady's slipper, wild sarsparilla, lion's-paw and wild-lily-of-the-valley carry out most of their photosynthesis and growth under a closed canopy (Smith, 1980; Kricher & Morrison 1988). These herbs, known as summer-greens, grow after the spring ephemerals but maintain their leaves till fall. They have a low-light-saturation-point of only 11% full sun (Barbour et al., 1987).

Shade-intolerant species are adapted to high light intensities and have higher photosynthetic and respiration rates. Evergreens like lambkill and wintergreen retain their leaves and remain dormant in the winter, producing new leaves in the spring or have a continuous leaf turnover at different times during the growing season (Smith, 1980, Barbour et al., 1987).

Red oaks are moderately tolerant and although found in drier sites, they do well in both moist and dry conditions and are therefore considered as generalists capable of exploiting a wide range of environmental requirements (Smith, 1980; Greller 1988).

All plants, however, have certain patterns of growth, reproduction and longevity that prove successful in a particular time and place. These life history patterns provide additional strategies that help to maximize fitness (Barbour et al., 1987).

LIFE HISTORY PATTERNS, RESOURCE ALLOCATION & DISPERSION

Most of the herbaceous plant species found in the woods at The Oaks are perennials. They have long life cycles allocating resources towards larger or more reproductive structures in order to gain a greater share of pollinators or toward more photosynthetic and perennating underground tissues. Red oak, however, can reproduce heavily in some years (mast years) and therefore gain a better chance of escaping predation once squirrel populations are satiated after the mast years (Barbour et al., 1987).

Seeds of perennial species are dispersed by wind, mammals or birds. Some reproductive structures are equipped with spines or hooks that attach to coats of animals thus facilitating dispersal away from parent plants. Seeds that are equipped with plumes or wings like those of the trembling aspen (*Populus tremuloides* Michx.) birch or red maple are dispersed by wind, promoting longer distance dispersal. Seed dormancy can be variable and seed pools of perennials are persistent, the advantage being that germination may be postponed until conditions are more favourable, e.g., an opening in the canopy gap. In addition, over long periods, many genotypes may have accumulated in the seed pool, thus increasing the chance of the germination and growth of well-adapted species (Barbour et al., 1987).

THE ECOTONE

The ecotone area at The Oaks is a zone of transition between the wooded area and the lawn (or garden). This zone of integradation is abrupt and narrow but ecologically very interesting.

Having been disturbed by man at various times (and once recently when building an experimental turf), this area contains plant species typical of a secondary successional community. Species that colonize this area are mostly annuals and some perennial weed species, that are adapted to newly disturbed areas. Examples of these are shepherd's purse (*Capsella bursa-pastoris* (L.)Medic.), dandelions (*Taraxacum officinale* Weber and *Leontodon autumnalis* L.), broad-leaved plantain (*Plantago major* L.), sheep sorrel (*Rumex acetosella* L.), St. John's-wort (*Hypericum perforatum* L.) and lady's thumb (*Polygonum Persicaria* L.). These pioneers are adapted to grow in substrates low in nutrients and organic material, and on surfaces exposed to strong solar radiation and evaporation. Some seeds remain viable in the soil for a long period of time until conditions are suitable for germination. After germination, they grow rapidly and some species capable of vegetative propagation, spread extensively.

Soil nutrient level is gradually being improved through the turnover of these pioneer species as well as through nitrogen fixation of species like tufted vetch (*Vicia Cracca* L.) clovers (*Trifolium pratense*

L. and *T. repens* L.) and sweet fern (*Comptonia peregrina* (L.)Coult.). They also reduce surface evaporation through shading and thus pave the way for more demanding species like evening primrose (*Oenothera biennis* L.), hawkweed (*Hieracium Lachenalli* C.C. Gmel.), asters, goutweed (*Aegopodium Podagraria* L.), shrubs like pin-cherry (*Prunus pensylvanica* L.), blackberry (*Rubus spp.*), sweet fern (*Comptonia peregrina* (L.)Coult.) and small trees like trembling aspen, paper birch and maples. These plants, typical of a later successional stage require more nutrients and moisture to support woody growth or any other perennating tissues.

The distribution of these species in the ecotone varies widely because of microclimate, soil effects, allelopathy, competition, reproduction and dispersal patterns as well as because of the effects of trampling (Smith, 1980). As a result, this environment seems rather patchy in some areas but is compensated for by several exotic shrub and herb species previously introduced to enhance the edge of the woods.

Some of these planted species have blended in with the secondary successional species in the ecotone, with some herbaceous plants escaping into open areas of the woods. Examples of these shrubs (or small trees) are hawthorns (*Crategus spp.*), a magnificent fuschia rhododendron (*Rhodora spp.*), Japanese quince, Japanese barberry (*Berberis Thunbergii* DC.), forsythia (*F. suspensa* (Thunb.) Vahl), red dogwood (*Cornus spp.*), white hedge roses (*Rosa multiflora* Thunb.), European cranberrybush (*Viburnum Opulus* L.), pink and crimson bush-honeysuckles (*Weigelia florida* (Sieb. & Zucc.)A.DC.), lilac (*Syringa vulgaris* L.), hydrangea (*Hydrangea paniculata* Sieb.), junipers and cedars (Fernald, 1950). These shrubs and small trees play an important role not only aesthetically, but ecologically, serving to reduce the gradient of wind flow, moisture, temperature and solar radiation between the lawn and the wooded interior. They also contribute to increasing the organic content in the soil. Their fruit or berries are sources of food for migratory and resident birds while those with dense foliage act as good hiding and resting places. Planted conifers like Scotch pine (*Pinus sylvestris* L.) with its characteristic peely orange bark serve as canopy cover, protecting ground cover herbs.

Herbaceous species that were planted include lily-of-the-valley (*Convallaria majalis* L.), Japanese spurge (*Pachysandra terminalis* Sieb. & Zucc.), periwinkle (*Vinca minor* L.), mayapple (*Podophyllum peltatum* L.), Solomon's seal (*Polygonatum pubescens* L.), forget-me-not (*Myosotis sylvatica* Hoffm.), lupins (*Lupinus polyphyllus* Lindl.), star-of-Bethlehem (*Ornithogalium umbellatum* L.), and tawny day-lilies (*Hemerocallis fulva* L.). These plants provide ground cover, adding beauty and richness to the woodland floor.

CONCLUSION

Although the woodland at The Oaks covers only a small area, it shows a distinct vertical stratification determined largely by the life form of the plants. This in turn influences the amount of light that finally reaches the woodland floor. Red oak, is at the top of the stratification and is the dominant species, in biomass and influence it exerts on the other layers rather than in numbers. The diversity and richness of the woodland herbaceous species is affected not only by the microclimate beneath the canopy, but also by the edaphics, gradient, position and microtopography.

The floral richness of The Oaks is further enhanced by the weedy species found in the ecotone as well as the secondary successional shrubs and small trees. Ecologically they play an important role in nutrient recycling, shading to prevent excessive surface evaporation, and in the fixation of nitrogen by some leguminous species and sweet fern. The planting of naturalized or introduced shrubs and trees has added diversity to the area yet provides an overall unity. They are important as windbreaks and for shade while also enhancing the landscape. Herbaceous species planted as ground cover among the conifers help to conserve soil nutrients through preventing runoffs in the spring. They also add to the heterogeneity of the woodland floor.

Through life history variations, resource allocation, dispersal and dormancy patterns, the plants at The Oaks are able to function and survive as separate communities. The woodland area represents

a fairly stable climax community, while the ecotone, an edge environment, contains plants typical of secondary succession undergoing cyclic replacement and integrating with cultivated species.

Though ecologists predict that vegetation in a temporary and disturbed habitat that is left alone upgrades eventually to a climax community, it seems unlikely that this phenomenon can occur at The Oaks because of the likelihood of frequent human disturbances.

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APPENDIX : Notes of Interest on Plants at The Oaks

HERBS

Bittersweet Nightshade - A climbing perennial with lower leaves mitten-shaped. Drooping purple flowers ripen into glossy orange and red berries which are poisonous. Leaves and fruit contain alkaloid, solanine. Used in 16th and 17th-century England to counteract witchcraft. Family Solanaceae (Potato Family).

Common Dandelion - Name derived from "dent de lion" (lion's teeth) referring to teeth on leaf margins. Young leaves can be used in salads; mature leaves and yellow flowers for making wine. Roots can be cooked and eaten or roasted as a coffee substitute. Family Compositae.

Butter-and-Eggs - Spurred yellow flowers in terminal clusters. Orange marking on lower petal serves as a guide for insects to nectar. Experiments have shown that these "nectar guides" if removed and placed on other flowers will attract certain moths. Family Scrophulariaceae.

Coltsfoot - Leaf resembles a colt's foot. Used for making cough drops, candy or dried for tea. Family Compositae.

Fireweed - Showy purple flowers on long terminal raceme. Attractive to hummingbirds and bees. Young shoots and leaves can be cooked and eaten. It is a post-fire invader. Family Onagraceae.

Indian Pipe - A white saprophytic plant lacking in chlorophyll. Has one pearly white or pinkish nodding flower, becoming erect when mautre. Plant turns black when fruit ripens or when picked. Obtains nourishment from decayed organic material on the forest floor through mycorrhizae in roots. Family Monotropaceae.

Lamb's Quarters - First weed to appear in disturbed soil. Leaves have mealy undersurface. Delicious as a potherb. Family Chenopodiaceae.

Lily-of-the-Valley - Flowers contain volatile oil used in perfume, soaps and lotions. It is one of the sources of digitalis, a heart medication. Family Liliaceae.

Lupin - Showy pink or purple flowers on tall raceme. A common garden ornamental that also fixes nitrogen. However, contains alkaloid, quinolizidine that has psychoactive properties. Family Leguminosae.

Mayapple - Characterized by large waxy solitary flower between a pair large umbrella-like leaves. Name refers to flower which looks like an apple blossom and blooms in May. All parts of plant are poisonous although the ripe fruit can be used for making jellies. Family Berberidaceae.

Pink Lady's Slipper - An orchid, commonly found in dry woods. Has two large dark green basal leaves, with distinctive pink inflated slipper-like flowers veined in red. Should not be picked or transferred to gardens as it propagates poorly. Family Orchidaceae..

Red Clover - Magenta pea flowers in short raceme. Leaflets with whitish V-shaped pattern near middle. Used as a rotation crop for improving soil fertility because of nitrogen fixation by symbiotic bacteria, *Rhizobium,* in root nodules. Family Leguminosae.

Sheep Sorrel - Arrowhead-shaped leaves are sour-tasting. Small reddish or pink flowers are attractive to bees and butterflies. Seeds are food for ground birds . Family Polygonaceae.

Shepherd's Purse - Wedge-shaped seed pod resemble medieval shepherd's purse, thus the name "Capsella bursa-pastoris". Even today, some herdsmen in parts of Middle East carry purses of this shape. Family Brassicaceae (Cruciferae).

Solomon's Seal - Long graceful arching leafstalk with greenish-white pendulous flowers on leaf axils. Leafstalk scar on rhizome is said to resemble King Solomon's seal. Indians used the starchy rhizomes for food. Family Liliaceae..

St. John's-wort - Bright yellow flowers are delicately decorated with tiny black dots along their margins. Leaves speckled with unique translucent dots that can be seen when held up to the light. Family Hypericaceae.

Tufted Vetch - A climbing perennial with one-sided raceme of tubular lavendar flowers and compound leaves ending in fine, curly tendrils. Important as a nitrogen fixer. Family Leguminosae.

Wild Sarsaparilla - The aromatic rhizomes are used as substitute for sarsaparilla. Creamy-white flowers mature into black berries in late summer. This plant belongs to the Ginseng Family Araliaceae.

Yarrow - Delicate finely-divided leaves formerly used for medicinal purposes - breaking fever, treating hemorrhage, rashes and curing stomach disorders. Family Compositae.

Yellow Wood Sorrel -- Lemon-tasting leaves can be used to perk up a green salad. A common weed in lawns. Family Oxalidaceae.

SHRUBS AND TREES

Canada Blueberry - Berries are important to wild life and are good for making jam. Together with huckleberry and cranberry, they represent true berries and are of North American origin. Family Ericaceae.

Dogwood - Species with wine-red branches provide beautiful contrast against a background of snow. Twigs when cut give off a soft watermelon scent. White berries provide food for birds. Tea brewed from stems used by Indians to relieve dysentry and bark solution used for eye baths. Dried bark and leaves were popular for tribal ceremonial smoking. Family Cornaceae.

Hawthorn - Showy white to pink flowers blossom in May - the pilgrim ship "Mayflower" named after the English hawthorn. Fruit resemble tiny apples, called "haws" , can be used for jellies. Long, sharp thorns were used by Indian women for sewing leather.
Family Rosaceae.

Lambkill (Sheep Laurel) - An evergreen with poisonous resin that acts on muscle and nerve tissue causing painful intoxication or even death to livestock or humans. Deep pink flowers have stamens tucked into pockets in the corolla which pop out when touched. Family Ericaceae.

Mountain Ash - Bright orange or scarlet berries are attractive to grosbeaks, robins and cedar waxwings. These berries , rich in iron and Vitamin C can be used to make jellies. Leaves contain cyanide compounds and are poisonous. Bark teas were used by Indians to relieve the pain of childbirth. Family Rosaceae.

Pin Cherry - Nicknamed "fire cherry" because it is a common post-fire invader. Seeds can lie dormant in the ground for 30 to 50 years. Bright red cherries are food for many songbirds and are edible by humans. Pits, leaves and bark contain cyanide and are poisonous. Powder produced from inner bark were used by Indians to treat prickly heat. Family Rosaceae.

Red-Berried Elder - Bright scarlet, berry- like drupes are attractive to song-birds. Plant is poisonous. Inner bark was brewed and used by Indians as a purgative or emetic. Twigs have an orange-coloured pith and are the right size but an unwise choice for a marshmallow skewer. Family Caprifoliaceae.

Red Oak - Used mainly for flooring and furniture. Cannot be used to make barrels for containing liquids as wood has many large open pores revealed by blowing air through a cut end of a small piece of wood (white oak pores are clogged). Acorns are food for squirrels and blue jays. Family - Fagaceae.

Shadbush (Serviceberry) - Edible pea-sized berries are dark purple, sweet and juicy. They were used by Indians with meat and fat to make pemmican. Difficult to classify plant because of long history of hybridization. Highly resistent to urban pollution. Family Rosaceae.

Sweet Fern - Aromatic leaves have shape resembling fern leaflets. Fruits are bur-like. One of few natural shrub species that fixes nitrogen in roots due to symbiotic actinomycete, *Frankia.*
Family Myricaceae.

Wintergreen (Teaberry) - Its genus name "*Gaultheria*" derived from Dr. Gaultier, a Canadian physician of mid-18th century. Leaves with aromatic wintergreen flavour used for flavouring tea, candies, chewing gum or medicines. Shrub of North American origin. Family Ericaceae.

Witch-hazel - Our only shrub that blooms in the fall. Its "spidery" yellow flowers are sessile on the twigs and strap-like petals have the ability to curl back into a bud when temperature drops, expanding again when it gets warmer. Flowers develop into explosive woody capsules that shoot out seeds to a distance of about 6m. Extracts from twigs used in after-shaves, cosmetic creams, soaps and mouthwashes. Forked branches were used by dowsers for locating water. Family Hamamelidaceae.

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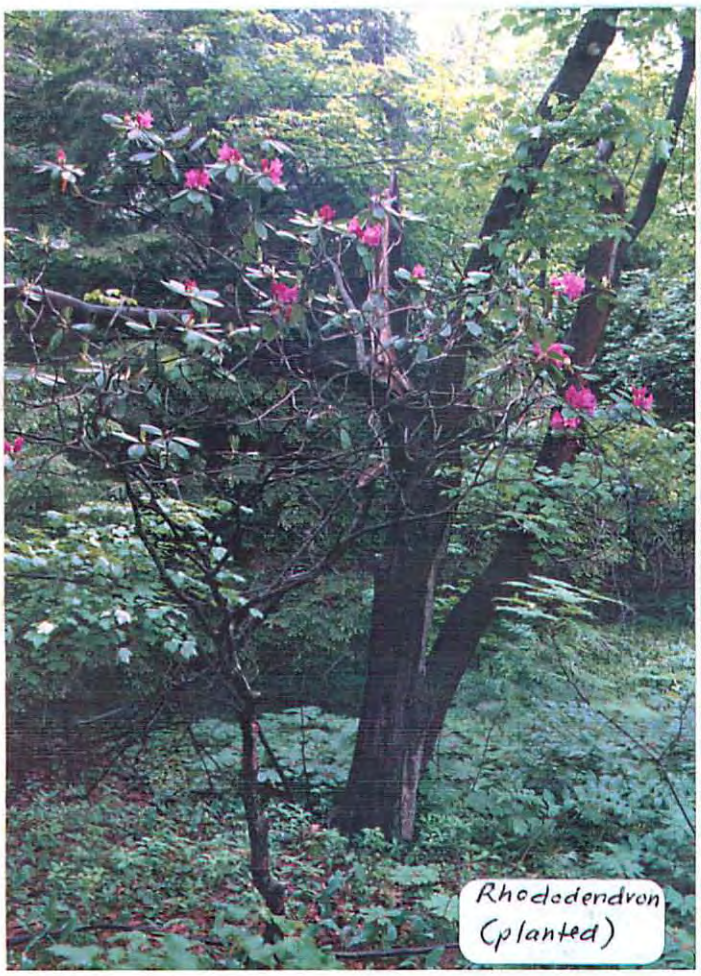
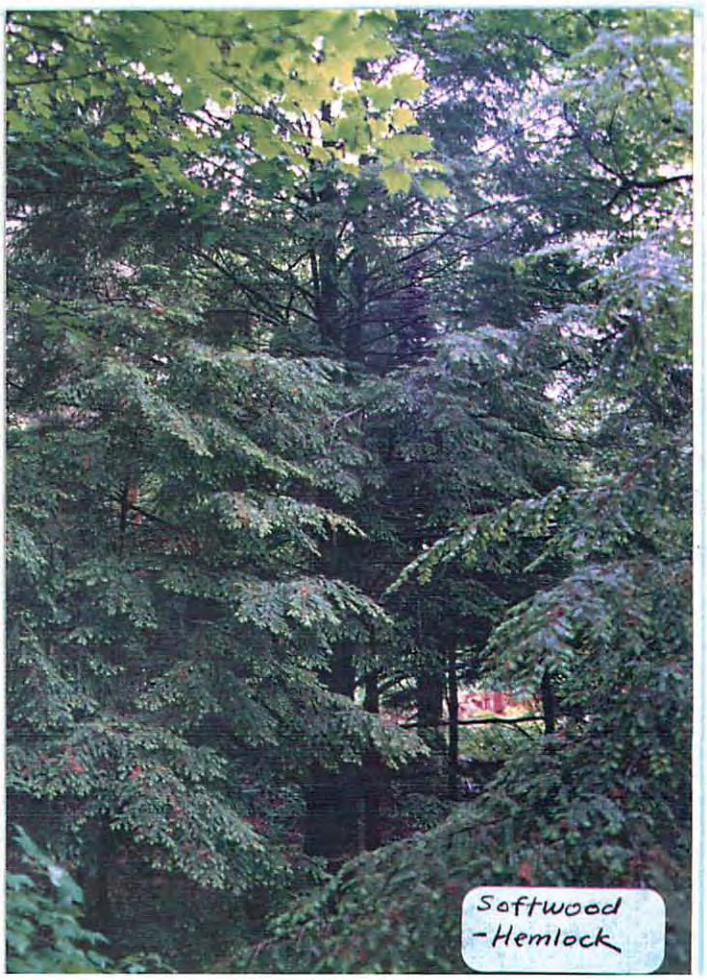
Wooded
Interior &
path.


Dominant
species -
Red Oak


Rhododendron
(planted)


Softwood
-Hemlock


Lily-of-the-
Valley
(planted)


Solomon's Seal
(ground herb
-planted)


Tapestry of
ground herbs

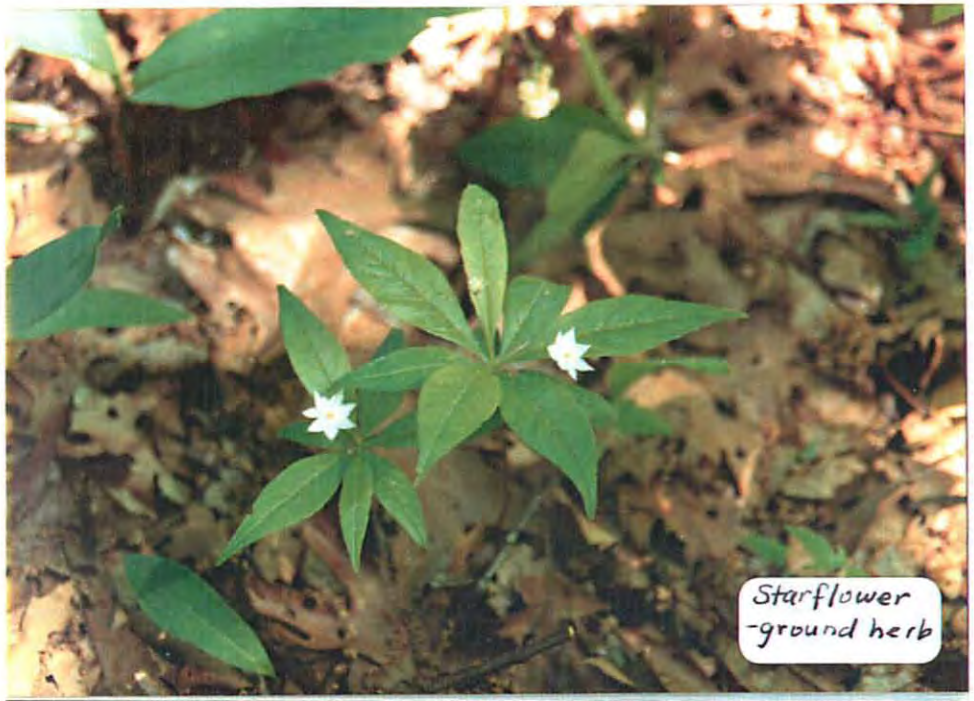

Mayapple
(ground herb
planted)


Corn-lily
(ground herb)


Bracken fern
+ Pink Lady's
slipper
(ground herbs)


Berries of
Corn-lily


Japanese
Spurge -
(planted gd herb


Starflower
-ground herb


Mountain Ash
- Understory


Pink Lady's
Slipper
-ground herb


Wild Lily-of-
the valley
(ground herb)


Lambkill
- evergreen
shrub


Canada
Blueberry -
shrub


Indian Pipe
- saprophyte


Wintergreen
- evergreen
shrub


Wild
Sarsparilla
(ground herb)


Bush
Honeysuckle
- understory


Polytrichum
- moss and
acorn


Wood Asters
- ground herb


Edge and patchy environment


Evening Primrose - biennial herb - Ecotone


Goutweed - perennial herb - Ecotone


Woodland floor after fire


Blackberry
- Ecotone
shrub


Sweet fern
with bur-like
fruit - Ecotone


Butter-and-
Eggs - perennial
herb - Ecotone


Tufted Vetch
- nitrogen
fixation - Ecotone


Fireweed +
Field Bindweed
- Ecotone


St. John's wort
- perennial
herb - Ecotone


Tawny Day-
lily - Ecotone
(planted herb)

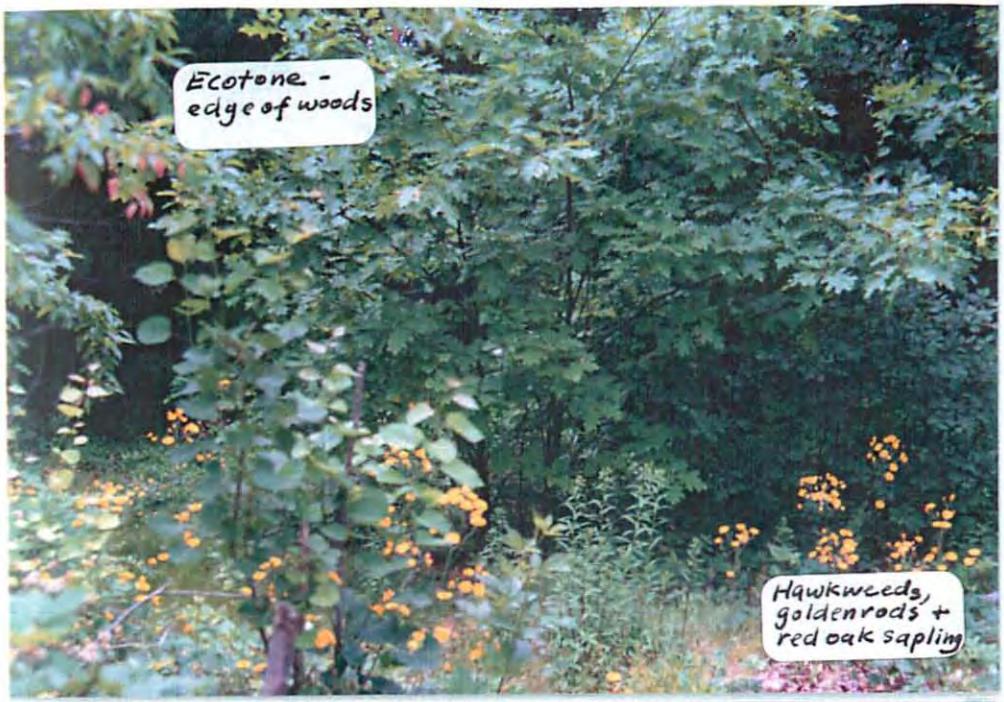

Japanese Quince
- Ecotone
(planted shrub)


Blackberry canes – Ecotone


Annuals + perennials - Ecotone


Pin cherry + young trembling poplar


Trembling Poplar – 20 succession sp.


Ecotone -
edge of woods
Hawkweeds,
goldenrods +
red oak sapling


Sweetferns +
mountain maple
- Ecotone


Hawkweed
with purple-
blotched leaves


Red Dogwood
(planted shrub)