

Sustained life on Planet Earth is a characteristic of ecosystems not a function of any individual species.

[Quote from original ZooWoods website – ENV200y (2009)]

Naturalistic Landscapes

The **Boreal** and **Carolinian** Forests (in the courtyards of the Earth Sciences Centre) and **ZooWoods** (the little woodlot between the Ramsay Wright building and Sidney Smith Hall on the St. George Street side) are examples of what is called "**naturalistic landscaping**". In naturalistic landscaping, plants are grouped in the combinations that would be found in the locations where the plants grow naturally, i.e. **ecosystemic** groupings. The term naturalistic planting is also usually restricted to plantings with species **indigenous** to an area, rather than plants from **exotic** systems.

Naturalistic Plantings: A recognition of ecology

Urban landscapes have traditionally used plants as if they were random assortments of living things, some combinations of which are more aesthetically pleasing than others. We have tended to plant vegetation where we want it and we have rarely thought about whether a particular plant or animal might have its own physiological requirements that might adapt it for some locations better than others. Rather than promoting plants in appropriate environments, we water, use pesticides, herbicides, and fertilizers in an attempt to change the environment in order to keep these "**alien**" plants growing where we want them.

Ecologists tend not to view plants and animals as random assortments of living things. They generally recognize that the occurrence of a particular group of plants in a particular location can be understood in terms of the climatic extremes of the area, the nutrient conditions in the soil and perhaps the nature of animals that may pollinate or even feed on the plants.

Ecological understanding has crossed disciplines to influence architects and landscape architects. Rather than continuing to view plants as aesthetic objects in the drab urban landscape, we now tend to recognize that a naturalistic approach to landscaping is environmentally friendly. Plants that are naturally adapted to an area tend to need only the water that is supplied from rain, are suited for the nutrient conditions found naturally in the soils, will survive the extremes of climate of the area and have come to some kind of generally peaceful co-existence with both the other plant species of their environment and with the insect or other pest species that are also endemic to the area.

This means that once they are established, naturalistic landscapes should not require large investments in weeding or herbicides (used with **exotic plants** to reduce competition with "**weeds**"), should not require fertilizers (used to amend the nutrient composition of the soil), and should not require pesticides (used to keep plant predators at bay).

Creating a naturalistic landscape

Creating a naturalistic landscape is not as easy as just letting the grass grow. Simply neglecting an area will most likely result in a random collection of aggressive (often exotic) "pioneer" species. There are a number of reasons that naturalistic landscapes don't just happen spontaneously.

Ecologically, lawns and other conventionally landscaped sites represent "disturbed" ecological systems. If the GTA were still characterised by expanses of Beech-Maple forest, it is likely that over time, such sites would undergo a process of succession during which they would ultimately come to resemble the surrounding, dominate forest type. We no longer have Beech-Maple forests in close proximity to most urban landscapes. Hence there are few sources of seeds to start the succession process. Even if there were source populations, a number of exotic species now exist in the GTA that are formidable competitors to the original inhabitants of the Beech-Maple ecosystem. The Norway Maple is an example of an exotic species that has received a lot of publicity for its invasive habit.

In addition, disturbed sites often have had alterations in the soil and changes in water regime that make re-establishment of some species difficult. While a naturalized landscape ultimately requires less maintenance, it does require attention in its early stages. Existing grass or other species must be removed, the soil may need substantial inputs of leaves or other organic material and newly established plants require weeding and perhaps watering until they are established.

ZooWoods: Purpose

ZooWoods is an experiment to test whether native plant species will be a better landscaping choice for the environment on the UofT campus. The assumption is that native plants should be better adapted to the nutrient, water and "pest" species regimes of southern Ontario and hence require fewer chemicals, water or maintenance. However it will be years before these assumptions are fully tested.

ZooWoods was originally designed as a joint venture between staff of Facilities and Services at the University (the people responsible for the landscaping of the University of Toronto campus), and members of the Department of Zoology. (The Department of Zoology and Department of Botany were disestablished in 2005 [?]. *The Department of Cell and Systems Biology and Department of Ecology and Evolutionary Biology were established in their place – an example of the dynamic, changing state of scientific knowledge and education.*)

A University's mandate is to create and disseminate knowledge, and we believe ZooWoods exemplifies UofT's mandate at a number of levels:

(1) Since its inception, ZooWoods has been used for teaching purposes by various academic units within the University (e.g., laboratory/tutorial exercises). Several independent projects have been undertaken by students in the Division of the Environment, the Department of Zoology and the Faculty of Forestry. For many years, ENV200Y (Assessing Global Change: Science and the Environment), a large class of 300 students used ZooWoods as an introduction to the ecosystem concept.

(2) Ecology tells us that our campus cannot be considered in isolation from the urban landscape of the City of which we are a part. We hope ZooWoods serves to increase awareness of naturalistic landscaping both for other members of the University Community and for the larger public community around us.

The Beech-Maple Ecosystem

1. What is a Beech-Maple Ecosystem?
2. Why do two tree types characterize this system? Why for example, don't either Beech or Maple become dominant?
3. Is ZooWoods really an ecosystem?

1. What is a Beech-Maple Ecosystem?

The **Beech-(Sugar) Maple** forest is one "type" of eastern temperate forest community. Beech-Maple forests once covered much of southern Ontario including what is now the University of Toronto campus. They would have blended into the Carolinian deciduous forests to the south and the continental boreal forests to the north.

As you might surmise from the name, beech-maple forests are characterized by an abundance of beech and (sugar) maple trees (in some cases up to 90% of the trees are of these two species). Other trees that are less frequently encountered are ash, oak, dogwood and witch hazel.

In contrast to some other forest types, there are no unique shrubs or herbaceous plants that are exclusively characteristic of the Beech-Maple forest and over 500 species of herbaceous and woody plants have been identified in various Beech-Maple communities.

2. Why do two tree types characterize this system? Why for example, don't either Beech or Maple become dominant?

The answer provides us with one insight into the nature of an ecosystem. Experiments on tree growth show that young maple trees grow better underneath old beech than they do under old maple trees. The reverse is also true: young beech seedlings grow better under older maple trees than they do under older beech trees.

Ecologists call this phenomenon **frequency-dependent selection**: the more abundant a species becomes in the canopy, the worse its offspring do in the understory. Frequency-dependent selection results in a slow oscillation in the system between beech dominance and maple dominance as the current canopy dominant species is replaced by the understory-dominant species over a cycle that may take 500 years to see the process repeat itself.

Beech are extremely long-lived, huge trees. The oldest beech in North America are over 360 years old and over 40 metres (120 feet) in height. They don't even begin to produce seeds until they are over 40.

Recent research on **sugar maples** has shown that they grow very slowly in the deep shade of beech trees, sometimes remaining surprisingly small for up to 150 years. Then when a disturbance occurs that permits more light to penetrate the understory, the sugar maple accelerates its growth up into the canopy where it may live for 100-200 years only to be replaced upon its death by more beech.

3. Is ZooWoods really an ecosystem?

There are few remnants of Beech-Maple forest remaining in southern Ontario today and ZooWoods will never be a Beech-Maple forest. Instead it is an attempt to echo elements of the natural system that once characterized the site. It is also now home to numerous Beech-Maple herbaceous plants "rescued" from development for housing and the new 407 highway that has obliterated what little remained of beech-maple remnant forest in the GTA. Nevertheless, ZooWoods can be considered an ecosystem.

Traditionally, ecologists have considered ecosystems to be energy processing unit whose components have evolved over a long period of time.

At a minimum, we expect an ecosystem to have living and non-living parts and to exhibit two basic processes: chemical cycling and energy flow. The **biotic** community of a system, the living part, generally has at least an **autotrophic** species (a species that can produce its own food or organic matter from inorganic compounds and energy) and a **decomposer** species. As units, ecosystems are also expected to have boundaries. Sometimes these are well-defined. In other instances, the transitions between ecosystems can be gradual. There is nothing in the definition of "ecosystem" that excludes the presence of humans or anthropogenic structures.

In natural ecosystems, plants serve many functions besides their role as autotrophs. They interact with the soil and its associated microbial community by taking up nutrients and water and by adding organic compounds. They serve as food for an extensive **herbivore** community that includes a wide variety of insects and other arthropods, amphibians, reptiles, birds and mammals, which are in turn, good for a complex of **carnivores** and decomposers. ZooWoods is a reasonably clearly defined system, although some would argue that it is made up of several smaller systems and that it is embedded in the larger landscape that is the GTA.

The challenge for us in ZooWoods is to capture as much of the natural function of a Beech-Maple system as we can given our small space. We have had to make choices about the ZooWoods system. The plant community is not a perfect representation of what one would find in a natural Beech-Maple system. We have emphasized plants with more wildlife value over those with less, since we realize that the area available for animals to forage is severely limited. We accept that the plant resources available in ZooWoods will never sustain the animal communities characteristic of large patch of intact Beech-Maple forest. [An artificial pond and waterfall was originally created to help increase local humidity and provide a close source of drinking water for animals. This was later filled because ... ???]

Sustained life on Planet Earth is a characteristic of ecosystems not a function of any individual species. We have tried to capture as much of that life sustaining function as we can in ZooWoods. In addition we hope we have provided an island of tranquillity where people can relax and enjoy the wonders of nature. At its best, naturalistic landscaping is an attempt to return ecological integrity to a fragmented, urban landscape.

Species List

Scientific names of the plants or their **genus and species names** (the parenthetical italicized two part names following the common name of the plant).

Scientific names are often used among scientists so that there is no possibility of confusion given the myriad of common names often attached to the same organism in different locations. You can think of a scientific name as similar to your own name except the last name comes first. The first word in a scientific name is the **genus**. It is like a last name. The **species name** comes second and it is unique to a particular organism. Just as there may be more people in your family with your last name, there may be more than one species within a genus.

Trees:

The term "tree" isn't particularly definitive, but we all sort of know what a "tree" is - a tall, "woody" plant with a reasonably well developed crown of leaves and a single trunk. All three trees we have chosen are deciduous, that is they lose their leaves in winter and all are characteristic of the Maple-Beech ecosystem, although they can be found in other forest types as well.

[Sugar Maple](#) (*Acer saccharum*)

[Shagbark Hickory](#) (*Carya ovata*)

[Green Ash](#) (*Fraxinus pennsylvanica*)

American Beech (where is this located on the site???)

American Elm

Basswood

Black Cherry

Blue Beech

Choke Cherry

Eastern White Cedar

Hackberry

Ironwood

Juneberry/Service berry

Pin Cherry

Wild Plum

Shrubs:

The term shrub is usually used for woody plants that are smaller than trees with multiple stems.

Alternate-Leaf Dogwood

Beaked-Hazel
Leatherwood
Prickly-Ash
Raspberry
Staghorn Sumac
Viburnum sp.

Vines:

[Virginia creeper](#) (Parthenocissus quinquefolia)

Carrion-Flower
Climbing Bittersweet
Ground Nut
Virgin's Bower
Virginia Creeper
Wild Grape

Herbaceous Plants:

[The use of sp. rather than a species name with the goldenrod and aster simply refers to any species of the named genus.]

[Aster](#) (Aster sp)

[Goldenrod](#) (Solidago sp.) – includes Canada Goldenrod & ZigZag Goldenrod

Sedges
Barren Strawberry
Blue Cohosh
Early Meadow Rue
Foam Flower
Sharp-lobed Hepatica
Herb-Robert
May-Apple
Red & White Trilliums
Trout Lily
True Solomon Seal
False & Starry Solomon Seal

History

ZooWoods as it was: Summer 1994 [insert photo]

Prior to 1994, ZooWoods was a typical University of Toronto lawn. The site had very few plant species, simply grass and a few trees. These plants had relatively low wildlife value and animal diversity on the site (including the presence of humans) was extremely low. It was rare to see people using the site. When people who walk past the site every day are now asked to recall what was previously on the site, no one could remember.

ZooWoods started in response to a University decision to work towards a better environment as exemplified in the University's Environmental Policy. The concept was to use the expertise in the academic and administrative sectors of the institution to create areas that were educational, more environmentally friendly than conventional landscaping, aesthetically pleasing and less labour intensive. The Department of Zoology volunteered as the test site.

ZooWoods was created through the efforts of the Zoology Landscape Committee working in conjunction with the Office of the Vice-Provost and Assistant Vice-President (Planning), the Department of Facilities and Services, the University's Arboretum and Botanical Garden Committee, and classes and faculty from the Program in Landscape Architecture. Students from Landscape Architecture used ZooWoods as a class project and created a number of original designs for the space. The Zoology Landscape Committee, acting as the class' client, selected a number of elements from many of the plans and worked with the class to refine the final project.

Work on ZooWoods began in the fall of 1994 with a plant rescue at the Altona Forest. Regrettably much of the Altona Forest, a remnant Beech-Maple forest in the GTA, was destroyed in 1994 to make way for new sub-division. Members of the Department of Zoology were among those who participated in a plant rescue at the site. Dozens of plants, otherwise doomed, were dug up and transported to their new home in ZooWoods. In the Spring of 1995, we were rewarded with the sight of native wildflowers blooming again in ZooWoods for the first time in over 150 years!

With many herbaceous plants already in place, the official groundbreaking for ZooWoods took place on UofT Day, October 22, 1994. Canadian Astronaut, Roberta Bondar; UofT President, Rob Pritchard and Marsha Chandler, Dean of the Faculty of Arts and Science all took time to help us plant three tree species characteristic of the Maple-Beech forest.

Over the summer of 1995, members of Facilities and Services, continued to work to implement the design of ZooWoods. Additional plant rescues were undertaken and some plant species were purchased. Water elements (no longer present) were added to ZooWoods, as were the path and bridge. On 15 September, 1995, ZooWoods was officially declared open for everyone to experience and enjoy.

ZooWoods is indebted to many volunteers from the Department of Zoology, particularly the graduate students of the department, for the hours they spent in removing dandelions and other invasives from the garden in its early stages.

This is very much an on-going project and with continued support and success, we hope it will expand to surround the entire building. We also hope that others-on and off campus-will like the concept and adopt their own version of a naturalistic approach to landscaping.

Links to other sources of information

Invasive Plant Species

[what are they? why they are a problem?]

[with links to websites on them & their control measures]

Burdock

Garlic Mustard

White Mulberry

Norway Maple

Manitoba Maple

Scotch Elm

Siberian Elm

Tartarian Honeysuckle