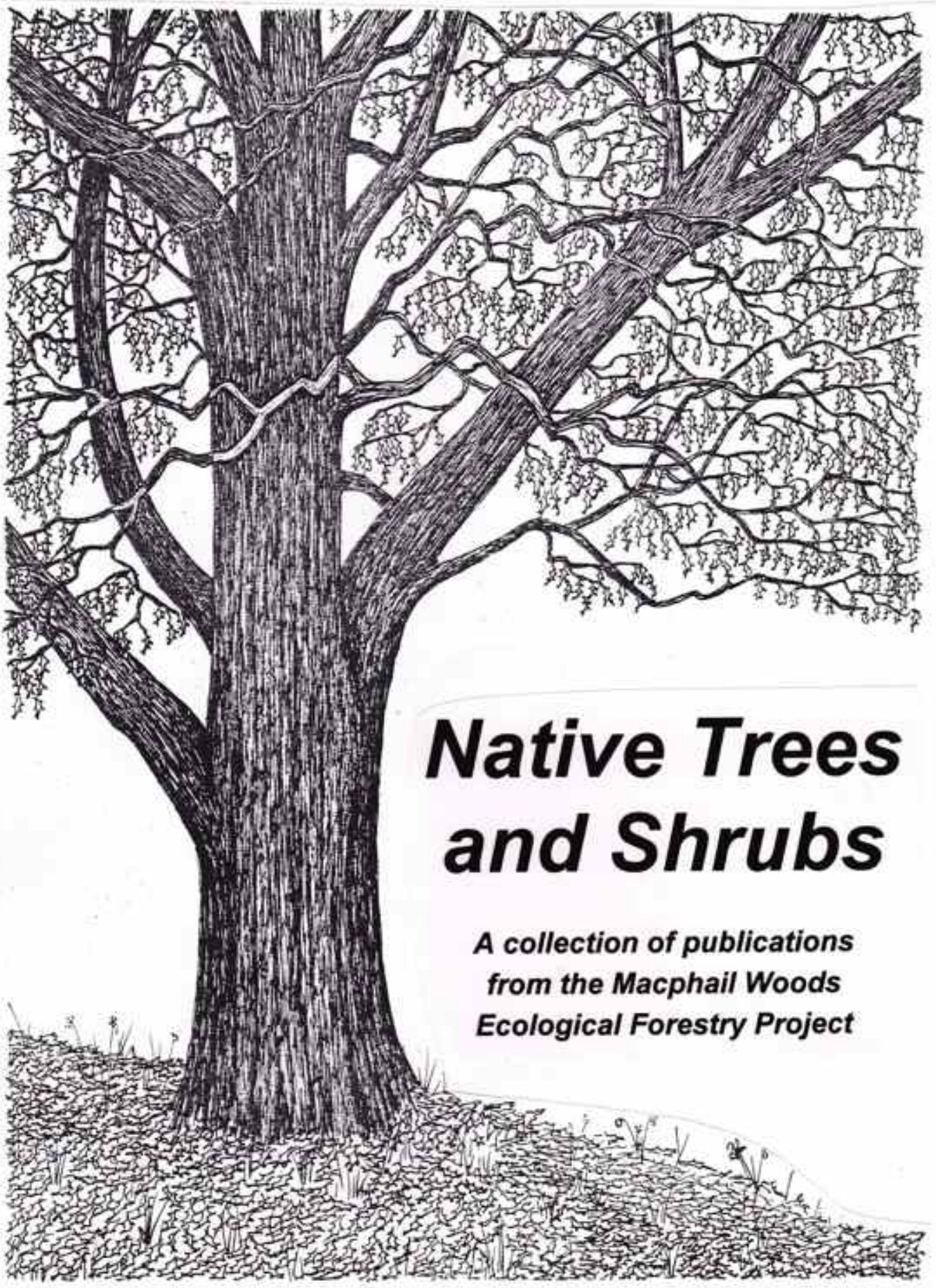


Native Trees and Shrubs

A collection of publications from the Macphail Woods Ecological Forestry Project

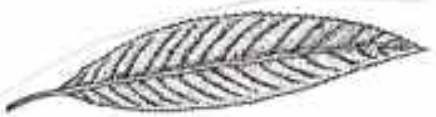
An introduction to Native Trees and Shrubs

Even before the first seeds were planted in the Macphail Woods nursery in the fall of 1991, we were thinking of ways to help people restore forests. The Acadian forest, which features such a variety of high-valued and long-lived species, was becoming increasingly rare. It seemed a broad range of people had to become involved if this restoration was to succeed - students planting at schools, landowners reforesting their property and homeowners planting their local areas. In 1994, we printed a small run of "Native Trees and Shrubs". Building on that success, we published "More Native Trees and Shrubs" and "Tree Sheets" - all aimed at making forest restoration easy.

This publication is a compilation of the previous three booklets, with some changes and additions. It is not the complete work on native trees and shrubs that will be done someday, but it should give people the tools to actively participate in making significant environmental improvements.

Many people and funding agencies have been involved in the production of the Macphail Woods publications. This collection was financially supported by the provincial Department of Technology and Environment's Wildlife Habitat Improvement Program, the Environmental Coalition of Prince Edward Island and the Sir Andrew Macphail Foundation. Past funders for the publications have included Environment Canada, the provincial Fish and Wildlife division, Human Resources Canada, the National Fish and Wildlife Foundation, Mountain Equipment Co-op and the Samuel and Saidye Bronfman Family Foundation. As always, this publication owes a debt of thanks to the late Geoff Hogan for his inspiration and support.

Writing, editing and research: Gary Schneider, Ruth Richman, Liz Dacombe, Kevin MacLean, Susan Shaw and Susan MacDonald.
Illustrations: Katherine Poole
Design and production: Gary Schneider



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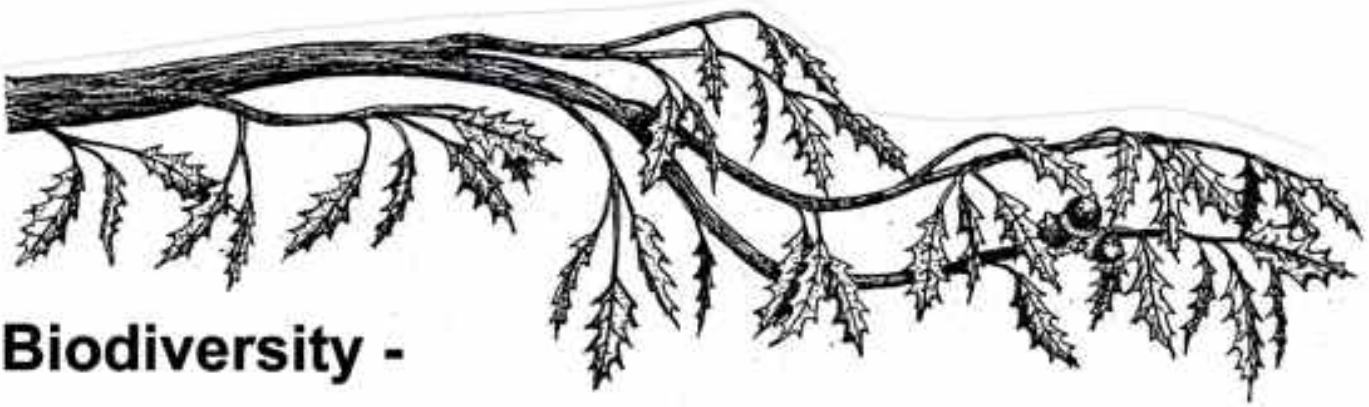


Biodiversity - why worry about it?

"If the land mechanism as a whole is good, then every part is good whether we understand it or not. If the biota, in the course of eons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the first precaution of intelligent tinkering."

Aldo Leopold, "A Sand County Almanac"

Over the past few years, much has been written on preserving biological diversity (or biodiversity) around the world. Biodiversity is the variety of life and all its processes and includes the living organisms, their genetic differences and the communities in which they occur.

"Management for biodiversity consists of providing recognition of, and appropriate consideration for, all living things because of their contributions to a healthy ecosystem. This principle acknowledges the inherent value of living organisms whether or not their benefits are fully known and understood at the present time. Stewardship that incorporates biodiversity is also likely to help protect the health and welfare of people." **David W. Taber, Department of Natural Resources, New York State College of Agriculture and Life Sciences, Cornell.**

Protection of the world's remaining rainforests, with their incredible variety of plants and animals, is the key to conserving global biodiversity. At the same time, it is also important to protect the diversity of all our natural ecosystems, whether that be wetlands, forests or shorelines. But why bother protecting biodiversity? And can we become "intelligent tinkerers," protecting and restoring biodiversity at home?

The first question is the most complex. Even highly-regarded ecologists and biodiversity experts admit they do not know exactly how ecosystems function. Let's take a small stretch of the Orwell River that runs through the Sir Andrew Macphail homestead. As a forest type, it is primarily large, older hemlock, white pine, yellow birch and balsam fir. Yet the diversity that makes up this ecosystem is very rich and interacts in ways that we do not understand. It includes other trees, soil bacteria, earthworms, flowers, ferns, shrubs, insects, fish, stream invertebrates, resident and migratory birds, rodents and other small mammals, amphibians, moulds and fungi, and of course, humans. There are hundreds, if not thousands of different species interacting along the stream, and we know very little about how they work together.

That they are connected, though, is very clear. A chipmunk stores acorns from a red oak tree underground for the winter. A coyote catches the chipmunk in the open and has it for lunch one day, and the acorns are free to germinate into seedlings, which one day may grow into large trees that produce more acorns. Or take the caterpillar feeding on the leaves of speckled alders along the stream. It soon becomes a snack for a yellow-rumped warbler, which in turn might be eaten by a sharp-shinned hawk. These are all components of the "web" that makes up an ecosystem.

What happens to one species if we remove another? Species have multiple roles to play within a given ecosystem - a tree stores carbon, provides nesting sites and food for a variety of animals, and will provide a source of nutrients for a future forest. A chanterelle mushroom helps the trees around it absorb nutrients from the soil and is a source of food for red squirrels and humans. Scientists do not know what species are most important. Taking away one component of an ecosystem can have disastrous effects on the health of that community. We should protect biodiversity since we do not know what parts of the ecosystem might turn out to be important.

Another reason to protect biodiversity at home is the example it sets for others. It is critical to global environmental health that countries with vast tracts of undisturbed rainforest do not continue or accelerate present harvesting rates. Forests provide humans with a wide variety of products, from foods to medicines to chemicals. At the same time, we know that few forest plants have been tested for what they might someday offer to humans. Western yew growing in British Columbia forests is the source of taxol, one of the most potent anti-

cancer substances ever found and tests for medicinal properties are being done on our local Canada yew. There are undoubtably many more plants that have similar benefits to offer, if only we take the time to look. If wealthy countries can not conserve biodiversity, how can the world's poorer countries ever be expected to? The tree and shrub species in most forests add a small but important part to the diversity of that community. The mixture of species and ages provides homes and food for a variety of wildlife. It also protects the forest from large-scale destruction by insects and diseases, and makes excellent use of available sunlight, soil and water resources. Protecting biodiversity in forests safeguards those ecosystems and helps maintain healthy wildlife populations.

Much concern about the worldwide loss of biodiversity originally focussed on endangered species. Today, it goes beyond that, to include protection of ecosystems and restoration of degraded areas. Edward O. Wilson advises us to "go beyond mere salvage to begin the restoration of natural environments, in order to enlarge wild populations and stanch the hemorrhaging of biological wealth. There can be no purpose more enspiriting than to begin the age of restoration, reweaving the wondrous diversity of life that still surrounds us."

It is important to remember that biodiversity does not mean variety at any cost. Zoos contain an incredible diversity of wildlife, yet they do not represent biodiversity. The goal is to have healthy, fully-populated communities or ecosystems with the wide variety of inhabitants that would naturally occur in that area. Obviously this does not mean that ecosystems will remain static. They change by themselves over time, and human activities and interventions can bring both positive and negative changes. Protecting or restoring biodiversity means looking to work with nature, using native species whenever possible.

The following pages are meant to be a guide, rather than a blueprint, for using native trees and shrubs to restore biodiversity, protect watersheds, enhance habitat for wildlife and add beauty to our homes. For a variety of reasons, it is impossible to be exactly sure what plants are or are not natives. The debate is not critical. Plants migrate, their seeds spread by wind, water and animals (including people). There are plants native to New Brunswick and Nova Scotia that are not considered native in this province. Would they have naturally migrated here, spread by wind or animals? And since 80% of Prince Edward Island was cleared for farming by the late 1800's, many small populations of trees and shrubs could have been wiped out without anyone being aware of the loss.

The Plants of Prince Edward Island (updated in 1985 with new records) is the best source of information and we try to stay within their findings of native and introduced species. No effort is made to list all the native trees and shrubs, especially since some shrubs such as willow hybridize freely, but we have listed the large majority of the species found on Prince Edward Island.

Native plants are usually very reliable - they have adapted to the climatic conditions of the area and serve a variety of functions within the ecosystem. Most are proven performers - hardy, fitting into a wide variety of habitats, valuable to wildlife, useful for stabilizing streambanks and/or controlling soil erosion. A good starting point to restoring biodiversity is to carefully match the plant to the site. It makes little sense to plant a sun-loving tree in the shade or a shrub that will not tolerate salt spray along the shore. Use common sense and caution when planning and planting, and you won't go too far wrong.

Why plant shrubs?

One question often heard is "why plant shrubs instead of trees?" At Macphail Woods, we use a combination of trees and shrubs in all our plantings. In addition to the diversity of plant species, we gain a variety of feeding and resting areas, food sources and nesting habitat.

The line between trees and shrubs is not a clear one. Distinctions are obvious between a large pine tree and a small, bushy alder. But other species fall somewhere in the middle, or have characteristics of both trees and shrubs. As a general definition, shrubs are low, woody plants that at maturity are under 25 feet (7.6 m) in height. They usually have several stems, but this is more common in some species than others. The definition is not important - the key is how interesting and useful shrubs can be. More and more people working in the areas of forest restoration, wildlife enhancement and watershed protection are realizing the values of shrubs. This is part of an increasing recognition that we need to view ecosystems as more than a few species of trees, ducks and mammals.

The following seventeen shrubs selected are native species, but more important they are proven performers - hardy, fitting into a wide variety of habitats, valuable to wildlife, useful for stabilizing streambanks and/or controlling soil erosion. These will give you a great start towards enhancing the environment.

Red-osier dogwood
(Cornus stolonifera)

Description: this low spreading shrub, seldom reaching more than 4 feet (1.2 m) in height, is easily identified by its red bark. It has small flat clusters of white flowers, producing white berries. Leaves are typical of dogwoods, with distinct veins running towards the tip, while buds are small and opposite.

Growing conditions: found on wet sites and tolerant of flooding, it is common in roadside ditches, damp areas of fields and on streambanks, although it can grow well on drier sites. This dogwood spreads by suckering and layering, forming dense thickets. It grows best in full sun, but will grow slowly, and with less fruit production, in shade.

Propagation: one of the easiest shrubs to grow from either summer or winter cuttings. For larger transplants, make cuttings in the summer and plant to a nursery bed when roots are established. Using this technique, our plants averaged 14 inches (35 cm) at the end of the second summer, with the tallest 24 inches (60 cm). Some were even producing seed. Smaller rooted cuttings are useful in stream plantings, enabling you to put in large numbers of plants with little soil disturbance.

Cuttings can also be taken in the spring and stuck right in the ground where you would like the plants to grow, although you need moist, protected conditions and can expect less success. Seeds usually take one year to germinate, depending on the hardness of the seed coat, but they are easily collected in large numbers and worthwhile growing. Keep an eye on a particularly healthy roadside patch during the summer and collect berries when ripe (late July to the end of August). Crush fruit in a strainer and clean seed. Seeds should be dried if you plan to store them for more than a day or two. Soak seed for 12 hours before planting. This dogwood transplants very well, especially from roadside ditches. Tops should be cut back to just above ground level.

Wildlife uses: berries are a preferred food of ruffed grouse, northern flicker, downy woodpecker, eastern kingbird, common crow, American robin, Swainson's thrush, evening grosbeak, cedar waxwing and purple finch. They are well-utilised by dozens of other species of songbirds, particularly during fall migration. The branches and foliage form dense summer cover, offering protection and nesting sites for species such as the American goldfinch. Flowers are an important source of pollen for honey bees. Red squirrel, chipmunk and raccoon include red-osier dogwood in their diets, while snowshoe hare and beaver browse the twigs in winter.

Areas of usage: one of the most useful native shrubs for landscaping purposes, red-osier dogwood is attractive throughout the year. Creamy white flowers, deep green foliage and red twigs (which make a striking contrast against a winter snowfall) make it an excellent choice for border or clump plantings. This shrub is also well-suited for streamside plantings, especially since it is tolerant of flooding. It makes fairly rapid growth on sunny, moist sites and the spreading roots bind soil to control erosion. Thick foliage provides summer shade to maintain cool water temperatures for fish, while the cover and berries offer additional benefits for birds. Red-osier dogwood is a good low shrub that will help fill in the bottom parts of windbreaks if conditions are not too dry. Clumps of these shrubs, so easy to grow or transplant, will add beauty, food and cover to plantings and increase the number of wildlife species that make use of your windbreak.

Alternate-leaf dogwood
(Cornus alternifolia)

Description: our tallest native dogwood can look like a 6 foot (1.8 m) shrub or a 20 foot (6.1 m) small tree. It is one of the most underrated shrubs, whether native or non-native. The bright green bark is streaked with white, except on the newer wood, where it is dark purple. Clusters of creamy white flowers turn into dark purple berries. Its branches tend to be long and horizontal. Leaves are typical of dogwoods, with distinct veins running towards the tip. Buds are small and alternate.

Growing conditions: often found at the edges of woodlands and as an understory plant in a variety of forest types. It tolerates both sun and shade and will grow on almost any fertile, moist, well-drained site.

Propagation: this is one species we grow exclusively from seed. Collection is easiest along the edges of woods where the fruit crops are usually heaviest, from late July through September. Break the fruit by squeezing between your fingers and plant as soon as possible. Most will not germinate until the second spring, but should grow over 1 foot (30 cm) in that season. Collecting fruit before fully ripe (when still pink) and planting soon after may allow germination in the first spring. This shrub can be grown from cuttings, but our success

rate has been very low and not worth the effort. Few wooded areas have an excess of young plants that have grown from seed. Most young plants are suckers growing from the roots of larger specimens and are difficult to dig up successfully without damaging the parent plants. We do not recommend transplanting this species.

Wildlife uses: berries are a preferred food of ruffed grouse, northern flicker, downy woodpecker, eastern kingbird, gray catbird, American robin, wood thrush, hermit thrush, Swainson's thrush, gray-cheeked thrush, red-eyed vireo, cedar waxwing, evening grosbeak, purple finch and pine grosbeak. Chipmunk and other small mammals make use of the fruit, while buds are eaten by ruffed grouse and ring-necked pheasant. Alternate-leaf dogwood provides cover and nesting sites to many species of birds.

Areas of usage: since this is one of our shrubs that is most tolerant of shade, it can be used extensively in woodland plantings. Plant one or two seedlings wherever there is enough light for them to get established, or in small patch cuts with other species of trees and shrubs. This will help diversify a forest, both in species and height, while providing an additional source of food. As a landscape plant, it is extremely versatile, growing in the sun by itself or in the shade of larger trees. Its physical grace adds a Japanese-like touch to any garden (it is often called "pagoda" dogwood). The dark purple fruit maturing on bright red stems adds to its attractiveness in the late summer. Alternate-leaf dogwood will also increase the variety of songbirds and small mammals that visit your area.

Speckled alder
(Alnus rugosa)

Description: one of our largest and most common shrubs, growing to 25 feet (7.6 m), and forming dense clumps. Bark is brown to blackish-gray and speckled with many white spots. Flowers are non-descript. Male and female flowers appear on separate catkins which form the previous fall. The males are slender and cylindrical and hang in clusters of 3-5 from short leafless branches. Females are cone-like, 1/4 inch to 3/8 inch (6-9 mm) long. Leaves are alternate, oval and toothed. They are dark green above, lighter below and have prominent veins. Buds are set away from twigs on 1/4 inch (6 mm) stalks. Another native alder (downy or mountain alder) has pointed buds tight to the stem. It can be substituted in any plantings on drier sites.

Growing conditions: alder is one of the first species to invade abandoned fields, especially those which are poorly drained. It is also quite common along stream banks and roadside ditches. It makes its best growth in full sun, but is often found growing in the shade along streams. Alder does not tolerate salt spray.

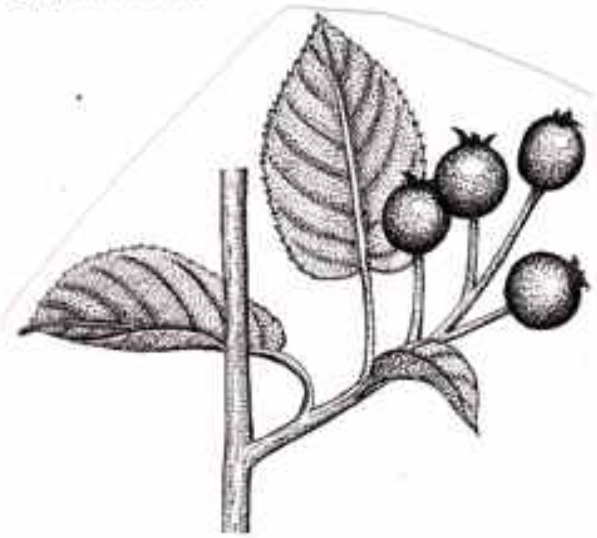
Propagation: this species is most easily propagated by transplants, since they are common along most roadways and even some forest roads. Many farmers will allow you to transplant from their fields. Best results come from newly-invaded fields, where you find transplants between 1-2 feet (30-60 cm) tall. Transplants of any size benefit from being cut off to just above ground level right after transplanting. We are growing some from seed at Macphail Woods - it is easy seed to collect, since the crops are heavy and need little cleaning. Seeds cluster together in strobiles, almost like cones, and can be collected from late September onwards. When dry, the strobiles can just be rubbed together between your hands to release the seeds. Sprinkle over a seed bed and cover with a light layer of soil or sand, then mulch for the winter. They should germinate the next spring.

Wildlife uses: alder seeds are a favourite winter food of common redpoll, pine siskin and American goldfinch and are eaten by dozens of other species. The shrubs are valuable as cover and nesting sites for many birds and their quick growth makes them useful in naturalization plantings. Earthworms, found in abundance in the nitrogen-rich soil under alders, are the preferred food of the American woodcock. Because of this, woodcock feed, nest and rear their young almost exclusively on the ground beneath alders. During late spring evenings, the male performs an impressive court-ship dance in fields next to alder patches. In winter, ruffed grouse eat buds and snowshoe hare browse twigs. Beaver eat alder bark and use the stems for dam and lodge construction.

Areas of usage: alders are generally regarded as a nuisance, though this attitude is beginning to change. They are not one of our more attractive shrubs, but are very useful in windbreaks, preventing erosion along stream banks and building up depleted soils. Alders can annually add up to 140 pounds/acre (160kg/hectare) of nitrogen to the soil by bacteria in nodules on roots and leaf fall. They have great potential in small forest plantations, providing some shade and protection while enriching soil for more valuable trees. Along streams, alders prevent erosion and provide excellent overhanging shade for trout.

Serviceberry
(Amelanchier spp.)

Description: there are many names (Saskatoon, Indian pear, shadbush) and varieties of this species. Hybrids can also form when two varieties interbreed. Height can vary from a 2 foot (60 cm) spreading shrub to a 25 foot (7.6 m) or more tree. Positive identification may be difficult, but the species itself is easy to recognize. Bark is light gray streaked with darker vertical lines. The smooth young bark becomes more flaked with age. Serviceberry is one of our first shrubs to flower, with striking white flowers in May before the leaves have even fully developed. In July and August, edible berries turn dark purple and are sweet and juicy. Leaves are oval to round and usually toothed. Slender twigs bear long, pointed buds.



Growing conditions: serviceberry can be found growing in most conditions, except where extremely wet or the deepest shade. It grows best in full sun and on moist, well-drained soil but can be found along roadsides, invading abandoned fields, in existing windbreaks and in woodlands.

Propagation: while serviceberry can be grown from cuttings, it is seldom worth the effort. Seeds are easily collected and germination is usually quite good. Collect ripe berries during July and August and place in a small pail of dry, clean, sifted sand. Crush berries with your hands while mixing with sand. Sift mixture through a window screen, remove larger pieces of fruit. Plant this mixture of seeds and pulp into rows in the nursery, trying to get about 3 seeds per inch (2.5 cm). If you just planted the berry, which has several seeds, the fruit would probably ferment and heat up enough to damage the seeds. Seeds should be planted as soon as possible and will germinate the next spring. Germination is usually less than 50%, but growth is rapid, averaging about 1 foot (30 cm) per year.

Wildlife uses: one of the most important food sources for birds, especially those fattening up for fall migration. Berries are a preferred food of northern flicker, blue jay, American crow, gray catbird, American robin, hermit thrush, Swainson's thrush, veery, Bohemian waxwing, cedar waxwing, American redstart, northern oriole and evening grosbeak (left) and eaten by over 30 other species. Red squirrel, chipmunk, flying squirrel and red fox are also fond of the fruit, while in winter the twigs and buds are browsed by snowshoe hare and red fox. Ruffed grouse also eat the buds in winter. Serviceberry's early flowering in spring makes it an important initial source of pollen and nectar for bees and other insects.

Areas of usage: since it has very attractive flowers and foliage, serviceberry is well-suited for plantings around the home. This will allow you to get a fair share of the tasty berries before the local wildlife have a feast. They make excellent pies, wine, and preserves, so you might want to plant more than one. These plants fit in well anywhere they can get enough sun to bear fruit, although larger specimens are even found bearing fruit in forests. They do well in windbreaks, roadside plantings and along the banks of streams and ponds. They are resistant to air pollution and suitable for urban plantings.

Willow
(Salix spp.)

Description: the many native species of willow can be quite hard to distinguish from one another, especially since they can hybridize. Some are small shrubs, while others look more like single-stemmed trees, yet they are usually easily identified as a type of willow. Leaves are generally long, fine-toothed ovals, darker green above than below. Twigs are often highly coloured. It is the buds that usually identify willows. The buds are highly

variable - some are fat and pointed while others are narrow and rounded, and colours range from black to brilliant yel lows and oranges. Yet the buds all sit flat to the stem, like a fingernail on a finger. Flowers of both sexes appear as fuzzy catkins (the most notable is the flower of the pussy willow).

Growing conditions: willows thrive wherever there is an abundance of water - along streams and riverbanks, the edges of bogs and ponds, and in areas with a high water table. But these shrubs are some of our most versatile and can be found in roadside ditches, abandoned fields and existing wind breaks. They achieve best growth in deep, rich soil with full sun and adequate moisture. Willows are hardy shrubs that tolerate salt spray, although they grow poorly in shaded conditions.

Propagation: this is a very easy plant to grow from cuttings. Source material is available almost everywhere, especially along ditches where they are continuously cut down. Both winter or summer cuttings work well, with or without using commercial rooting hormone. For larger transplants, make cuttings in the summer and plant in a nursery bed when roots are established. Plants easily grow more than 1 foot (30 cm) per year. Smaller rooted cuttings are useful in stream plantings, enabling you to put in large numbers of plants with little soil disturbance. Cuttings can also be taken in the spring and stuck right in the ground where you would like the plants to grow, although you need moist, protected conditions and can expect less success. Along eroded streambanks, use cuttings up to 3 feet (90 cm) long if the soil is loose enough. Leave only a few buds showing. This allows more roots to form deeper in the soil and helps bind the streambank together. Whenever taking cuttings, it is wise to select material from a variety of plants and areas, so that you are not relying on a narrow base of parent stock.

Wildlife uses: willow buds are second only to the buds of poplars as preferred food of ruffed grouse. Beaver, muskrat, red squirrel, and snowshoe hare all include willow in their diet. The leaves are rich in Vitamin C and zinc. Pussy willows are an important nesting site for American goldfinch, while other songbirds use them to a lesser degree. The cover and protection thickets of willow provide are probably of equal importance to wildlife as its food value.

Areas of usage: one of the best plants for stabilizing lightly-shaded streambanks, or areas with fluctuating water levels such as borrow pits. Willows can attract beaver if the habitat is suitable, which may or may not be desirable. Nevertheless, they are excellent plants for wet sites. They are also useful in wild landscape gardens, since many have particularly attractive twigs and buds. Try to find varieties of particularly pleasing form and colour. Willows are suitable as a low cover in windbreaks as long as the site is not too dry.

Mountain ash
(Sorbus spp.)

Description: two species of mountain ash are native to Prince Edward Island - American and showy. Both are quite common and can grow to the size of a small tree. Small white flowers are borne in flat-topped clusters in May and early June. Clumps of berries turn orange in late August and September, often hanging on through most of the winter. Leaves are alternate and compound, with 11-17 leaflets. Leaflets of the American mountain ash (shown here) are long and pointed, while those of the showy are more rounded at the base. Buds are dark, sticky and can be slightly hairy. Bark is smooth and grayish-brown.

Growing conditions: a common sight along fencelines and windbreaks, mountain ash is also found along hillsides, railway lines or forest clearings. It prefers full sunlight and rich, deep soil, but will grow under a variety of conditions. It will not tolerate flooding, but can stand some salt spray.

Propagation: gather berries in late September and remove pulpy flesh by hand. Each berry contains up to 10 tiny seeds. Plant in nursery beds and cover lightly with soil. Seeds will germinate the second spring and grow quite quickly. At Macphail Woods, our first year's growth averaged 16 inches (40 cm).

Wildlife use: berries are a preferred food source of ruffed grouse, gray catbird, American robin, eastern bluebird, European starling, cedar waxwing, common grackle, northern oriole, evening grosbeak and pine grosbeak. Crops are fairly regular and the ability to hang on throughout winter makes the berries excellent emergency food. Beaver eat the bark and snowshoe hare browse on winter twigs. Yellow-bellied sapsucker drill larger specimens for the sweet sap.

Areas of usage: this is another shrub well-suited for use around the home, since it has attractive foliage, flowers and fruit and is a food source for many bird species. The leaves are poisonous, so this might be a consideration if there are young children present. The fruit can be eaten by humans and is rich in iron and Vitamin C. A few frosts improve the taste, but the berries are most often used in jellies. These shrubs can be used in group plantings or as individual specimens. Mountain ash are suitable along roadsides, in windbreaks, and especially around ponds and open streambanks. They are also useful when converting areas of old field white spruce to a mixed forest. The shrubs provide shade and protection for young trees, and attract wildlife to the area. Plant one or two in openings along with a mixture of other shrubs and trees.

Common elder
(Sambucus canadensis)

Description: a small shrub, usually with many stems arising from the base, that can grow up to 7.5 feet (2.75 m) high. Flat clusters of creamy white flowers contrast with lush, compound leaves containing 5 to 15 leaflets. The dark purple, almost black fruit, about 1/4 inch (6 mm) in diameter, ripens during late August and September. Elder leaves exude an unpleasant odour when crushed. The tips of twigs die back and branches often break off over the winter. Buds are opposite and large, although though not as big as those of red-berried elder and pointed rather than round. Bark is pale deep green, changing to light brown as the plant grows older.

Growing conditions: unlike the closely-related red-berried cousin, this elder likes moist soil and can stand flooding conditions. It is often found in damp areas along roadsides, fencelines and streambanks. Common elder prefers full sunlight but is very tolerant of shade.

Propagation: common elders can be grown from cuttings, both summer or winter. If you want just a few plants, cut the ends of branches with three sets of buds in late fall. Plant directly into a well-worked nursery bed, making sure the soil is loose. Bury two sets of buds and leave the top set exposed. Mulch well. For larger amounts of plants, it is easier to grow common elder from seed. Collect ripe berries, crush them between your fingers, and plant. Each berry contains 3-5 seeds, so they can be planted 1-2 inches (2.5-5 cm) apart. Most will not germinate until the second spring.

Wildlife uses: berries are a preferred food of blue jay, northern mockingbird, gray catbird, American robin, wood thrush, Swainson's thrush, gray-cheeked thrush, veery, cedar waxwing, rose-breasted grosbeak and white-throated sparrow, and are eaten by dozens of other species. The shrub provides good cover, and is used as a nesting site by alder flycatcher, yellow warbler and American goldfinch. In winter, snowshoe hare and other mammals browse the twigs and buds.

Areas of usage: this shrub is useful for planting in a wide variety of sites, as long as sufficient moisture is present. As a landscape plant around the home, it is well-suited to larger clumps or hedges. It fits in well with the earlier-flowering red-berried elder. The combination of lush green foliage, common elder's white flowers and red-berried elder's colourful fruit is striking. The berries of common elder are also used as a food source by humans - as fresh fruit or for elderberry wine, jams, jellies, pies. The twigs, bark and leaves are highly toxic. Common elder adds an important source of food and cover and should be incorporated into any plantings near wetlands, streambanks or ponds.

Red-berried elder
(Sambucus pubens)

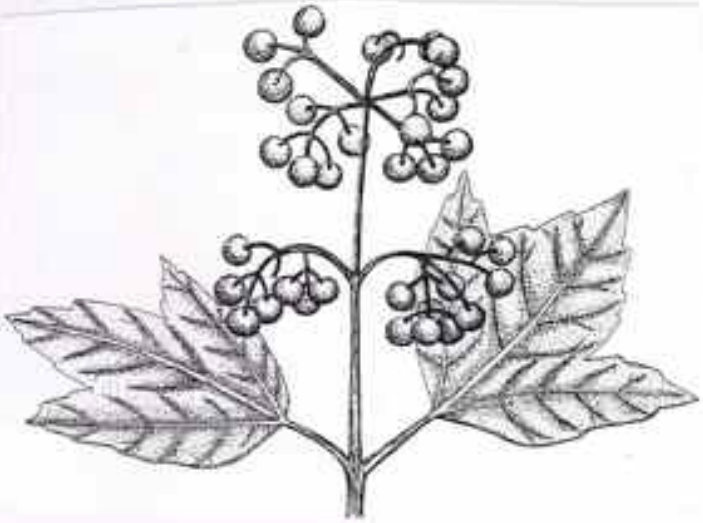
Description: although easily confused with common elder, the red-berried elder has much larger buds and stouter twigs. It tends to be somewhat taller and stockier, growing up to 12 feet (3.7 m) high. Small, creamy flowers give way to cone-shaped clusters of small scarlet berries in June and July. Fruit is thought to be poisonous. Bark is light brown and covered with what appear to be warts. Buds are opposite and the largest of all our native shrubs.

Growing conditions: this elder thrives on fairly dry sites and is very intolerant of flooding. It is common along the edges of newly bulldozed forest roads or the sunnier edges of woodlands. Red-berried elder tolerates some shade but achieves best growth and fruit production in full sun.

Propagation: very easy to grow from seed and will usually show up in large numbers in any nursery or garden if seed sources are nearby, spread by birds. Large numbers of seed are produced annually. Collect when seed is scarlet in late July and August. Germination will often take place over two seasons and percentages can be low. Plant seeds 1/2 inch (13 mm) apart. Since the seeds are so easy to collect, try planting some at several different stages of ripeness, before they turn dark scarlet. This may speed up germination significantly and give you a higher success rate. Because it is quite common along forest roads, large numbers of young plants can often be transplanted. This can be difficult because of the deep, fibrous roots, but with some care and top pruning they survive quite well.

Wildlife use: berries are a preferred food of ruffed grouse, American robin, Swainson's thrush, veery, cedar waxwing and rose-breasted grosbeak. Red-berried elder is also extensively used by many other birds for both food and cover. Red squirrel, chipmunk, skunk, raccoon, snowshoe hare and red fox also eat the berries. Red-berried elder often grows near fox dens, providing cover and food. In winter, ruffed grouse feed on the buds and snowshoe hare browse the twigs.

Areas of usage: as described earlier, it makes an excellent companion in plantings of common elder around the home. Flocks of cedar waxwing often arrive to devour the entire seed crop and it is worth planting red-berried elders just to attract these birds to your home. This plant is well-suited to windbreaks and forest edges. On drier sites, red-berried elder is a better choice than common elder. It is sensitive to salt, so avoid planting it along shorelines and roadsides where salt spray occurs.



Highbush cranberry
(Viburnum trilobum)

Description: this is one of our more confusing native shrubs, since it is not a true cranberry and has a European cousin *(Viburnum opulus)* that is quite common locally. It grows up to 15 feet (4.6 m) high, with clusters of white flowers in late June. Fruits are cranberry-size and bright red, often hanging on through the winter. Leaves are three-lobed and maple-like, but vary considerably even on the same shrub. Buds are opposite and the tips of twigs die back during the winter. Bark is smooth and gray to light brown. The European variety is generally found around homesteads and parks and produces bitter fruit often totally ignored by wildlife. The native variety is more at home along streams, swamps and low, open woods. Its berries are tastier and seem to be eaten before the non-native variety.

Growing conditions: can be found in damp thickets and moist woods, but will grow on drier sites. It does best on rich soils and full sunlight although it is quite tolerant of a variety of conditions.

Propagation: if you can find sources of native highbush cranberry, cuttings are the easiest method of propagation. Summer cuttings work especially well, with success rates usually over 90 per cent. Seed takes two years to germinate but should give satisfactory results. Make sure to either clean the fruit or crush the berries between your fingers to break the skin before plant ing. Each fruit contains one flat seed.

Wildlife use: native highbush cranberry fruits are much more desirable for wildlife than those of the showier European variety. It is a preferred food only of ruffed grouse and cedar waxwing, but fruit is also eaten by over 20 other species. More importantly, fruits hang on throughout the winter and serve as critical emergency food when other sources are not available. Because the tips die over the winter, plants become very bushy as they get older. They provide valuable cover and are used as nesting sites by several species of birds.

Areas of usage: for landscape planting, it is hard to beat highbush cranberry. While not the best of our shrubs for wildlife, it is a very attractive plant and the persistant ruby-red berries are a pleasing sight throughout the winter. Berries are edible (though not choice) and were once commonly used with other fruits in pies and jams. Around the home, plant highbush cranberry singly, in clumps or as a hedge. These plants can also be used as part of a windbreak, along streams or when planting the edges of ponds. Since they can grow in sun or shade and in moist or dry conditions, you have flexibility in planning where to use them. Unfortunately, they are sensitive to salt spray and should not be used along roadsides and shorelines.

Wild raisin
(Viburnum cassinoides)

Description: also known as witherod, this common woodland shrub grows to 12 feet (3.7 m) tall and has umbrella-shaped clusters of white flowers. In early September, each cluster will have green, white, pink and dark purple fruit present, as ripening is independent. If not eaten by birds, fruits turn dark and shrivel like raisins. Leaves are opposite, thick and leathery, and vary even

on the same shrub. Some are heavily toothed while others have almost smooth edges. Light brown buds are very distinctive, lance-shaped and 1/3-1/2 inches (8-13 mm) long. Bark is grey or brown and covered with small white spots.

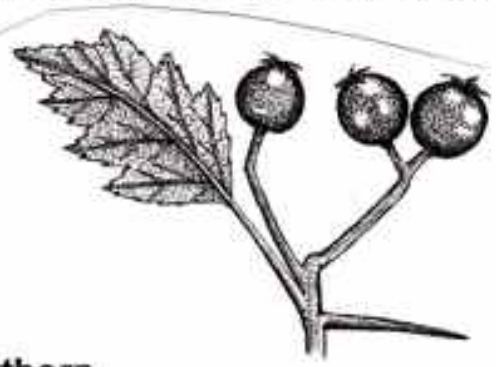
Growing conditions: often present as an understory plant in mixed forests, it is common in a wide variety of habitats. Wild raisin prefers moist, shady sites, but can grow in almost any condition - in clearings, on the edges of swamps and along roadsides. It is one of our most shade and flood tolerant shrubs.

Propagation: despite other information we have read, production from seed is quite easy. Crops are usually heavy, making seed collection a simple task. Mash ripe fruit in a strainer with water and clean seeds. Plant in the fall. Germination occurs late in the first summer and is usually less than 50%. Plant seeds about 1/2 inch (12 mm) apart. They will continue germinating throughout the first growing season, even into November. A light mulch during summer and fall protects the soil from drying out and allows for late germination. Early seed collection may improve germination rates.

Cuttings are useful for certain purposes, such as along steep streambanks where you may not wish to dig much of a hole for roots. We have had more success with summer cuttings than winter cuttings, but neither method has been as easy or productive as growing plants from seed.

Wildlife use: unlike some other shrubs, wild raisin consistently bears heavy crops of fruit. Berries are not a preferred food, but are eaten by ruffed grouse, American robin, rose-breasted grosbeak, purple finch, cedar waxwing and other birds. Snowshoe hare, chipmunk, red squirrel, skunk and mice all eat the fruit, which can hang on late into the winter. Especially where it forms dense thickets, wild raisin provides valuable cover for many types of mammals and birds.

Areas of usage: this is another excellent ornamental shrub, with lush foliage, white flowers and very attractive, multi-coloured clusters of fruit. The foliage can also be quite glossy and in fall the leaves turn rosy-orange. Due to its shade tolerance, it is important as an understory shrub in forest plantings. Within a forest, planting wild raisin will increase diversity of height, cover and food sources. Wild raisin can also be planted along the banks of streams and ponds, windbreaks and roadsides. Since it is salt tolerant, it is suitable for coastal plantings.



Hawthorn
(Crataegus spp.)

Description: another shrub with a wide variety of species, generally from 6 feet (1.8 m) to 20 feet (6.1 m) high and forming dense thickets. Keys to identification are the clusters of orange-red "haws" or fruits, and the long, hard thorns. Leaves are opposite, toothed and usually lobed. Showy clusters of white flowers give way later in the year to small apple-like fruits, which often remain on the shrub late into the year. Buds are small, brown and rounded, and thorns can be over 2 inches (5 cm) long. Bark is red to grey with lighter spots.

Growing conditions: commonly found on abandoned fields, forest edges and around older homesteads, it is adaptable to a wide range of conditions. Hawthorn prefers rich, moist well-drained soil but will tolerate some flooding. It grows best in full sun and makes poor growth in shade.

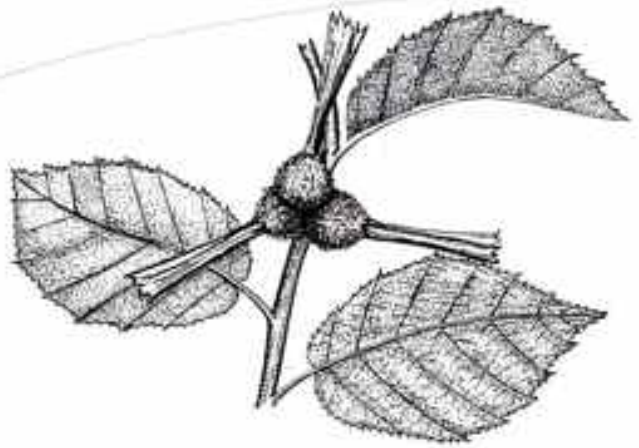
Propagation: this is one of the hardest natives to grow from seed. Transplanting from the wild is the best route, again taking smaller plants. Remember to wear thick gloves, as the thorns really can tear up your hands. If you would like to try seeds, collect fruit from September on and clean by hand. Each fruit contains 1-5 seeds, with extremely hard seedcoats. Germination usually takes place the second spring after planting, but may take longer.

Wildlife use: hawthorn's value to wildlife is not as a preferred food, although it is well-utilized by ruffed grouse, American robin, cedar waxwing, fox sparrow and pine grosbeak. More important are its emergency food value and the protection it offers. Since the fruit hangs on quite late into the winter, it is often available when other food is not. The heavy thorns also provide the best protection for small birds fleeing hawks and other predators. This is also why hawthorn is used as a nest site by so many species. In winter, snowshoe hare browse on twigs and buds.

Areas of usage: this is an excellent plant to have around the home in combination with some of the more important fruit bearers, such as serviceberry and the dogwoods and elderberries. Allow it to form a dense clump (you probably will have little choice, since it freely spreads from root suckers). The flowers and berries are quite attractive and its protective thorns are especially valuable near feeders. This is also a good choice for windbreaks, and unshaded streambank and pondside plantings. It should not be planted near commercial apple orchards, since it can act as a reservoir for the apple maggot. It can also spread into farmlands, causing flat tires on tractors and damage to cattle feet. Take this into consideration and avoid planting in livestock areas or where spreading will cause problems. Hawthorns are sensitive to salt and are poor candidates for shore plantings or at the edge of salted roads. Despite these concerns, hawthorns should be greatly encouraged in appropriate areas.

Beaked hazelnut
(Corylus cornuta)

Description: this small shrub grows up to 10 feet (3 m) under good conditions. Male flowers appear in the form of small catkins in fall, pollinating tiny red female flowers in the spring. This is our only nut-bearing native shrub, producing large round nuts, covered with bright green bristly husks that form a long "beak". The nuts may grow singly, but more often are found in clumps of 2-3. Leaves are alternate, toothed and bright green. Buds are small and round, on slender twigs. The bark is light brown, often with a white striping.



Growing conditions: often found in the forest understory and along the edges of forests, hazelnut tolerates fairly heavy shade, especially from tall, old trees. It

grows best and produces more fruit in full sun. Hazelnut prefers rich, well-drained soil, but can grow on the edges of wet sites.

Propagation: transplanting small root suckers from larger plants can be done quite successfully with a moderate amount of care. Seed is the best route for more than a few plants, but it is not easy. Red squirrels seem to come out of nowhere just before the nuts are ripe and strip the shrub. Collect nuts when husks are starting to turn brown, although they usually don't last long. Find an area with lots of shrubs bearing nuts and race the squirrels. Keep nuts in a dry place for a few days and remove the husks. Nuts are best planted in a bed that can be screened with wire mesh small enough to keep out squirrels. No matter what you do, germination will probably be low. Despite this, it is still a very worthwhile shrub to grow.

Wildlife use: as you would expect, the nuts are rich in protein and fat and favorites of red squirrel and chipmunk. They are also a preferred food source of ruffed grouse, ring-necked pheasant, hairy woodpecker and blue jay. The buds in winter and catkins in spring are a valuable protein source for ruffed grouse, snowshoe hare and American woodcock. Snowshoe hare heavily browse young shoots during the winter.

Areas of usage: this is another good choice for an understory shrub when rebuilding forests, or just to add to a wooded area lacking diversity. Like many shrubs, hazelnut plays an important role in nutrient cycling within a forest. Its leaves are rich in calcium and manganese and help fertilize nearby trees and other plants. This attractive shrub is useful for plantings around the home where some shade and protection are available. The nuts are tasty and in the past were much more commonly eaten by humans. Since it does not tolerate much wind, hazelnut grows poorly in open windbreaks, but can be used along streambanks.

Choke cherry
(Prunus virginiana)

Description: commonly a shrub 6-20 feet (1.8-6.1 m) tall, with gray bark marked by small pale spots. Leaves are dark green and finely-toothed. Although the shape is oval, choke cherry leaves are broader near the tip than at the base, making them easy to recognize. Clusters of red cherries turn dark purple in late August and September. These fruits are very sour but are edible, and contain a single seed. Twigs are stout and when the bark is scraped, give off an unpleasant odour. Buds are alternate, pale brown and pointed.

Growing conditions: common along edges of woodlands and in existing windbreaks, choke cherry prefers rich, moist well-drained soil and will not tolerate flooding. It will grow under light shading but best fruit production occurs in full sun.

Propagation: young seedlings are easy to transplant where they can be found in the wild. When growing from seed, collect fruit when ripe in late-July through September. If the fruits are ripe, the seeds are very easy to clean and it is worthwhile taking this extra step. Just mash ripe fruit in a strainer with holes small enough to catch the pits and rinse under water.

Wildlife uses: fruits are a preferred food for ruffed grouse, pileated woodpecker, yellow-bellied sapsucker, eastern kingbird, common crow, gray catbird, American robin, wood thrush, Swainson's thrush, gray-cheeked thrush, eastern bluebird, cedar waxwing, European starling, rose-breasted grosbeak and evening grosbeak. Dozens of other bird species utilize the fruit to a lesser degree, as do many small mammals. In winter and spring, red fox, skunk, chipmunk and snowshoe hare browse twigs and buds. This shrub bears consistent, heavy crops of fruit.

Areas of usage: although one of the best food sources for wildlife, regularly bearing heavy crops, choke cherry has some faults. The leaves are poisonous to humans and cattle, so this should be taken into consideration if there are young children around or cattle have access to the area. It also is a host of black knot fungus, showing up as black growths on branches, which make it less than ideal for landscaping around the home.

Further, it is a host of another disease which will kill commercial cherry and peach trees nearby. Take this into consideration and avoid future difficulties with neighbours. So why plant choke cherries at all, especially since they can spread aggressively? Their quick growth and heavy crops of fruit make them excellent plants for windbreaks if cattle are not farmed in the area. They can also be used in forest plantings when converting areas from old field white spruce to a mixed forest, providing shade and protection for other seedlings while attracting wildlife. Choke cherry is also resistant to salt and can be used along roadsides and shorelines. The closely-related pin cherry is also an exceptional wildlife plant but more often grows to a tree form and will be discussed in a future publication on native trees.

Staghorn sumac
(Rhus typhina)

Description: one of the easiest shrubs to identify throughout the year, staghorn sumac has a spreading, open form growing up to 15 feet (4.6 m) tall. Tiny green flowers in the spring are insignificant, but are later replaced by large cones of crimson berries that remain throughout the winter. Leaves are alternate, compound and turn a beautiful scarlet red in the fall. Buds are small, covered with brown hair and borne on fat, furry twigs. Bark on older wood is smooth and grey to brown.

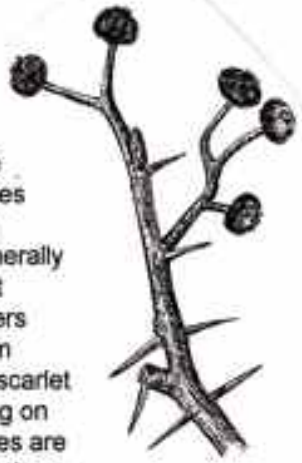
Growing conditions: sumac is commonly found on abandoned farmland, near old homesteads or along fencerows. It prefers full sun but will grow under light shading. Sumac does best on well-drained sites and will not tolerate flooding. Even in poor soil, it usually makes good growth and requires little care.

Propagation: this is a very difficult shrub to grow from seed, but fortunately it spreads prolifically from root suckers. Most people who have these shrubs growing on their lawn will let you have some young plants. Dig up small shoots early in the spring before the leaves have formed. It is best to move young sumac to a nursery bed. Water well and keep the bed mulched. After a year or two, they can be transplanted out to the final site. If the suckers do have leaves on them they can still be moved. Just keep them well-watered and mulched and cut them back to just above ground level. Cuttings can be made in the late fall from roots. If you are trying sumac from seed, collect cones when crimson, separate individual berries and plant closely, about 100 to 200/square foot (.09 sq. m). The seed coat is very hard and may take many years before it breaks down enough for the seed to germinate.

Wildlife use: berries are a preferred food source for ruffed grouse, ring-necked pheasant, eastern phoebe, common crow, northern mockingbird, gray catbird, American robin, wood thrush, hermit thrush, eastern bluebird and European starling. It is also used by over 30 other species, and since the fruit hangs on throughout the winter, is another excellent emergency source of food. Honeybees are attracted to the flowers in spring.

Areas of usage: a good choice for landscape plantings around the home, especially where spreading from root suckers will not be a problem. Its distinctive shape, exotic foliage, furry twigs and cones of red berries make it one of the best ornamentals available. Sumac can be used in clumps for more natural plantings, or as a single specimen with root suckers controlled by mowing. Shallow, widespreading roots make sumac a good choice for soil conservation along slopes, streams and pondsides if the soil is well-drained. Staghorn sumac is an excellent addition to a windbreak if the spreading root suckers will not cause problems. Since it is resistant to salt, this is one of the best native shrubs for protection along shorelines or highways.

Wild rose
(Rosa spp.)



Description: a common site on abandoned land, wild roses come in a variety of colours, shapes and sizes. They generally are low shrubs, from 2-6 feet (.6-1.8 m) tall, with pink flowers from May until August. From July onwards, they produce scarlet "hips" or fruits that often hang on throughout the winter. Leaves are alternate and compound, made up of 5-7 small, toothed leaflets. Twigs have distinctive (and very sharp) thorns. Bark is green on new growth and turns red-to-brown as the plant gets older.

Growing conditions: can be found most often on unfarmed pastureland, and in meadows, hedgerows and windbreaks. Of the two main native species, Carolina or pasture rose *(Rosa carolina)* grows on drier sites, while Virginia rose *(Rosa virginiana)* tolerates wetter conditions along edges of marshes or swamps. Both grow best in full sun and will not tolerate much shading. Wild rose suckers freely from roots and underground stems, forming dense colonies if allowed to run wild.

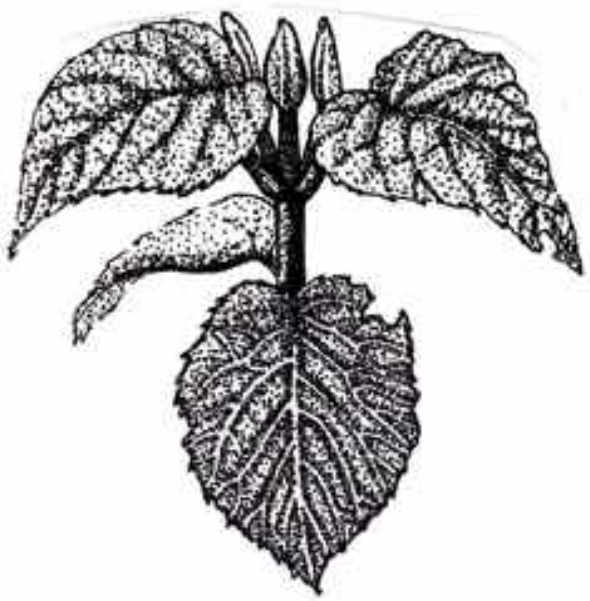
Propagation: transplanting can be successful, but since you are usually digging up runners with few roots, it is best to cut off most top growth above 2 inches (5 cm). Cut just above a bud where possible. Plant where you can provide adequate water, mulch thoroughly, and do not give up hope. Often they will initially turn brown and wither, but weeks later one or two new green shoots appear from the crown. They really are tough, resiliant plants. Summer cuttings also work well if you avoid the soft tips, but success is usually less than 50%. Propagating from seed is the best way to grow large numbers of plants. Collect any time after hips ripen, separate seeds from fruit by hand and plant in a nursery bed. These seeds have hard seed coats and usually take two years to germinate.

Wildlife use: rose hips are a preferred food of northern mockingbird, Swainson's thrush and cedar waxwing. They are also eaten by a dozen other species and used as emergency food during the winter. Ruffed grouse and ring-necked pheasant also eat the buds in winter, while many birds use thickets of wild rose for cover and protection from predators. Many types of small mammals are also known to browse fruit, leaves and twigs.

Areas of usage: a very ornamental addition to semi-wild landscape plantings around the home. Again, plant wild rose only where thickets can form. Leaves change colour in the fall and the scarlet fruit contrasts nicely against a snowy background. Rose hips are rich in Vitamin C and can be added to jellies and teas. Wild roses are also useful as a low shrub in windbreaks and hedgerow plantings, enhancing both the landscape and wildlife habitat. Since wild roses frequently hybridize, try to plant roses from wet areas into wet areas and from dry sites to dry sites. This is a good idea whether transplanting or growing from seed or cuttings.

Hobblebush
(Viburnum alnifolium)

Description: one of our showiest plants throughout the year, although these shrubs are so rare that few Islanders have had the chance to see them. Growing to a height of 6 ft. (2 m), hobblebush has opposite, velvety buds. These develop into large, heart-shaped leaves that take on a very attractive bronze colour in the fall. The flowers form large, flat clusters early in the spring and are very white. The berries turn cranberry red in late August and finally purple-black when fully ripe. These plants are a pleasure to see in any season, though so rare that most Islanders never see them.



Growing conditions: like so many of our rare plants, these favour shade and rich soil and are usually found in mixed wood stands.

Propagation: the plant gets its name because if the tips bend down and touch the ground, roots can form and the shrub can literally "hobble" you as you walk through the woods. The easiest way to grow this shrub is from seed. When ripe in mid-to-late September, the seeds are mashed by hand to break up the fruit and planted every 2 in. (5 cm) in rows 4 in. (10 cm) apart, at a depth of 1/4 in. (6 mm). Seeds generally take two years to germinate and should be lightly mulched and given light shade. Any that germinate the first summer should be transplanted to a separate nursery bed under light shade and mulched well.

Wildlife uses: hobblebush produces heavy crops of berries, which are used by ruffed grouse (below), pine grosbeak, Swainson's thrush and other birds. Although it is not listed as a preferred food by most wildlife manuals, for several years now the heavy seed crops have vanished quite quickly, so they obviously are a favourite food of some Island birds.

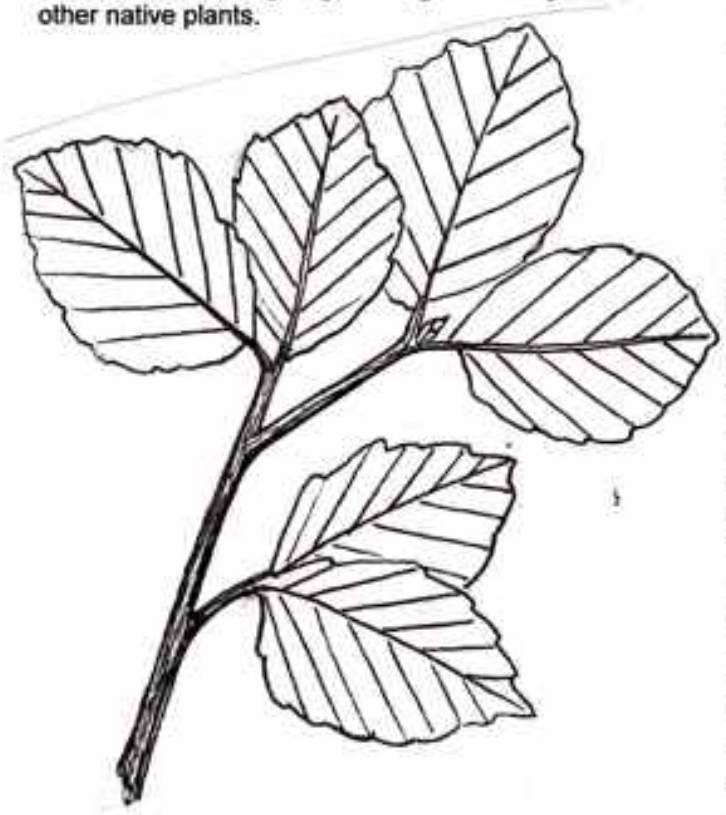
Areas of usage: a premier landscaping plant if you have any shade at all around your home, especially given its attractiveness throughout the year. It works best in a naturalized situation, perhaps in a wild area under larger trees. It is also important in woodland plantings, not only for its beauty but for its heavy seed crops for wildlife and the diversity it provides.

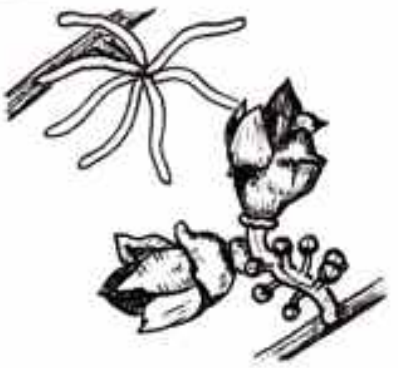
Witch hazel
(Hamamelis virginiana)

Description: another very attractive yet rare native shrub. It grows to a height of 20 ft. (6 m) and is a slender, graceful shrub. The leaves are 2-6 in. (5-15 cm) long, wavy and toothed, and turn yellow in the fall. In September and October, as the leaves are falling, the bright yellow flowers bloom. The flowers look like those of the forsythia shrubs commonly planted around Island homes, yet appear at the opposite end of the growing season. The seeds are shiny and black, encased within a capsule 1/2 in. (1.2 cm) long. Buds are small, velvety-brown and alternate.

Growing conditions: the best growth is made under light shade in rich, well-drained soil, but it tolerates a wide range of soil conditions. Witch hazel is a slow growing shrub but is quite hardy.

Propagation: collect the capsules as they turn from green to light brown throughout September. Place these in a paper bag or cardboard box in a warm place and allow to dry. The bag should be closed, since as the capsules dry, they split in half and throw out the seeds with a loud "snap". Plant the seeds every 2 in. (5 cm) in rows 4 in. (10 cm) apart, at a depth of 1/4 in. (6 mm). Seeds generally take two years to germinate and should be lightly mulched and given light shade. Any seedlings that germinate the first year should be carefully transplanted to another bed with some shading. Witch hazel is not as forgiving of rough handling as some other native plants.





Wildlife uses: the value to wildlife is relatively low, but red squirrel and ruffed grouse eat the seed and the plant provides cover and protection for other species.

Areas of usage: another excellent landscape plant if you have some shade. The plant has a very attractive shape and fall leaf colour and the unique time of flowering alone makes it a worthy addition to any suitable yard. Again, it is important in wood land plantings for its beauty and the diversity it provides.

Witch hazel is very important as a medicinal plant. Twigs and bark are used to produce oil of witch hazel, while the roots are used to produce a tincture known for its healing powers. Also, witch hazel is the shrub of choice for making the divining rods used in water-witching. This is one of the rarest native shrubs in the province, being found to date only in Murray River and a few isolated plants in Valley.

Some of our rarer native trees

As with the shrubs, we simply didn't have the resources to put together fact sheets on every native tree species, though we hope to sometime in the future. The following six deciduous trees and three conifers are not common on the Island but can play an important role in restoring this province's natural diversity. Most are highly valued for their wood and are desirable for a variety of other reasons. Some of these trees are so rare that they should be encouraged on every suitable site in the province just to start to bring back healthy populations. Since so little of the original Acadian forest mix still occurs, we should look both at restoring suitable sites and conserving the remaining healthy areas. This might mean protecting that one beautiful elm in the stand or not clearing land that is regenerating in red oak.

At Macphail Woods we are especially interested in finding any seed sources for black ash and ironwood. While we have a few sources for ironwood, black ash has proved to be elusive, though it certainly grows here. If we are to restore Island forests, we need to find and maintain the best seed sources of these and many other species of both trees and shrubs. Please let us know if you find some of these rarer species.

Ironwood (*Ostrya virginiana*)

Description: this member of the birch family is one of our rarest native trees. It is mainly found in scattered patches around Prince County, although there are small amounts in other areas. Also known as eastern hophornbeam, it is a relatively short-lived and small tree. It grows to be 40 ft. (12.5 m) tall and 12 in. (30 cm) in diameter, although it rarely reaches this size. It is a slender tree, with leaves like yellow birch, although ironwood leaves have teeth of two different sizes. The bark of ironwood is light brown and scaly, shredding off in narrow, curling strips.

Growing conditions: ironwood prefers rich, moist soil and grows best in the partial shade of other trees.

Propagation: in September, small, greenish seeds can be collected from the trees. The seeds are enclosed in a papery sac, with many sacs being held together in a cluster like true hops. When ready for harvest, the clusters will start to turn brown and some will drop to the ground. Pick seeds off the tree if possible. When you separate the seed from the sac, you might want to use thin gloves, since the sacs have fibreglass-like hairs that stick into your fingers. Plant seeds every 2 in. (5 cm) in rows 4 in. (10 cm) apart, at a depth of 1/8 in. (3 mm) and mulch for the winter. If the bed is in full sun, some form of shading should be provided during the growing season. Most seeds take two years to germinate but any that germinate the first summer should be transplanted to another bed. This avoids the problem of having older plants in the bed when seedlings are germinating the second year. We have not had very high rates of germination in this species so be sure to plant lots of seed.

Wildlife use: the buds and catkins of ironwood are valued by ruffed grouse and red squirrel. The seeds are eaten by purple finch, rose-breasted grosbeak and other birds.

Areas of usage: this tree almost lives up to its name. Its wood is our hardest and heaviest and in the past was used for tool handles, sled runners, mallets, ladder rungs and firewood. However, until ironwood is much more common in our woodlands, it should be a protected species in almost all woodlands - it is critical that we keep as many sources of seed as possible. It is an excellent choice for underplantings or interplanting after a mixed wood thinning, and will help provide diversity of height in older forests. As well, it is a good for landscape plantings where there is shade.

Red oak (*Quercus rubra*)

Description: our provincial tree and only native oak is now quite rare and primarily found in scattered areas around Charlottetown, Tracadie and Georgetown. The largest specimen on P.E.I., a 5 ft. (1.6 m) diameter giant in Charlottetown's Royalty Oaks, fell to the ground in 1994. Red oak leaves are deeply cut with pointed lobes. Some oaks around churches and homes look like red oak but are actually scarlet or black oaks. It can be hard to tell them apart (and they can hybridize) so if you are collecting from these areas get a leaf sample and acorns and check them with a good field guide.

Growing conditions: red oak is a fast-growing tree and makes good growth in almost all well-drained soils. It can grow in full sun or partial shade.

Propagation: acorns should be collected off the tree when some have already started to fall to the ground, usually mid-September to late-October. Seeds can be visually inspected and those with holes discarded. Another method is to put them in large buckets of water and keep only the ones that sink. If you use raised beds with wooden sides and can use hardware cloth to protect the acorns from squirrels, fall planting works well. Otherwise store in a stratification bed (see page 40) and spring plant as soon as the ground is workable. Place acorns every 2 in. (5 cm) in rows 6 in. (15 cm) apart, at a depth of 1 in (2.5 cm). Oaks grow long tap roots, so either plant seedlings out the second spring, or transplant them to another bed after pruning the tap root to 6 in. (15 cm). Red oak responds well to pruning. If the seedling does not have a straight, single stem, it can

be pruned back almost to the ground in the spring. One or more sprouts will come up and these can be pruned to give the desired structure.

Wildlife uses: as you will no doubt experience if you plant any amount of red oak, snowshoe hare love to browse oak and red squirrel feast on the acorns. As well, blue jay, grackle, the woodpeckers, ruffed grouse and many other birds and small mammals favour acorns, making red oak one of our most important wildlife trees.

Areas of usage: given its status as provincial tree, its wide range of uses, quick growth and high value, red oak is at the top of our list for tree planting. It can be used in reclaiming fields, especially if there is some alder present, and also works well in diversifying existing conifer plantations. At Macphail Woods we use it in almost all of our forest plantings, except in wet conditions or under dense shade. The wood is hard and heavy and one of the most valuable that can be grown here. It is used for furniture, flooring and interior finish work. Red oak is also a premier tree for planting around homes and can be used in windbreaks along with other deciduous and coniferous trees.

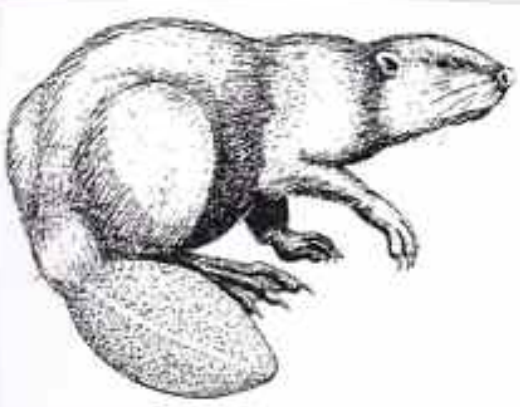
White ash
(Fraxinus americana)

Description: another rare native tree that turns up in surprising places - not only in West Prince, but in scattered patches in Kings and Queens counties as well. It is a tall, slender tree with gray or light brown bark, furrowed into diamond patterns. The leaves are compound, with small stems attaching leaflets to the main stem. The leaflets tend to be slightly rounded. Buds are opposite, furry and dark brown.

Growing conditions: this ash tolerates a wide variety of conditions, from moist soil to dry sites, from partial shade to full sun. It makes its best growth on rich, well-drained sites and light shading.

Propagation: seed should be collected from the tree if possible. Crops are usually quite heavy and occasionally hang on late into the year. Through September and into October, collect seed and plant as soon as possible. If the seed is allowed to dry out, it may take two years to germinate. Plant seeds every 2 in. (5 cm), in rows 6 in. (15 cm) apart, at a depth of 1/4 in. (6 mm). White ash makes very fast growth, generally over 12" (30 cm) each year, so you can have very nice seedlings to plant out quite quickly.

Wildlife uses: the seeds are an important food source for red-winged blackbird, evening grosbeak, pine grosbeak, purple finch and other birds. Beaver often use young white ash for food.



Areas of usage: along with red oak, yellow birch and white pine, it is a favourite tree for reforestation. It can be used to diversify existing plantations, underplanted after thinnings and planted in small openings in areas of old field white spruce. It grows quickly and can be used where raspberries and other competition might pose a problem. The wood is very valuable and used in making canoe paddles and tool handles, framing light vehicles and for a wide variety of other purposes. It is also excellent as an ornamental and can be used as a component in windbreaks.

Black ash
(Fraxinus nigra)

Description: black ash is a slender tree, though not as tall as white ash. It seldom reaches over 50 ft. (16 m) or a diameter of 12 in. (30 cm). It has compound leaves with pointed leaflets that turn yellow in the fall. Unlike white ash, it has no stem connecting the leaflet to the main stem. The bark is grey, with shallow fissures and becoming scaly as the tree ages. Buds are opposite and dark brown to almost black. The seeds are ripe in September and can hang on the tree until late fall. The sam-ara (the actual seed plus the wing that it is attached to) is oblong and has a much broader seed cavity than the white ash.

Growing conditions: generally only found along stream banks and the edges of swamps, although it was used for street plantings in some areas. It grows well in open stands of eastern white cedar, red maple and other swamp hardwoods. It does not tolerate shade.

Propagation: as with white ash, plant seeds every 2 in. (5 cm), in rows 6 in. (15 cm) apart, at a depth of 1/4 in. (6 mm). We have yet to find a good seed source for black ash, so if anyone can help out please contact the Macphail Woods project at 651-2575.

Wildlife uses: as with white ash, the seeds are an important food source for red-winged blackbird, evening grosbeak, pine grosbeak, purple finch and other birds. Beaver will use young black ash for food.

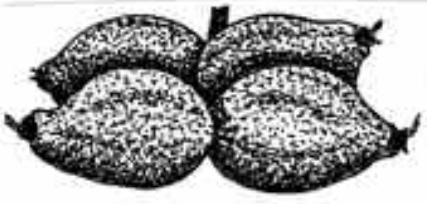
Areas of usage: in the past, black ash was heavily used by native people for basket making and it is still used today for this purpose. It is a good choice for streambank and wetland restoration if the site has full sun.

Butternut
(Juglans cinerea)

Description: there is some debate as to whether this tree is native to Prince Edward Island. There seems to be evidence on both sides of the argument, but it is a rather academic debate. Butternut is native to the Saint John River valley in New Brunswick and would have eventually found its way here anyway. It is a very exotic looking tree, with large, compound leaves made up of 11 to 17 leaflets. With light shading, trees become tall and stately and make good growth. In spring, butternut trees produce small, purple flowers. Nuts are smaller than walnuts and more egg-shaped. The nut shell itself is very rough.

Growing conditions: butternuts do well in moist, rich soil and with light shading. Several butternut plantations were established at Macphail Woods and Brudenell Park in the early 1980's. Those in full sun are excessively branched and have not made good growth, while those with some shading have done exceptionally well.

Propagation: collection begins when seeds begin to fall, from September to mid-October. As with red oak, fall or spring planting works well. When fall planting, keep nuts in a container for a few weeks until the husks can be rubbed off (this is a messy job, so wear gloves). For spring planting, store in a stratification bed. Plant nuts every 2 in. (5 cm), in rows 8 in. (20 cm) apart, at a depth of 2 in. (5 cm). Butternuts produce tap roots and should be root pruned the same as oaks. Most seed will germinate the first season, but if the winter was very mild, some may not germinate until the second or third growing season. These trees also respond well to pruning, both in the nursery and especially in the field. It makes a world of difference to properly prune young trees, as they often suffer winter damage. If you don't prune them back to a single stem, you will get bushy trees with structural problems. A few minutes with pruning shears will greatly increase the health and value of these trees.



Wildlife uses: butternuts are eaten by red squirrel, chipmunk and blue jays. Smaller birds and mammals often consume butternuts on the ground that have split naturally or have been partially eaten by larger species.

Areas of usage: excellent for diversifying young conifer plantations, these trees can also be planted in openings in old field white spruce. Small patch cuts are ideal places for a few butternuts mixed with other species of trees and shrubs. Try to find conditions where they will be stretching for the sun, instead of making wide, branchy growth. Light shade encourages tall, straight growth, which will produce a higher-value tree. If there is a heavy grass cover, mulch all plantings to conserve moisture and deter mice.

Butternut is also a good choice for plantings around the home. The nuts are tasty, although smaller than walnuts and more difficult to crack. Selecting the largest nuts for seed should produce superior trees. The wood is attractive and easy to work. It is often used for furniture making and decorative woodwork.

Sugar maple
(Acer saccharum)

Description: perhaps our most beautiful native tree, it reaches a height of 80 ft. (25 m) and can be 3 ft. (1 m) or more in diameter. Sugar maples usually grow tall and straight in the forest, while when grown in the open they are shorter and more heavily branched. The leaf closely resembles the emblem on the Canadian flag, sharp-point-ed with rounded notches. Buds are opposite, reddish-brown and sharp. Sugar maples produce a brilliant array of red, scarlet, orange and yellow fall colours.

Growing conditions: best growth is made in rich, well-drained soil and with light shading. It grows mainly in mixed stands with American beech, yellow birch, eastern white pine, red spruce and eastern hemlock and is a key component of our climax Acadian forest.

Propagation: seed should be collected from the tree if possible, or from the ground if the tree cannot be climbed. Seed production is unpredictable there is little available some years. Consider collecting extra during a heavy seed year and storing the seeds in a dry place for future planting. The winged parts of the samara should be dry before picking and some should have already started to fall from the tree. In each paired samara, only one seed is viable. Germination can be poor, so plant more than you think you might need. Plant individual samaras 1 in. (2.5 cm) apart, in rows 6 in. (15 cm) apart, at a depth of 1/4 in. (6 mm). Mulch the area over the winter removing most of this in the late spring. Provide seedlings with light shade during the growing season. After planting out, check seedlings regularly and prune when necessary to maintain a strong central leader. Young plants can be cut back to the ground if they have poor form.

Wildlife uses: seeds of the sugar maple are eaten by grosbeaks and other birds and small mammals. The trees are also extremely important as nesting sites for a wide variety of birds and mammals, and the young plants are often browsed by snowshoe hare.

Areas of usage: sugar maple is one of our best woods for furniture and instrument making, being the source of bird's eye and flamed maple. It is used for veneer, plywood and vehicle stock. Maple syrup and sugar are made from the sap. In forest plantings, it works well in thinnings and even in gaps in old field white spruce. It is valuable as a landscape specimen throughout the year, especially for its fall colours.

Red spruce
(Picea rubens)

Description: a very tall, straight conifer once much more common than it is today. It grows up to 70 ft. (22 m) in height and 2 ft. (60 cm) in diameter. Red spruce can hybridize with black spruce, so it is best to collect from areas with only large red spruce. As a generalization, white spruce is found in old fields, treelines and along the shore, with branches straight out from the trunk. Black spruce is found in wetter areas and the branches droop. Red spruce grows in rich mixed wood stands and is not nearly as bell-shaped as black spruce. Twigs of red spruce are reddish and hairy and the new growth flushes much later in the spring than its other two relatives.

Growing conditions: red spruce grows best in mixed wood stands, often along the sides of streams in deep, rich soil. It is found growing with hemlock, white pine, sugar maple and yellow birch in the climax of the Acadian forest. Light shading when the tree is young keeps it growing tall and straight and prevents the soil from drying out.

Propagation: given the height of most of the red spruce we collect seed from, wait until the red squirrels have knocked down a bunch of cones. This means that you may have to visit the site every few days during October, but it is a lovely excuse to get out into the woods. Each cone will contain many seeds, although some may not be viable. Place the cones in a paper bag or cardboard box with some ventilation, and keep in a warm place. As the cones dry out and open, the seeds will drop out. These can be fall planted or stored in a dry place until spring. Plant seeds every inch (2.5 cm), in rows 4 in. (10 cm) apart, at a depth of 1/4 in. (6 mm). Mulch the

area over the winter removing most in the spring. Beds should have some shade and not be allowed to dry out.

Wildlife uses: all spruce are extremely valuable for wildlife, whether as a food source, nesting site or protection. Red spruce seeds are the preferred food of white-winged crossbill, red-winged crossbill and pine siskin, although many other birds and mammals also rely on them. Especially in hardwood stands which lack conifers, red spruce plays an important role in providing cover and protection for both predators and prey.

Areas of usage: red spruce is very valuable for lumber production and for log home building. It should be a component of many forest plantings, especially after a hardwood thinning where conifers may be lacking. Red spruce does not do well under white spruce, since an attack of spruce budworm will devastate the seedlings, but if the opening is large enough they can be successful. They also make poor growth under deep shade so make sure there are partial openings in the canopy.

Eastern hemlock
(Tsuga canadensis)

Description: although still common in a few areas, hemlocks are quite rare across the province. It is one of our largest native trees, reaching a height of over 70 ft. (22 m) and a diameter of 3-4 ft. (1-1.3 m). Its small, flat needles resemble those of balsam fir, but hemlock needles are attached to the stem by a small, string-like stalk. The ends of the branches and leader also droop, unlike the balsam fir branches which grow straight out to the end. Older hemlock trees have a very round profile, when seen from a distance.

Growing conditions: hemlock makes its best growth in rich, well-drained land, growing with yellow birch, sugar maple, white pine and red spruce.

Propagation: cones can be collected from the tree when ripe in late September and treated the same as red spruce. An easier method is to find a 4-10 year old forest road that has been bulldozed through a stand containing good hemlocks. You will usually find healthy seedlings growing on the roadway. These transplant easily and can go into a shaded nursery bed, at six to 12 inch (15-30 cm) spacings depending on the size of the seedlings. In a few years you can use these transplants for your forest, streamside or home plantings. Placing rotted wood in the hole when planting out will make sure the seedling does not dry out and provide nutrients for future growth. Seedlings should also be mulched well.

Wildlife uses: hemlock seed is a preferred food for American goldfinch (left), boreal chickadee, ruffed grouse, pine siskin and the crossbills. Many other species of birds and mammals eat the seeds. Since hemlock a tree that is long-lived and can grow very large, it is used by raccoon for dens and is a common nesting spot for a wide variety of birds. Hemlocks also offer great cover and protection for both small and large birds and at Macphail Woods the largest hemlock contains a hive of honeybees that has overwintered successfully for many years.

Areas of usage: an excellent species for underplanting, since it tolerates shade. We use it in almost all woodland plantings, especially hardwood thinnings that have few other conifers. We also use hemlock when replanting patch cuts made in stands of old field white spruce. As with red spruce, they should not be planted beneath older white spruce as they tend to suffer more insect damage. This species is also well-suited to stream-side plantings where there is some existing cover. Hemlock can also be used to great advantage around the home. It can be pruned quite heavily and used for hedging if the site is protected, or allowed to grow to its full stature to recreate some wild areas. Many older barns and homes on Prince Edward Island were sided with hemlock boards, but the wood is not as valuable as pine or spruce.

Eastern white cedar
(Thuja occidentalis)

Description: this small tree can reach a height of 40 ft. (13 m), with a diameter of up to 1 ft. (30 cm). The trunk usually has a lot of taper and is often twisted. Leaves are small and scale-like and stay on all year. The bark is thin and reddish brown, furrowing and peeling as it gets older.

Growing conditions: cedar grows in swamps or wet sites, mainly in Prince County. It can grow on dry areas, but usually does not make good growth. It will not tolerate much shade.

Propagation: cedar cones can easily be collected from the trees, since some the branches often droop down within reach. Collect the cones in late September and October, before they turn brown and release the seeds. Treat the cones the same as for red spruce. Seedlings should be given partial shade and not be allowed to dry out. Cedar can also be grown from cuttings, taken in mid-summer or mid-winter and treated with rooting hormone. The rooted cuttings should be raised in a nursery bed for a year or two and given light shading and mulch.

Wildlife uses: a healthy cedar hedge is a thing of beauty, for humans and other forms of wildlife. Seeds are a preferred food for pine siskin and are eaten by evening and pine grosbeak, American redpoll, red-winged and white-winged crossbill and other species of birds and mammals. But it is as protection and cover that cedar excels, since smaller birds can find solace from both winter winds and predators within the dense branches.

Areas of usage: cedar can be used for streamside or wetland rehabilitation and in reforestation on wet sites. Some cedar were planted at Macphail Woods in a wetter part of the old field white spruce area and are growing well. This is due to the dampness of the area and the taller trees around it providing light shade. Cedar can also be used around homes if there is already some protection. It does not make a good hedgerow or wind-break tree if there is no protection, since the leaves dry out from heavy winter winds. The wood is our most rot resistant and is used for fence posts, shingles and boats.

Eastern white pine
(Pinus strobus)

Desription: this species produces some of the largest trees in the province. White pine is the only native pine with bundles of five needles (red pine and jack pine needles come in bundles of two). The needles have a blueish tinge to them and feel quite soft. Though high-quality trees have become harder and harder to find, white pine can grow to 100 ft. (30m) tall and over 4 ft. (1.2m) in diameter. The tops of older specimens often break off, giving them a flat-topped appearance. This makes them easy to pick out from a distance.

Growing conditions: grows on a variety of sites but does best on a moist, sandy soil. It can be found in mixed stands with red pine in the Murray River area and is quite common in hardwood mixes with eastern hemlock. Older specimens can also be found along property lines. Will tolerate a fair amount of shade.

Propagation: the easiest way to propagate White Pine is to collect cones after the squirrels have cut them off the tree. Find large, healthy specimens that have a heavy seed crop and make regular trips to the site. Squirrels cut off the cones and accumulate large numbers under the tree before taking out the seeds. Place cones in a paper bag (this is a very messy job, since the cones exude resin) and store in a warm, dry place. The cones will open and the seed can be shaken out and stored in a cool, dry place. If the seeds are ready, plant in the fall, or you can wait until spring. Plant seeds every inch (2.5 cm), in rows 4 in. (10 cm) apart, at a depth of 1/4 in. (6 mm). Lightly mulch the planted area. Seed beds should be in a shaded area or you can place a shade table above the bed. Like most conifers, white pine seedlings are slow to develop but don't let that deter you from planting them.

Wildlife uses: many eagles nest in the tops of white pine, attracted by their height and wide, flat tops. Robin, blue jay and many other birds are known to build nests in these trees and they make great homes for the cavity-nesting species such as black-capped and boreal chickadee and red-breasted nuthatch. Seeds are favoured by pine siskin, junco, white-winged crossbill, red-winged crossbill, black-capped chickadee, boreal chickadee and a host of other birds. Red squirrel, flying squirrel and chipmunk depend on pine seeds for food.

Areas of usage: if you are working on restoring native forests, white pine is especially suited for planting in patch cuts made in stands of old field white spruce, or underplanting in mixed wood stands after a thinning. White pine that grow up stretching for the sun usually become tall, straight trees free of lower branches. It is a very attractive tree for planting around homes if you have enough space. Also, it can be pruned very heavily and kept as a small, dense tree. The wood is highly-valued and excellent for all kinds of woodworking, homebuilding and shipbuilding projects. Although the overall-quality of white pine has been degraded in the province, you can still find good sources of seed. It is increasingly important that the remants of Acadian forests containing quality white pine should not be cut. With our help its past glory could be restored.

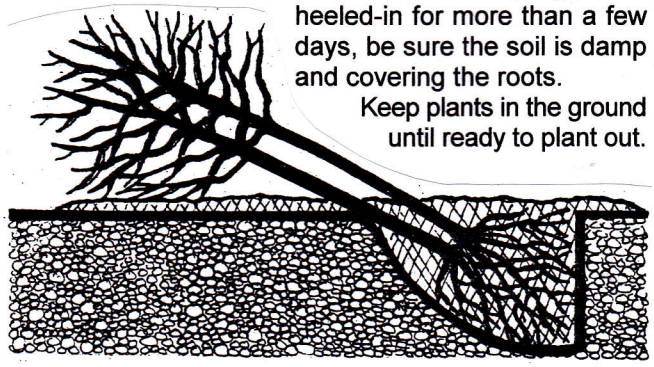
How to plant trees and shrubs

Bare root stock

Bare root stock should be planted in spring before the leaves open or the new needles have started growing. When buying stock, time the purchase for when you have the time to plant. Sometimes this is impossible or impractical as when planting large numbers of trees or in case of poor weather. Plants can be held for awhile in the ground by "heeling-in".

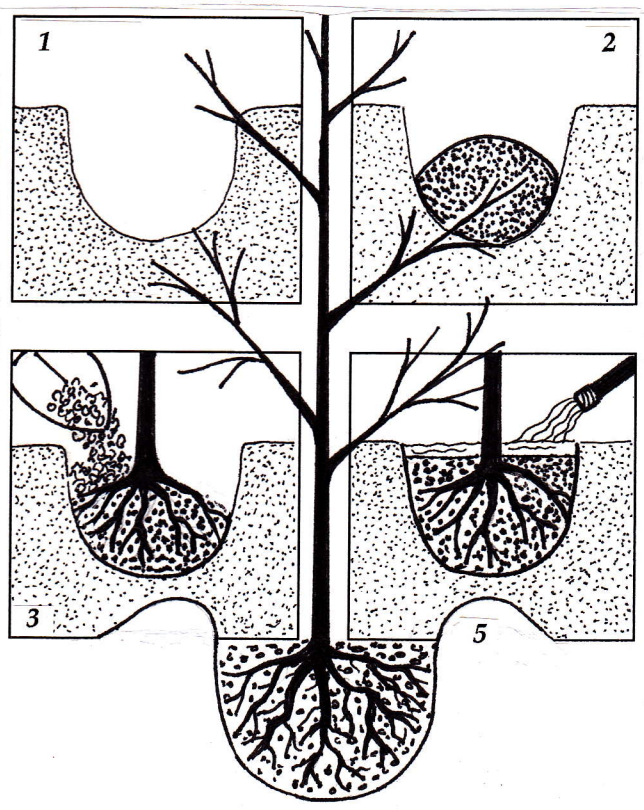
Heeling-in. Choose an out of the way location, with some shade, where you can dig holes large enough to bury the roots. Bundles of trees and shrubs can be heeled-in together. Water well and mulch to keep the soil moist. If keeping plants heeled-in for more than a few days, be sure the soil is damp and covering the roots.

Keep plants in the ground until ready to plant out.



Never let the roots dry out. Soak bare root stock in buckets of water overnight before planting. Keep the trees and shrubs in the buckets of water as you check over the roots and while preparing holes and planting. Check the roots and prune any that are broken, split or scraped. Use sharp by-pass pruners to ensure a clean cut. Prune roots of small stock (under 12 inches - 30 cm) to about 6 inches (15 cm). Larger trees and shrubs will need more root and a larger hole than smaller stock. Prune any roots that are circling the trunk, if they will not straighten.

Keep roots wet: make a "slurry", a soupy mix of water and soil. Dip roots into it while getting ready to plant. The slurry will stick to the roots and keep them from drying out. Dig a straight-sided hole about 12 inches (30 cm) deep for every 8 inches (20 cm) of root depth. If possible, put the topsoil on a cloth or tarp to make refilling the hole easier. Dig a wide hole to allow unrestricted lateral root growth. Even small trees and shrubs will benefit from a 1-2 foot (30-60 cm) wide hole. All plants should have a hole at least twice as wide as the diameter of the root mass. Rough up the sides of the hole and place a mound of topsoil or compost at the bottom. Spread the roots over the mound. The plant should be at the same soil depth or slightly higher than it grew in the nursery (look for a colour change at the



root collar). Fill in the hole and firmly tamp to remove air pockets. Water deeply and mulch with a 3 inch (7.5 cm) layer of leaf mould or wood chips. Keep mulch 3-4 inches (7.5-10 cm) away from the stem to discourage damage from rodents during the winter.

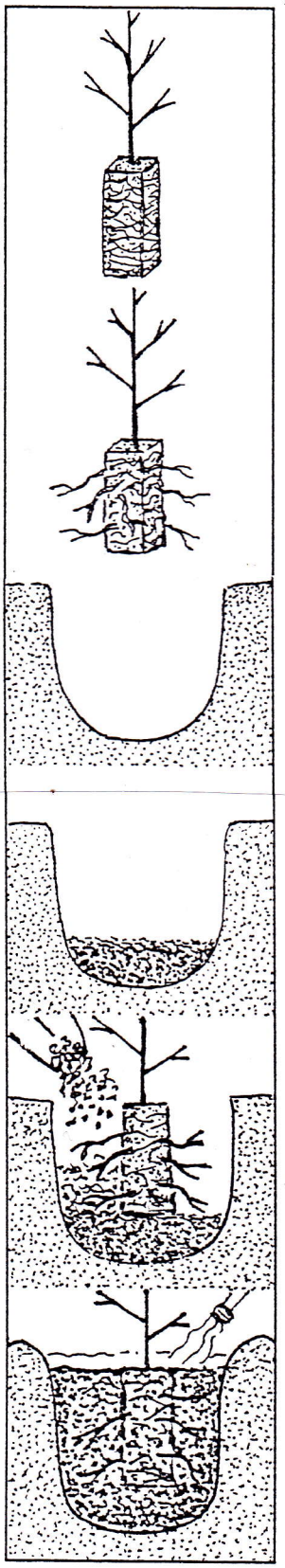
If bare root stock is in leaf when it is planted, prune 30% of each branch, taking care not to prune the leader (main stem). This reduces the moisture loss from the plant and helps ensure survival. Small trees usually do not need to be staked but if size requires it, use two stakes and rubber tubing, hose or nylon stockings. Do not use wire or rope as they will cut into the stem and cause serious damage. Remove stakes and ties by the second growing season.

Container stock

Timing is not quite as important for container-grown seedlings as for bare root stock. Container stock can be successfully planted through the growing season. Container size is generally one litre and up. Hardwood seedlings in containers need special attention if planting out when growth is already well underway. Shade plantings are easier to maintain than plantings in full sun, which will need to be watered regularly and kept well mulched.

Water the container plants well the day before planting. To remove the plant from the container, turn the container over with the stem between your fingers. Give the container bottom a good rap with the palm of your hand and catch the root ball as it slides out. Be careful not to damage the stem. Prune any roots that are circling the trunk which might eventually girdle the tree. Using a screwdriver, pull some of the larger roots away from the root ball to help stimulate new growth.

Dig a hole with straight sides, about 8 inches (20 cm) deep for every 12 inches (30 cm) of container depth. If possible, put the topsoil on a cloth or tarp to make refilling the hole easier. Dig a wide hole, at least 2-3 times the container width to allow wider, unrestricted root growth. Rough up the sides of the hole and place some topsoil or compost on the bottom of the hole. The plant should be at the same soil depth as it was in the container. Fill in the rest of the hole and tamp well to remove air pockets. Water deeply and mulch with a 3 inch (7.5 cm) layer of leaf mould or wood chips. Keep mulch 3-4 inches (7.5-10 cm) away from the stem to discourage rodent damage during winter. Container stock will rarely need pruning, especially if the plants are young. Prune lightly for shape, if desired, or to remove damaged branches. Do not prune central leader.



Trees and shrubs need:

* room to grow - look up before digging and do not plant under power lines
* the right soil - for example, very little grows in heavy clay, add compost and sand to break up clods. Have a soil test done before adding any fertilizers or amendments you may not need
* strong roots - with young plants, roots are more important than above-ground growth. The fine, absorbing roots are the most important and also the most fragile
* water - regular and deep watering
* mulch - to retain moisture and discourage competition
* proper pruning - for both desired shape and strong growth

Transplanting wild plants

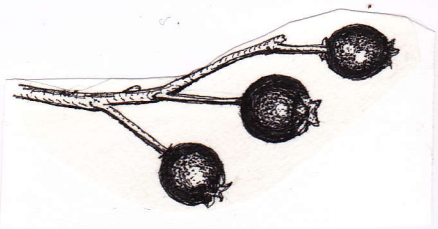
When digging transplants from the wild, keep as much soil as possible around the roots. Bring a bucket of water or slurry if possible and something to wrap the plants in. Keep the roots moist and shaded. Trim roots if necessary and prune branches if the tree is in leaf. When collecting large numbers of small plants, dig them bare root and wrap 50-100 in a cloth or plastic bag with moist leaves or soil around the roots. This is an easy way to acquire large numbers of plants at little cost. Put them in a nursery bed and you will have excellent stock for planting in a year or two. The extra growing time adds height to the seedling and encourages the formation of a dense root mass. This will greatly increase the success of your final plantings. Ask the landowner's permission before digging plants and make sure to leave the site in good shape. Woods roads, ditches and old fields are good sources of species such as white spruce, white birch, red osier dogwood and willow.

Digging from woodlands can rarely be done without damaging roots of existing trees. It can also result in unsatisfactory transplants and so is not recommended.

Attracting wildlife to your backyard

The Macphail Woods Ecological Forestry Project has been working for years to promote the values of native plants and forest restoration. Native plants are usually very reliable - they have adapted to the climatic conditions of the area and serve a variety of functions within the ecosystem. More important they are proven performers - hardy, fitting into a wide variety of habitats, valuable to wildlife, useful for stabilizing streambanks and/or controlling soil erosion.

Native plants are also useful if you are reducing the size of your lawn. Naturalizing areas around your home will lead to lower maintenance costs, pesticide reduction and improved biodiversity in the area. Planting rare species of native trees and shrubs on your property can have far reaching impacts, since birds, small mammals or the wind can transport seeds to nearby woodlands.



Many native plants are also excellent choices as specimen plants in more formal landscapes. Look at the beauty of plants all year long, not just for showy blooms. Since most plants in this climate are leafless for more than six months a year, textured bark, colourful twigs, exotic structure and fruit that hangs on over the winter will greatly add to the attractiveness of a landscape.

We offer the following planting maps as we would seeds from our nursery - they will grow differently in every area. Feel free to make the actual plantings larger, change plants, add different plants in the years to come. Or throw the plans away and come up with something totally different. When planning your plantings, keep the following in mind:

1. variety will increase the number of wildlife species that find your yard attractive. A mixture of tall trees and low to medium shrubs provides a diversity of heights that improves the value of your yard as wildlife habitat.

2. in addition to a variety of species and heights, provide: a diversity in flowering and fruiting times (early blossoms for pollinators, fruit that stays on into winter for year-round residents); food production (seeds, nuts, fruit, twigs and buds); nesting sites (tall conifers and young hardwoods); and protection (dense conifers for shelter and hawthorns to escape predators).

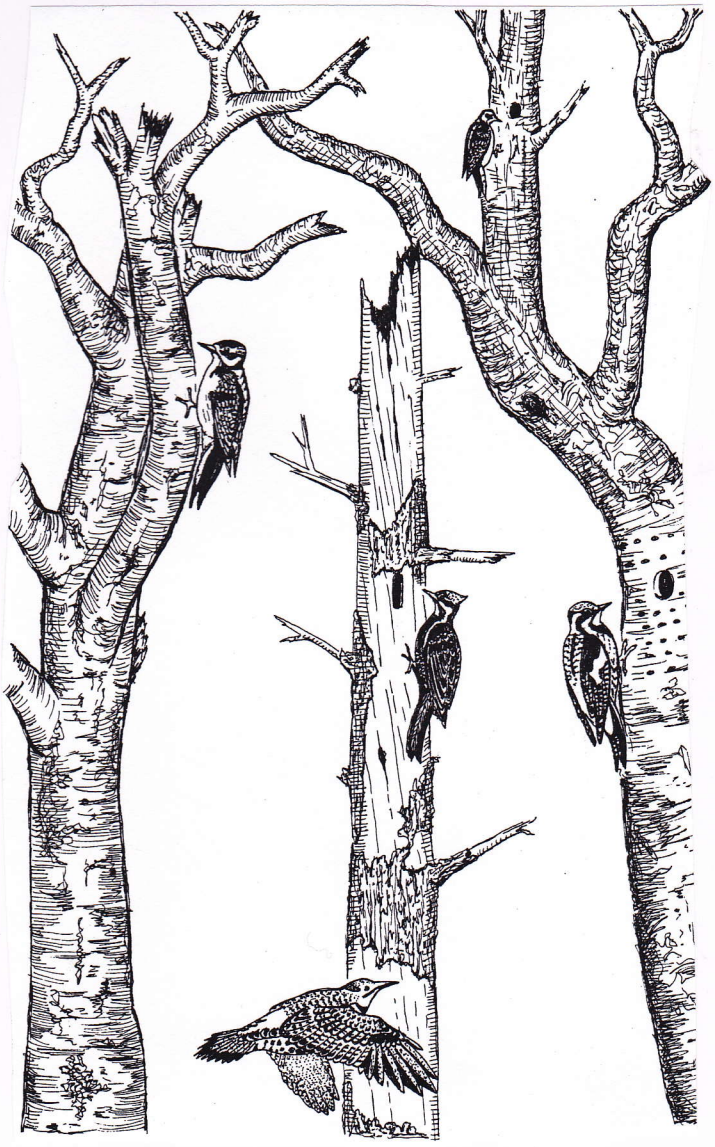
3. aim for a variety of appropriate species - plants that like to grow in full sun generally do poorly in dense shade, and plants that can't take excessive water will drown in a low spot.

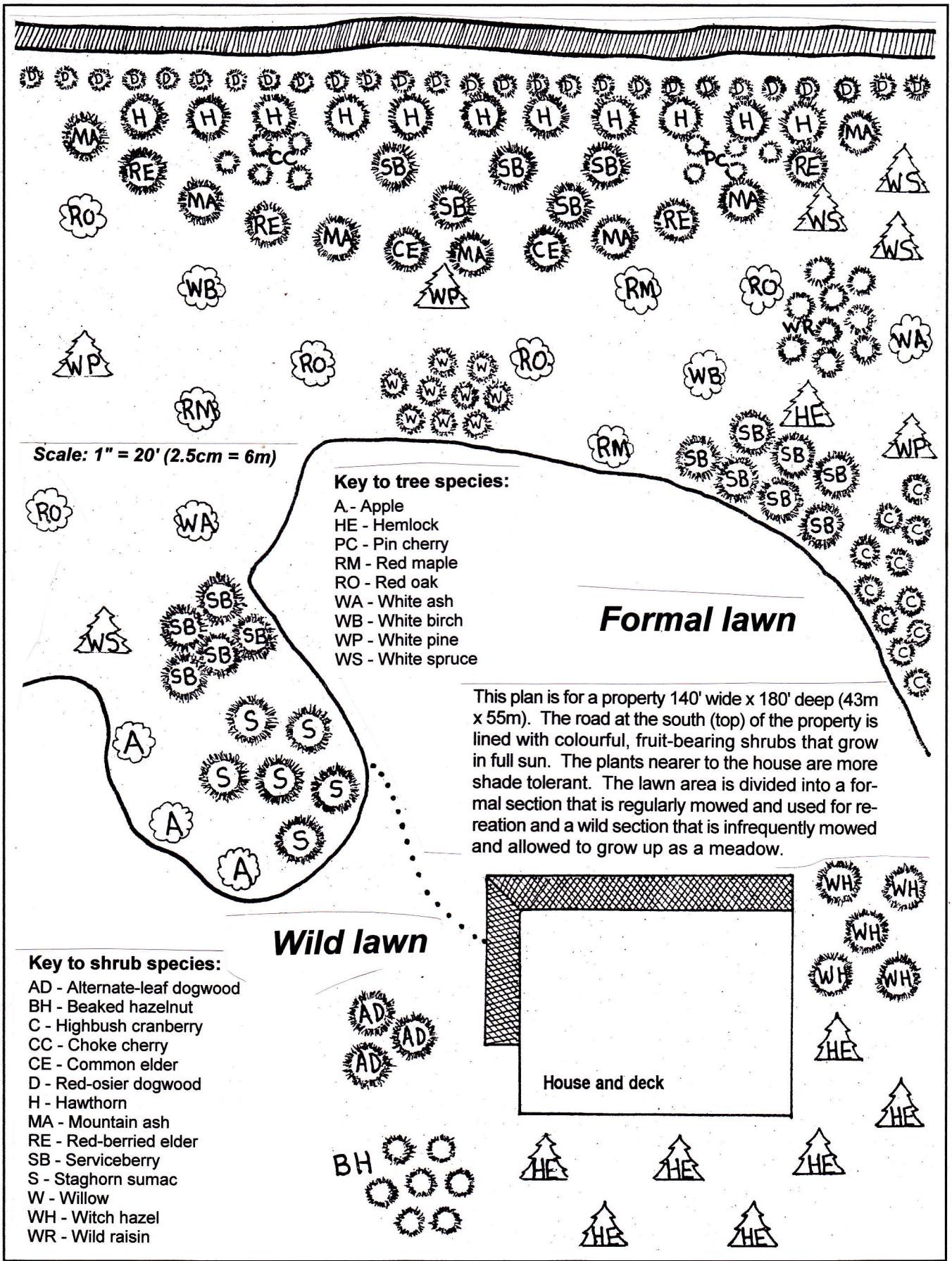
4. if you plan a large planting, a walking path will allow access through the area.

5. supplemental feeding and watering can attract large numbers of birds to your property, especially during the winter months.

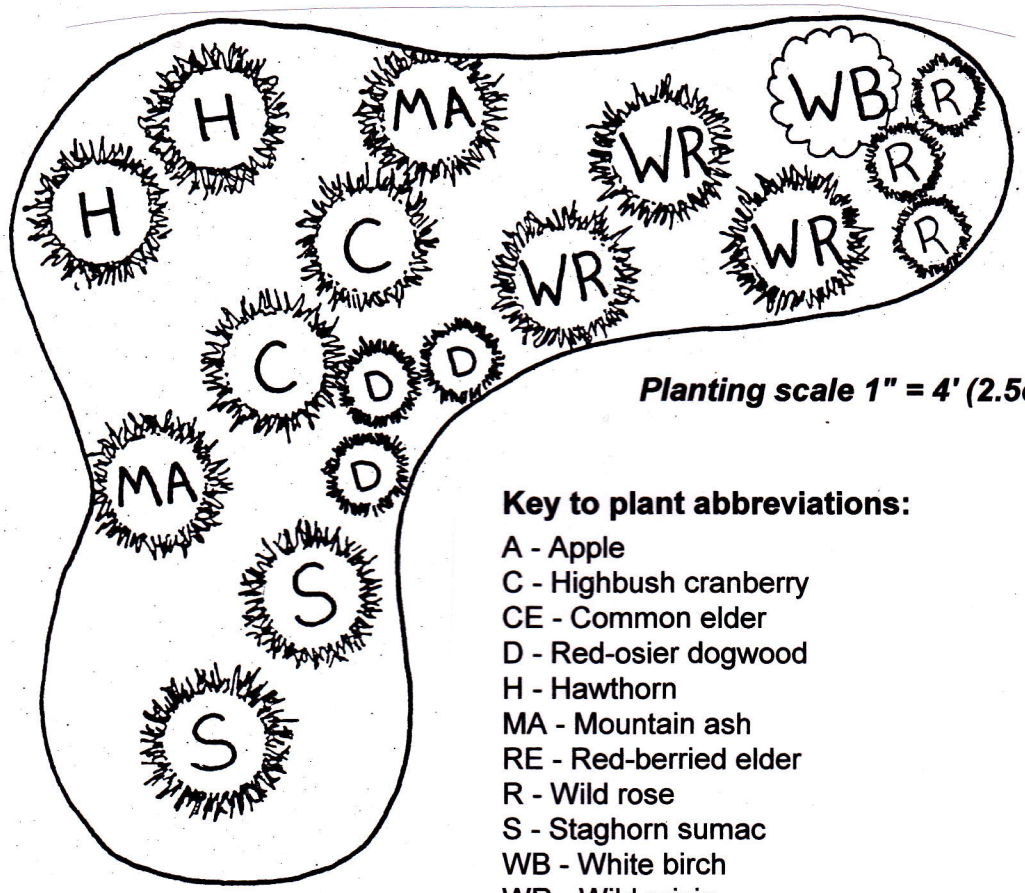
6. large trees in nearby forests or on your property are valuable assets to wildlife habitat, whether dead or alive. Leave them standing as long as they pose no danger to people or property. They will attract cavity-nesting birds such as chickadees, woodpeckers and nuthatches.

7. native plants respond to pruning and tender care just as much as introduced garden varieties. It depends on the look you want and how much time you invest in your landscaping.




Scale: 1" = 20' (2.5cm = 6m)
Key to tree species:
A - Apple
HE - Hemlock
PC - Pin cherry
RM - Red maple
RO - Red oak
WA - White ash
WB - White birch
WP - White pine
WS - White spruce
Formal lawn
This plan is for a property 140' wide x 180' deep (43m x 55m). The road at the south (top) of the property is lined with colourful, fruit-bearing shrubs that grow in full sun. The plants nearer to the house are more shade tolerant. The lawn area is divided into a formal section that is regularly mowed and used for recreation and a wild section that is infrequently mowed and allowed to grow up as a meadow.
Wild lawn
House and deck
Key to shrub species:
AD - Alternate-leaf dogwood
BH - Beaked hazelnut
C - Highbush cranberry
CC - Choke cherry
CE - Common elder
D - Red-osier dogwood
H - Hawthorn
MA - Mountain ash
RE - Red-berried elder
SB - Serviceberry
S - Staghorn sumac
W - Willow
WH - Witch hazel
WR - Wild raisin

Planting bed designs for sunny areas

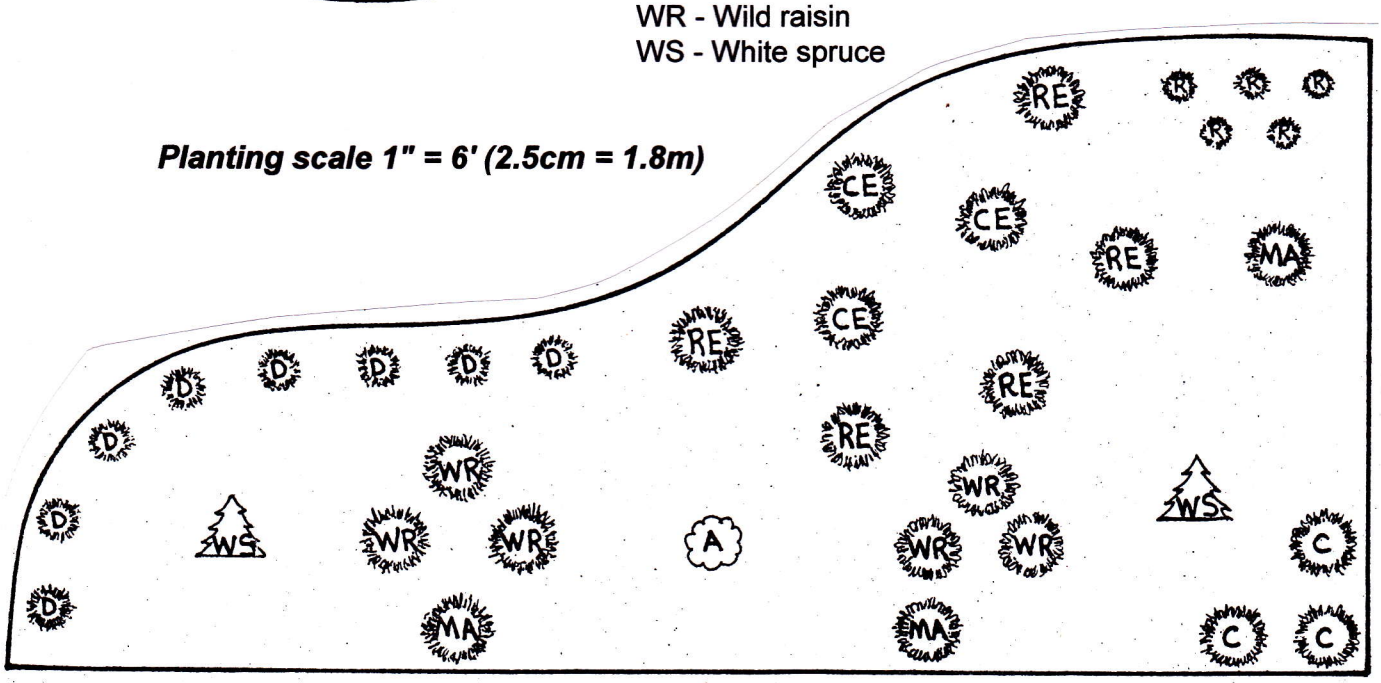


Planting scale 1" = 4' (2.5cm = 1.2m)

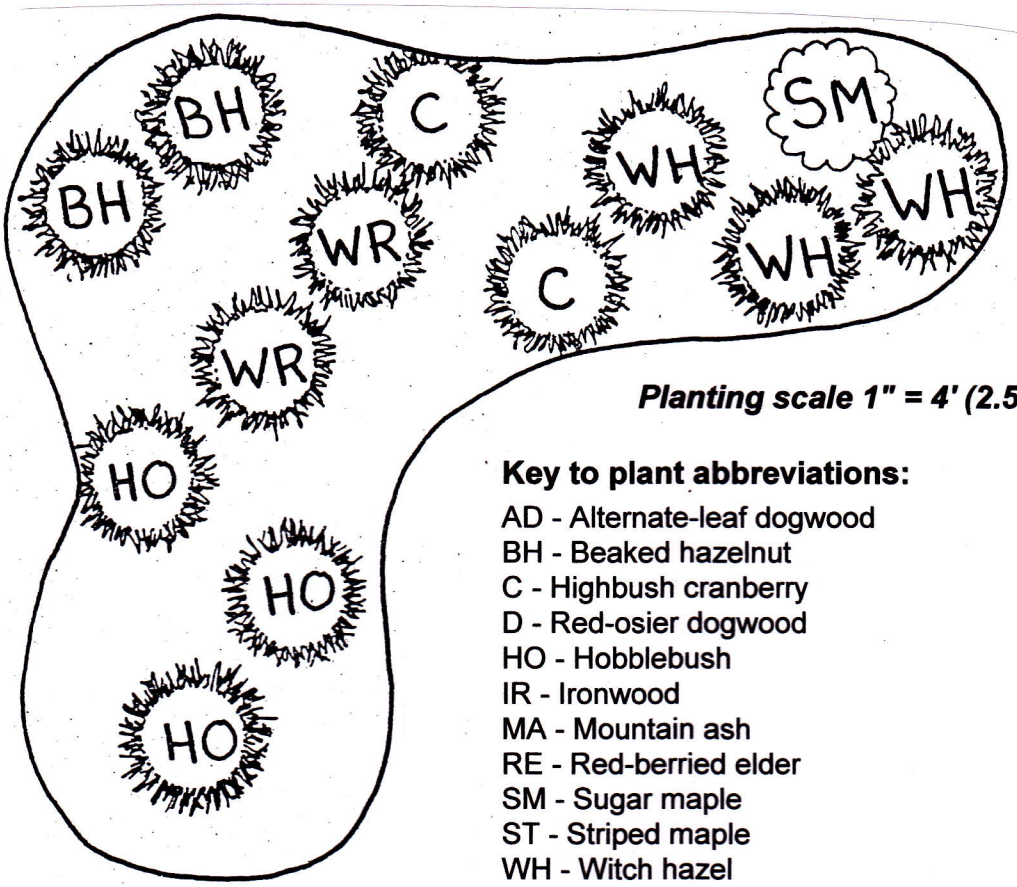
Key to plant abbreviations:

A - Apple
C - Highbush cranberry
CE - Common elder
D - Red-osier dogwood
H - Hawthorn
MA - Mountain ash
RE - Red-berried elder
R - Wild rose
S - Staghorn sumac
WB - White birch
WR - Wild raisin
WS - White spruce

Planting scale 1" = 6' (2.5cm = 1.8m)



Planting bed designs for shaded areas

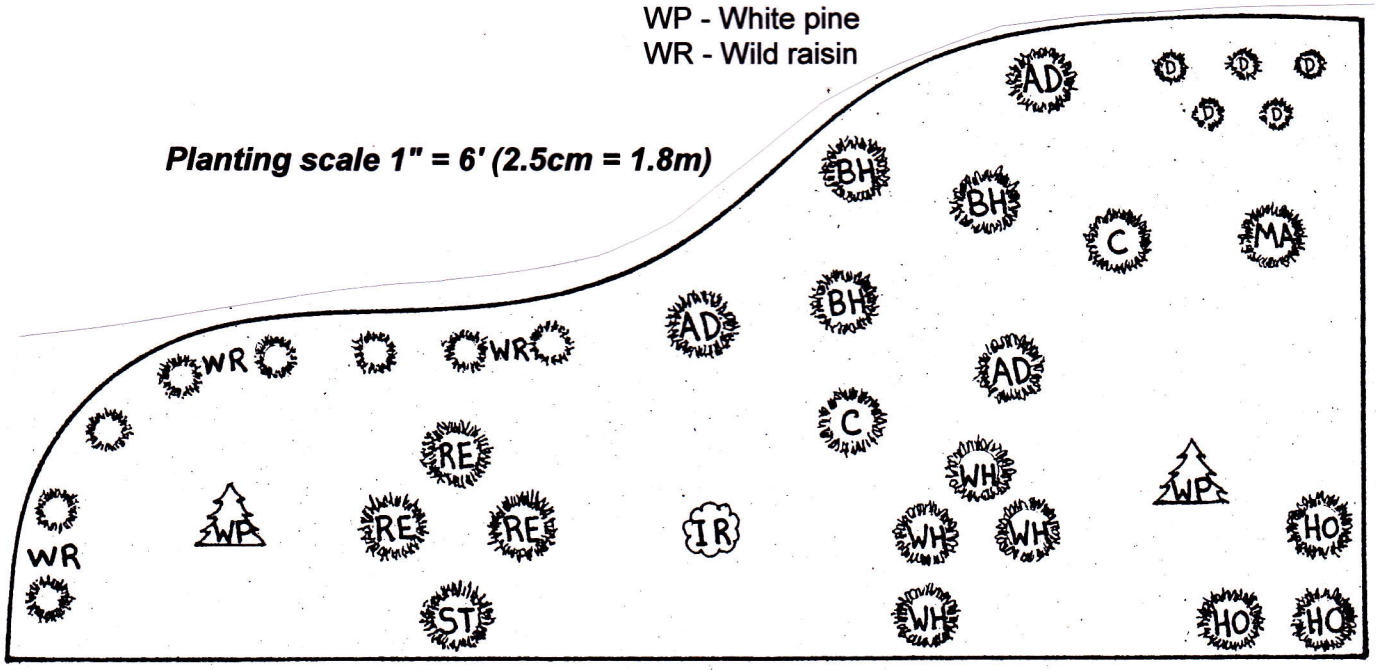


Planting scale 1" = 4' (2.5cm = 1.2m)

Key to plant abbreviations:

AD - Alternate-leaf dogwood
BH - Beaked hazelnut
C - Highbush cranberry
D - Red-osier dogwood
HO - Hobblebush
IR - Ironwood
MA - Mountain ash
RE - Red-berried elder
SM - Sugar maple
ST - Striped maple
WH - Witch hazel
WP - White pine
WR - Wild raisin

Planting scale 1" = 6' (2.5cm = 1.8m)



Planting hedgerows and windbreaks

Hedgerows, also called windbreaks or shelterbelts, once divided Island farms into a pattern of small fields. They provided shelter for livestock, protected houses and barns from winter winds and helped cool the buildings in the summer. The micro-climate in the fields was improved as the trees provided wind protection for the crops; the soil held heat and moisture and wind erosion was minimal. As farm mechanization increased the number of hedgerows decreased. Larger machines needed larger fields in which to manoeuvre. Soil erosion increased and important wildlife habitat corridors were lost as hedgerows were cut.

Many of the hedgerows which were not cut are old and collapsing. Old hedgerows can be revitalized and new hedgerows can be established. With good planning and the appropriate tree and shrub species a hedgerow can provide cover and food for birds and wildlife, be a source for fuelwood and lumber, provide privacy, reduce road noise and be beautiful year round, in addition to the other benefits that hedgerows give to the land and the buildings on it.

Why plant a hedgerow?

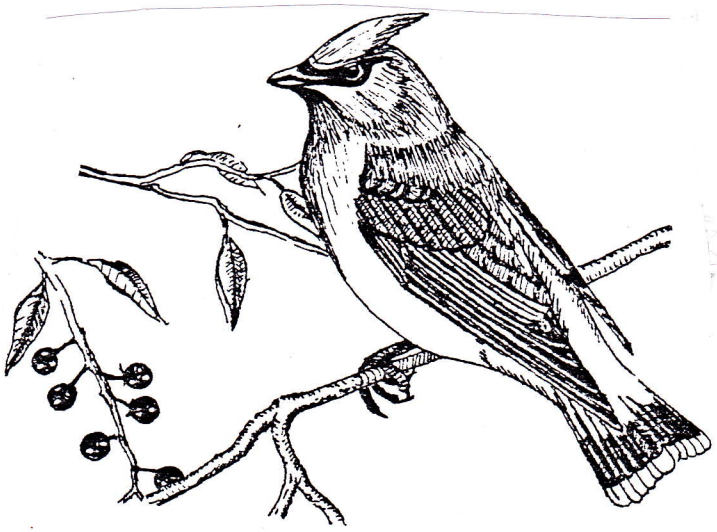
- **increase wildlife habitat**
- **decrease soil erosion**
- **increase soil moisture and temperature**
- **provide protection to buildings and decrease heating bills**
- **trap snow to cover fields and not roads**
- **aesthetic value**

An important factor to remember while designing and planting a hedgerow is that the effect will keep changing as the trees grow. A young hedgerow may cause snow to drop away from a driveway but as the trees mature snow may land directly on the driveway. Remember also, that the aim of a hedgerow is to reduce the velocity of the wind, letting it pass over and through the trees. A 50% density is ideal and can protect a field, orchard or building on the leeward side for a distance of up to ten to fifteen times the height of the trees. Planting shrubs with trees will create an even wall of foliage and branches from the ground up to sieve the wind. Tall coniferous and deciduous tree, shrubs of medium height and low-growing plants such as wild rose and bayberry make a particularly effective combination.

Many species of trees and shrubs will grow well in hedgerows. Quick maturing species such as poplar, willow, red maple, and white birch can be planted with slower maturing white spruce, white ash and red oak. The fast growing species will provide protection for the other trees and shrubs and cover and food for birds. Once the slower maturing, longer living trees and shrubs are well established the pioneer species will begin to decline; they can be harvested for fuelwood or left to provide nesting sites for cavity-dwelling birds. If the trees and shrubs grow together and block too much wind, lower limbs can be pruned or some trees removed to keep the density between 40-60%.

A single row of trees and shrubs can be effective but plantings of two and three rows are better. Choose native species when designing a hedgerow as they are adapted to the local climactic changes, provide food and cover for the bird and mammal population, are readily available and are beautiful. Ideally, windbreaks should be planted at right angles to the prevailing winds. In the winter the winds are generally from the north and northwest but in the summer the winds come from the south and southwest. Another design consideration when enclosing a field is access. Angle planting at entrances will slow the wind. Access also allows cold air to leave a field. If possible leave an opening about 50 feet (15 m) wide at the low end of the field.

A sunny hint for new hedgerows: Newly established hedgerows can sometimes be hard to see, especially from tractor seats. Plant a row of sunflower seeds when planting the trees and shrubs in the spring. The sunflowers will grow quickly and with their large leaves and bright yellow flowers they are easy to see. They will provide some wind protection, make passer-bys smile and provide food for birds.



The best time to plant is early spring, especially if using bare root stock. If you are planning ahead, prepare the site in the fall - plowing or tilling, adding compost and mulching with bark, wood chips or eelgrass to provide winter cover, add organic material and keep weeds down. The earth will be easy to dig in spring and the mulch can be used in between rows to keep competition down.

If you can't prepare in the fall and just dig individual holes for the plantings in spring, mulch around each plant with several layers of newspaper topped with wood chips or bark. It is important to control vegetative competition until the trees and shrubs are well established. The space between the rows can be mowed when necessary.

To revitalize an old hedgerow, plant a single or double row of trees and shrubs 15 feet (4 m) from existing trees, on the most protected and sunniest side possible. Do not plant between the existing trees unless there are large gaps. When the new trees are well established remove the old trees. Plant new trees and shrubs in the old line.

A word of caution: Old hedgerow trees may have wire fencing imbedded in them. They are often rotten in the middle and can be dangerous to remove.

The following sample plantings demonstrate some possible planting arrangements using native species, angled access and a spacing which allows easy maintenance.

Keys to windbreak plants

(use any combination of species from appropriate categories)

Coniferous trees
White spruce
Black spruce
Red pine

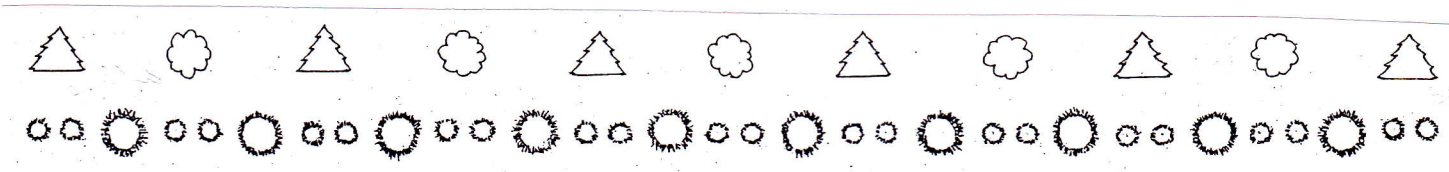
Low shrubs
Red-osier dogwood
Bayberry
Wild rose
Sweetfern

Deciduous trees
Red oak
White birch
Red maple
White ash
Pin cherry
Apple

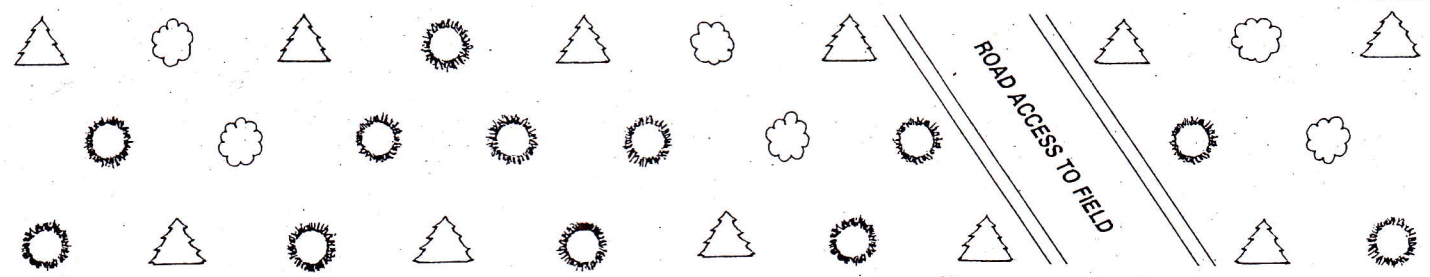
Tall shrubs
Mountain ash
Serviceberry
Hawthorn
Wild raisin
Choke cherry
Willow
Red-berried elder
Common elder
Alder

SINGLE ROW WINDBREAK: Scale 1" = 15' (2.5cm = 4.6m). Each plant is 7.5' (2.3m) apart.

DOUBLE ROW WINDBREAK: Scale 1" = 15' (2.5cm = 4.6m). Each tree is 15' (4.6m) apart. The tall shrubs are planted at the same spacing, while the low shrubs are 3' (.9m) apart. Leave 8' (2.4m) between the rows.



TRIPLE ROW WINDBREAK: Scale 1" - 15' (2.5cm = 4.6m). Spacing is 15' (4.6m) within rows and 10' (3m) between rows. The entrance road is angled to give more wind protection for the field.

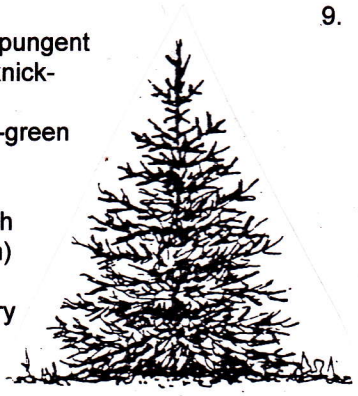


Planting a white spruce hedge

Hedges provide privacy, protection from wind, and reduced erosion. On Prince Edward Island, white spruce is often planted and pruned for a hedge near a house. Without pruning, white spruce becomes a tall tree, but with annual pruning the height and diameter can be controlled. The growth will eventually be thick and lush, but to look their best the trees need to be planted properly and pruned annually.

How to identify white spruce

- crushed needles have a strong, pungent odour, earning this species the knick-name "cat spruce"
- needles are bright green or blue-green
- needles are stiff and sharp
- twigs are mostly hairless
- twigs are orange-brown to whitish
- cones are 1.5-2 in. (3.75 to 5 cm)
- cones hang from the branches
- bark is scaly, ash-brown to silvery
- mature trees have widely-spreading branches



Developing a white spruce hedge

1. Acquire healthy stock with a dense root mass and preferably from 1 - 2 feet (30 - 60 cm) in height.
2. If possible, plant before the long weekend in May.
3. Choose a site with full sun. If shaded, white spruce will drop its lower branches.
4. The best soil is dry, rich loam. White spruce does not tolerate wet ground.
5. If your ultimate hedge height is 6 feet (1.8 m) or more, plant the trees 2 to 2 1/2 feet (60 - 75 cm) apart. Remember, the hedge needs to be pruned annually and a tall hedge is harder to prune. If your ultimate height is less than 6 feet (1.8 m) plant the trees closer together, approximately 1 1/2 feet (45 cm).
6. Do not plant a double row of trees. The hedge will be very wide and hard to prune properly.
7. Water trees well right after planting. Mulch with wood chips to reduce moisture loss and control competition.
8. During the growing season, water if the weather is hot and dry for long periods.
9. Shear each tree annually, when the new growth appears (usually by late June). The new "flushed" growth will be light green and floppy. **Do not cut the leaders until the desired height is reached.**
   - shear the sides after the new growth appears but before the end of the growing period. More new growth will appear after the shearing, which will give the hedge a softer look.
   - while the young trees are growing to the desired height and width, shear just the tips of the new growth, not all of it.
   - when the desired height and width is reached, shear most of the new growth to limit the tree's size.
10. Shape the hedge as it grows.
    - a square, or top heavy shape will shade the bottom branches which will kill them. The hedge will then have an open, scraggly, unattractive bottom which will not grow back.
    - prune to have a wider bottom than top, such as a pyramid shape. Light will be able to reach the lower branches, keeping them alive and green.
    - the more work you put in, the better it will look.

Why choose white spruce for hedgerows?

Many of the tree's characteristics make it an excellent hedge choice:

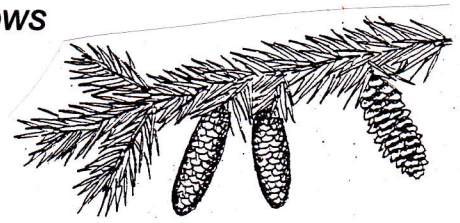
- lower branches are retained as the tree grows

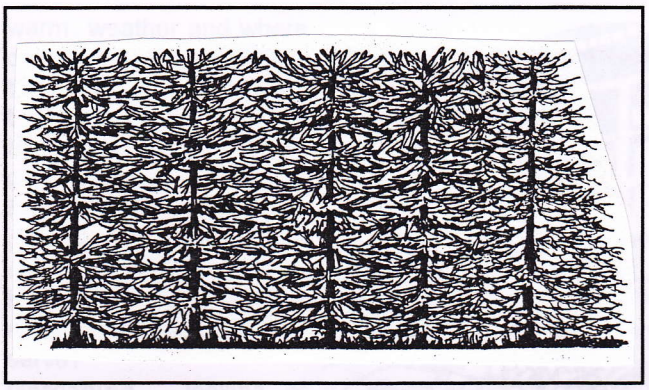
- hardy to most weather conditions

- likes to grow in full sun

- responds well to pruning

- tolerant of wind and some salt spray (roadside or seaside)

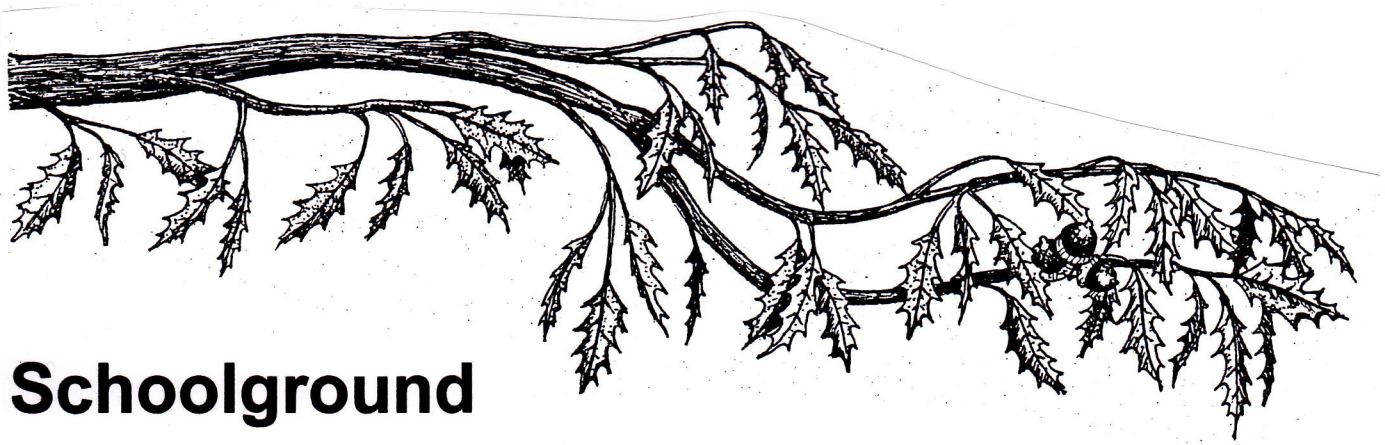




Other native species can be pruned to be hedges, including deciduous hardwood trees. A hardwood hedge is unusual but in the right place it can be lovely and useful. Birds will use it for cover in the summer and a food source in the winter. Some suggestions:

- **hawthorn** will grow into a tight tangle of branches and thorns, and provide excellent cover for small birds. If left with a natural, "soft" finish, the plants will flower in the spring and produce haws to supply food for the birds. Prune every other year to maintain the shape.
- **hemlock** is one of the best choices for a sheared hedge. It is not wind tolerant but does well in partial shade or sunny locations if protected from the wind. Mulch trees well with wood chips to keep the ground moist and cool. Prune hemlock lightly but often during the first few growing seasons (two to three times from late June to late August for two to three years). After three years prune once, in late June, as with white spruce. Do not cut the leader until the desired height is reached. Hemlock has lovely long, graceful shoots; to enjoy a different look, prune every other year. The hedge will be soft one year, and smooth the next.
- **eastern white cedar** makes a lovely hedge if the right site is chosen. Cedar will not tolerate salt spray, so do not plant near the road or where salt spray may reach it from the shore. Cedar is also intolerant of wind. Both wind and salt may cause the leaves to turn brown. Winter drying, or desiccation, might be prevented by watering thoroughly in late fall and mulching heavily. Cedar does best in a protected site with adequate moisture. If the trees are stressed (from wind, salt, hot dry weather) they are susceptible to cedar leaf miner and mites, which may turn the trees brown. Although a bit worrisome to grow, their fragrant flat, scale-like needles, pleasing shape and light green colour make them worth the work.

Thanks to Tammy Poole, at Ard Gowan National Historic Site in Charlottetown, for sharing her hints.



Schoolground naturalization

Most Prince Edward Island schools are situated on old fields - large brick buildings in the midst of grassland. At many schools, teachers and students have recognized that planting trees would help to make the school yards more interesting and attractive. A few schools have done outstanding work in improving their surroundings. The Macphail Woods Ecological Forestry Project is trying to encourage others to recognize the many benefits that plantings can bring to a school. Every year we help students plant trees and shrubs at schools and we hope to assist even more schools in the future with not only schoolyard plantings but also woodlot management and Acadian forest restoration.

Why should you do school plantings at all? School yard plantings should be considered an extension of the classroom, becoming the focal spot for teaching a variety of subjects. They become excellent places to explore:

Natural succession - an important cornerstone of the natural world. Plantings teach you that things change as you alter soil conditions, amount of available sunlight, seed sources, etc.

Wildlife identification - you will want to know what you are planting and what species you hope to attract.

Habitat restoration - planting rare native trees and shrubs can have far-reaching impacts, since birds, small mammals or the wind can transport seeds to nearby woodlands.

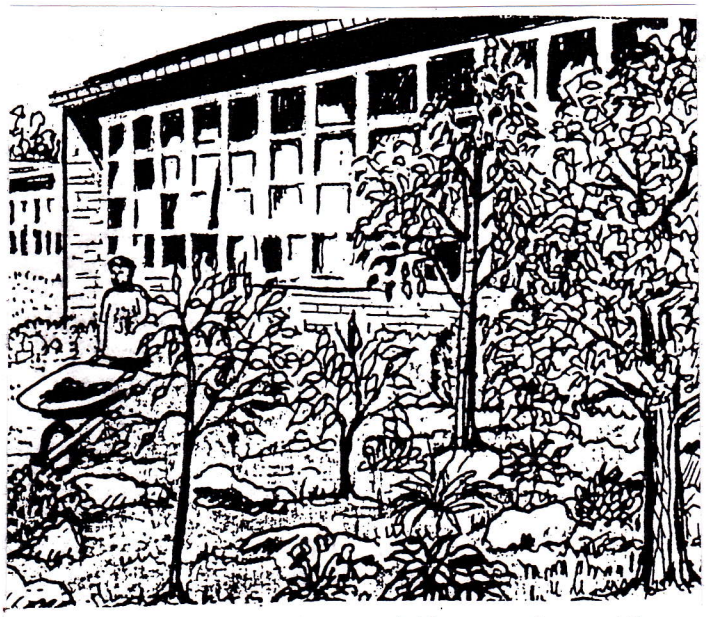
Bird migration - why are some birds here only in the

warm weather and where do they go for the rest of the year? Are there any threats to those birds on the wintering and breeding grounds?

Soil science - how plants get nutrients, what makes up good soil and what kinds of things live there and what roles do they serve?

Gardening - looking at pollination and pollinators, seeds and methods of propagation.

The many uses of plants - native species have medicinal uses and were valued by indigenous peoples. As well, plants are used for building boats, furniture and houses and provide important sources of food.



Plantings can save schools money, through lower maintenance costs and reduction in pesticide use. Lawns must be mowed regularly and are often fertilized or sprayed with "weed" killers. Once established, native plantings need only periodic pruning and mulching that the students themselves can take on.

Why use native plants?

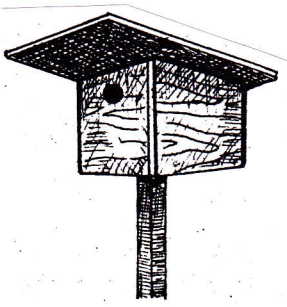
Native plants are usually very reliable - they have adapted to the climatic conditions of the area and serve a variety of functions within the ecosystem. More important they are proven performers - hardy, fitting into a wide variety of habitats, valuable to wildlife, useful for stabilizing streambanks and/or controlling soil erosion. Instead of looking for exotic species, many of which cause serious disturbances in our areas or need winter protection, look at the beauty of native plants all year long. Many native species have colourful twigs, buds and fruit, showy flowers and an exotic structure.

Steps to success

1. get students involved early and give them some control over the work. A good method is to offer a list of suitable plants for the site with information on how they grow and what types of wildlife they attract. The students then do the planning, design and planting.
2. be flexible when planning - it is better to put in a dozen plants than none and you can always expand later. On the other hand, don't be afraid of the energy that may be out there. Larger plantings are exciting and give a sense of accomplishment when they are done. Just make sure you can look after the plantings.
3. if you don't have the expertise, find someone in the community who will help - call up someone in a local environmental or natural history group, a university or college biology club, garden club, a local landscaper or contractor, etc.
4. plant only good quality plants grown in the area and remember that it is the rootstock that is important, not the height of the plant.
5. make sure the students are interested - if you can't inspire them, call in someone who can or visit a woodlot with someone who loves trees and wildlife. Try taking your class out for a nature walk or having someone come into the school with a presentation about wildlife and native plants.
6. promote the plantings within the school - wild areas are not a threat, since you are using them to promote good values and students will take pride and ownership in the plantings. The plantings also can save the maintenance people a lot of needless mowing, often in steep unused areas.
7. make it fun - the students must do the plantings but make it an entertaining event. You can save the earth and enjoy yourself at the same time. Avoid large plantings unless you have lots of bodies to do the work and supervise the planters - a long day of planting can make anyone cranky.
8. plan to maintain the plantings. A heavy mulch of wood chips goes a long way towards lessening future problems with weeding and the need for watering. Designate someone to look after the plantings over the summer, if only to keep an eye on things.

What else can you do?

- initiate a rare species rescue program, trying to bring back some native species that have been eradicated from your area
- start a small nursery at the school
- do a community planting
- adopt a nearby pond, stream or forest
- volunteer with groups working in your area of interest
- start a composting project for fertilizing future plantings or just to give away
- set up and maintain bird feeders and bird waterers
- build and set up nest boxes



Planning a productive acre

The idea for "Planning a Productive Acre" comes from seeing many older Island farm homes tucked into a grove of mixed woods. Think of all the benefits that good site planning provides - an attractive, comfortable setting; a close source of fuelwood and lumber; shelter from the prevailing winds; lots of nearby wildlife to appreciate. But what if your house is stuck in a field, like so many are today? What options do you have? Fortunately, you have choices available.

An overall look at the Productive Acre would show the northernmost row to have a lot of white spruce and other hardy trees and shrubs to help protect the rest of the forest. Other rows would contain a mixture of trees and shrubs. The rows would alternate between having a lot of trees for fuelwood and having more trees for lumber.

The Productive Acre is based on several different planting systems. **"Coppicing with Standards"** is a system that has been used for centuries to grow a variety of products on the same acreage. "Coppicing" refers to the repeated cutting of trees from the same root stock. Clumps of red maple that occur in Island forests usually result from a previous cutting. New sprouts from the stumps grow very fast as they have the extensive root system of the old tree to draw from. "Standards" are the trees in the acre specifically grown for either softwood or hardwood lumber.

We have taken this system several steps forward and included shrubs for a variety of reasons:

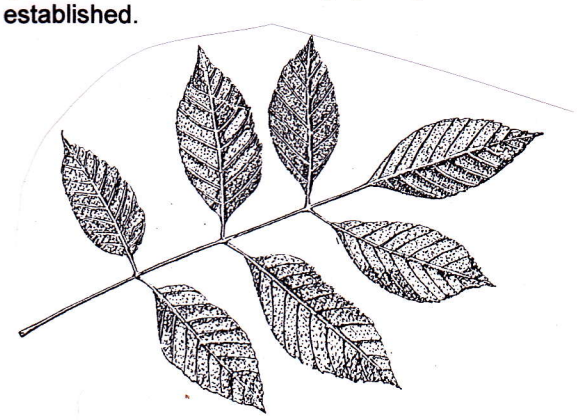
* to add nutrients and organic matter to depleted soils
* to attract wildlife
* to provide shade, moisture conservation and protection for other less hardy plants
* to provide the diversity that will help confuse insect predators that may get out of control in a monoculture
* the roots of shrubs and other brushy (early successional) species can help break up compacted soil layers

The following plan is meant to be used as a guide for designing large plantings around your home. The plan is for 1/4 acre (.1 ha) and these blocks can be stacked side by side or one over the other. Plantings can wind up being long rectangles, squares, curved or L-shaped. The site and the owner's needs will dictate the best shape.

Many of the recommended species are easy to transplant or grow from seeds or cuttings and nurseries are slowly starting to grow a variety of native plants. Feel free to substitute appropriate species.

The Productive Acre will provide a wide variety of resources and accomplish several different goals.

1. As a windbreak: you are creating a small forest that will break the wind and create a more comfortable setting for your home. It can also save money by helping to reduce heating and snow removal costs.
2. To attract wildlife: even small plantings can really change the dynamics for wildlife around homes. The food production, the nesting sites, the protection offered by a variety of trees and shrubs all serve to make the area more attractive to many species of birds, amphibians, insects and small mammals. It will obviously be a while before you get dead trees large enough to provide cavities for barred owls, but black-capped chickadees, robins and many other birds will come fairly quickly once the trees are established.

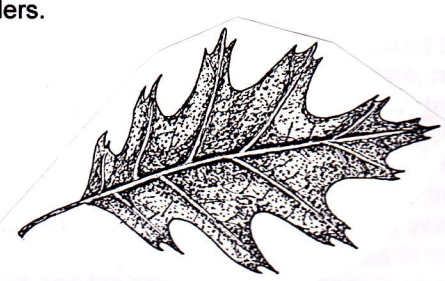


3. As a source of fuelwood: hauling wood from the back forty can be a problem, even if you do have a tractor. Many of the species that can be planted, such as red oak, red maple and white ash, make excellent firewood and can be repeatedly cut by the "coppice" method. As well, you get fuelwood that is close to your home, easy to handle and a good size for most stoves.
4. As a source of lumber: both softwood and hardwood lumber can be produced under this system. The conifers (except for the white spruce grown on the north side of the planting) are for lumber production. White pine, balsam fir and larch should all make good growth on most

sites. As well, white birch, white ash and red oak can be grown for hardwood lumber. Since they are growing in full sun at first, which produces heavier branches on the trees, it is advisable to go through and properly prune the young lumber trees every two years.

5. As a source of other products: whether you want to harvest fenceposts, fruits and nuts, mushrooms, medicinal herbs, or basketmaking material, these plantings (like most healthy, mixed forests) will provide a multitude of products that can be used around the home.

6. To build soil: the importance of good soil health is often underestimated in forest plantings. Especially since many fields are lacking in both organic matter and nutrients, the role of shrubs is very important. The litter of dead leaves and branches provides important soil nutrients. For example, alder leaves are rich in nitrogen and dogwood litter is high in calcium. As well, alders fix nitrogen in their roots and are one of our most important soil builders.



7. As a landscape planting: many of the native plants that are suitable for this type of planting are also very attractive. Instead of bare fields and drifting snow, imagine a mixed forest full of interesting trees and shrubs. Red maple and staghorn sumac give a colourful show in the fall, and many of the trees and shrubs have attractive flowers in late spring. As the forest develops, it will become even more of an asset to your property, though it will be your children who will really benefit from the work that you do.

8. Pesticide reduction: if you are planting a manicured lawn or cropped field, your pesticide usage will drop to zero. The diversity and focus on soil health will help avoid serious insect and disease infestations in these plantings. If necessary, hand pick problem insects off the young seedlings. Fertilizer requirements will be minimal, although it may be worthwhile to put some compost or well-rotted manure in with the "standards", especially if organic matter is low.

Preparations for planting

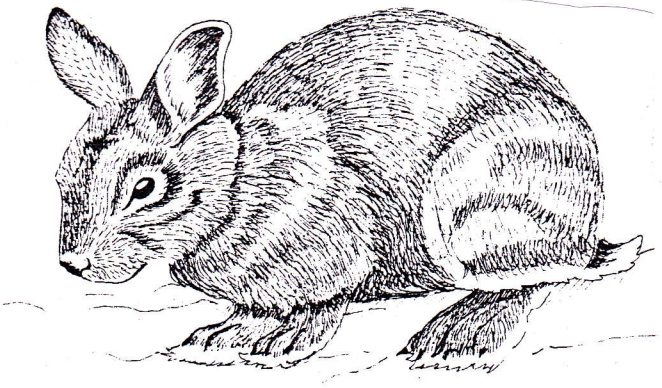
Plan your plantings well in advance. Know what species you wish to plant and what pattern they will grow in. Mark out rows but remember that they do not have to be straight. Some can be closer together or farther apart and rows can curve and sway, making a more pleasing planting. In Fall, or before the planting day in Spring, remove several feet of sod from each planting area by shovel. Site preparation can also be done in narrow planting strips using a tractor with a plow, discs and harrows; a tractor-mounted tiller; a sod stripper; or large home tiller. Have water and wood chips or other mulch on site.

Planting the productive acre

Please read pages 21 and 22 before undertaking any planting. Plantings should be done in the late spring before the trees and shrubs have leafed out or flushed with new growth. All seedlings in a block can be planted at once, or they can be planted over several years. You may want to plant one block each year for a few years. The key is to be flexible. If you have trees or shrubs already growing up in the place you want to plant, either work the seedlings into your plan or transplant them to another area. Remember that you will be planting approximately 400 trees and shrubs per acre (1000 per ha) at 10'x10' (3mx3m) spacing. If there is much regeneration on the site already, you may reduce this figure by hundreds of plants. Have some friends or family along to help dig the holes and plant and mulch the seedlings.

Maintenance and additional planting

A cornerstone of the Productive Acre system is that you will never clearcut the area and have to replant. You will get a variety of high-quality products and the trees and shrubs will do a more than adequate job of reseeding themselves. In fact, you should be able to collect seed and carefully transplant young seedlings from the site for other forest restoration projects. Yet since the planting originally takes place in a field with little or no shade, there are certain species (such as hemlock and sugar maple) that can not be planted at the start. These can be added later, when some of the plants are providing shade and protecting the site from drying out. Maintain a heavy mulch or mow between the rows for the first few years to reduce competition. The only other maintenance will be proper pruning of crop trees. The Macphail Woods Ecological Forestry Project offers annual pruning workshops and there are several excellent publications available on the subject.



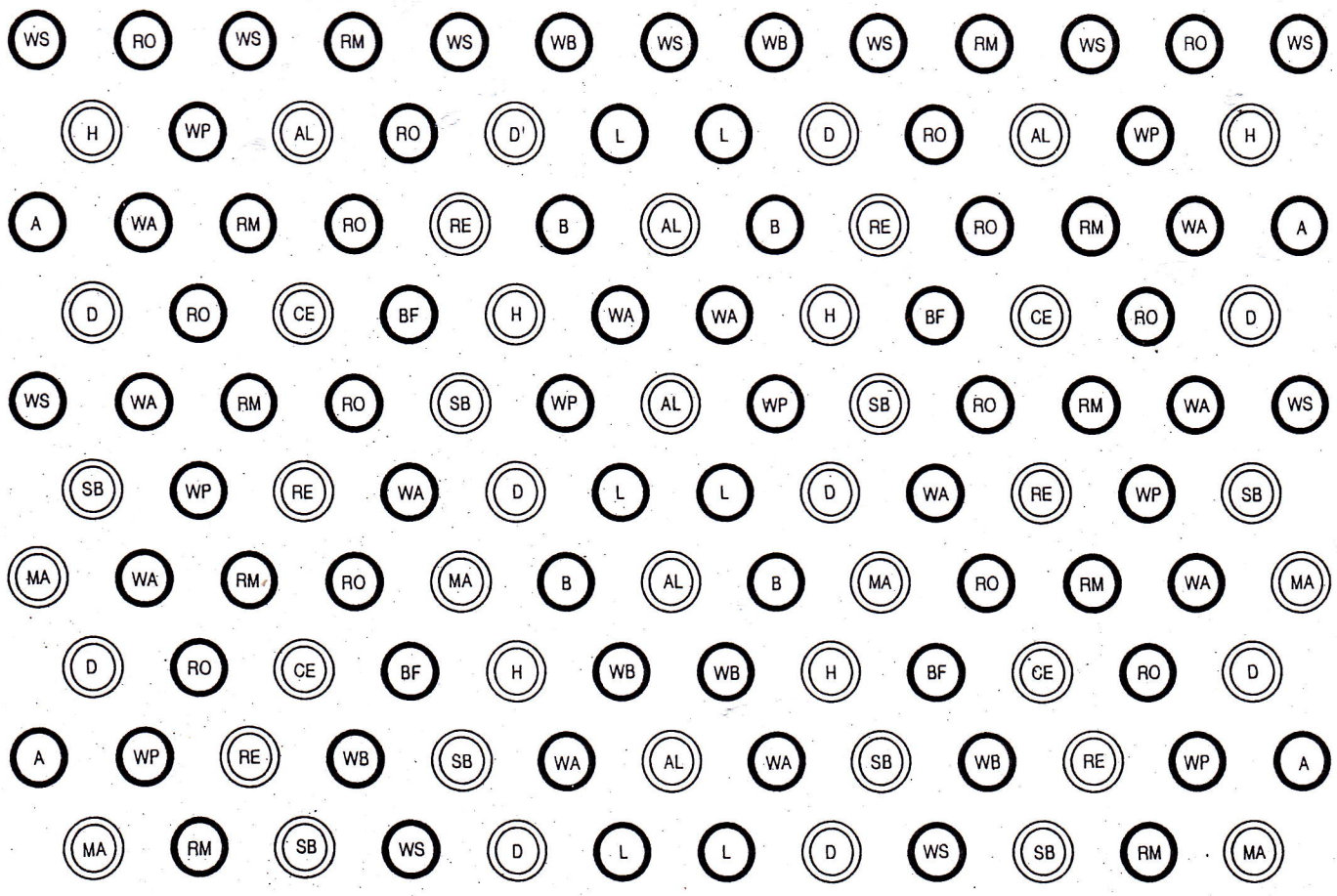
Planting design for a productive acre

The Plan: The windbreak row at the north (top) of this planting is critical in providing protection for interior trees and shrubs and the home itself. It is only necessary at the northern border of the planting, although it will not cause problems if you have this row scattered throughout a larger planting. There are many other plants that you can choose to replace those in this plan, especially shrubs that like to grow in full sun. Willow, wild raisin, staghorn sumac, highbush cranberry and wild rose will do especially well in this type of planting, so feel free to substitute. If you want to simplify the planting, you can eliminate some of the species of shrubs, as well as trees such as butternut and balsam fir. In this map, solid circles represent coniferous and deciduous trees, while the double-wall circles indicate shrubs.

The Harvest: Crop trees for lumber are spaced throughout the planting. In the second from the top row the white pine, red oak and larch will be left to grow older and pruned if necessary. In the third row only the butternut will be targeted for lumber, while the white ash, red maple and red oak will be coppiced for fuelwood. In the fourth row the red oak, balsam fir and white ash will be left. Timing of harvest depends on your needs. You can harvest fuelwood in 12-15 years while the white pine can grow for hundreds of years. A few trees in each block should be left to grow old and fall down, providing habitat and nutrients for centuries.

Key to species and numbers:

A - Apple	4
AL - Alder	6
B - Butternut	4
BF - Balsam fir	4
CE - Common elder	4
D - Red-osier dogwood	10
H - Hawthorn	6
L - Larch	6
MA - Mountain ash	6
RE - Red-berried elder	6
RM - Red maple	10
RO - Red oak	14
SB - Serviceberry	8
WA - White ash	12
WB - White birch	6
WP - White pine	8
WS - White spruce	11



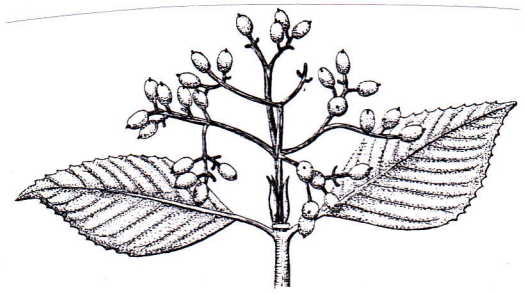
Areas to be planted and appropriate species

Please note that even within the following fairly narrow categories, such as "Wet areas in full sunlight", there will always be a range of conditions - some drier spots, areas with lots of competing low vegetation, etc. Know your planting conditions well, and try to plant the correct species. When in doubt, look around for similar conditions and see what plants are doing well there.

Wet areas in full sunlight:

(swamps, floodplains, etc.)

Black spruce
Eastern larch (tamarack)
Eastern white cedar
Red maple
Black ash
White ash (if not in standing water)
American elm
Willow
Wild raisin (witherod)
Common elder
Red-osier dogwood
Speckled alder
Winterberry
Alder buckthorn
Large-tooth aspen
Mountain holly
American or showy mountain ash



Wet areas with partial shade:

(wooded streambanks, high areas in swamps and swamps & the upper edges of floodplains)

Eastern hemlock
Eastern white cedar (light shade)
Striped maple
Mountain maple
Yellow birch
Ironwood
Red maple (will tolerate standing water)
Mountain holly
Wild raisin (will tolerate standing water)
Winterberry
Common elder (will tolerate some flooding)
Alternate-leaf dogwood
Beaked hazelnut

Dry areas receiving full sun:

(old fields, upper banks of streams, etc.)

White spruce
Jack pine (generally grows poorly)
Balsam fir
Red pine (moderately, in sandy soils)
White birch
Apple
Grey birch
Red oak
White ash
Trembling aspen
Balsam poplar
Large-tooth aspen
Butternut
Wild rose
Pin cherry
Highbush (American) cranberry
Choke cherry
Serviceberry
Red-berried elder
Common elder
Hawthorn
Staghorn sumac
American or showy mountain ash
Sweetfern
Speckled alder
Mountain (downy) alder
Northern bayberry
Wild raisin (witherod)

Dry areas with partial shade:

(woodlands needing additional diversity)

Eastern hemlock
White pine
Red spruce
Balsam fir
Sugar maple
Striped maple
American beech
Yellow birch
Red oak (light shade)
White ash (light shade)
Canada yew
American fly honeysuckle
Beaked hazelnut
Alternate-leaf dogwood
Wild raisin (witherod)
Highbush (American) cranberry
Hobblebush
Witch hazel

Around homes and buildings:

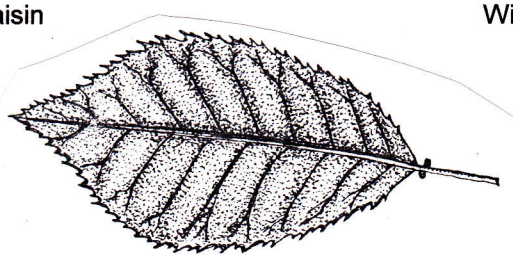
(for wildlife enhancement and beautification)

White pine
Red pine
Eastern white cedar
White birch
Red oak
White ash
Sugar maple
Red maple
Striped maple
Mountain holly
Apple
Serviceberry
Highbush cranberry
Wild raisin
Red-osier Dogwood
Alternate-leaf dogwood
Hawthorn
Staghorn sumac
Witch hazel
Common elder
Red-berried elder
Beaked hazelnut
Willow
American or showy mountain ash
Northern bayberry
Hobblebush (with some shade)

Windbreaks and hedgerows:

(for controlling wind and erosion, as well as reducing heating costs and increasing privacy)

White or black spruce
White pine
Jack pine
Eastern larch
Red maple
Apple
Serviceberry
Staghorn sumac
Red-osier dogwood
Common elder
Red-berried elder
American or showy mountain ash
Pin cherry
Choke cherry
Speckled or mountain alder
Northern bayberry
Hawthorn
Wild rose
Wild raisin
Willow



Shore plantings:

(generally must tolerate salt spray & wind)

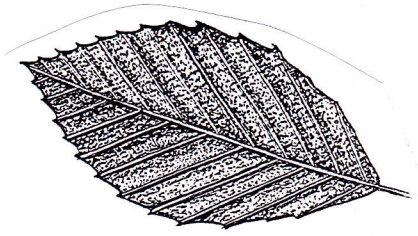
White spruce
Red oak
Grey birch
Trembling aspen
White pine
White birch
Balsam poplar
Red maple
White ash
Wild rose
Willow
Mountain ash
Pin cherry
Mountain (downy) alder
Common juniper
Northern bayberry
Wild raisin
Staghorn sumac
Choke cherry
Speckled alder
Red-osier dogwood
Ground juniper

Partial list of native trees and shrubs and how they can be easily grown or obtained

Please contact landowners for permission before collecting seeds, cutting material and especially transplant material. Some trees and shrubs are best grown from seed while others are especially well-suited to propagate from cuttings. Still others can be found in great abundance and easily transplanted. A letter following a plant name represents an easy method to increase numbers of that plant - S (seeds) C (cuttings) T (transplants).

CONIFEROUS TREES:

White spruce (Picea glauca) T, S
Black spruce (Picea mariana) S, T
Red spruce (Picea rubens) S
Eastern white pine (Pinus strobus) S, T
Red pine (Pinus resinosa) S
Jack pine (Pinus banksiana) S, T
Eastern larch or tamarack (Larix laricina) T, S
Eastern white cedar (Thuja occidentalis) S, C
Eastern hemlock (Tsuga canadensis) T, S
Balsam fir (Abies balsamea) T, S

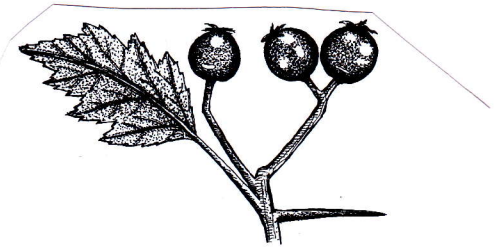


DECIDUOUS TREES:

Sugar maple (Acer saccharum) S, T
Red maple (Acer rubrum) S, T
Striped maple (Acer pensylvanicum) S, T
Mountain maple (Acer spicatum) S, T
Red oak (Quercus rubra) S
Yellow birch (Betula lutea) S, T
White birch (Betula papyrifera) S, T
Grey birch (Betula populifolia) T, S
American beech (Fagus grandifolia) S
White ash (Fraxinus americana) S
Black ash (Fraxinus nigra) S
Large-tooth aspen (Populus grandidentata) T, C, S
Trembling aspen (Populus tremuloides) T, C, S
Balsam poplar (Populus balsamifera) T, C
American elm (Ulmus americana) S
Butternut (Juglans cinerea) S
Ironwood (Ostrya virginiana) S
Apple (Malus), many species and hybrids T, S

SHRUBS:

Serviceberry (Amelanchier), many species & hybrids S
Willow (Salix), many species and hybrids C, T
Wild raisin (Viburnum cassinoides) S, T
Highbush Cranberry (Viburnum trilobum) C, S
Hobblebush (Viburnum alnifolium) S
Common elder (Sambucus canadensis) S
Red-berried elder (Sambucus pubens) S, T,
Red-osier dogwood (Cornus stolonifera) C, T, S
Alternate-leaf dogwood (Cornus alternifolia) S, T
Speckled alder (Alnus rugosa) T
Mountain (downy) alder (Alnus crispa) T
Beaked hazelnut (Corylus cornuta) T, S
Witch hazel (Hamamelis virginiana) S
Winterberry (Ilex verticillata) S, T
Sweetfern (Comptonia peregrina) T
Northern bayberry (Myrica pensylvanica) T
Mountain holly (Nemopanthus mucronata) S, T
American mountain ash (Sorbus americana) and
Showy mountain ash (Sorbus decora) S, T
Hawthorn (Crataegus), many species & hybrids) S, T
Wild rose (Rosa), several species C, S, T
Pin cherry (Prunus pensylvanica) S, T
Choke cherry (Prunus virginiana) S, T
Staghorn sumac (Rhus typhina) T
Canada yew (Taxus canadensis) S
American fly honeysuckle (Lonicera canadensis) C, S
Alder buckthorn (Rhamnus alnifolia) S
Common juniper (Juniperus communis) T, S
Ground juniper (Juniperus horizontalis) T, S



Starting a community nursery

Community nurseries are a source of inexpensive plants for environmental restoration, beautification or wildlife enhancement. The following pages lay out the steps you can take to start your own nursery, large or small. Since many of our more unusual native trees and shrubs are not available commercially, a community nursery may be the only source of these valuable species. The nurseries already set up across the province are promoting the use of native trees and shrubs, which must be present if we hope to preserve and restore natural ecosystems.

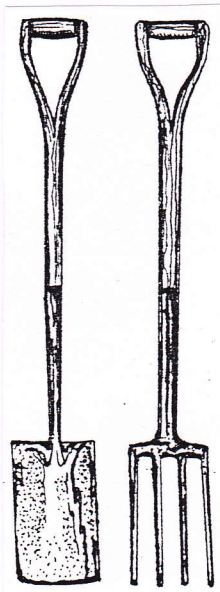
STEP ONE - Making plans

The first step in starting a community nursery is deciding that you want to use trees and shrubs to improve the environment. From organization to organization, the reasons will vary. Some groups might want to restore a favourite stream in the area. Others will be more conerned with protecting soil, restoring degraded forests, saving energy, enhancing wildlife or reducing global warming.

Community nurseries ideally are operated by volunteers from one or more local organizations. Find out who else is interested and how much time they will have to put into such a project. Local environmental groups, recreational fisheries associations, church groups, Rotary Clubs, Women's Institutes, 4-H Clubs and Boy Scout troops are good places to start seeking support. Try to get as many groups as you can involved in the project and don't forget local businesses - they may be looking for a project to support. The nursery and future plantings will build community spirit and demonstrate how people can really make a difference in improving the environment.

Good planning comes from knowing the needs of your area. What types of sites need restoration? What are your own interests? Nurseries primarily designed to retore a streamside will use different species and probably be on a smaller scale than one whose goals include urban plantings and wildlife enhancement. It is best to start small and let the nursery grow with your increased expertise, interest, volunteer base and funds.

The key to sizing your nursery is to decide how many seedlings you need to produce and, perhaps even more important, how many you are capable of planting out every year. Even a corner of your garden can produce a large number of seedlings. Conifers are usually grown in a seedbed for two years, then moved to a transplant bed for two years. Deciduous trees can be moved to transplant beds after the first year. Seedlings can also be started in containers or transplanted to containers after one or more years in a nursery bed.



STEP TWO - Location

Almost any site is suitable for a small, short-term nursery, including a section of backyard garden. More care should be taken in selecting a

site for a larger, permanent nursery. Here are some tips on what to look for and what to avoid.

Access - A road that is accessible during the entire growing season is almost a necessity, especially if you have to haul water or soil amendments (manure, compost, etc.) very far. This means siting the nursery beside a road or a well-maintained driveway. The closer a nursery is to the centre of your group's operations, the better. Volunteers will be more likely to help out if they don't have to drive long distances to get to the site. Accessibility has to be balanced against the chance of vandalism.

Water - no matter how much rain falls during the year, there are times when having water on site will make or break a crop of trees. Seeds need moisture to germinate, while a dry spell can ruin newly transplanted trees. Running water is the best solution - from a town system or well, or pumped from a nearby pond. If those are not available, you will have to haul water.

Soil - dramatically changing soil is a challenge, so start off with the best you can find. When selecting a site, consider the following:

- what has the site been used for during the past five years? Avoid land that was continuously cropped or had heavy applications of pesticides.
- what is now growing on the site? Alders will have added nutrients but can take quite a while to eradicate. Couch grass (also known as quack or witch grass) and thistles are hard to get rid of without losing a year of growing time. Again, if all other aspects of the site are ideal, it may be worth the effort.
- what is the drainage like? Building raised beds will help overcome drainage problems, but only to a degree. Make sure there is no standing water and avoid heavy clay soils.

Site characteristics - the site should be flat or slightly sloping, with a southern or south-western exposure. Light shade is acceptable, but the nursery must receive sun for most of the day. Avoid "frost pockets" that receive frosts earlier than surrounding areas. Someone who knows the area will probably be the best source of information on this subject.

Shelter - windbreaks that slow prevailing winds can be trees or even buildings. If there are no windbreaks, trees and shrubs can be planted for this purpose. Fencing made from slabs or boards can slow wind and keep out wildlife at the same time. Proper windbreaks reduce wind speed, allowing 50% permeability. Under normal conditions, a windbreak or fence 10 ft. (3 m) on the windward side of the nursery will protect plants up to 100 ft. (30 m) away.

STEP THREE - Soil conditioning

The ideal soil for a nursery site is a light, loamy sand with plenty of organic matter. Take samples from several areas on the site and test for nutrients, pH and organic matter. The provincial Department of Agriculture and Forstry can instruct you in this and charges a nominal fee for the test. Once you know the condition of your soil, begin preparing the site. If the nursery will occupy part of your garden, the work may already be done. Small plots in urban areas can be worked with hand labour and/or a rototiller. Use a spade to strip off the sod, which should be piled together and allowed to slowly decompose. The ground should be worked as deeply as possible, using a spade and a garden fork.

To improve drainage and add nutrients, add well-rotted manure and compost if available. Most of our beds at Macphail Woods are roughly made up of 1/6 part well-rotted manure, 1/3 part topsoil, 1/3 part potato compost or some other low-nutrient organic matter, 1/6 part leaf mould. We might also add seaweed, mussel mud or other organic matter on hand at the time. Any natural soil amendment that may be available in your area should not be overlooked. Crab and lobster shells, fishmeal and bonemeal are excellent sources of nutrients. In the spring, spread dolomitic limestone to bring the pH up to about 5.5, then use a garden fork or rototiller to prepare the soil for planting.

For larger nurseries in rural areas, you may decide to hire a nearby farmer to prepare the site, making use of his/her expertise. Perhaps you could trade for a future windbreak planting. Plowing should be followed by spreading manure or compost. This can be disced in while the soil is still workable. Spread limestone in the spring, then harrow several times or use a rototiller.

Some old fields may have developed a hard pan, a compacted area just below plowing depth that can hamper drainage. A chisel plow, designed to break up the subsoil and disturb the surface as little as possible, can solve this problem. It should be noted that even rototilling too often at the same depth creates a hard pan. Tillers can be used for initial preparation of the site and seedbeds, but should not be used more than absolutely necessary. Excess tillage can destroy the soil texture that you have worked so hard to achieve.

THE BUCKWHEAT METHOD

If your site is very weedy and lacks nutrients and organic matter, prepare the site and plant buckwheat in the spring. When this crop is in the flower stage, turn it under and plant more buckwheat. When it reaches the flower stage, turn it under and plant winter rye. Next spring, disc in the winter rye and harrow or rototill. The soil will be almost weed-free with improved levels of nutrients and organic matter.

STEP FOUR - Laying out the site

In gardens and urban areas, fencing may not be necessary, though cats and dogs can become problems. In some rural areas it may be best to fence the nursery before planting, although we have stopped using fencing at Macphail Woods and have suffered little damage. A 4-6 ft. (1.2-1.8 m) fence will usually keep snowshoe hare from browsing twigs in winter. Fencing can be made of chicken wire, boards, slabs, snow fencing - whatever is handy.

Between the fencing and the actual planting beds, maintain a weed-free strip. This will stop weeds that spread by underground stems from creeping into your nursery. Lay down newspaper and then a heavy mulch, or till the strip regularly.

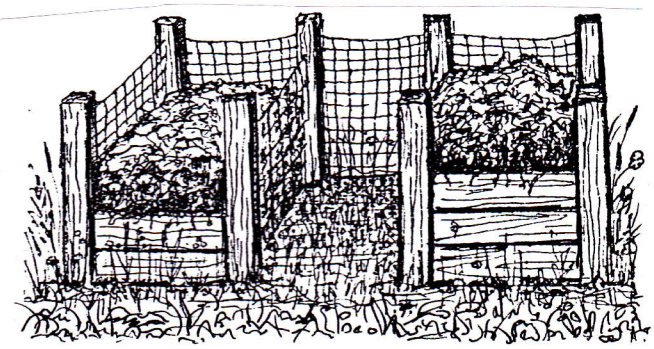
Your nursery may include one or more seed beds, potting area, transplant or container area, compost bins and watering system.

Seed bed - a good working size for all beds is 3 ft. (90 cm) wide by up to 20 ft. (6 m) long, with 18 in. (45 cm) paths. Mark out beds with string and use a spade to move soil from paths into beds, making the centre of each bed slightly higher than its edges. On heavy soil, beds should be 4 in. (10 cm) above paths; on well-drained soil, 2 in. (5 cm); and on very sandy soils the beds need not be raised. Soil in beds should be firmed (but not compacted) using the back of a garden rake or a tamping board.
Framing a raised bed with 8-10 in. (20-25 cm) wide planks or boards is more costly but offers several advantages. The bed is easier to weed; dries out more slowly along the edges; erodes less; and is more easily screened to keep out rodents.

Potting area - this can include a shed for tools and working indoors when it rains, or be as simple as a large table at convenient working height. Whether planting sprouted seeds or year-old seedlings into containers, a good soil mixture is important. No one formula will fit every situation, but here is a good general mix: 2 parts garden loam; 1 part compost or leaf mold; 1 part clean, coarse sand. The addition of pulverized rock phosphate and either granite dust or greensand (1 tablespoon of each per 2-litre container), will reduce the chance of nutrient deficiencies. Take a sample of the mix and raise the pH to about 5.5. About 6 lb. (2.7 kg) of dolomitic limestone will raise the pH of 1 cu. yd. (.77 cu.m) of mix 1 unit (e.g., 5.0 to 6.0).

Transplant or container area - whichever method or combination of methods you choose, the area will be at least four times the size of the seedling area. Both systems have advantages. Transplants in beds are easier to water; require less water; have better drainage; can be grown in a smaller area; and suffer less loss from winter damage. Container-grown plants can be planted out throughout the spring, summer and fall. This is especially important if you will be doing plantings around certain events that take place outside of early spring and allows you to spread the work over a longer period. In addition, plants in containers often experience better growth and suffer less setback when transplanted.

Containers can be anything you find locally, preferably for free. This system works well: use wooden grape crates (free from most grocery stores) to hold 12 2-litre or 24 1-litre milk cartons. Cut off tops and use a knife to make 1/2 in. (12 mm) drainage holes in bottoms of cartons.



Compost bins - a three-bin system, using wire fencing or boards for sides, will give you room for all the composting materials you collect. It is also easy to aerate the material as you periodically move it from one bin to the next. All dimensions of each section should be about 4 ft. (1.2 m).

Watering system - however you obtain it, water must be clean and adequate to ensure good growing conditions. A convenient way to transport large quantities is in 45-gallon (205-litre) food-grade plastic barrels. These can be purchased from fish-packing plants and beverage companies.

STEP FIVE - Collecting seeds and wild plants

Most seeds are best planted in the fall soon after collecting, while some prefer the spring. Plant seeds no deeper than two times their diameter. Small diameter seed can be broadcast and covered with a 50-50 mix of inland sand and sawdust, about 1/4 in. (6 mm) deep.

For fall planting, wait until the ground is frozen and then cover the bed with a 4-6 in. (10-15 cm) mulch of eelgrass, leaf mould, chopped straw or pine needles to prevent repeated freezing and thawing. In the spring, remove most of the mulch and keep a close eye on the bed. The seedbed should be kept moist until the seeds have germinated and established roots. For both seeds and tender seedlings, use a watering rose or a special hose nozzle that spreads out the water. These most closely emulate natural rainfall.

Stratification beds - acorns and butternuts can be overwintered in boxes with 10 in. (25 cm) wooden sides. Over a one-inch (2.5 cm) layer of sand, spread one layer of nuts. Cover with another layer of sand and peat moss. Attach hardware cloth to the top of the frame, cover with a piece of plywood and mulch with 6 in. (15 cm) of eelgrass, straw or sawdust. Check regularly in the spring and plant in containers or beds when the seeds have begun to sprout. For the first two months after germination, apply water several times a week if it does not rain. After that, a thorough, weekly watering will usually be adequate. Deep watering promotes better root growth at lower soil levels.

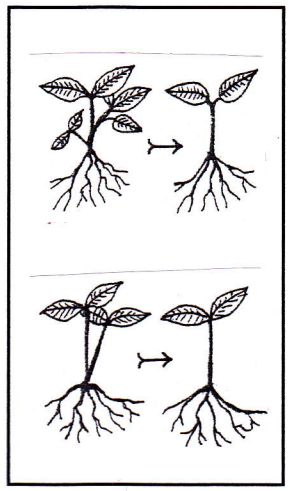
Most seedlings need partial shade during the first summer to conserve moisture and escape excessive heat. The simplest way is to make a frame to support snow fencing about 1 foot (30 cm) over the bed. You can also use laths at the same height - anything that gives you about 50% shading. If the weather is especially wet and muggy, you should remove the shading to allow the beds to dry out faster. This helps avoid problems with fungi and bacteria.

Transplanting is usually not a desirable way to get much planting stock. Often you can not be sure what the parent stock was like. The act of transplanting itself usually damages the transplant and other plants growing nearby. Here are some areas where you can safely get transplants:

1. **forest roads** - most people do not want trees growing up on their forest roads. Most of the plants would get run over by machinery anyway, so this is a great place to practice guilt-free transplanting. Be careful of damaging roots of trees growing alongside the road - they spread for long distances at shallow depths.
2. **fields** - if you are looking for white spruce or alders to plant, many farmers will let you dig them for free from their fields that have started to grow up. Other species not wanted by farmers can be found in fields, such as willow, red-osier dogwood and hawthorn.
3. **roadside ditches** - often a good source of willow, alder and red-osier dogwood. These are usually hacked down by machines or workers every year, so taking some of the smaller plants does little harm.

Always transplant in early spring before plants produce new growth, unless you are able to dig up and carry a substantial ball of earth around the roots. Seedlings up to 2 ft. (60 cm) give best results. Deciduous seedlings should be marked in the fall with flagging tape (a different colour or code for each species) while they are still in leaf, since it is often difficult to identify leafless seedlings in the spring. Make sure the seedling has good form and avoid suckers that have grown up from a stump. Some species such as beech put up many root suckers, which make poor transplants. Deciduous and coniferous trees can be transplanted bare root or with a plug of soil. Treat transplants the same as if you were moving seedlings to transplant beds (Step Six).

STEP SIX - Transplanting seedlings



Transplanting seedlings within the nursery and letting them grow for a year or two produces stocky plants with dense root masses and no tap root. Before new growth has emerged, use a garden fork to move seedlings to transplant beds or containers. Take care to avoid damaging any roots or branches.

On seedlings under 2 ft. (60 cm), prune roots longer than 8 in. (20 cm) with hand pruners or a pair of sharp scissors. Seedlings with split roots or other major defects should be discarded. Prune multiple leaders (the growing tips of the plant) to a single stem. Roots MUST NOT be allowed to dry out. They can be bunched together in wet moss and burlap, dipped in thin mud, or placed in a bucket of water. It is best to dig up small amounts of seedlings and transplant them quickly.

Plant seedlings in rows across the bed. A handy tool is a 6 in. (15 cm) wide board, 3 ft. (90 cm) long, marked off in increments of three, four and five inches (7.5, 10 and 12.5 cm). Using a spade, dig a trench next to the board deep enough to hold the roots. The side nearest the board should be vertical. Place seedlings against the vertical wall of the trench at the same depth as they grew in the seedbed, indicated by a slight change in bark colour at the root collar. Roots should be spread out evenly, not twisted together or L-shaped. Spacing differs for each species, but use the markings on the board to ensure each is the same distance apart. Replace soil and firm around transplants to eliminate air pockets. Water deeply. Transplanting should be done in the evening or on a cloudy or rainy day. The greatest risk is loss of water from shoots, especially if roots have been damaged in transplanting. If you must transplant seedlings after they have leafed out, prune immediately to reduce the area from which water loss can occur. For trees, trim off about 30% of each branch but avoid cutting the leader if at all possible (this is less crucial for shrubs than trees). It depends on the health of the transplants and weather conditions.

Treat transplants as you would new seedlings - a deep weekly watering and regular weeding are essential. A 1/2 in. (1.3 cm) mulch of eelgrass, leaf mould or composted bark will help to keep weeds down and conserve moisture. Using a shade table (which allows only about half the available sunlight to get through, also helps save moisture and can mean the difference between a successful transplant and a total waste of time.

STEP SEVEN - Maintenance

Apply a 3-4 in. (7.6-10 cm) mulch to the seedling and transplant beds in November before the snow falls. This will protect the roots from freezing and thawing and prevent frost heaving. Remember to apply mulch late in the fall and remove it early in the spring. If you have trouble with rodents, you may have to pull the mulch away from the seedlings and transplants, let some local cats patrol the area, or spray on some non-toxic rodent deterrent.

Overwintering container stock can be especially tricky - they do not have the large thermal mass of soil for protection. Containers can be moved into an unheated building (a garage or your front porch). If left outdoors, pack containers tightly together and place sawdust, seaweed or spruce boughs around the outside of the area to lessen frost damage to roots. They should be in an area that will collect snow, which is an excellent winter mulch. Snow fencing or spruce boughs can be used to trap snow.

Be a regular visitor to the nursery - this is the only way to avoid serious problems with underwatering, pests and diseases. Many insect and disease problems can be avoided by growing plants in healthy soil with adequate water. Plants that are undernourished, overfed or subject to repeated dry spells are prime targets. When absolutely necessary, look for organic insecticides that are the least harmful controls. Most of these also kill beneficial insects, so use them sparingly.

Good record keeping is an important part of nursery work. Seed batches should be labelled with species name, collection date and where they are from; beds should be marked to clearly show the species and age of the plant. A nursery map to identify seedling and transplant locations is also essential. Accurate records allow you to learn from successes and mistakes.

After a few years of growing seedlings, you will probably want to develop new beds so that crops can be rotated. This will allow you time to plant green manures and add nutrients to beds so that seedlings and larger transplants always get off to a good start. It will also let you take care of weed problems before they get out of hand, significantly reducing time spent on maintenance.

STEP EIGHT - Finished stock

This is the fun part, where your planning and work pay off. Before deciding on a planting site, consider the possible effects of moving a plant to the area. Will the plant be too successful and crowd out what is already growing? Can you transplant and not damage roots of existing plants? Are you meeting the growing needs of the plant (amount of sunlight, water, soil conditions) so that the plant will be healthy? Are you going to run into conflicts with other people using the area, such as local farmers? Certain plants are hosts to rusts and diseases that can affect farm crops, while other plants can become invasive in fields. Do you want to produce hardwood lumber for a future harvest? Here are some potential uses, with suitable species:

1. Streamside restoration
How many of us have seen a favourite stream go from prime fishing habitat to a silted, sluggish brook. These areas should be rich in wildlife, yet often are severely degraded. To restore badly eroded and silted streams, you will often need to plant willow and alder along the banks. These species grow quickly under difficult conditions and their roots help stabilize the soil. Once the stream banks are more secure and the shrubs are providing shade, underplant species such as yellow birch.

2. Urban landscaping
Trees can help convert unused and degraded urban areas into ecologically healthy and diverse parks, nature trails and "green spaces"; provide beauty and shade and reduce air pollutants. Red oak, sugar maple, red maple and white birch are excellent choices for city plantings, as park trees or planted along streets. Shrubs such as alternate-leaf dogwood, serviceberry, beaked hazelnut and mountain ash beautify areas and attract wildlife.

3. Soil protection and crop improvement
In rural areas, windbreaks and hedgerows slow the wind and help prevent soil erosion by wind and water. They also have a positive effect on crops, with yield increases of 5-40% commonly reported. Mixed plantings of conifers and deciduous species will also attract beneficial birds and insects. Species often used in these types of plantings include white spruce, larch, red oak, white birch, red maple, apple, mountain ash, serviceberry, highbush cranberry, wild raisin and willow.

4. Energy conservation
Sugar maple, red oak, white birch or white ash provide summer shade and reduce cooling costs when planted to the south of your home. Plant a windbreak with conifers and shrubs along the north side of your house to block prevailing winds and lower heating bills. A well-planned shelterbelt can also prevent snow from piling up around the house and on the driveway.

5. Restoration of degraded forests
Across much of the province, forests have been simplified and important components may be missing

even in mixed wood stands. Underplant red spruce, yellow birch, sugar maple, white pine, and/or eastern hemlock, at rates of 5-20/acre (12-50/ha). In stands that are primarily white spruce, create small openings and plant red oak and white ash.

6. Wildlife enhancement
While all trees and shrubs have value for wildlife, certain species are favoured over others. They may provide food for rarer types of birds; offer a food source throughout winter; blossom early; or provide dense cover for small mammals. Plant both deciduous and coniferous species, from low shrubs to tall trees. Learn about needs of birds and mammals you want to attract.

7. Reducing global warming
Windbreaks and other energy-saving plantings save money and reduce the amount of fossil fuel burned to heat or cool homes and offices. This reduction means less carbon dioxide, a major contributor to global warming, is released into the atmosphere. Trees also remove carbon dioxide from the air and release oxygen. Planting a variety of native trees and shrubs is an environmentally-sound way to achieve this goal.

Plant propagation

There are four routes to acquiring native plants - buying from a nursery, transplanting from the wild, growing from cuttings and growing from seed. Local supplies of native plants are seldom available. Even if they are, few groups or individuals can afford to buy stock in the numbers required for most restoration projects.

The last three options make the best use of available resources and are the keys to any large-scale projects such as stream rehabilitation, windbreak plantings or forest restoration. Select seed, cutting material or transplants from good parent stock and know that you are maintaining or improving the quality of the species.

Here are some general tips on collecting material - whether seeds, seedlings or cuttings:
Always ask permission of the landowner: while this might seem unnecessary, it is in your best interest. At Macphail Woods we have been developing good relationships with landowners who are happy that we can make use of plants on their property.
Go easy on the environment: avoid degrading one area to improve another. You should never collect more than 10% of the total seed crop in an area. If others are using the same source, lower this considerably.
Prune with care: cuttings should be taken using proper pruning techniques, leaving the parent plant in good condition and able to produce some seed in the next growing season.
Look for healthy plants: always collect from vigorous plants. Poor parent stock often means poor offspring, so avoid collecting from diseased or unhealthy plants.

Transplants

Most trees and shrubs are easy to transplant, especially if under 2 feet (60 cm) tall. Dig plants early in the spring before new growth has started and ideally after a rain when the soil is soaked. Most roots will be within 8 inches (20 cm) of the surface, so a wide hole is better than a deep one. A bushel basket will hold larger specimens, while small plants fit into 2 litre milk containers. The better you treat the transplant, the more successful it will be. Here are some general tips:

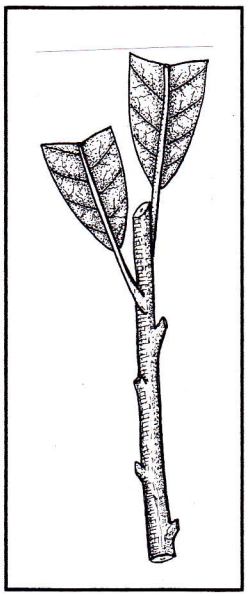
* Try to keep all roots intact with as much soil in place as possible. Prune all damaged roots and branches.
* Keep transplants moist, but not soaking wet, at all times. Soil should be wet enough to hold together.
* Tall transplants of maples, alder, willow, wild rose and other species benefit by being pruned back to 1-2 feet (30-60 cm). The larger the root ball and the more you can water the plant, the less you need to cut it back.
* Plant in a suitable location (common elder from a wet area should not be placed in a dry windbreak).
* Place transplants into the ground at the same depth as they were originally growing.
* Water thoroughly at transplant time.
* Mulch transplants after planting, using wood chips, bark, leaves or eelgrass.

Cuttings

Many shrubs can be easily grown by taking cuttings in the summer, fall or winter. The pages on individual species contain specific recommendations. Use the following as guidelines for all cuttings:

Summer cuttings: use only the current year's growth, preferably taking the cutting mid-June to mid-August. Discard the soft, fleshy tip of the branch. The cutting should be about 6 inches (15 cm) long, with the top cut made at a low angle about 1/4 inch (6 mm) above a bud and the bottom cut straight across about 1/4 inch (6 mm) below a bud, with one or more buds in between. This is the ideal that is not often reached. Try shorter or longer cuttings if necessary. The angle of cuts is a simple way of making sure that you know which is the base of the cutting. This way, you will never plant a cutting upside down (a common mistake when using cuttings without leaves). Cut the top leaves in half unless they are quite small and strip away all remaining leaves.

As soon after collecting as possible, cuttings should be placed in a bed located in a semi-shaded area. The bed can be as large as you need and have time to look after. Let's use a 4 foot x 8 foot (1.2 m x 2.4 m) bed as an example. The easiest method is to scrape the weeds off an area with a shovel or mattock and place 3-4 layers of newspaper on the ground, extending beyond the boundaries of the bed. Construct your frame out of 1 inch x 8

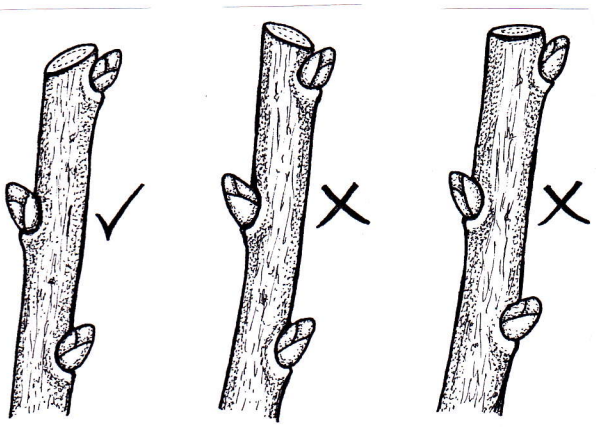


inch (2.5 cm x 20 cm) or 2 inch x 8 inch (5 cm x 20 cm) material and set in place. Place a 6 inch (15 cm) layer of clean, inland builder's sand in the bed and water thoroughly. Mulch outside the bed's base with wood chips or bark to keep weeds from infiltrating. Sprinkle a small amount of #2 rooting hormone (we use Stim-Root, available from most nurseries and stores with gardening sections), on the flat top of an ice cream container. Dip each cutting in the hormone, covering the base, just before you plant it. Rooting hormone stimulates better root development. Once it has come in contact with plant material, do not return the hormone to its original container. It can contaminate the remaining product and should be discarded at the end of each cutting session.

Cuttings should be planted so that about 1 inch (2.5 cm) of the tip is exposed. Use a screwdriver, stick or whatever you have to make a hole, place cutting to desired depth and firm sand around cutting. Place cuttings 2-3 inches (5-7.5 cm) apart, depending on species and size of the leaves. A bed this size can hold between 500-1150 cuttings. Cover the bed with white plastic, old windows or plywood - anything to keep the moisture levels high. Beds should not be allowed to overheat. Check weekly to see if the sand is still moist, and water if necessary. After about three weeks, start giving a little tug on a few cuttings of each species. When you feel resistance, you have succeeded in getting root growth. Dig up a few and see what they look like. If the roots look strong and are between 1-2" (2.5-5 cm), cuttings are ready to transplant. Move them out into a shady, protected location or transplant them to the nursery and wait a year or two until you have larger plants.

Winter cuttings: these cuttings can be made as soon as the plants become dormant in the fall, after the leaves have dropped, and anytime before the buds swell in the spring. Again, use the current year's growth, discard the softest growth at the tip and make cuttings the same as you would in summer. Remember to use a slanted cut at at the top of the cutting and a straight cut at the bottom. We tie winter cuttings in bundles of 50, marking each bundle with a plastic tag and recording species, location, date and other information that might be useful. The base of the bundle is then dipped in #3 rooting hormone and the bundle is placed in a plastic bag. Store bag in a refrigerator or cool basement, or in sand in the cutting bed under a thick layer of mulch.

In the spring, as soon as the ground is workable, you have two options. Place the cuttings in a cutting bed to root and be transplanted later; or plant them in a regular



garden bed at 3-6 inch (7.5-15 cm) spacings. Spacing depends on when you want to use the plants - wider spacing allows you to leave the cuttings in the bed an extra year if you want to set out larger transplants. These beds need to have loose soil so that the new roots are free to develop. Mulch lightly and keep well-watered, since a garden bed can not maintain the cutting bed's high humidity level.

Seeds

Saving the best for last is an old trick, but growing trees or shrubs from seed is really the best way to do large or small numbers of most species. You can select from local, reliable parents - vigourous plants with heavy crops of seed - and grow hundreds of seedlings for transplanting at almost no cost.

Most seed has some kind of dormancy which prevents germination in the fall during a warm spell. Dormancy can be quite complex - a hard seed coat that needs to break down over a winter, an embryo that is not fully developed, chemicals within the fruit that inhibit germination, or any combination of the above. Fortunately, you do not have to worry about dormancy, as long as you follow recommendations for each shrub. If you grow some species that germinate in the first growing season and some that sprout the second spring, separate these groups. It makes weeding and mulching much easier and efficiently uses available nursery space.

Seed preparation also differs between species - serviceberry fruits contain multiple seeds, while wild raisin has a single seed. Some seedcoats need to be removed or crushed, while others are fine to plant just as they come off the shrub. Just follow the recommendations for each species. Seeds should be planted as soon as possible after collecting, to prevent moulds from forming on the fruit or the seed from drying out. Planting depth is generally twice the diameter of the seed - plant small seeds such as roses about 1/8 inch (3 mm) deep and larger seeds like hawthorn about 1/4 inch (6 mm) deep. Place a 2-3 inch (5-7.5 cm) layer of mulch such as eelgrass over the beds in the fall and remove most of this in the spring. If the seeds need two winters before germinating, mulch again the second winter.

Glossary of terms

Biodiversity: the most common definition looks at three levels of diversity - genetic diversity (variety within species); species diversity; and ecosystem diversity. Put simply, what is the variety within a given species, what is the total variety of species, and how many types of ecosystems are present over a given area.
Cuttings: certain shrubs and trees can be grown from vegetative cuttings, using a short length of stem taken during the winter or summer months.
Ecosystem: groups of plants, animals, microorganisms, soil, water, minerals, sunlight, water and air that form a living, changing community. It could be a small ecosystem such as the area along a stream, or a larger ecosystem such as a bog.
Native plants: plants that are assumed to be naturally occurring in an area, although some have migrated naturally and others that appear to be native may have been transported by aboriginal peoples.
Riparian zone: the area adjacent to a stream or river, including the waterway itself.
Trees and shrubs: generally, mature trees are taller and single-stemmed, while shrubs are shorter (under 25' or 7.6 m) and often have multiple stems.

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USDA, Forest Service, **Silvics of Forest Trees of the United States**, Agriculture Handbook No. 271, U.S. Government Printing Office (newest edition in two volumes)

Wilson, Edward O., **The Diversity of Life.** The Belknap Press of Harvard University Press, Cambridge, MA, 1992.

Resources

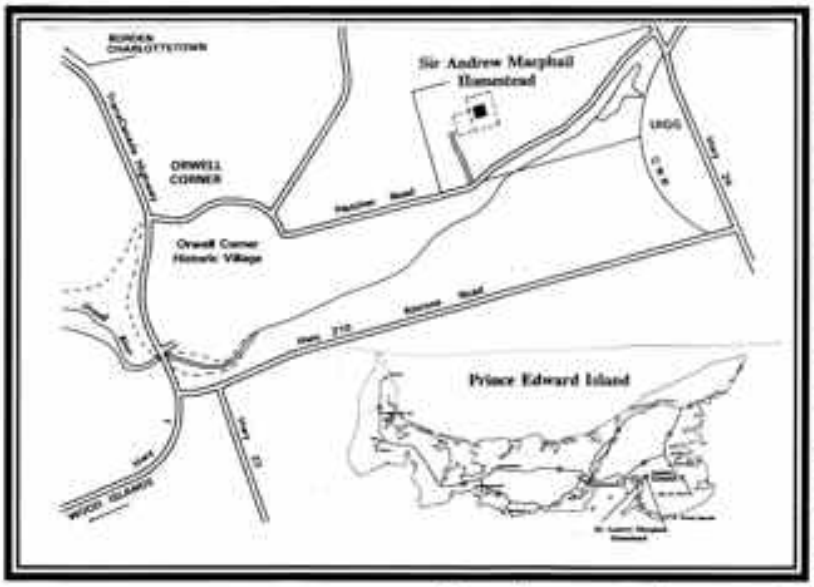
Soil tests: Soil and Feed Testing Laboratory, P.E.I. Department of Agriculture, Fisheries and Forestry, P.O. Box 1600, Research Station, Charlottetown, C1A 7N3. Phone 368-5600.
Tree and shrub pruning workshops: contact the Macphail Woods project (651-2575) for information on dates (usually in late spring).
Ecological forestry-related workshops: throughout the year we offer workshops on forest restoration, starting community nurseries, collecting seeds, tree and shrub identification and more, both at Macphail and in other places. Please call 651-2575 for information.
Information on ecological forestry and other environmental topics: for information on a broad range of issues or to get involved with bringing positive environmental changes to the province. Call the Environmental Coalition of Prince Edward Island: 566-4696 or stop in at our office at 126 Richmond St., Charlottetown, PEI C1A 1H9.
Lee Valley Tools:an expensive but high-quality supplier of a variety of tools. Home of our favourite pruning saws and shears. Call 1-800-267-8761 for a free catalogue.
Vesey's Seeds: an Island company with a good supply of tools and other things you might need around a nursery - dormant oil spray, rooting hormone, dolomitic limestone and more. Visit their store in York or call 1-800-363-7333 for a free catalogue.

Sources of plant material

Macphail Woods Ecological Forestry Project: Sir Andrew Macphail Homestead, Orwell, P.E.I. The largest variety of native trees and shrubs in the province. Write or call Gary Schneider c/o ECO-PEI, 126 Richmond St., Charlottetown, P.E.I., C0A 1G0 (902) 651-2575, for price list or hours of operation. Our price list and more infor-mation are also on our website:
www3.pei.sympatico.ca/garyschneider
J. Frank Gaudet Tree Nursery: Department of Agriculture, Fisheries and Forestry, P.O. Box 2000, Charlottetown, P.E.I., C1A 7N8, (902) 368-4711. Source for most conifer and some hardwood tree seedlings.
Community nurseries: more and more watershed groups, schools and other organizations across the are setting up small nurseries of native plants and may have extra stock available. Contact your local watershed group for more information.
Private nurseries: there are many retail sales outlets across the province. Most import their stock, but some do grow limited amounts of native species.

Helping out at Macphail Woods

Macphail Woods is a joint effort of the Environmental Coalition of Prince Edward Island and the Sir Andrew Macphail Foundation. Most of the homestead's 140 acres (57 hectares) is wooded and includes a stream valley full of large hemlock, white pine and yellow birch, a reminder of the original Acadian forest. The remaining woodlands include older mixed wood stands, abandoned fields grown up predominantly in white spruce, thickets of balsam fir and young coniferous and deciduous plantings. A dam on the larger of the two streams creates a pond that attracts great blue herons, belted kingfishers, osprey and many species of waterfowl, as well as mink, muskrat and beaver.



Macphail Woods combines protection of the natural area along the stream with wildlife enhancement, watershed protection, forest stewardship, environmental education and ecological research.

The project began in September 1991 with a wildlife garden and native plant nursery. It includes three nature trails and demonstrations of forest restoration, innovative windbreaks and erosion control. We offer regular workshops on a wide variety of natural history and silvicultural topics - birds, wildflowers, mushrooms, pruning, transplanting - as well as tours of the property and our work. The nursery and wildlife garden attract special attention, showcasing a wide variety of native trees, shrubs and wildflowers. Our recent efforts have included planting an arboretum beside the nursery and converting the barn into the Macphail Woods Nature Centre. These two works in progress will greatly enhance our abilities to teach natural history conservation.

Would you like to help with our efforts at Macphail Woods? Government and corporate funding, as well as income from sales of wood products and seedlings, help support the project. But we rely heavily on donations of both time and money from the public. If you like to garden, maintain trails, plant trees and shrubs, or lead tours, please contact the Environmental Coalition of Prince Edward Island, 126 Richmond St., Charlottetown, C0A 1G0 (566-4696). Financial contributions help us continue our research and educational efforts. ECO-PEI is a registered charity and issues receipts for tax purposes for all donations. Please make donations payable to ECO-PEI - Macphail Woods.

The sale of native trees and shrubs from our nursery helps fund many of our other programs at Macphail Woods. Why not come out for a walk or a workshop and pick up some trees for your property? From mid-April to the end of October you can call us at the nursery (651-2575) for information, hours, or a catalogue. Visitors are welcome to tour the site on their own at any time of the year. A map of the trails is available on-site, with descriptions of what you can expect to see along the way. To arrange for group or school tours of Macphail Woods or the Nature Centre, call the above number or e-mail: garyschneider@pei.sympatico.ca

The Macphail Homestead

The Sir Andrew Macphail Foundation was incorporated in 1990 as a private, not-for-profit, registered charitable organization. It is governed by a Board of Directors chosen from among the Foundation's members. Membership is open to anyone supporting the aims and objectives of the Macphail Foundation.

The organization leases the Macphail Homestead from the provincial government under a commitment to manage the property in ways that recognize the life and interests of the brilliant scholar Sir Andrew Macphail (1864-1938). Born and raised on the site, Sir Andrew became a successful writer, editor, scientist, social critic and professor at McGill University. He regularly returned to the homestead, inviting friends and colleagues to enjoy the Prince Edward Island landscape in summer.

Informally known as the "Friends of Macphail", the Foundation is dedicated to promoting education and interpretation of the house and surrounding property as a living memorial to Sir Andrew's genius and diversity of interests. The homestead, 18 miles (25 km) east of Charlottetown, has used funding from private and public sources to establish a museum interpretive area. It caters to small conferences and workshops and provides a secluded space for retreat and renewal. The site is also available for weddings and other activities and offers special events throughout the year. There is a tea room and small gift shop on site to serve day visitors during the summer months. For information, write to the Sir Andrew Macphail Foundation, Orwell, P.E.I., Vernon P.O., C0A 1E0, or call (902) 651-2789.

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