

LANDSCAPE PLANT CARE  
THE DECIDUOUS TREES (PART 2)  
GOOD CARE PRACTICE  
ELEMENTAL, BIOLOGICAL AND SYNTHETIC CHEMICAL  
CONTROL OF INSECTS AND PLANT PATHOGENS  
BIOTIC AND ABIOTIC DAMAGE



**GOOD CARE PRACTICE**

Trees are the most imposing feature in your landscape. They may grow quite large and live quite long. As mentioned before; they moderate hot season temperature near your home, provide shade and cool areas, absorb sound and rain, give privacy, prevent erosion, filter pollutants and provide oxygen, add character and value to your home as well as providing a nurturing area for beneficial insects, birds and small animals. The benefits of trees on your property far outweigh the possibility of biotic (caused by living things such as insects) or abiotic problems (caused by non-living things such as weather) a tree might have during its lifetime. Keep in mind that you may never experience a problem on your property. Most disease and insect problems tend to be localized or cyclic in nature. Forest Tent Caterpillar is a good example of a cyclic problem in our region.

The most effective means of control of biotic (i.e., disease, insects) and abiotic (i.e., physical and chemical) damage is to prevent it from occurring. Choosing the right tree for the location with the proper growth conditions is the first step. After that, the risk of other problems can be reduced with a relatively simple good care program with an emphasis on prevention. Keep in mind that no good care program will overcome poor site conditions.

Before you plant, consider that the quality of soil in which a tree grows is one of the most important factors affecting tree health. Soil conditions, including the amount of organic matter, depth of topsoil, soil structure and type, pH (acidity/alkalinity), nutritional status, aeration and drainage all have a direct affect

on tree health. Almost every tree needs at least 40 cm of well drained soil. Roots growing in poorly drained soil are deficient in oxygen and have limited nutrient uptake. If soil saturation with water is continuous, root hairs die and the tree becomes an easy target for root-rot organisms. The leaves of the tree begin to wilt because of the reduced number of water-conducting roots. Leaves will turn yellow and drop prematurely. Trees growing in gravel or sandy soils that do not retain adequate soil moisture may show symptoms of stress during hot, dry periods. Lack of moisture is also a problem where soils are severely compacted or have high clay content, as the water tends to run off the surface horizontally instead of percolating down through the soil, into the root zone.

Section one and two below cover the most environmentally friendly means to prevent problems without resorting to elemental or synthetic chemical control. The downside of synthetic chemical control (primarily insecticides) is that it will affect more than the bad guys. Keep in mind that about 80% of the bugs in your landscape are good guys, or at least neutral, and will also suffer loss, which may be your loss also. Sometimes there is no reasonable alternative, but as a principle, we advocate that synthetic chemical control should be the last resort.

1. The easiest care practice is to provide good nutrition to your plant every year or two. A healthy plant is better able to withstand insect and disease predation. The deciduous tree species are not heavy feeders, so the best nutrients are from good organic compost spread under the tree from the trunk to the drip zone. Stronger compost with Nitrogen equivalent to 1.0 or greater (first number in the NPK series) is most effective for a top-dressing. Compost will provide all the nutrients the plant needs for good growth, as well as improving soil structure, which is very beneficial to plant health and growth. Synthetic fertilizer does not improve soil structure and should be used with great care, as an excess of granular or liquid fertilizer may be detrimental to the plant. Ensure directions are followed carefully when using granular or liquid synthetic fertilizers, and remember that less is better than more with synthetic fertilizer. More detailed information is available from Scott's Nursery's nationally certified staff.

2. A good clean-up in of leaves and twigs in the fall and control of grass height from spring to fall tends to help prevent both fungus and insect problems. Good culture practice can help prevent entry of fungus and insects via wounds. Trimming of loose bark is recommended but use of wound paste has both defenders and detractors (See the section on abiotic disease control). Avoidance of wounds on young trees by whipper snipper, mower and especially rodents is

recommended. Assorted tree guards are available for this purpose. Most loss of young trees in our region is due to mice girdling the young tree in search of cambium as a food source. A young tree, once girdled, seldom recovers. Mulch should not be placed within 6-8cm of the trunk of a tree as it provides a haven for predatory insects and may cause damage to the collar section of the tree. Solid rubber mats should also be avoided around trees. Young trees are prone to wind damage, especially in wet weather. Combinations of soil softened by high moisture content and wind acting on the leafed-out head, as on a sail, can fatally damage roots or even uproot or break a young tree. Young trees should be double staked for a minimum of three years. Ties should not cause abrasion or girdle the tree. There are a number of reasonably benign methods to reduce harmful insect damage. Some insect populations may be reduced by the use of insect traps. Some traps target a specific insect and some are more general in nature. Pheromones are used in some cases to attract certain species of insect such as the apple codling moth. The use of Nematodes to assist in control of some insect populations such as Birch Miner have also been developed in recent years as an alternative to synthetic chemical products. Biofungicides are becoming more common in the commercial plant world and are starting to enter the marketplace as an alternative to synthetic chemical and elemental fungal control. Some biofungicides are now available for small plants but none are currently available for trees. A biological insecticide (utilizing *Bacillus thuringiensis*) such as BTK is available for use on caterpillars, budworm and looper. Another effective method on size-manageable trees is the use of dormant oil in early spring which prevents emergence of some species, especially scale insects. Although traps and dormant oils may impact some of the good bugs as well, the overall impact should be mitigated when compared to synthetic chemical spray.

3. A preventative spray program may be beneficial if you or others in your vicinity are experiencing significant disease or insect problems or you are growing some specific species such as *Prunus*. It is strongly recommended that you read all label information and follow the recommended safety and application guidelines for any product used in pest control. There are a number of pests that can affect deciduous trees such as a variety of fungi (blight, canker, leaf spot, rust, tar spot, verticillium wilt, etc.) and insects (aphids, borers, scale and assorted sawflies, weevils and mites). But, don't panic, most of the above mentioned are relatively uncommon on trees used for landscape in our region. Keep in mind that insect and plant pathogen problems affect woodland trees much more readily than landscape

trees. The most common problems that nursery clients have consulted about in recent years are listed in the disease and insect treatment section below

4. Pictures of a problem, as well as samples of affected leaves or branches, may greatly assist in possible identification of a cause. Please secure samples brought to the nursery for insect or disease identification in a clear plastic bag with a contact name, phone number, and identification whenever possible of the tree species and details of the problem. The certified staff at Scott's Nursery would be pleased to assist with recommendations concerning infestation control within their experience.

## **ELEMENTAL, BIOLOGICAL AND SYNTHETIC CHEMICAL CONTROL OF INSECTS AND PLANT PATHOGENS**

As mentioned above, sometimes there is no reasonable alternative but to resort to elemental (i.e., sulphur, copper), biological (i.e., BTK) or synthetic chemical (i.e., Pyrethrin) for prevention or control of plant pests. It is most important to read the label for the elemental, biological or synthetic chemical product you are considering and carefully follow the safety and application directions. The first premise to be considered is that some plant pathogens and insect infestations, once established, are not likely controllable by the householder with any product available in the marketplace. In this situation if the infestation is likely to result in, or results in, the loss of the tree; replacement with an alternative or resistant species may be prudent unless (in some cases) you are prepared to maintain a preventive spray program with the same replacement variety. Examples are a plant pathogen (fungi in this case) that causes "black knot" in *Prunus* species and mid or late stage insect borer damage. A second premise to consider is that some infestations by plant pathogens or insect species are not harmful to the tree, but are primarily an aesthetic concern, as with fungi causing "tar spot" in *Acer* (Maple) or insects causing Galls in *Quercus* (Oak). As no serious damage is likely, it may be prudent to concentrate on good care practice methods as an alternative to spraying a product that may or may not be effective. The third premise concerns the choice of product. In most cases it is recommended that the householder considers spraying the most benign product that may be effective in control and going up scale as necessary. An example of scaling up for an insect

problem would be starting with agricultural insecticidal soap (fatty acids), as the most benign, followed by Pyrethrins (first derived from the natural insecticidal properties of the chrysanthemum), Permethrin (derived from Pyrethrin), Sevin (Carbaryl), and Malathion. Both Sevin and Malathion are cholinesterase inhibitors. With respect to fungicides; sulphur, lime sulphur and copper sulfate are relatively benign elemental products that are most often used to control or prevent fungi problems in trees. Copper sulfate cannot be routinely used in prevention or control as an accumulation of copper in the soil may also be detrimental to the tree. Keep in mind that it is usually more practical to be preventative, since many plant pathogen problems once started, are not likely to be eradicated. Captan has been restricted in the marketplace due to its toxicological properties but is available as a fruit tree spray, mixed in powder form with Carbaryl and Malathion. This product is capable of causing severe consequences if used improperly. It should be considered a last resort and not used without adequate safety equipment and safety procedures.

## THE INSECTS

We can subdivide insect predation into several categories such as 1) I borers 2) leaf chewers and miners 3) gall producers 4) sucking insects 5) root pests.

### 1. Borers:

We receive occasional queries about borers at the nursery. The boring pests attack mainly the inner bark and wood, although all parts of the tree are affected. Borers may weaken the tree to a point where it cannot stand wind stress and/or affect the ability of the tree to feed itself. After sufficient damage occurs the tree will succumb fairly quickly. Borers are difficult to eradicate once established as they reside in the tree and are only susceptible to systemic insecticides, which are no longer available to the householder. The best means of dealing with borers is prevention. A healthy tree (see the good practice section) is less likely to be affected, and if provided with suitable nutrition and moisture, may prevent infestation by borers. Borers are known to attack several species such as *Betula* (birch), *Malus* (Crabapple), *Sorbus* (Mountain Ash) and *Querus* (oak) and may occasionally be found in other species. *Fraxinus* (Ash) is not currently on the problem list here but the Emerald Ash Borer that is devastating trees in central Canada is moving eastward and has been found in Maine and Quebec. The most

common queries at the nursery concern *Betula* (birch), *Malus* (Crabapple) and *Quercus* (oak). Knowing the lifecycle of a particular borer is also helpful in control and prevention. Some borers make their initial presence known by a deposit of sawdust at the base of the tree which may be removed mechanically. A borer that attacks *Malus* (Crabapple) establishes itself in loose material at the base of the tree so the use of loose material such as mulch around the base should be avoided as it provides a convenient hiding place for the egg laying borer and young larvae. An early to mid-spring spray of the tree base with an insecticide with a residual capacity such as Malathion or Seven or use of a BTK may also be helpful where the problem is known to be prevalent. A *Betula* (Birch) variety however may benefit from any practice that promotes a constant, suitable moisture level such as mulching since the Birch Borer life cycle is different. Although borers established in the tree are not accessible by exterior spraying, new larval hatches of the Birch Borer may be affected by 2 or 3 insecticide sprays of the trunk and branches in early and late spring. Species such as *Quercus* (Oak) that are not stressed appear tolerant of most borer species and may sacrifice an occasional branch, but are largely unaffected.

## 2. Leaf Chewers and Miners:

These pests feed on the leaves of deciduous trees and for the most part the damage is more aesthetic than harmful. The damage done by various larval (caterpillar or grub) forms of moths, beetles, and sawflies is usually not fatal to healthy, established trees. Some mature trees can regenerate after complete defoliation although repeated defoliation will be stressful and may leave the tree prone to other problems. Damage to trees is usually limited to a short period of time during the larval feeding stage. Various tent caterpillars or bagworms responsible for leaf damage on smaller trees can be manually removed in some cases or sprayed with BTK or an insecticide if warranted. Most of the skeletonizers and beetles do not cause enough damage to warrant intervention on a mature unstressed tree. A young tree may benefit from an insecticide treatment. A healthy tree is less likely to be affected. Miners (a member of the sawfly family) on the other hand pose a different problem as they are inside the leaf tissue and cannot be affected by topical insecticides. The only infestations in deciduous species that we have been made aware of by clients at the nursery in recent years are the birch and oak leaf miners. The oak leaf miner is an uncommon introduction from the west coast whereas the birch leaf miner is quite common in our region. They overwinter in the soil as pupae. Adults emerge about

mid-May and there may be a second emergence in mid-June. Adult birch leaf miners are small (about 3 mm long), black and fly-like and they lay eggs on the tree which hatch into legless, worm-like insects. These immature larvae feed between the leaf surfaces and can be seen easily when leaves are held up to sunlight. The immature leaf miners feed for about two weeks and then drop to the ground to develop into pupae. Horticultural oil applied at the right time may help kill eggs or tiny larvae within the leaf tissue. Oil applications should be made as soon as adults have emerged in the spring and egg-laying has occurred, and should continue weekly until mid June. BTK applied to the soil area at the time of larvae occurrence may also be helpful. A recent introduction that appears to work well when applied properly, are specific nematodes, which are a natural predator of the larval form of the sawfly, found in soil.

### 3. Gall Producers:

These insects produce bumpy growths which usually contain the insect. Despite their appearance, most galls affect the aesthetics of trees as opposed to their health. Once the gall has formed around the insect it is quite protected from topical applications which make control quite futile. The oak gall appears most common in our region although *Acer* (Maple) may also have galls. The incidence of galls also appears to be somewhat cyclic in nature.

### 4. Sucking Insects:

The mites, aphids and scale, which are the predominant sucking insects, extract cell sap either from foliage or directly from the cambium of a tree. They can cause wilting, colour change and curling of leaves. In high numbers, they are capable of stressing a tree quite severely. We have had few queries about mite infestation of deciduous trees, other than fruit trees, at the nursery in the last decade. Mites (arachnids) are tiny spider-like creatures that feed by sucking plant sap. Often mites leave tiny egg cases and webs around infested foliage. Aphid infestations are not common on most tree species. We have had no customer queries at the nursery concerning aphid infestation in deciduous trees during the past decade. On species that may be affected, an infestation, once started, may be severe and be more of a problem in the second year. Only a few species may be suspect for infestations such as some varieties of *Betula* (Birch), *Malus* (Crabapple) and *Acer* (Maple). Scale insect infestations are rare in most deciduous trees. Scale infestation has been noted in some varieties of *Malus* (Flowering Crab), *Sorbus* (Mountain Ash) and *Ulmua* (Elm). A well-timed and thorough spray of

horticultural (narrow-range) oil during the dormant season, or soon after scale crawlers are active in late winter to early summer, can provide good control of most species of scale. The crawler part of the life cycle of some scale insects is prone to available insecticides but most cycle states of the scale insect is difficult to control with other than a systemic insecticide, which is not available to the homeowner. Keep in mind that some tree varieties are highly resistant to scale and the problem is relatively uncommon on landscape trees in our region.

#### 5. Root Feeders:

We only mention this as we have experienced a noticeable increase of white grubs in lawns in recent years. These pests live in the ground and feed on the non-woody portions of plant roots which include the feeder roots. They are unlikely to affect a mature healthy tree but may have a greater impact on new plantings, which are more susceptible. Where lawn damage is noticeable it may be prudent to implement practices to reduce the grub population where new tree planting is anticipated. Information on immediate control measures such as specific nematodes and long-term prevention lawn care is available from Scott's Nursery's nationally certified staff.

## PLANT PATHOGEN DISEASE

Pathogens are disease-causing organisms. Plant pathogens may be bacterial, fungal, or viral in nature. However, most hardwood disease is caused by the fungi.

#### 1. Bacterial Disease:

There are two bacterial diseases of trees, Fire Blight and Bacterial Canker. Fire blight only attacks trees in the *Rosaceae* family, such as *Malus* (Crabapple) and *Pyrus* (Pear).

We have had no reported incidences of fire blight in our region in the past decade. Fire Blight tends to be spread by insects, especially Aphids and can spread quickly if not checked. If you suspect Fire Blight in *Malus* (Crabapple) and *Pyrus* (Pear), please contact Scott's Nursery staff for more detailed information.

Bacterial blight or canker attacks a number of species such as *Syringa* (Lilac) and all *Prunus* species although it is rarely reported in our region. Only elemental fungicides containing copper will help control this bacterial disease. Heavily infected trees (especially with a canker on the main trunk) or young trees, should be removed, destroyed and replaced with healthy trees. It is not root spread so

new trees will not be infected in the soil. Canker on limbs may be cut out down to clean wood when the tree is not dormant. Pruners should be disinfected between all cuts and a Bordo paste applied to the wound. A preventative spray of Bordo in early spring and late fall may be prudent where Bacterial Canker has been noted.

## 2. Fungal Disease:

The most common tree diseases are caused by fungi. Many fungi are microscopic but some are visible in the form of mushrooms or conks on the tree, pronounced growths on limbs, or a black sooty appearance on the bark.

### Foliar Fungal Diseases:

Leaf spots, tar spots, twig dieback and "anthracnose" can be caused by a number of different fungi. These can usually be controlled by removal and destruction of infected leaves. Some diseases may benefit from an elemental fungal spray such as Sulphur or Bordo in spring and/or fall. Several leaf spot types may be caused in some trees such as *Acer* (Maple), but only some respond to fungal spray. Tar spot is not readily treatable by spraying but it is difficult to differentiate from similar looking leaf spots that may respond to treatment. As Tar Spot is primarily an aesthetic concern, adequate clean-up and disposal of leaves and good care practice is often the best approach.

Some foliar diseases may also cause twig and branch cankers such as in *Salix* (willow). If twig and branch cankers are present, these should be pruned back to healthy wood where possible. Pruning tools should be disinfected between cuts using 10% bleach or 70% rubbing alcohol. An elemental fungal spray with Bordo or Garden Sulphur is recommended in spring and/or fall.

Anthracnose diseases of hardwood trees may occasionally be noted in *Quercus* (White Oak), *Juglans* (Black Walnut), *Fraxinus* (Ash) and *Acer* (Maple) in Eastern Canada. The most common symptom is dead areas or blotches on the leaves. Anthracnose does not cause permanent damage, but can weaken the tree. Plant in well-drained soil, ensure a constant moisture level, rake up and destroy leaves and prune out dead and dying branches. Following good care practice will reduce the possibility of occurrence.

Black Knot is caused by the fungus *Plowrightia morbosa*, which causes the formation of dark brown to black swollen growths or knots on the branches of most types of cultivated plums, prunes and cherries. Small, light brown swellings

form on the twigs or branches the first season after infection has taken place. Young knots are olive-green early in the season but later become hard, brittle and coal-black. Once thoroughly established in the branches or on the main trunk the tree will succumb. If caught early on the branches knots should be cut out and destroyed. The cut should be made about 20cm back from the knot and pruners should be sanitized with alcohol or 10% household chlorine solution between cuts. It is relatively easy to control by prevention with an elemental spray program using lime sulphur and garden sulphur at appropriate time and intervals.

#### Root Associated Disease:

Root disease such as Vascular Wilt Infection occurs via the roots and then spreads up through the vascular system in the tree. It is usually distinguished by dieback of young twigs and branches. A black or brown ring can usually be seen in the vascular tissue of dead twigs. Mature trees may "seal off" the infection and live for many years while others succumb quickly. The fungus carries over in the soil for several years, so only resistant species should be used for replanting.

Root rot may be caused or assisted by a fungus but is almost always the result of over watering. Root damage, prior drought stress, poor soil conditions and flooding can also play a part. Except for highly susceptible species, replanting with healthy trees should not be a problem if the soil and environment are improved and good horticultural practices are followed.

#### Rust:

Rust is a complex fungal disease often involving two different host plants and up to five types of spores. Some need an alternate host to complete their life cycle each year such as pear/juniper rust and cedar/apple rust. Other rusts will continue to infect only one host species year after year. It is seen most often in mid to late summer and autumn when the fungus causes pustules to break out, most often on the lower leaf surface. The pustules on leaves and occasionally on other aerial parts can be orange, yellow, brown, black or white but most often a rusty brown colour, giving the disease its common name. The few primary hardwoods that may be affected are *Malus* (Crabapple), *Crataegus* (Hawthorn), *Amelanchier* (Serviceberry) and *Pyrus* (Pear). Control consists of removing one host in the first case, where possible, and raking and destruction of all diseased and dead material at the end of the growing season. The overwintering spores of some rusts are very resilient, so do not use infected material to make compost. It

helps to provide conditions that encourage strong growth, but avoid an excess of synthetic nitrogen fertilizer as this results in soft, leafy growth that is easily colonized by rust. Rust is very hard to treat and the use of elemental copper and sulphur may help control but will not eradicate the fungus. A preventative approach is effective since garden sulphur is known to stop the germination of fungus. Good care practice will assist in prevention and control.

### 3. Viral:

Viral disease in trees is not generally considered significant as it is difficult to diagnose and the effects are often subtle. It has been known to cause lesions, ringspots and yellowing. It has also been associated with decreased growth and possible reduction in cold tolerance but is rarely fatal to the plant.

## **ABIOTIC DISEASE OF DECIDUOUS TREES**

Abiotic diseases are caused by non-living environmental conditions such as frost, wind, drought and chemical burn. For simplicity, we can divide abiotic disease of deciduous trees as principally winter damage, summer damage, and chemical damage.

### 1. Winter damage of deciduous trees:

The frequency and severity of winter damage is determined by a number of factors including the plant species or cultivar involved, the placement and conditions under which the plant is grown, and weather extremes during the dormant period.

Frost penetration of the soil around newly planted trees without snow cover in early fall or late spring may damage the shallow roots if the temperature drops below -10 centigrade. Root damage may also occur during the winter when low temperatures are of prolonged duration. It may be prudent to provide some extra protection from ground frost during the winter months. A 10-20cm layer of mulch or a 20-30cm layer of straw or wood chips will prevent freeze and thaw damage by maintaining more constant soil temperatures. If the fall has been dry, water heavily before the ground freezes to reduce frost penetration. Check new plantings for cracks in the soil and fill them in with more soil.

Winter injury is more often associated with extreme temperature fluctuation than with prolonged cold weather. Young trees that are dormant but not fully acclimated can be stressed or injured by a sudden rise or drop of temperature

over the winter season. Extended periods of mild winter weather such as we have been experiencing quite often in recent winters can deacclimate plants, again making them vulnerable to injury from rapid temperature drops. A sudden drop in temperature causes the outer layer of wood to contract more rapidly than the inner layer, which results in a vertical crack at weak points in the trunk. Once a frost crack occurs on a tree, it is likely to appear annually. Plants most likely to suffer winter injury are those that are marginally hardy for the area, already weakened by previous stress, young, or just more susceptible such as some *Acer* (Norway and Red Maple), *Aesculus* (Horse chestnut), *Malus* (Crabapple), *Juglans* (Walnut) and *Tilia* (Linden). Several wraps of the main stem with a light coloured insulating material (white felt, burlap, etc.) in late fall will greatly assist in prevention of winter damage.

Winter wrap may also prevent sun scald. Sun scald refers to damage on the south or southwest side of trees following a sudden exposure to direct sunlight. Young *Fagus* (Beech), *Acer* (Maple) and *Tilia* (Linden) may be prone to sun scald. In winter, the temperature on the sunny side of the trunk may exceed air temperature by as much as 20°F. This is thought to trigger deacclimation of trunk tissue causing damage to the cambium layer, resulting in a sunken area or canker. Affected trees may have sparse foliage, stem dieback, and stunted growth. To repair sun scald damage cut the dead bark back to live tissue with a sharp knife, following the general shape of the wound, rounding off any sharp corners to facilitate healing. Do not use a wound spray. A fungicide spray, or a damp cloth taped on the injury for a three week period may be beneficial. Wrap the trunk in subsequent winters to prevent further damage, especially on young, thin barked trees. Put the wrap on in the fall and remove it in the spring after the last frost. Newly planted trees should be wrapped for at least two winters and thin-barked or zone marginal species up to five winters or more. Tree wrap should be removed in spring to prevent damage from fungi and insects. Another way to protect trees with thin bark is to place smaller growing plants nearby that will shade the south side of the tree during the winter months.

A late spring frost can also cause damage to blossoms, and new shoots. Though symptoms resemble blight diseases, freeze injury appears suddenly after a hard frost, while diseases are progressive over time.

The branches of many hardwoods, such as *Acer* (Maple) and *Betula* (Birch) may be seriously damaged in ice storms. Improper removal of ice or snow from the tree might increase damage. Heavy snow should be removed gently with a broom

before it freezes to limbs and branches. Removing ice that is encased on branches can cause additional damage and should be allowed to melt off naturally.

Mice and rabbits often damage young trees in the winter by feeding on the bark and girdling the trees. Mice damage is most prevalent on a young tree and if girdled, it will likely not recover. Damage occurs most commonly when there is prolonged, heavy snow cover, and food is scarce. Rabbits feed on the bark above the snow, while mice feed near the ground level. Mouse damage is usually more severe when the trees are surrounded by heavy grass, weed cover, or heavy mulch, so it is essential to use a rodent guard, especially on younger trees. Various mice guards are available commercially including spiral and hard plastic wraps and wire mesh of appropriate size. Trees should be protected from the ground to the possible snow line. Wire mesh is most effective above the snow line to mitigate rabbit browsing.

Winter dieback is difficult to avoid in some cases. Plants that are marginally hardy should be planted in sheltered locations (microclimates). Plants in vigorous growing conditions late in the fall are most likely to suffer winter dieback, so avoid late summer pruning, fertilizing, and overwatering. Proper pruning to eliminate multiple leaders and weak branch attachments will reduce snow and ice damage.

## 2. Summer damage of deciduous trees:

Predation from deer may occur summer and winter as they feed on and damage terminal and side branches of small trees. Repellents may provide some control if feeding pressure is not extremely heavy. Plants can be sprayed or painted with the repellent and/or hanging heavy rags dipped or sprayed with repellent may also be effective. If deer are starving, there is little that will prevent feeding.

Salt damage may also occur in summer and winter but symptoms appear in spring and early summer and include browning of evergreens, leaf scorch and branch die back. Dead areas of turf nearby may also be noted. Branches and twigs can be killed from salt spray in coastal areas or from snowplows winging salty material during snow removal. Salt may leach through well-drained soils, but damage can be extensive in poorly drained soils. Consider salt spray zones when locating tree sites and choose salt-tolerant species for sites where salt stress may be a problem.

The quality of soil in which a tree grows is one of the most important factors affecting its health. Soil conditions, including the amount of organic matter, depth of topsoil, soil structure and type, pH (acidity/alkalinity), nutritional status, aeration and drainage all have a direct affect on tree health.

Soil disturbance can have a negative impact on tree roots, especially shallow-rooted trees such as beech, birch and sugar maple. The survival and growth of tree roots depends on soil drainage. Soil drainage and aeration affects the amount of oxygen available to the roots and is necessary for normal root growth and nutrient uptake. Soil drainage can be affected by many factors including texture (clay soils drain much more slowly), mineral composition, amount of organic matter and compaction (e.g. foot traffic, machinery) and contour (low areas where excess water pools). Roots growing in poorly drained soil are deficient in oxygen and have limited nutrient uptake. If soil saturation with water is continuous, root hairs die and the tree becomes an easy target for root rot organisms. The leaves of the tree begin to wilt because of the reduced number of water-conducting roots. Leaves will turn yellow and drop prematurely. Trees growing in gravelly or sandy soils that do not retain adequate soil moisture may show symptoms of stress during hot, dry periods. Lack of moisture is also a problem where soils are severely compacted or have high clay content, as the water tends to run off the surface horizontally instead of percolating down through the soil into the root zone. Trees may suffer from both short-term and long-term drought stress. The leaves of trees experiencing short-term drought stress tend to wilt during the hottest part of the day, and later the leaf margins turn brown and become brittle. Extended dry periods may also result in some defoliation in midsummer and the development of premature fall colour. Because trees are perennial plants, they can exhibit symptoms of drought stress beyond the year in which it was experienced.

Recently planted and shallow-rooted trees are susceptible to strong winds and root damage and/or complete uprooting of the tree. It normally takes several years for a tree to develop a root system sufficient to withstand all but the harshest winds. The leaf growth on a deciduous tree acts as a sail and roots are not well enough developed to hold, especially in wet, loose ground. Young trees should be staked (two stakes preferably) for a minimum of three years using a flat wrap that does not girdle (go completely around) the trunk. There are commercial wraps available but pantyhose will also work quite well.

There are a number of stressors that affect trees before, during and after transplanting which should be considered. Exposure of bare roots to high temperatures, direct sunlight or drying winds and planting the root collar too deep are common problems. The root collar on a tree should never be covered by soil or mulch. Roots should also be spread out when transplanting to avoid “root girdling” problems, especially in species such as *Acer platanoides* (Norway Maple). Soil should be firmed around the roots to ensure contact between the roots and soil. Trees should be well watered immediately after planting, and again a few hours later. New trees need supplemental watering after transplanting or planting every 7 to 10 days as a rule. A trickle from hose, a sprinkler, or an irrigation hose will help improve water infiltration and reduce horizontal runoff. Water long enough to moisten the upper 10-15cm of soil. A long, gentle watering cycle encourages the development of healthy roots at a reasonable depth. Short, frequent irrigation cycles cause roots to form near the soil surface, making them more susceptible to drought stress in summer. Run irrigation systems either at night or preferably in the early morning to limit the amount of loss by evaporation. Avoid wetting the foliage. Leaf wetness promotes disease, creating more problems for a plant that is already under stress. When it is sunny, water droplets act as a lens on the foliage and can cause foliar burn through the action of the sun’s rays. Direct the water to the soil surface.

### 3. Chemical damage of deciduous trees:

Most deciduous trees are not heavy feeders. Soil structure and consistent moisture levels are more critical for good growth and the health of the tree. Synthetic chemical fertilizer does not improve soil structure and should be used with great care, as an excess of granular or liquid fertilizer may be detrimental to the plant. Ensure directions are followed carefully when using granular or liquid synthetic fertilizers, and remember that less is more. Applying large amounts of synthetic chemical fertilizer, especially nitrogen at any time of the year, stimulates excessive succulent vegetative growth and creates hardening-off problems. Excess nitrogen may also inhibit flowering and reduce the plant’s natural ability to resist stress. Applications of quick release synthetic chemical fertilizer are also discouraged because as in addition to the above, we see a higher fatality rate. Top-dressing with compost is a safer and more effective means of adequate feeding while promoting good soil structure and obtaining good plant health and growth. See the Good Practice Section for more detailed information.

Some trees are very susceptible to herbicides found in sprays and synthetic chemical fertilizers. Affected leaves become distorted, twisted, curled, or cupped, margins may turn brown, and it may also cause stunted growth or death of the tree. Herbicides should not be used within 20 meters of the drip line of a tree.

More detailed information on planting and care is available from Scott's Nursery's nationally certified staff.