ABIOTIC ISSUES

Deep Planting/Grade Change

DAMAGE/SYMPTOMS There are several signs that a tree might have been planted too deep. The most obvious sign is the lack of trunk flare, which is where the tree widens near the soil surface. Trees planted incorrectly tend to lack vigor and have a shortened life expectancy. They exhibit premature leaf drop, wilting, scorch, chlorosis, and stunted growth. When the trunk is excavated, adventitious and girdling roots are often found.

OCCURRENCE Recently planted trees are extremely susceptible to damage due to deep planting. Balled and burlapped trees can also be planted too deep due to where the soil is deposited on the trunk during the packaging process. Landscape construction in the vicinity of trees and grade changes in a landscape can also lead to trees being lodged too deep.

SUSCEPTIBILITY/TOLERANCE Any tree is susceptible to damage from deep planting. Improper planting is a major reason for premature tree death. Most tree roots grow in the top six inches of soil where water, nutrients, and air are readily available. When excess soil is deposited on top of the existing soil it limits the tree's ability to access these resources.

MANAGEMENT Recently planted trees can be lifted and replanted correctly. A root collar excavation can be done on established trees. Excess soil and mulch can be removed from the circumference of the trunk to the point where the trunk flares out into root growth.

A Adventitous roots growing from trunk where it had been buried too deep. **B** Trunks that show no flare where they enter the soil are planted too deep. **C** A hackberry planted too deep displays chlorosis and canopy dieback.


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Deer

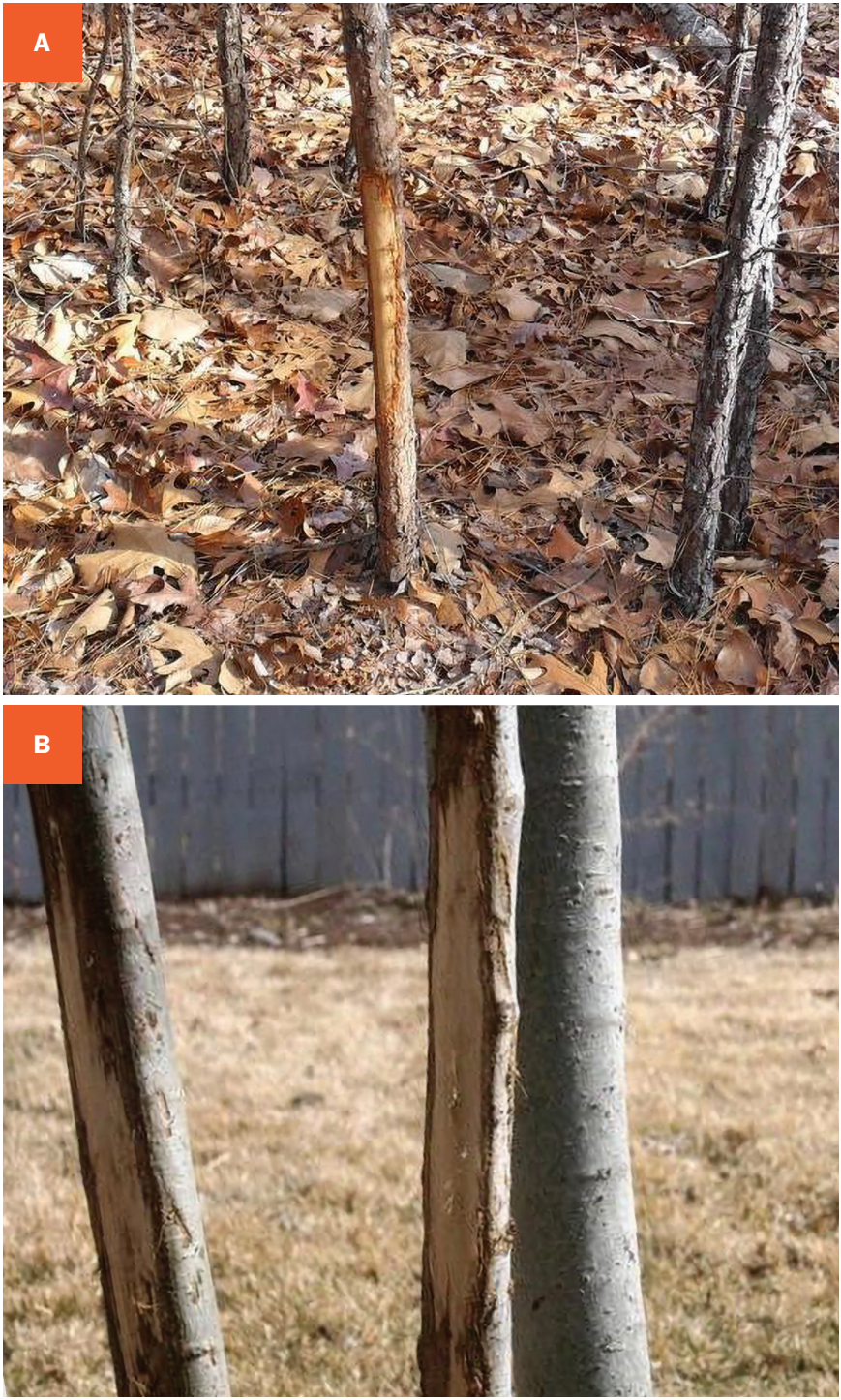
DAMAGE/SYMPTOMS Bark scraping and shredded bark are evidence of antler rubbing by deer. Bucks rub or scrape the velvet from their antlers on trees. Deer may also feed on trees. Mule deer and white-tailed deer lack upper incisors. Because of this, they leave no teeth marks. They often leave a jagged or torn surface on twigs or stems that they feed on.

OCCURRENCE In the fall and early winter, male deer will rub on trees to remove velvet and to mark trees. Deer will feed on trees throughout the year, but less in the summer due to abundant food sources.

SUSCEPTIBILITY/TOLERANCE Deer prefer to rub on immature trees with smooth bark and no limbs.

MANAGEMENT Install trunk guards/tree protectors to susceptible trees. Plant native trees and shrubs that are more tolerant of browsing or deer-resistant plants. Use fencing to exclude deer from certain areas. There are also repellents available to deter deer.

A Damage to trunk by deer rubbing. **B** Deer prefer smooth-barked trees, like aspen, for rubbing.


A
B

Drought Stress

DAMAGE/SYMPTOMS Drought stress is most apparent in areas of the tree crown that are in full sun. Chlorosis, leaf scorch, wilting, reduced growth, fewer/smaller leaves, and shorter growth between leaf buds are all symptoms of drought stress. Early leaf/needle drop (premature senescence) and lowered energy reserves for survival through winter are also issues. Drought-stressed trees have decreased resistance to pests, so they are more vulnerable to secondary attacks.

OCCURRENCE Newly planted trees are the most vulnerable to drought stress due to an underdeveloped root system. Drought stress occurs when the plant is unable to extract enough water from the soil to properly function. Under drought conditions, soil might bind available moisture, making it unavailable to the plant. For instance, clay soils can inhibit absorption.

SUSCEPTIBILITY/TOLERANCE Well-established trees are less likely to show symptoms of drought stress. Trees planted within three years or less are more likely to sustain permanent injuries due to drought. Trees native to Montana are more tolerant of drought conditions.

MANAGEMENT Water trees weekly in the fall until the ground freezes. This will reduce the chance of stress in the summer. Removing competing vegetation such as grass from beneath a tree's canopy will make more resources available to the tree and may reduce drought stress. Use three to four inches of mulch to the edge of the tree canopy to insulate the fine feeder roots from drying out. Water slowly and deeply rather than quickly and shallowly.

A Premature coloration of maple leaves due to drought. **B** Dogwood with damaged leaves from effects of drought. **C** A conifer exhibiting browning and premature casting of needles due to drought stress.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B


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Fasciation

DAMAGE/SYMPTOMS Fasciation is a symptom. It most often occurs in stems and causes them to take on a flattened appearance. The contorted tissue may have an elongated or ribbon-like appearance. Flowers with fasciation may have a bushy growth habit. Some affected plants are propagated intentionally due to their tendency towards fasciation.

OCCURRENCE Fasciation occurs in plants due to abnormal activity in the meristem or growing tip of the plant. It can be the result of hormonal or genetic factors. It can also be caused by pathogens (bacterial, fungal, or viral), insect damage, or animal damage. Abiotic issues, such as chemical exposure, mechanical injury and frost, can also cause fasciation.

SUSCEPTIBILITY/TOLERANCE All plants can exhibit fasciation. Trees in the *Prunus* or *Salix* genera and the Rosaceae family are examples of plants that display fasciation most often.

MANAGEMENT Affected parts can be pruned out. There is no treatment for fasciation.

A Lilac with a fasciated limb. **B** Some plants like *Veronicastrum sibericum* are propagated because of their fasciation.


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Frost Crack

DAMAGE/SYMPTOMS Frost cracks are vertical splits that occur in tree trunks and bark after severe, rapid temperature changes in the winter. Damage usually occurs on the south or southwest side of vulnerable trees because those sides experience the greatest fluctuation in temperature. Frost cracks can reopen and enlarge in subsequent winters and may extend to the center of the tree.

OCCURRENCE When temperatures are below 15 degrees, frost cracks may form due to the shrinking and expansion of wood in relation to water movement and ice formation. Young trees and smooth barked trees are more likely to sustain damage.

SUSCEPTIBILITY/TOLERANCE Maple, birch, poplar, apples, and ash are susceptible to frost cracks.

MANAGEMENT To avoid frost cracks in young trees, a trunk guard can be installed. These guards are usually white and reflect sunlight from vulnerable surfaces. They should be installed in the fall and removed in the spring. Leaving them on year-round can promote fungal and insect issues. If damage occurs, monitor trees for the development of decay. Reduce stress and encourage tree vigor through proper watering and pruning. Do not treat frost cracks with "wound paint", as these products do not reduce the chance of decay.

A Green ash often show frost crack damage. **B** Frost cracks generally appear on the south and southwest sides of trees.


A


B

Herbicide Injury–Glyphosate

DAMAGE/SYMPTOMS Leaves appear narrow and chlorotic. Branches may die back starting at the tip, and growth from buds below the dieback portion of the branch may be chlorotic and distorted with excessive sprouting called "witch's broom."

OCCURRENCE Glyphosate is commonly used around trees to control weeds. This practice is usually safe for trees since glyphosate is not generally absorbed by plant roots or mature bark. However, if glyphosate contacts aboveground growth such as leaves or root suckers, it can impact the tree. Glyphosate may also be absorbed through young bark or exposed roots.

SUSCEPTIBILITY/TOLERANCE Glyphosate is non-selective, meaning all types of plants are susceptible.

MANAGEMENT Monitor the tree to see if it recovers. Support tree health and limit further exposure to herbicides. To limit stress to the tree during recovery, do not prune or fertilize the tree for one growing season. Injury symptoms may occur for more than one year. To prevent glyphosate damage, be sure to protect all desired plants from contact with this herbicide.

A Glyphosate injury on deciduous tree.


A

Herbicide Injury–Synthetic Auxins

DAMAGE/SYMPTOMS Various growth abnormalities including twisting, cupping, and curling of leaves, stems, and twigs on broadleaf trees are common. Conifers can also show symptoms of needle and shoot distortion.

OCCURRENCE Synthetic auxin herbicides such as 2,4-D and dicamba are used to control broadleaf weeds in lawns and along roadsides. Drift of these herbicides occurs when spray particles move through the air during application or when they form a gaseous vapor due to volatilization after application.

SUSCEPTIBILITY/TOLERANCE Broadleaf trees and conifers are susceptible.

MANAGEMENT Wait and see if the tree recovers. Support tree health and limit further exposure to herbicides. Injury symptoms may occur for more than one year. To prevent damage from this type of herbicide, make sure to read and follow product labels. Avoid applying these herbicides under tree canopies. Also, avoid using these herbicides during windy weather, or when temperatures are forecast to be above 80 degrees.

A 2,4-D injury on grape. **B** 2,4-D injury to pine.


A


B

Leaf Chlorosis

DAMAGE/SYMPTOMS Leaf chlorosis generally progresses from light green earlier in the season to yellow later in the season. Leaf veins may remain bright green while the leaf tissue yellows. Advanced stages of chlorosis can cause reduced leaf size, browning of the leaf margins, subsequent tissue deterioration, and premature leaf drop.

OCCURRENCE Chlorosis can be caused by a single issue such as a nutrient deficiency, but more commonly it is due to multiple factors influencing the health of the plant. Drought, over watering, compacted soils, limited planting areas, and poorly drained soils can impact a plant's vulnerability to chlorosis. Soil pH can influence leaf chlorosis because it has a significant role in a plant's ability to uptake available nutrients. For example, some nutrients such as iron can be less available to plants as soil pH increases.

SUSCEPTIBILITY/TOLERANCE Certain trees are more prone to chlorosis such as apple, maple, and poplar. Trees and shrubs that are more tolerant of alkaline soils and less likely to show leaf chlorosis are linden, ash, boxelder, oak, elm, hawthorn, and honeylocust.

MANAGEMENT Planting trees that are tolerant of alkaline soils is important in managing chlorosis. Supplemental watering during drought conditions can reduce tree stress and the risk of chlorosis. Removing grass at the base of trees will reduce the competition for water. Mulching with two to three inches of compost to retain soil moisture will also reduce the risk of chlorosis.

A Browning of leaf margins in advanced stages of chlorosis. **B** Certain tree species, like maple, are more susceptible to chlorosis. **C** Light green leaf tissue along with darker veins can indicate chlorosis.


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Leaf Scorch

DAMAGE/SYMPTOMS Leaf scorch usually appears as brown necrotic areas on the margin of leaves which move from the leaf tip downward and from the margins inward. Scorch can cause leaves to turn dark brown to black and fall off prematurely.

OCCURRENCE Scorch is a physiological disorder. Adverse environmental conditions can result in leaf scorch. For instance, hot summer days will cause many trees, shrubs, flowers, and vegetables to develop dry, brown leaf margins. Windy conditions that reduce leaf moisture also contribute to leaf scorch and dehydration. Minimal soil moisture in the winter and spring will contribute to leaf scorch development.

SUSCEPTIBILITY/TOLERANCE Aspen, maple, ash, oak, linden, birch, and horse chestnut are most susceptible to leaf scorch. Scorch can affect a variety of plant species.

MANAGEMENT Leaf scorch is irreversible; however, proper water management may help the plant recover. To prevent scorch, water more deeply and less often to ensure that the water is deeply penetrating the soil, for deep root development. Mulching around the tree can also help conserve soil moisture, improving the tree's condition. Winter watering is another way to help prevent scorch.

A Brown necrotic areas on the margin of leaves. **B** Leaf scorch can cause leaves to turn brown and prematurely fall.


A


B

Seasonal Needle Drop

DAMAGE/SYMPTOMS Seasonal needle drop is the gradual yellowing or browning and eventual loss of older interior needles. Needles that drop due to age may have some spots and blemishes; however, they do not display typical symptoms of disease or insect damage.

OCCURRENCE Seasonal needle drop occurs in late summer to early fall. This casting of needles is triggered by weather and the time of year, and many evergreens are likely to show symptoms at the same time.

SUSCEPTIBILITY/TOLERANCE The amount of needle loss is dependent upon species, temporal factors, and environmental conditions. White pines are seriously affected. Third- and even second-year needles yellow and fall throughout the entire tree. Austrian and Scotch pines typically lose only fourth-year needles. Cedars often display browning of leaves and flagging of older branchlets. Eventually entire branchlets are shed. Spruce and fir generally maintain many years of growth. Seasonal needle drop is typically not obvious but can be visible on inner branches. Larch and tamarack trees lose all of their needles every fall.

MANAGEMENT Management for seasonal needle drop is not necessary. If the yellowing and needle drop is restricted to older needles and is not extreme, it is likely not a problem. Maintain tree health. Irrigating evergreens thoroughly before the ground freezes will help to minimize the possibility of winter injury through desiccation.

A Browning of older needles in a pine.


A

Transplant Shock

DAMAGE/SYMPTOMS Leaf scorch, wilting, reduced leaf size, and chlorosis can all be attributed to the pressures that occur during transplanting. Delayed growth is common after recent planting.

OCCURRENCE Compromised roots are the primary cause of transplant shock. Tree roots are frequently damaged because of the way they were packaged for sale. In addition to the symptoms listed above, plants that are under stress from transplant shock are also more vulnerable to disease and insect infestations.

SUSCEPTIBILITY/TOLERANCE Transplant shock is common in newly installed trees. Balled and burlapped trees may have sustained a significant reduction of root mass, due to the excavation process. Bare root trees and containerized trees can also exhibit transplant issues.

MANAGEMENT Woody ornamentals can take up to five years to establish themselves in a new location depending on the size of the tree planted. Smaller stock is less susceptible to transplant shock. Watering properly is essential when trees are establishing. Regular watering for the first year is crucial. Pruning of newly planted trees should be limited to those limbs that are diseased, damaged or dead. Excessive pruning of newly planted trees will increase stress.

A Watering is essential when trees are establishing. **B** Compromised roots are the primary cause of transplant shock. **C** Transplant shock is common in newly installed trees.


A


B


C

Voles

DAMAGE/SYMPTOMS Tiny marks from vole incisors can be seen on the bark of trees and shrubs. Bark damage is usually on the lower eight to ten inches of the trunk where it is protected by snow.

OCCURRENCE Vole damage to trees and shrubs primarily takes place in the fall and winter. During winter months and sometimes during drought, voles will move from surrounding uncultivated areas into landscaped yards and gardens to find food.

SUSCEPTIBILITY/TOLERANCE Voles primarily eat grasses but will eat a wide assortment of vegetation including bark during the winter months.

MANAGEMENT Habitat modification, such as removing ground covers, eliminating debris, and lawn mowing, are strategies to reduce vole numbers. Exclusion is another approach for limiting vole damage. Install hardware cloth at least six inches below the ground and extending at least 14 inches above ground. Protect seedlings or young trees with trunk guards or poly wrap. Repellents like capsaicin, the compound of chili peppers that makes them hot, are registered for voles in Montana. They can be sprayed on non-crop/feed plants, such as ornamental trees, shrubs, fruit bushes, and vines. Trapping is a tool for controlling voles in areas with a few acres or less. Unbaited mouse snap traps can be placed perpendicular to their paths with the trigger in their trail. Baited snap traps are also effective but should be protected by an overhead cover to prevent injury to non-target animals.

A Vole paths become more apparent as snow melts in the spring. **B** Bark removed from juniper due to vole feeding. **C** Vole damage to the base of a tree.


A


B


C

Woodpeckers and Sapsuckers

DAMAGE/SYMPTOMS Sapsuckers are a type of woodpecker that peck horizontal holes in limbs to create hollows to feed on sap. These holes fill with sap and the birds also feed on insects trapped in this sap. Other woodpeckers peck at wood searching for insects. Woodpeckers and sapsuckers both excavate roosting/nesting cavities in trees.

OCCURRENCE Most damage occurs during the breeding season, which occurs from February through June.

SUSCEPTIBILITY/TOLERANCE Woodpeckers most often attack trees that are already weakened by insects, disease, or fire, but also damage healthy trees.

MANAGEMENT Hardware cloth can be used to protect trees from woodpecker and sapsucker damage. Wrap branches and trunks loosely to avoid girdling as the tree grows. Devices hung in the tree that flash or reflect light when moved by the wind may frighten the birds. Tactile repellents like polybutene-based gels are registered for repelling birds from surfaces.

A Close-up photo of a sapsucker. **B** A red-naped sapsucker perched on a limb with previous pecking damage. **C** Woodpeckers and sapsuckers excavate cavities in dead trees for nesting. **D** Sapsucker damage on a birch limb.


A


B


C


D