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YELLOWING, DIEBACK, AND DEATH OF NEEDED EVERGREENS

Every year, many needled evergreens develop symptoms of needle yellowing and browning, tip dieback and needle drop, poor vigor, and even death. Pine, yew, hemlock, and juniper are among those commonly affected. Although these symptoms can sometimes be attributed to fungal pathogens or other disease agents, in *many* cases the symptoms are associated with environmental factors. These factors act singly or in combination and result in plant stress and damage. The most common causes are wet soil, drought or dry soil, winter damage, and low-light or shading.

WET SOIL:

Roots in flooded or water-logged soils are damaged and die from oxygen deficiency. Feeder roots are particularly sensitive and are frequently the first ones damaged. When roots are damaged, they are unable to provide water to the top of the plant. Damage can be sudden or gradual, depending upon the plant and the flooding conditions. This can occur on plants in obviously wet sites and on those in marginal sites or soils such as along city streets or in areas where high clay content in the soil impedes drainage. Most trees cannot grow in water-logged soils for very long and can die if flooded for only a few days during the growing season. Visible symptoms are **often** not evident until considerably after the damage has occurred, especially when the root damage is gradual. Seedlings and new transplants are more sensitive than established plants and gymnosperms (needled evergreens) are generally considered more sensitive than angiosperms. Top symptoms may not develop until water demands increase during the hot summer months. Other evergreens appear to lose vigor and slowly decline over a period of years. This can occur on trees that have been otherwise "healthy" for 10-15 years but are growing in poor sites or heavy soils. Dormant plants generally appear to tolerate flooding longer than those in active growth. In addition to direct root damage, trees in flooded soils are predisposed to secondary root rot pathogens and other opportunistic pests.

Strategies for minimizing wet soil problems include: 1) selection of an appropriate site and proper planting practices; 2) cultural practices that maintain plant vigor and stimulate growth; 3) selection of appropriate species for soil and site conditions: water-tolerant (larch) vs. water-intolerant (spruces, hemlocks, yews); and 4) pruning dead or dying tissues to minimize secondary invaders.

DROUGHT OR DRY SOIL:

Drought or dry soil conditions resulting in feeder root damage and death contribute to the development of water deficits in plants. Symptoms are manifest in different ways but are often not evident until some time after the event has occurred- **even as much as a year later!** Effects are particularly severe on seedlings or new transplants because their roots occupy the uppermost layers of soil where the most rapid drying occurs and are compounded by the loss of feeder roots during the transplant process. It often takes woody transplants two years to become completely established in a new site. Established trees are also affected, especially in marginal sites such as those in pockets of soil on ledges or in sandy soils or those that had been improperly planted. Native plants are usually adapted to regional and seasonal fluctuations in the amount of precipitation and only unusually severe drought causes problems. In addition to direct root damage, drought predisposes the plant to secondary invaders.

Drought stress can be minimize by: 1) watering in periods of low soil moisture: trees and shrubs require approximately one inch of water per week, best if applied at one time as a slow, deep soaking; 2) selecting an appropriate site and following good planting practices; 3) selecting native plants or matching plant species to site conditions: drought-sensitive (arbor vitae) vs drought-tolerant (some junipers); 4) mulching to maintain soil moisture; and 5) pruning any dead or weakened tissues to avoid secondary problems.

WINTER INJURY:

Winter injury or drying results from factors which contribute to a water deficit in a plant. Injury commonly occurs on plants growing in wind-swept or in sheltered locations. Water evaporates from the needles on windy or warm sunny days during winter or early spring. This water is not replaced since the roots are not able to obtain sufficient water from cold soil nor can they absorb any water from frozen soil. Damage often appears on one side or on one branch, usually the side facing prevailing winds and one-third to one-half of each needle is often browned. Visible symptoms often do not appear until the following spring or summer. Winter drying also weakens a plant making it more susceptible to opportunistic pests.

While there is no cure for this disorder, steps to help minimize the effects of winter injury include: 1) select an appropriate site for planting and maintain plant vigor by good cultural practices; 2) deep water plants before the ground freezes in the fall and mulch around the base of the plant to provide and maintain sufficient moisture in the root zone; 3) fertilize at the proper time and rate- avoid late summer and early fall fertilization; 4) prune dead or weakened branches prone to secondary problems; and 5) construct physical barriers to minimize drying winds.

LOW-LIGHT NEEDLE DROP:

Shading or low-light conditions may result in a slow decline of some evergreens, especially established, somewhat overgrown arborvitae, yew, hemlock, and juniper. Initial symptoms appear in the center of the plant where light is most limited and needles yellow and drop. Branch dieback occurs and the plant loses vigor. This problem can be minimize by following a regular pruning and general care program throughout the life of the plant.

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