

## THE EXTENSION LINE

Bob Mugaas of the University of Minnesota Extension Service is a regular contributor to Hole Hotes. As Hennepin County Extension Agent, Mr. Mugaas compiles various articles related to the golf field for our information. Bob is an excellent source for answers to many questions on horticultural problems. He may be reached at 542-1420. Written requests should be sent to:

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This month's articles cover Tree Mulch, Tree Stress, and Verticillium Wilt.

### MULCHING TREES AND SHRUBS - ADVANTAGES & DISADVANTAGES

by **Thomas L. Green**  
MORTON ARBORETUM

Mulch has been defined as "any material used at the sur-

face of soil primarily to prevent loss of water by evaporation, to keep down weeds, to dampen temperature fluctuations or to promote soil productivity." Organic mulches include a full range of organic and inorganic materials. Organic mulches include leaves, wood chips, bark, sawdust, perennial groundcovers, peatmoss, moss, lawn clippings, hay, straw, nut shells, grain hulls, corn cobs, mushroom compost, manure, conifer needles, newspaper, sludge, and numerous other organic by-products. Inorganic mulches include polyethylene, river stone, crushed rock, volcanic rock, crushed bricks, ground tires, aluminum foil, asphalt, synthetic fabrics, and numerous other materials.

When mulches are used correctly they can greatly enhance plant growth and make the landscape more attractive. Incorrectly used, mulches can be harmful to plant health.

#### Part I: ADVANTAGES

Plants grow best when conditions are favorable for root growth. Mulches can enhance root growth by creating a favorable microclimate in the rhizosphere and improving the physical, chemical, and biological properties of the soil.

**Favorable Microclimate.** Few people water established trees and shrubs sufficiently during dry periods. Mulch --

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over a properly prepared surface - improves water infiltration and retention during the hot dry summer weather and reduces the need for irrigation. Soil moisture vapor can condense on the cooler mulch at night and return moisture to the soil. In the spring or during rainy periods, when the upper soil layers tend to be saturated, some mulches act like sponges and hold water. Unless the mulch texture is too fine, roots can grow through the upper mulch layers and receive adequate amounts of oxygen and moisture.

Soil temperature moderation is important. Mulch can keep summer soil temperatures lower and winter soil temperatures higher. Turf and bare ground temperatures in the summer often exceed the limits past which roots of trees and shrubs can live. Without snow in the winter, turf and bare ground may freeze, and when soil temperatures drop below 10 degrees F roots begin to die. Summer heat and drought can kill tree and shrub roots that grew in late spring. Then they'll regrow them in the fall, only to lose them again to winter cold. This abnormal root loss requires great expenditures of energy for regrowth and winter loss may affect mineral absorption in early spring during foliation. By minimizing temperature fluctuations, mulch helps more roots survive to support top growth.

**Soil Property Improvement.** Physical Properties. Most organic mulches are light and porous. When incorporated, they can improve the aeration of heavy (clay)

soils and the water-holding capacity of light (sand) soils. Organic mulch can increase the size of soil aggregates in the surface soil and total porosity. Improved aeration favors root growth and other biological activity which, in turn, enhances soil structure. Mulch helps prevent erosion and compaction. It also prevents cracking of clay soil. Cracks increase water loss and break roots.

**Chemical Properties.** As organic mulches decompose they are converted to humus. During this change, much of the nitrogen, soil phosphate, sulfate, and other inorganic elements become part of the humus fraction of the soil. With the aid of various microorganisms, the minerals of humus are made available to the roots. Also, by lowering surface soil evaporation, mulches reduce the soluble salt content which can build to toxic concentrations during periods of low rainfall.

**Biological Properties.** Mulch provides a favorable environment for the growth and development of many types of soil fauna and flora. The stimulation of aerobic organisms will improve soil granulation, stability, and water infiltration. Mulch makes a favorable environment for earthworms. Research has shown that composted hardwood bark mulches can reduce root diseases: the increased biological activity is helpful in favoring decomposing organisms and reducing pathogens. Mulches reduce weed competition by inhibiting germination.

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Through the millennia, organic plant material, mostly leaves, has provided the natural mineral recycling for plants. The establishment of a more natural environment for the root system will allow for optimum root growth, which in turn allows for better top growth. A healthy plant is more resistant to disease and insect attack.

## PART II: DISADVANTAGES

Organic mulches are generally better than inorganic mulches. But even organic mulches can be detrimental to plant health when used incorrectly.

**Unfavorable Microclimate.** Excess moisture may occur with fine textured mulches, organic and inorganic. Sawdust, fine peatmoss, and grass clippings retain moisture and should not be used as a single mulching material. Also, mulches used over poorly drained soils can result in nitrogen loss (denitrification).

Moisture and oxygen deficiencies are major problems under plastic mulches. Plastic mulch is usually not recommended. If used, it must have holes to allow for water and oxygen infiltration.

Unfavorable temperatures can occur with mulch. Mulches that reflect light and heat can radiate enough heat to injure plants. Dark-colored rock can absorb solar

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radiation during the day and radiate heat in the evening. These mulches can stress plants and increase air conditioning costs.

Mulch insulates the soil from surface temperatures. After becoming frozen in the winter, mulch is slow to warm in the spring, which slows root growth and function. It is better to apply organic mulch after a hard frost in the fall or after frost in the spring. The insulating effect of mulch can also delay hardiness development. It should not be placed in contact with trunk surfaces; this will allow the trunk base to acclimate for winter. This may be very important in grafted and budded plants with graft junctions near the ground line. Under certain conditions, as frost occurs, the temperatures just above a mulch may be a few degrees lower than the temperatures above bare soil. This sometimes causes winter injury and bark splitting.

**Nutritional Imbalance.** A nitrogen deficiency may develop when fresh mulch is used. Mulch should be composted and applied to the surface, but not incorporated. If using fresh mulch, add a little nitrogen fertilizer.

Calcareous materials (e.g. marble, limestone, volcanic rock) should not be used where soil pH is above 6.5. Acidic rainfall dissolves this material, causing the soil pH to raise and makes micronutrients (e.g. iron, manganese, zinc, copper) less available to the plant. This may result

in deficiency-related diseases.

**Toxicity.** Toxic substances can be produced when fresh organic mulch is improperly composted. Composted mulch has an earthy odor; avoid using any mulch with a sour or foul odor. Fresh mulch, especially wood chips, becomes covered with hydrophobic fungal spores. The water is repelled and the chips do not wet; therefore, they do not decompose. A few drops of dish soap or wetting agent will correct with problem.

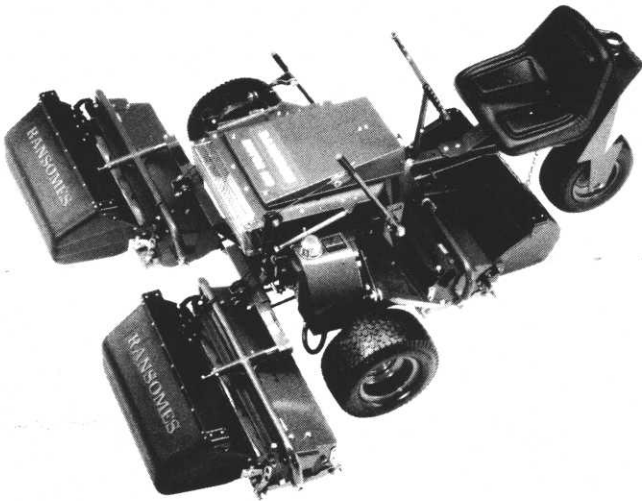
In 1981 an experiment was begun to study the effects of turf and mulch on 40 newly planted, bare root, 2-2 1/2 inch diameter "Green Mountain" sugar maples. Mulched trees received a basal layer of two inches of composted leaves topped with two inches of wood chips, mostly fresh, applied on eight-foot diameters. Turf trees had turf to the trunk. The mulch has reduced scorch, increased growth and color, and increased survival compared to the trees surrounded by turf. Two inches of fresh wood chips are being added every 203 years.

## EARLY SUMMER TREE NOTES

by Bert T. Swanson  
MINNESOTA EXTENSION SERVICE

The combination of last year's drought stress and this

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year's rains has created all kinds of biological activity or lack thereof.

Drought stressed sugar maples were extremely slow and limited in breaking bud on the upper one-third to one-half of the tree. These trees should be watered and fertilized thoroughly to facilitate vegetative growth. By midsummer it should be apparent what is dead and what will continue growing. The dead wood should be removed.

Some drought stress, plus the late hard freeze in Mid April, was significantly injurious to the new growth of many oaks and to some extent growth on green ash. These were set back but have since pushed new buds and appear to be progressing satisfactorily. However, when a second flush is required, it greatly depletes the plant's carbohydrate reserves and decreases its tolerance of any subsequent injuries or diseases.

The birch leafminer, canker worms and the European pine sawfly larvae are certainly taking their toll on trees and shrubs. At this time the feeding period of all three of these insects is about complete so actual treatment of the insect is to no avail. However, some insects such as the birch leaf miner and others will have a second generation hatch about late June. Therefore, it is useful to spray plants with a systemic insecticide according to the label.

This will allow for the building of some insecticide within

the plant as well as provide some contact upon arrival of the pest. Two applications may be necessary. The European pine sawfly larvae were particularly devastating on mugo pine. It would take approximately two days for all the old needles on a 3-foot mugo pine to be completely gone. Aphids were already becoming prevalent by June 10 and if the rain continues, be observant for fungal diseases that will be much more aggressive this year than last year.

Treat with insecticides and fungicides according to the label where potential economic injury exists. However, also use preventive treatments by providing proper cultural practices including watering, fertilizing, aeration of the soil for trees in heavy clay, pruning or anything that enhances the fiber and overall growing conditions for the plant.

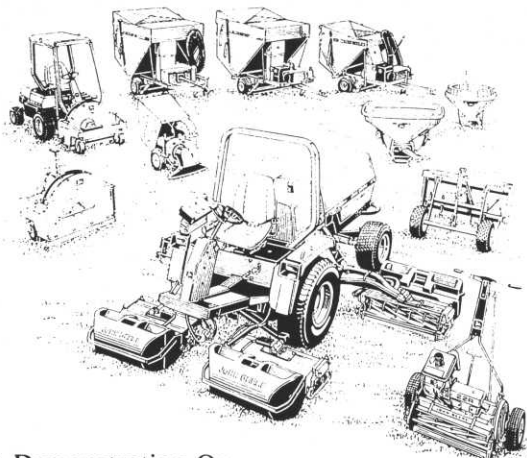
## VERTICILLIUM WILT

### TROUBLING TO SHADE TREES

by **Cynthia Ash & Ward C. Stienstra**  
**MINNESOTA EXTENSION SERVICE**

Ventricillium wilt is a fungal disease which interferes with the water conducting system in shade trees. The fungus

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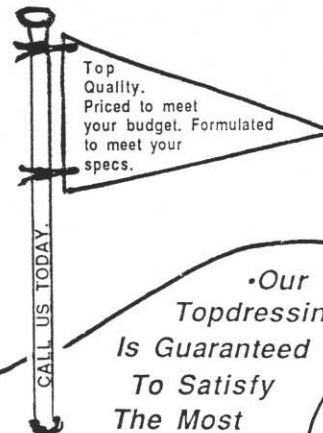
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is soil-borne and enters the plant through wounds in the roots. A natural consequence of having a fungus clogging up the water-conducting system is wilting followed by yellowing and dieback. Trees and shrubs showing partial wilt during the growing season may wilt further and die the following year. Others may recover and not wilt in succeeding years. The pattern depends on the extent of root infection and the severity of other stresses. When most of the roots are infected, the tree may wilt and die before the end of the first summer.

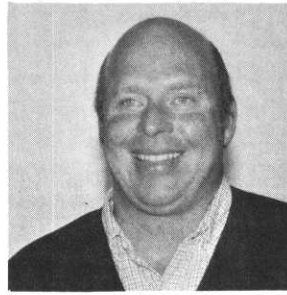
Trees showing general and severe wilt cannot be saved and should be replaced with a nonsusceptible species. Trees with some symptoms may be saved or their life prolonged for some time if they are watered, fertilized with nitrogen, and pruned of dead and wilting branches. Pruning does not eliminate the fungus from the tree, but removes weakened limbs, which may be infected by other fungi.

Trees and shrubs susceptible to Verticillium wilt

- Ash - black, blue, European, green, and white
- Azalea
- Barberry - Japanese
- Boxwood - Korean
- Catalpa
- Cherry
- Coffeetree - Kentucky
- Dogwood
- Elm - American, Chinese, and slippery
- Linden - American and littleleaf
- Locust - black
- Maple - Amur, Norway and varieties, red, silver and sugar
- Oak - pin and red
- Pagoda tree
- Plum
- Rose
- Russian Olive
- Smoke tree
- Sumac - fragrant, smooth, and staghorn
- Viburnum species

The following list of trees and shrubs might serve well as replacements for any trees the fungus kills:

- |             |                     |
|-------------|---------------------|
| Arborvitae  | Juniper             |
| Birch       | Larch               |
| Fir         | Mountainash         |
| Ginkgo      | Oak - white and bur |
| Hackberry   | Pine                |
| Hawthorn    | Poplar              |
| Hickory     | Serviceberry        |
| Honeylocust | Spruce              |
| Hophornbeam | Willow              |



## OFF THE TOP OF MY HEAD

GREG HUBBARD, CGCS  
Editorial Chairman

### DEVELOP AN IRRIGATION PHILOSOPHY - HOLD BACK THE WATER!

As last summer's drought taught us, water availability for golf course use has become a hot issue. As temperatures rose and grass plants withered, water resources suddenly dwindled and watering bans were mandated throughout the state. Where demand did not meet the need, bushes and trees, turfgrass, and mental outlooks suffered. Though many courses have now recovered from the short term drought effects, the long term problem of allocating water supplies fairly continues to grow. Suitable water supplies are becoming more scarce and competition for these limited supplies is growing. The lesson of 1988 is that the economics of water use, like that of the oil crisis in the 70's, will demand that we use this precious resource more sparingly and efficiently in the future. As demand outstrips supply, we will be forced to change our water use philosophy. No longer will water be in unlimited supply, readily available for our demands. As ground water reserves and surface water reservoirs become depleted through increased domestic and commercial use, and as pumping costs rise, more pressure will be put on golf courses to reduce their consumption. We will find ourselves at the end of the water main, last in line for this precious commodity. Now is the time to prepare for this eventuality. Now is the time to develop new water management strategies. **HOLD BACK THE WATER!**

The first step to developing new water management strategies begins with personal commitment, integrating old practices with new ideas. Rather than reacting to short term water supply problems through new wells and improved pumping systems, a long term comprehensive program on both a political and personal level is necessary. Politically, we should attempt to raise our category of water use prioritization to a higher level. Rather than being on the end of the water pipeline, we must actively influence legislative bodies, emphasizing our importance in the local economy over that of our country club image. We must stress our role in fulfilling recreational needs for our ever aging population and for those with more leisure time opportunities. We can also emphasize our importance in the environment, as wild life preserves, air conditioners, and water reservoirs. On a personal level, we must renew our devotion to the basics of turf management. Through the application of proper water conserva-