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## **CURRENT DISEASES IN THE LANDSCAPE**

Every year herbaceous and woody ornamentals in the Connecticut landscape develop many types of health problems. These problems can be caused by biotic or living organisms or by abiotic or non-living agents. Regardless of the nature of the problem, knowing what happened the previous year is helpful since it allows one to anticipate potential problems for the upcoming season. In the case of biotic problems, it is helpful to know the amounts and sources of overwintering inoculum. However, even armed with this information, weather still plays a critical role in determining both the incidence and severity of disease each year. Temperature, rainfall, and relative humidity can influence the development of the disease agent, the host plant, or both. As a consequence, disease management programs must be adjusted every year to take the prevailing environmental conditions into account.

### **I. COMMON PLANT HEALTH PROBLEMS:**

The two main categories of agents capable of causing plant health problems are abiotic and biotic, non-living and living factors, respectively. In natural settings, it is not uncommon for plants to be affected by both abiotic and biotic problems and it is often difficult to determine which came first. However, in many cases, plants which are initially stressed by abiotic factors will be weakened and therefore predisposed to biotic problems. For example, rhododendrons whose roots have been weakened by drought stress are more susceptible to the fungal root rot caused by *Armillaria* than their healthy counterparts.

**Biotic agents**, unlike abiotic agents, are able to spread from plant to plant. This is an important attribute since the number of diseased plants can increase over time as a direct result of the growth, multiplication, and movement of the causal agent. These agents include fungi, bacteria, phytoplasmas, viruses, and nematodes.

**Abiotic agents** can be categorized as being cultural or environmental. These types of agents cannot spread from plant to plant. Cultural agents are quite diverse and include planting practices, site and soil attributes, plant hardiness, incorrect or improperly timed pruning, incorrect mulching, and fertilizing practices. Environmental agents are also diverse and include winter injury, drought, excess water, misapplied pesticides, and de-icing salts. These agents are often overlooked as probable causes of plant health problems because they are very difficult to identify since they cannot be cultured or viewed microscopically. As a consequence, the ability to pinpoint the causal factor requires close review and examination of the cultural and environmental history of the plant in question.

## II. STEPS FOR DISEASE PREVENTION AND MANAGEMENT:

Regardless of the cause of the plant health problem that you might encounter, the steps for disease prevention and management are essentially the same and can be divided into three parts as follows-

### **A. Diagnosis-**

The first step in disease management is knowing what you're trying to control. Is it a disease caused by a fungus, the site, the weather, or your cultural care? Accurate diagnosis is important since it determines two things, the need for control and the type of control;

### **B. Assessing the Severity of the Problem-**

This step follows the first step with more detailed information with regard to the severity of the problem. It provides information on:

1. Nature of pest problem-  
type of disease, i.e., root vs. foliar, systemic vs. localized
2. Level of disease-  
loss threshold, i.e., amount of disease, number of years with problem, how many species are affected, number of plants affected

### **C. Management Options-**

A good program for managing plant diseases in the landscape incorporates many different strategies including culture, sanitation, resistance, biological, and chemical methods. However, in most cases, **prevention is the best strategy!**

#### **1. CULTURE:**

This includes cultural methods that modify the plant's growing conditions;

**a. Maintaining plant vigor-** maintaining optimum plant vigor by proper site selection, proper watering and fertilizing; avoiding mechanical injuries and soil compaction; appropriately timed pruning and transplanting, adequate spacing between plants, improving tilth and pH of the soil;

**b. Rotating crops-** this involves the practice of NOT planting members of the same plant family in the same location or part of a garden; in many cases, the rotation period is 3-4 years although 10 years is necessary in some situations;

**c. Interplanting (Companion planting)-** this involves the practice of placing plants in the garden bed according to the ways in which they interact or affect one another;

**d. Mulching-** this involves the use of mulches to minimize the spread of disease; helps with soil temperature moderation, soil moisture retention, and weed control;

**e. Controlling weeds-** this involves the practice of minimizing problems by eliminating weeds as reservoir hosts and by eliminating competition for available nutrients and soil moisture;

#### **2. SANITATION:**

This involves the use of vigorous, healthy, disease-free seeds, bulbs, cuttings or transplants; pruning of affected plant parts; raking and removing affected plant parts such as fallen leaves; using clean tools and equipment such as pruning shears, flats, pots, and spades; these can be disinfested with compounds such as

10% household bleach (1 part bleach : 9 parts water), 70% alcohol, or one of the commercially available compounds such as Greenshield<sup>®</sup> or Physan 20<sup>®</sup>;

### **3. RESISTANCE:**

This involves the use of resistant/tolerant cultivars; plants with genetic resistance to specific diseases; lists of cultivars with specific types of resistance are available;

### **4. BIOLOGICAL:**

This involves the use of living agents which are used to control specific pathogens which are also living organisms; the control agents can be antagonists (e.g., they secrete compounds or their by-products alter the environment and make it unfavorable for the growth of the pathogen) or competitors (e.g., they occupy the same niche or site or compete for the same food source) of the causal agent; examples include *Ampelomyces quisqualis* and *Trichoderma harzianum*.

### **5. CHEMICAL:**

This involves the use of pesticides for control of specific diseases on specific hosts; proper selection and timing of the pesticide applications are critical for control;

#### ***Categories of Pesticides:***

- **“Biorational” pesticides:** these pesticides are defined as products that are considered to be environmentally friendly because they have minimal harmful effects on non-target organisms and the environment; they are frequently more “user friendly” than traditional pesticides; examples include neem oil, insecticidal soap, horticultural oil, and potassium bicarbonate.
- **Biological pesticides:** these pesticides are living agents that are also called biological control agents.
- **“Chemical” pesticides:** these are considered “traditional” pesticides with traditional modes of action; examples include strobilurins, sterol inhibitors, benzimidazoles, coppers, and sulfurs.

## **III. COMMON ABIOTIC PROBLEMS:**

### **A. Winter Injury-**

#### ***1. Symptoms:***

dieback, foliar browning, sunscald and bark cracking or splitting; failure to leaf-out with normal foliage; sudden collapse and plant death in late spring or early summer;

#### ***2. Causal Factors:***

late spring frosts (after growth has started), cool summer followed by a warm fall and drop in temperature, excessive or late season nitrogen fertilization, dry soil or root injury, extremely low temperatures; frost cracking, excessive temperature fluctuations and drying winds, lack of snowcover;

#### ***3. Commonly Affected Plants:***

wide range of plants including broadleaved evergreens (rhododendron and mountain laurel), narrowleaved evergreens (arborvitae, yew, juniper, pine, and hemlock), deciduous trees and shrubs (weeping cherry, rose), many perennials, and ground covers (pachysandra and ivy);

#### ***4. Management:***

- a. select appropriate site for planting;
- b. have sufficient moisture in root zone before soil freezes;
- c. avoid late summer and early fall fertilization;
- d. mulch to increase moisture retention in winter;
- e. prune out dead branches or twigs in spring and fertilize to stimulate new growth;
- f. physical protection (i.e. burlap, shredded leaves) or applications of anti-transpirants or anti-desiccants;

## **B. Drought-**

### *1. Symptoms:*

loss of turgor in needles or leaves, drooping, wilting, yellowing, premature leaf or needle drop, dieback, poor growth, stunting, plant death; predisposes plant to secondary problems and cultural injuries; in woody ornamentals, symptoms often not evident in woody ornamentals until 1-2 years after the drought occurs;

### *2. Causal Factors:*

soil water becomes deficient and results in feeder root damage and death; plant unable to take up water;

### *3. Commonly Affected Plants:*

most perennials and annuals; broad range of deciduous and evergreen trees and shrubs; effects are particularly severe on seedlings or recent transplants but established plants are also affected; especially affected this year were maple, ash, hemlock, juniper, dogwood, and rhododendron;

### *4. Management:*

- a. water in periods of low soil moisture;
- b. select appropriate site and use proper planting practices;
- c. select native plants adapted to local seasonal and annual variations in the water supply; drought sensitive (e.g., dogwood, many oaks, arborvitae, many *Viburnum*) vs drought tolerant species (e.g., most pines, many *Prunus*, eastern larch, some junipers);
- d. prune out dead branches or twigs of woody ornamentals in spring;
- e. mulch to conserve and maintain soil moisture;

## **C. Excess Water-**

### *1. Symptoms:*

highly variable, including epinasty (downward bending of petioles), stem swelling, chlorosis, edema, reduced and stunted growth, twig dieback, wilting, leaf drop, root and plant death;

### *2. Causal Factors:*

root damage in flooded or waterlogged soils associated with oxygen deficiency; damaged fibrous and feeder roots die, decay, and plants are unable to take up water; predisposed plants are subject to secondary invaders and opportunistic pests;

### *3. Commonly Affected Plants:*

many perennials and annuals; seedlings and new transplants are more sensitive than established ones; dormant plants tolerate flooding longer than those in active growth; angiosperms are generally thought to be more tolerant than gymnosperms; particularly affected are yews, hemlocks, maples, and rhododendrons;

4. *Management:*

- a. avoid plant stress by appropriate site selection and proper planting practices;
- b. maintain vigor by fertilization to stimulate good growth;
- c. select appropriate species for site and soil conditions, water tolerant species (e.g., red maple, eastern larch, forsythia, green ash) vs water intolerant species (e.g., gray and paper birch, crabapple, dogwood, eastern hemlock);
- d. prune dead or dying tissues to minimize problems from secondary invaders;

**D. De-icing Salts-**

1. *Symptoms:*

vary with concentration and length of exposure; foliar browning, tip necrosis, marginal scorch, leaf/needle drop, tip/branch dieback, premature fall coloration (deciduous species), death of vegetative and flower buds, and outright tree death;

2. *Causal Factors:*

de-icing salts damage woody species through direct foliar contact (“spray zone”) and through chemical soil modification (soil absorption); the two most commonly applied de-icing salts are sodium chloride (rock salt) and calcium chloride; sodium chloride is less expensive and easier to handle than calcium chloride but it is also more damaging to vegetation;  
*on foliage*-- burning by direct contact of salt solutions with foliage  
*in soil*-- chloride ions in soil are transported to growing tips and leaves where they accumulate to toxic levels; sodium ions also compete with other ions in the soil and result in selective uptake; when this occurs, plants may develop symptoms of potassium and phosphorus deficiency;

3. *Commonly Affected Plants:*

species vary in their tolerance to salt exposure;  
*salt-tolerant* (autumn olive, honeylocust, Japanese black pine, yew, white oak);  
*salt-sensitive* (winged euonymus, viburnum, sugar maple, little-leaf linden, sycamore, eastern white pine, balsam fir);

4. *Management:*

- a. prevention is the best strategy;
- b. salt can be washed off the foliage or leached from soil with water; this should be done as soon after exposure as possible;
- c. in certain circumstances, gypsum applications can be helpful (50 lb./100 sq. ft. incorporated into the top 6 inches of soil at the drip line);
- d. where salt is a chronic problem, select salt-tolerant species;

**E. Incorrect Mulching-**

1. *Symptoms:*

non-specific symptoms include general decline, dieback, loss of vigor, stunting, and sudden collapse;

2. *Causal Factors:*

*Direct effects:* excessive (too thick) applications result in smothering or asphyxiation of roots due to limited oxygen; overmulching also limits the

ability of water to penetrate through the thick layer of mulch down into the root zone where it would be used by the roots;

*Indirect effects:* when mulches are placed right next to base of plant they hold moisture and can result in crown and root rots; additionally, mulch placed directly next to base of plants encourages vole activity and can result in gnawing damage;

3. *Commonly Affected Plants:*

any herbaceous or woody plant

4. *Management:*

a. apply the mulch at the proper thickness for the particle size of the mulch; example: fine shredded bark, 1-2 inches, coarse shredded bark, 2-3 inches, large bark nuggets, 4-6 inches;

b. have a mulch-free area around the base of the plant; 2-4 inches for herbaceous plants, 6-24 inches for woody plants;

## IV. COMMON BIOTIC PROBLEMS:

### A. Foliage Diseases

These comprise the most common of all plant diseases that we encounter in the landscape. In most cases they are considered to be more aesthetic than life threatening problems although they can result in significant premature leaf drop.

#### i. Leaf Spots

1. *Symptoms:*

most prevalent plant diseases; leaf spots appear as dead areas scattered over the leaf surface; the size, color, and shape can vary; usually have definite margins; can result in substantial premature defoliation;

2. *Causal Agents:*

wide range of fungi and some bacteria including *Septoria*, *Colletotrichum*, *Alternaria*; most require water on the leaf surface for infection to occur;

3. *Commonly Affected Plants:*

broad range of deciduous and broadleaved evergreen trees and shrubs, ground covers, and herbaceous plants;

4. *Management Strategies:*

see discussion at end of section on foliage diseases;

5. *Examples:*

Scab of Crabapple

Tar Spot of Maple

Cercospora Leaf Spots of Mountain Laurel

Black Spot of Rose

#### ii. Anthracnoses-

1. *Symptoms:*

necrotic areas are often V-shaped and defined by the veins; can appear as blotchy dead areas or as discrete leaf spots; severe infections result in twig and branch dieback; significant defoliation can occur; most serious during wet, cool springs;

2. *Causal Agents:*

several species of fungi including *Discula*, *Apiognomonina*, *Kabatiella*;

3. *Commonly Affected Plants:*  
many hosts, esp. prevalent on woody ornamentals;
4. *Management Strategies:*  
see discussion at end of section on foliage diseases;
5. *Examples:*  
Anthracnose of Sycamore, Maple, Dogwood, Lupine, and Heuchera

### iii. Needlecasts

1. *Symptoms:*  
characterized by premature needle drop, browning, chlorosis; often associated with branch and twig dieback; defoliation can be significant;
2. *Causal Agents:*  
numerous fungi including *Rhabdocline*, *Rhizosphaera*;
3. *Commonly Affected Plants:*  
many species of conifers;
4. *Management Strategies:*  
see discussion at end of section on foliage diseases;
5. *Examples:*  
Rhabdocline Needlecast of Douglas Fir  
Rhizosphaera Needlecast of Spruce

### iv. Powdery Mildews-

1. *Symptoms:*  
characterized as white, powdery growth, usually first evident on the upper surface of the leaf; symptoms can vary with each host and can result in minimal to extensive pre-mature browning and defoliation; usually develops mid- to late in the growing season;
2. *Causal Agents:*  
many species of fungi including *Erysiphe*, *Uncinula*, *Microsphaera*, *Phyllactinia*; these fungi do not require free water on leaf surfaces in order to infect!
3. *Commonly Affected Plants:*  
many herbaceous and woody hosts;
4. *Management Strategies:*  
see discussion at end of section on foliage diseases;
5. *Examples:*  
Powdery Mildew of Dogwood, Rose, Rhododendron, Zinnia, Phlox, Lupine, and Monarda

### v. Downy Mildews-

1. *Symptoms:*  
downy mildews can be troublesome in the landscape and are often misdiagnosed or overlooked because of the symptoms that they produce; pale green or yellow areas appear on the upper surface of leaves during the early stages of infection; diagnostic symptoms gradually develop on the undersurface as the fungus grows out of the infected leaf and appears as a fuzzy, white to gray-purple growth; these symptoms often go unnoticed until the infection is severe and heavily infected leaves turn brown and shrivel, often in a very short period of time;
2. *Causal Agents:*  
several genera of fungi including *Peronospora*, *Plasmopara*;

3. *Commonly Affected Plants:*  
many herbaceous ornamentals;
4. *Management Strategies:*  
see discussion at end of section on foliage diseases;
5. *Examples:*  
Downy Mildew of New England Aster, Veronica, and Coreopsis

#### vi. Rusts-

1. *Symptoms:*  
brightly colored raised blisters or pustules develop on leaves; these break open to reveal the orange to rusty brown spores for which these diseases are named; on evergreens, symptoms can also develop as galls or swellings on twigs and branches;
2. *Causal Agents:*  
numerous genera of fungi including *Gymnosporangium*, *Puccinia*;
3. *Commonly Affected Plants:*  
many herbaceous and woody ornamentals; some of the rusts require more than one host to complete their life cycle;
4. *Management Strategies*  
see discussion at end of section on foliage diseases;
5. *Examples:*  
Cedar-Apple Rust  
Hawthorn Rust  
Hollyhock Rust  
Viola Rust

#### Management Strategies for Foliage Diseases:

- a. maintain tree or plant vigor by following sound cultural practices;
- b. rake and remove symptomatic fallen leaves or plant debris in autumn;
- c. prune out dead branches or twigs in spring;
- d. use resistant cultivars when available;
- e. avoid close spacing to allow for good air circulation;
- f. avoid overhead irrigation;
- g. most foliage diseases are generally not serious enough to warrant chemical control; however, there are exceptions with regard to the value of the plant or tree, the specific host and type of foliar disease involved, the nature of the host-associated damage, and the timing of defoliation; most available pesticides are protectants and must be applied to developing foliage **before** symptoms appear; the number of sprays required for control will vary with weather conditions;

#### B. Blights and Diebacks

1. *Symptoms:*  
sudden and conspicuous damage to leaves and growing tips; blackening or wilting of growing tips, death of shoots and growing tips; often more severe during wet weather or on plants which have been stressed by other factors; can result in plant death;
2. *Causal Agents:*



wide range of fungi and bacteria including *Botrytis*, *Phytophthora*, *Alternaria*, *Xanthomonas*, and *Erwinia*;

3. *Commonly Affected Plants:*

many herbaceous species; broad range of deciduous and evergreen trees and shrubs;

4. *Management Strategies:*

- a. avoid plant stress and maintain good vigor by following sound cultural practices;
- b. protect plants from winter injury;
- c. use resistant cultivars when available;
- d. prune, remove, and destroy diseased portions of plants, especially spent flowers and leaf debris;
- e. pesticides are helpful in some host-pathogen combinations; many are protectants and need to be applied before symptoms appear; the effectiveness and number of sprays required for control will vary with weather conditions;

5. *Examples:*

Juniper Tip Blight

Diplodia Tip Blight of Pine

Volutella Blight of Pachysandra

Bacterial Blight of Lilac, Euonymus, and Viburnum

Botrytis Blight of Peony

Xanthomonas Blight of Geranium

### C. Vascular Diseases (Wilts)-

1. *Symptoms:*

loss of rigidity, wilting, yellowing of foliage, drooping of plant parts; often followed by premature defoliation; gradual dieback may be evident; "flagging" may occur when one limb or stem becomes symptomatic at a time; infected trees will occasionally produce a heavy crop of seed and have leaves that are smaller than normal; infected plants *may* develop characteristic brown or greenish streaks in the vascular tissues; once infected, plants are rarely "cured" since the fungus grows systemically in the plant; usually results in plant death;

2. *Causal Agents:*

several genera of fungi and some bacteria; most commonly *Verticillium* spp. (*Verticillium* wilt), *Fusarium* spp. (*Fusarium* wilt), and *Ophiostoma ulmi* and *O. novo-ulmi* (Dutch Elm Disease);

3. *Commonly Affected Plants:*

depending upon causal agent, **many** tree species as well as a wide range of herbaceous species;

4. *Management Strategies:*

- a. prune and remove affected branches or limbs as soon as symptoms are evident;
- b. plant resistant species or varieties where possible;
- c. maintain overall plant health by following sound cultural practices;
- d. avoid plant stress by appropriate site selection;
- e. practice crop rotation;

5. *Example:*  
Dutch Elm Disease  
Verticillium Wilt of Maple and Impatiens

#### **D. Branch and Stem Cankers-**

1. *Symptoms:*  
infections may appear as definite areas that vary in color from surrounding healthy tissues; necrotic, often sunken lesions can appear tan to dark brown and occur on twigs, branches, and main stems or trunks; when cankers girdle the stem or branch, leaves wilt, drop, and the distal portion of the stem or branch dies; can result in plant death;
2. *Causal Agents:*  
wide range of fungi and bacteria including *Botryosphaeria*, *Nectria*, *Rhizoctonia*, and *Cytospora*;
3. *Commonly Affected Plants:*  
virtually any woody and herbaceous plant;
4. *Management Strategies:*
  - a. prune and remove affected plant parts (e.g., limbs, stems) or entire plants;
  - b. maintain plant vigor by following sound cultural practices;
  - c. avoid plant stress by proper site selection;
  - d. pesticides are helpful with *some* host-pathogen combinations but need to be applied *before* symptoms appear;
5. *Examples:*  
Cytospora Canker of Spruce  
Rhizoctonia Canker of Aster  
Black Knot of Cherry  
Lupine Stem Canker

#### **E. Root Diseases and Root Rots-**

1. *Symptoms:*  
non-specific symptoms above ground; leaves turn yellow, wilt, and droop; twig, stem, and branch dieback; general decline, reduced or stunted growth, root and plant death;
2. *Causal Agents:*  
variety of fungi including *Phytophthora*, *Armillaria*, *Pythium*, and *Rhizoctonia*;
3. *Commonly Affected Plants:*  
wide range of hardwoods and conifers; many shrubs and herbaceous plants; plants under stress are more susceptible;
4. *Management Strategies:*
  - a. protect plants from drought or flooding and avoid wet areas;
  - b. maintain plant vigor by following sound cultural practices;
  - c. remove and destroy affected trees or plants; stump removal and removal of woody roots greater than ½ inch in diameter are often prudent and necessary;
  - d. select resistant species or varieties when available;
  - e. practice crop rotation if possible;

- f. pesticides are helpful with *some* host-pathogen combinations but are not curative and need to be applied *before* infection occurs;

5. *Example:*

Phytophthora Root Rot of Rhododendron

Armillaria Root Rot of Arbor Vitae and Rhododendron

Pythium Root Rot of Geranium

Liatris Root Rot

## **V. CURIOSITY PROBLEMS:**

**A. The Artillery Fungus, *Sphaerobolus stellatus***

**B. Slime Molds**

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