Certified Nursery &
Landscape Professional

C N L P

New York State
Certified
Nursery & Landscape
Professional

Training Manual

New York State Nursery & Landscape Association

2022

New York State Nursery & Landscape Association

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PROBLEMS OF ORNAMENTALS

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Problems of Ornamentals

Introduction

This chapter will discuss living and non-living factors that affect plant health and management strategies for reducing damage. Common insect pests and diseases are listed with brief descriptions and web links for additional information.

Objectives

1. Gain an understanding about plant health care.
2. Become familiar with a systematic approach to plant diagnostics.
3. Distinguish between biotic (living) and abiotic (nonliving) disorders.
4. Know the difference between signs and symptoms of plant injury.
5. Understand the role environmental stress plays in predisposition of plant health.
6. Learn about IPM and the importance to plant health care.
7. Gain understanding about major diseases, insects and weeds that attack turfgrass and ornamentals.

Plant Health

A healthy plant has leaves that are the proper color and size for that species, produces flowers and seeds or fruits, a well-developed root system and no insect or disease symptoms.

In order for a plant to remain healthy, basic needs should be met such as, the right planting location, light, water, nutrients and cultural practices to name a few . If plants are not properly sited and cared for they develop stress and are more susceptible to insect and disease infestations.

Plant Health Care is a holistic and comprehensive approach to managing the overall health and appearance of plants. Holistic is the big picture, understanding that plants are part of complex communities, rather than just individual entities. Each plant is affected by the soil, plant and pest communities surrounding them. Comprehensive includes variables that promote plant health. Some variables include site assessment, plant selection, installation, and cultural practices.

There are many considerations before choosing a plant for the landscape. One of the most important consideration is site location. Ask the question “Will the plant survive year round in this location?” Site considerations such as, climate, soil type, sun/shade, drainage, planting space above and below ground must be taken into account.

Assessing the Site

Reading the Site Assessment Guide and filling out the Site Assessment Checklist will provide details about the location and help narrow down the list of plants that will thrive in that location.

Site assessment checklist:

http://woodyplants.cals.cornell.edu/collections/urbantrees/3b-site-assessment-guide.pdf

Site assessment blank form:

http://woodyplants.cals.cornell.edu/collections/urbantrees/3a-site-assessment.pdf

Integrated Pest Management

What is IPM?

Integrated Pest Management (IPM) is an effective and environmentally sensitive approach to pest management that relies on a combination of common-sense practices. IPM programs use current, comprehensive information on the life cycles of pests and their interaction with the environment. This information, in combination with available pest control methods, is used to manage pest damage by the most economical means, and with the least possible hazard to people, property, and the environment.

IPM is not a single pest control method but, rather, a series of pest management evaluations, decisions and controls. In practicing IPM, those who are aware of the potential for pest infestation follow a four-tiered approach.

Set Action Thresholds

Before taking any pest control action, IPM first sets an action threshold, a point at which pest populations or environmental conditions indicate that pest control action must be taken. Sighting a single pest does not always mean control is needed. The level at which pests will either become an economic threat is critical to guide future pest control decisions.

Monitor and Identify Pests

Not all insects, weeds, and other living organisms require control. Many organisms are innocuous, and some are even beneficial. IPM programs work to monitor for pests and identify them accurately, so that appropriate control decisions can be made in conjunction with action thresholds. This monitoring and identification removes the possibility that pesticides will be used when they are not really needed or that the wrong kind of pesticide will be used.

Prevention

As a first line of pest control, IPM programs work to manage the crop, lawn, or indoor space to prevent pests from becoming a threat. In an agricultural crop, this may mean using cultural methods, such as rotating between different crops, selecting pest-resistant varieties, and planting pest-free rootstock. These control methods can be very effective

and cost-efficient and present little to no risk to people or the environment.

Control

Once monitoring, identification, and action thresholds indicate that pest control is required, and preventive methods are no longer effective or available, IPM programs then evaluate the proper control method both for effectiveness and risk. Effective, less risky pest controls are chosen first, including highly targeted chemicals, such as pheromones to disrupt pest mating, or mechanical control, such as trapping or weeding. If further monitoring, identifications and action thresholds indicate that less risky controls are not working, then additional pest control methods would be employed, such as targeted spraying of pesticides. Broadcast spraying of non-specific pesticides is a last resort.

Biotic vs Abiotic

Characteristics of Biotic & Abiotic Disorders

Plant health can be significantly influenced by **biotic** (living) and **abiotic** (non-living) factors. One or more of these factors can increase stress to a point of reducing plant health. Accurate diagnosis of a plant health problem is essential in determining what management strategies will be applied.

It is not enough to simply identify and treat the insect or disease causing the immediate symptoms, but to understand that plants are often experiencing a combination of stress factors. Identification of these factors will provide an understanding of biotic and abiotic factors and their influence on plant growth is an important part in understanding plant health care.

Abiotic or Nonliving Factors

Environmental Examples:

- Water
- Sunlight
- Soil
- Temperature

Physiological Examples:

- Plant functions
- Genetics
- Hormones
- Fertilizers
- Phytotoxic pesticides
- High soil salts

Biotic factors or Living Factors

- Insects
- Fungi
- Bacteria
- Nematodes
- Viruses
- Parasitic plants
- Wildlife

To diagnosis biotic (living) or abiotic (non-living) disorders knowledge of the affected plant is necessary. While some problems are more commonly seen and therefore easier to diagnose than others, consulting with a plant diagnostic clinic will be helpful for those more challenging situations.

Step-by-Step Diagnostic Approach

1. Identify the Plant

- Use Latin vs. common names, common names can cause confusion

E.g. pine tree = pine, spruce, fir, arborvitae

- Recognize a healthy plant appearance for that species
- Know the environmental conditions necessary for good growth
- Know what pest problems the plant is susceptible to

2. Identify the Symptoms, When They Started and Location on Plant

- Wilted leaves, leaves yellowing or dropping during active growing season, deformed leaves , branch dieback
- How severe is the damage
- When was the problem first noticed
- How quickly did the damage progress

3. Look for Patterns

- If it is a grouping of the same plants, are many or all plants affected or just 1 or 2
- Are symptoms found on the whole plant, scattered throughout or on one side of the plant
- Is younger or older foliage affected

4. Site Conditions

- Assess site conditions the plant is growing in; sun, shade; soil type and pH; prevailing winds
- Is there standing water, if so is it a seasonal event, or a one time event

5. Plant Management History

- How long has the plant been in it's current location
- Was it recently planted/transplanted
- Was Planting implemented properly
- What pesticides and fertilizers have been used in and around the plant(s) the last 6

months

- Is the plant(s) watered, if so, how much and how often
- Is the plant mulched; what material; what is the depth, is the mulch piled up around the trunk
- Has there been construction, trenching, grade change in the last few years
- Has the plant been pruned, if so when and how much

6. Organize Information

- Identify all possible causes
- Make an initial assessment
- Get follow-up questions answered from the site manager/owner

7. Perform Tests if Necessary

- Soil pH
- Soil Nutrient Analysis
- Soluble salts
- ELISA testing for certain fungal diseases

8. Final Conclusion

Learning About Abiotic Disorders

WINTER INJURY -

https://www.mortonarb.org/trees-plants/tree-and-plant-advice/horticulture-care/winter-injury-trees-and-shrubs

SOIL MOISTURE EXTREMES -

http://www2.ca.uky.edu/agcomm/pubs/id/id89/id89.pdf

WIND -

https://libanswers.nybg.org/faq/223339

CHEMICALS HERBICIDES/PESTICIDES CHEMICAL -

http://www.uky.edu/Ag/PAT/cat3/cat3a.htm

DRAINAGE/COMPACTION -

https://water.unl.edu/article/lawns-gardens-landscapes/manage-soils-improve-drainage-and-prevent- compaction

DEICING SALTS/FERTILIZER SALTS -

https://extension.umd.edu/resource/salt-or-fertilizer-damage-trees

NATURAL GAS -

https://extension.umd.edu/resource/natural-gas-injury

SOIL PH -

https://www.esf.edu/pubprog/brochure/soilph/soilph.htm

NUTRIENT DEFICIENCIES -

https://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home- gardener/advice-tips-resources/pests-and-problems/environmental/nutrients.aspx

MECHANICAL INJURIES -

http://www.missouribotanicalgarden.org/gardens-gardening/your-garden/help-for-the-home-gardener/advice-tips-resources/pests-and-problems/environmental/mechanical.aspx

TREE SUPPORT WIRES, PLANTING BASKETS -

https://extension.umd.edu/resource/embedded-wires-nylon-cord-and-wire-baskets

GIRDLING ROOTS -

https://extension.umd.edu/resource/girdling-roots

PLANTING DEPTH -

https://extension.umd.edu/resource/trees-planted-too-deeply

EXCESS MULCHING -

http://www.fayettevillenc.gov/homeshowdocument?id=4074

IMPROPER PRUNING -

https://extension.uga.edu/publications/detail.html?number=B949&title=Basic%20Principles%20of%20Pruning%20Woody%20Plants

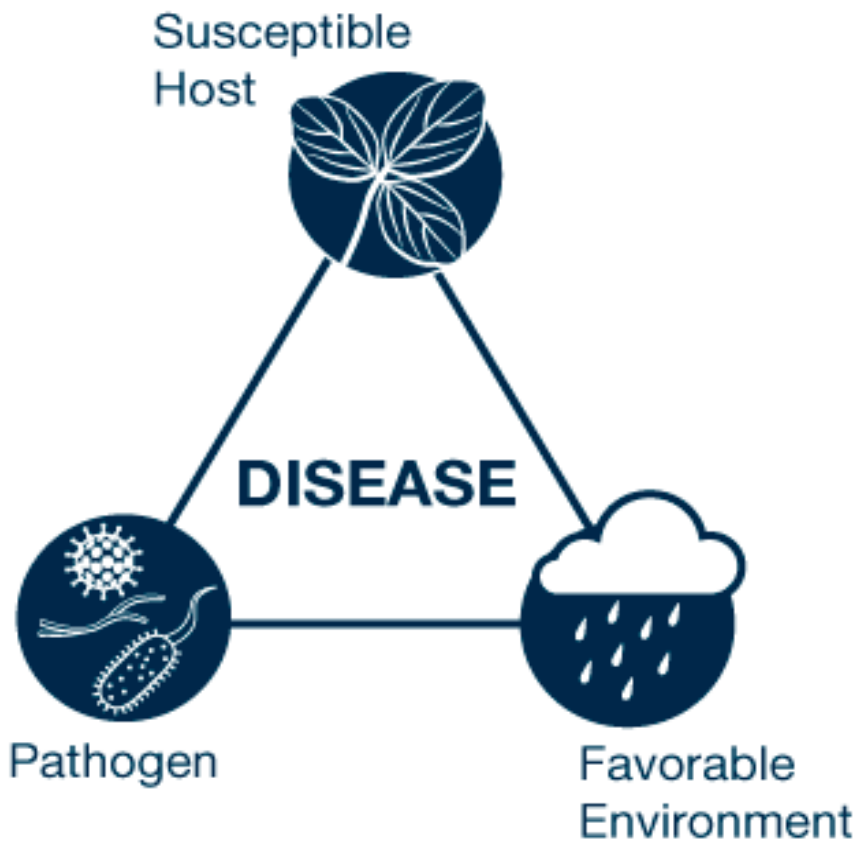
Learning About Biotic Disorders

Disease Triangle

A plant disease caused by a biotic agent requires 3 factors in order to develop, a susceptible host, a virulent pathogen, and an environment favorable for disease development .

Time of year is also an important aspect for the establishment of plant diseases. A favorable environment for some diseases requires the cool and wet conditions of spring. Other diseases require the warm, wet conditions of summer. Elimination of any one of the three factors will reduce the chances the plant will develop a dis- ease.

Pathogen: fungi, bacteria, virus, mycoplasmas



Damage from abiotic factors are more commonplace than diseases caused by pathogens.

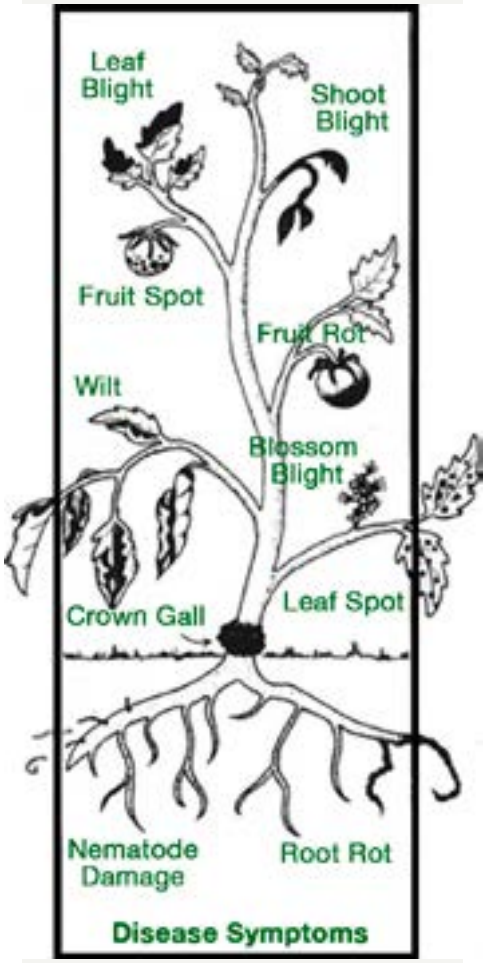


Figure 1 - Disease Symptoms

How Diseases Injure Plants

Biotic diseases are caused by living agents, fungi, bacteria and viruses, nematodes and parasitic plants. These are called pathogens. Figure 1

Diseases may be difficult to identify until the infection is in an advanced stage. Pathogens are often hidden within the plant tissue and so small that a microscope is necessary to see their features. You can, however, see symptoms - visible responses of a plant to a disease, blight, spots, wilt, etc. and sometimes the signs - the actual agent causing the symptoms of a pathogen's presence, ex. conks.

Damage from abiotic (nonliving) factors are more commonplace than diseases caused by pathogens. Examples include air pollution, drought stress, cold and wind injury, chemical injury, overwatering etc. Abiotic damage is not contagious spreading from plant to plant.

Ways in Which Infectious Diseases Damage Plants

Interfere or block water conduction inside stems

Symptoms: yellow, wilted, or brown leaves; dark brown streaks inside the stem

Destroy or injure roots

Symptoms: black or brown roots, galls on roots, stunting of the plant, yellow or brown leaves

Destroy or injure flowers, fruit, or food products

Symptoms: dead flowers, black or brown spots on flowers or produce

Destroy or injure stems or shoots

Symptoms: dead shoots or stems; cankered areas on branches, brown, shriveled, clinging leaves; brown inner bark

Disrupt normal cellular structure (gall-forming diseases)

Symptoms: unusual growths on flowers, leaves, twigs, or roots

Disease Diagnostic Tools and Resources

Table 1 - Symptoms of Plant Pathogen Groups

Symptom & Description	Plant Pathogen Groups						
	Fungi	Water Molds	Bacteria	Viruses	Nematodes	Phytoplasmas	Parasitic Plants
Blight	Rapid discoloration, wilting and death of plant tissue						
	X	X	X				
Blotch	Blotch or large spot on leaves, shoots, or fruit						
	X		X				
Bronzing	Leaves or needles develop a bronze color						
	X				X		
Canker	Dead region on bark of twigs, stems, or trunks, often discolored and either raised or sunken						
	X	X	X				
Chlorosis	An abnormal yellowing of plant parts						
	X	X	X	X	X		
Dampening-Off	Decay of seeds in soil or young seedlings shortly after emergence						
	X	X					
Decline	Gradual, often uniform, decline of plant health or death of plant tissue						
	X	X	X	X	X		X
Dieback	Progressive death of shoots, branches, or roots, generally starting at tips						
	X	X	X	X	X		
Distortion	Irregular shaped plant parts						
	X	X	X	X		X	
Flagging	Decline of a shoot or branch, while nearby branches remain healthy						
	X	X	X				
Gall	Abnormal, localized swelling on leaf, stem, or root tissue						
	X		X		X		
Gummosis	Production of a sticky gum that is exuded by the plant						
	X	X	X				
Leaf spot	Lesion on a leaf, may vary in color, shape and size						
	X	X	X	X			

Diseases Common to Specific Plants

Many of the links listed are factsheets from other areas of the country and may contain pesticide recommendations that are not legal in NYS. Always check the Cornell Pest Management Guidelines for Commercial Production and Maintenance of Trees and Shrubs for the most up-to-date pest management recommendations.

PLANT	PEST
Apple & Flowering Crab	Apple Scab Cedar Apple Rust Fire Blight
Beech	Beech Leaf Disease Bleeding Canker
Boxwood	Boxwood Blight and Misc. Diseases
Dogwood	Anthracnose Powdery Mildew
Douglas Fir	Rhabdocline Needlecast Swiss Needlecast of Douglas Fir
Flowering cherry, plum	Black Knot Cherry Leaf Spot
Hydrangea	Powdery Mildew, Leaf Spots, Anthracnose
Juniper	Juniper Tip Blight Cedar Apple/Hawthorn Rust
Lilac	Bacterial Blight Powdery Mildew

London Plane tree & Sycamore	Anthracnose
Maples	Anthracnose Maple Decline Tar Spot Verticillium Wilt Powdery Mildew of Trees and Shrubs
Oak	Anthracnose Tubakia Leaf Blotch Oak Leaf Blister Oak Wilt-
Ornamental Pear	Pear Trellis Rust
Pine	Dothistroma Needlecast Diplodia Tip Blight
Rhododendron	Botryosphaeria Canker Other Diseases
Rose	Powdery Mildew Rose Rosette Disease Black Spot
Spruce	Cytospora Twig Dieback and Canker Rhizosphaera Needle Cast Stigmina Needle Blight
Viburnum	Powdery Mildew Botryosphaeria Canker Downy Mildew

Additional Resources for Plant Disease Information

Diagnosis of Ornamental Plant Diseases,

Focus on Plant Problems

Diseases of Turfgrass

Only a few fungal pathogens causing injury to turfgrass are harmful. Many of these pathogens can coexist with grass without causing damage as long as environmental conditions and cultural practices do not become too stressful. Pathogens seldom attack healthy grass.

Diseases are only one factor that cause unhealthy and dead grass in a lawn. No amount of disease control effort can overcome poor growing conditions or improper cultural practices.

Diseases are only one factor that cause unhealthy and dead grass in a lawn. No amount of disease control effort can overcome poor growing conditions or improper cultural practices. Diseases are more likely to occur when lawns have been improperly fertilized, overwatered, mowed too low or infrequently.

Drought injury to turfgrass is frequently confused with disease. Drought symptoms on turfgrass occur because of:

- fast draining soils drying out
- prolonged periods of limited precipitation
- buried debris such as rocks, lumber, plaster, and concrete covered over with thin layers of soil

Patches of dead grass can be mistaken for diseased. Injuries from any of the following can promote disease development.

- cutting grass too closely ("scalping")
- fertilizer burn
- dog urine
- spilled gasoline, oil
- exhaust from power mowers
- improper use of pesticides

The best form of disease control is prevention. This includes understanding the site conditions, considering homeowners needs and maintenance level practices in order to favor the plant growth and discourage pathogen development.

Diagnosing turfgrass diseases can be difficult and disease pathogens should be confirmed using a microscope. For more help in diagnosing lawn diseases, contact your county Cornell Cooperative Extension office or send a turf sample to Cornell Plant Disease Diagnostic Clinic.

Diagnosing Diseases of Turfgrass

Links to Fact Sheets provided by Cornell University Plant Disease Diagnostic Clinic

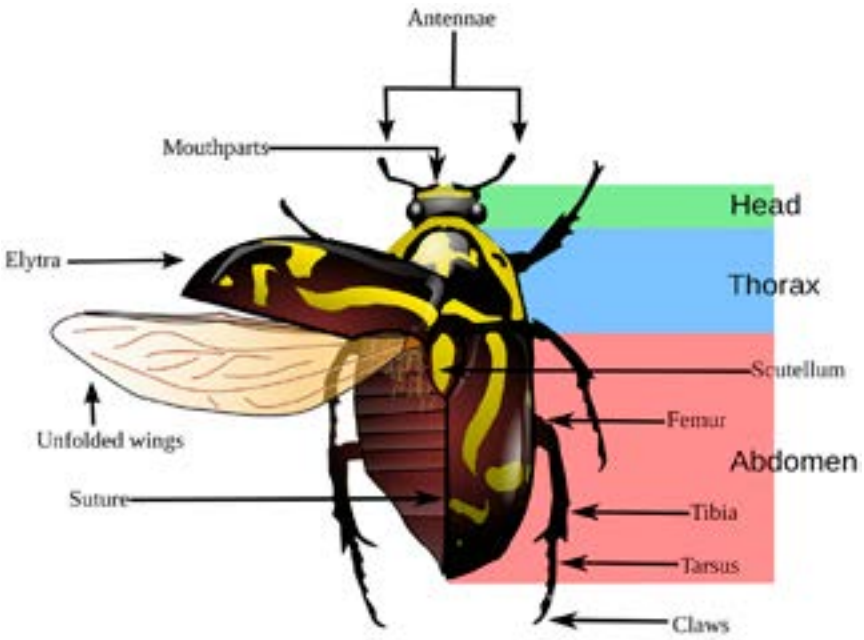
Example of Disease	Link to Fact Sheet
	Brown Patch
	Dollar Spot of Turfgrass
	Dreschlera Leafspot of Kentucky Bluegrass
	Gray Leafspot
	Red Thread
	Summer Patch and Necrotic Ring Spot
	Rust Diseases

Some insects are predators or parasites of harmful insects and therefore are considered beneficial.

Insects

With tens of millions of insect species found worldwide, there are more than 100,000 species found in the United States. Less than one percent of these are harmful to plants. There are more beneficial insect species than harmful ones. Some insects are predators or parasites of harmful insects and therefore are considered beneficial.

Parts of an Insect



Insects have 3 distinct body regions:

Head, Thorax and Abdomen.

Generally they have these specific features: 1 pair of segmented antennae, 1 pair of compound eyes and 3 pairs of legs

Most insects have 2 pair of wings, some like flies have one pair. Still other insects such as fleas have no wings at all.

Insects have complex life cycles. While one development stage can cause damage to a plant another life stage of the insect may cause no damage.

Nematodes

Nematodes are very small non-segmented worms only 1/16 -1/64" long. Most of those which feed on plants live and feed on roots but a few types feed inside leaves or within the resin canals of pine trees.

There are relatively few ornamental landscape plants in NYS affected by nematodes. The following links will provide additional information about the most commonly seen nematode problems. A microscope and special training is necessary to identify nematodes.

Foliar Nematodes: Commonly found on hostas, but can affect other herbaceous ornamentals (e.g., African violet, anemone, begonia, chrysanthemum, fern, orchid, veronica) and woody ornamentals (e.g., azalea, elm, privet).

Pinewood Nematodes vector Pine Wilt: Seen mostly on Austrian, Scotch, Mugo, and least likely on white pines.

Turfgrass Nematodes: Plant parasitic nematodes cause major problems on warm season grasses. Cool season grasses can also have substantial decline and damage symptoms. Nematode feeding can open sites for other pathogens which can cause more severe damage.

How Insects Injure Plants

Chewing - Chewing mouthparts usually leave obvious feeding wounds such as notched leaves, tunnels or wounds in wood, bark, roots, stems, fruit, seeds or leaves.

Sucking - Sucking mouthparts puncture and suck out juices

Oviposition Scars - Scar s formed on stems, twigs, bark or fruit as a result of injury during egg laying.

Vectors of diseases - Some insects carry diseases from plant to plant, e.g., elm bark beetles are vectors of Dutch elm disease, various aphids are vectors of certain viral diseases.

Excretions - Honeydew deposits secreted by some in- sects lead to the growth of sooty mold (black fungi). The plant may be weakened because of reduced photosynthesis.

Gall formation - Abnormal growth of plant tissue on leaves, twigs, buds, and roots. Galls disfigure plants, and twig galls often cause serious injury. Many galls are caused by insects, but some common galls are caused by fungi, bacteria, nematodes and viruses.

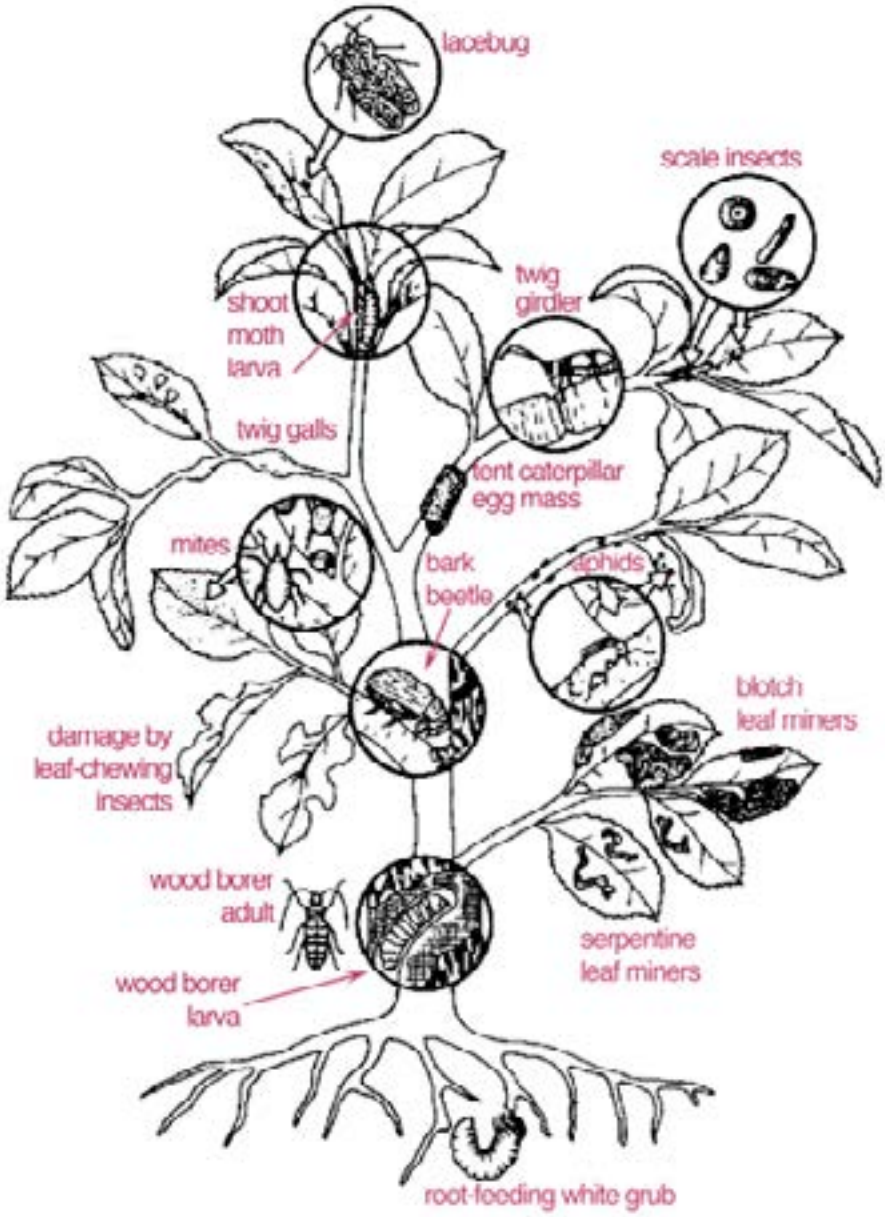


Figure 2 - How Insects injury plants

The Importance of Growing Degree Days (GDD)

Growing degree days (GDD), or heat units, are used to estimate the growth and development of certain crops and pests during the growing season.

Insects are cold blooded animals and their development is dependent on temperature. Insects have an optimum temperature range in which they develop rapidly. The rate of development increases as the outdoor temperature increases. Therefore, insect development is accelerated during warm years and delayed during cooler years.

Using GDD numbers is a more accurate way to decide when to apply a pesticide rather than looking at the calendar. Depending on weather conditions, insect development can vary from year to year by a few weeks. Pesticide applications may be ineffective if applied at the wrong time.

To simplify the calculation of GDD's, the baseline temperature of 50°F is used because most plants start growing between 45°F-55°F.

Data is collected from March 15 through September 30. The mathematical equation used in determining landscape insect GDD is based on minimum and maximum temperature. One method is to average the daily maximum and minimum temperatures and subtract from-it the 50 degree base temperature.

Maximum Daily Temp.+ Minimum Daily Temp.- Base Temp.= Daily GDD 2

The Northeast Regional Climate Center (NRCC). GDD begins to accumulate data on March 15 for by the 14 designated sites in NYS.

New York NRCC Stations
ALBANY INTL AIRPORT
BINGHAMTON
BRIDGEHAMPTON
BUFFALO NIAGARA INTL
FRANKLINVILLE
ISLIP-LI MACARTHUR AP
ITHACA CORNELL UNIV
MASSENA INTL AP
LAGUARDIA AIRPORT
ROCHESTER GREATER INT'L
SYRACUSE HANCOCK INTL
TUPPER LAKE SUNMOUNT
WATERTOWN AP
WESTCHESTER CO AP

For NRCC GDD data for these locations - CLICK HERE

Figures 3a, b - two stages of Gypsy Moth

Practical GDD Example:

Using gypsy moth as an example, egg hatch for this moth caterpillar is known to occur roughly between 90 and 100 GDD's when using a baseline temperature of 50° F.

1. You also have high value ornamental plants favored by gypsy moths that you want to protect. Keep in mind that egg mass numbers from last season are present in the landscape in high numbers, defoliation was extensive in your area last year, and there is good evidence that caterpillar numbers might be high this season.

2. By tracking GDD you can plan to monitor egg hatch. Once your local accumulated GDD's reach 85-90 you should anticipate emerging larvae. Watch caterpillar development closely. Remember that all insects are more easily controlled when the are in their early stages of development.

By anticipating the egg hatch you are prepared to apply protective strategies.

Additional GDD Resource:

Growing Degree Days for Management of Insect Pests in the Landscape

CLICK HERE

Insect Diagnostic Tools and Resources

Be aware that many of these links are factsheets are from other areas of the country and may contain pesticide recommendations that are not legal in NYS. Always check the Cornell Pest Management Guide for Commercial Production and Maintenance of Trees and Shrubs for pest management recommendations and read the product label before spraying.

By organizing common pests by the trees and shrubs they attack, the following Table is meant to assist with Insect Pest Diagnostics.

PLANT	Pest
Apple (flowering crab)	Aphids Cankerworms Roundheaded Apple Tree Borer
Arborvitae	Arborvitae Leafminer Bagworm Fletcher Scale Juniper Scale Spruce Spider Mite
Ash	Emerald Ash Borer
Azalea	Azalea Bark Scale Black Vine Weevil Lace Bugs
Barberry	Twobanded Japanese Weevil
Beech	Wooley Beech Aphid
Birch	Aphids Birch Leafminer Bronze Birch Borer
Boxwood	Boxwood Leaf Miner Boxwood Mite Boxwood Psyllid
Dogwood	Dogwood Borer Dogwood Sawfly
Douglas Fir	Cooley Spruce Gall Adelgid Douglas Fir Needle Midge Spruce Spider Mite
Euonymus	Euonymus Scale

PLANT	Pest
Fir	Balsam Gall Midge Balsam Twig Aphid Balsam Woolly Adelgid Spruce Budworm
Flowering Fruits (cherry, peach, almond)	Fall Webworm Japanese Beetle Lecanium Scale Peachtree Borers White Prunicola Scale
Hemlock	Elongated Hemlock Scale Hemlock Woolly Adelgid Spruce Budworm Spruce Spider Mite
Holly	Cottony Scales Holly Leafminer Sooty Mold
Honeylocust	Honeylocust Plant Bug Honeylocust Podgall Midge
Juniper	Arborvitae Leaf Miner Bagworm Juniper Scale Juniper Webworm Spruce Spider Mite

PLANT	Pest
Lilac	Lilac/Ash Borer Oystershell Scale White Prunicola Scale
Linden	Aphids Cankerworms Gypsy Moth Japanese Beetle Twospotted Spider Mite
Magnolia	Magnolia Scale
Maples	Aphids Asian Longhorn Beetle Cottony Maple Scale Galls Gypsy Moth Lecanium Scale Maple Gall Mite Spotted Lantern Fly Tent Caterpillar
Oak	Golden Oak Scale Gypsy Moth Kermes Oak Scale Lace Bugs Lecanium Scale Oak Gall Oak Leaf Miners Oak Leaftier Oak Skeletonizer

PLANT	Pest
Oak	Oak Spider Mite Tent Caterpillar Two-Line Chestnut Borer Twig Pruner
Pine	Black Turpentine Beetle European Pine Shoot Moth Nantucket Pine Tip Moth Pales Weevil Pine Bark Adelgid Pine Needle Scale Pine Sawflies Pine Spittlebug Pine Tortoise Scale Pine Webworm Pitch Twig Moth Spruce Spider Mite White Pine Aphid White Pine Weevil Zimmerman Pine Moth
Rhododendron	Azalea Bark Scale Black Vine Weevil Lace Bugs Rhododendron Borer
Rhododendron	Rhododendron Gall Midge Rhododendron Stem Borer Twobanded Japanese Weevil

PLANT	Pest
Rose	Aphids Japanese Beetle Rose Chafer Rose Slug Thrips Twospotted Spider Mite
Spruce	Cooley Spruce Gall Adelgid Easter Spruce Gall Adelgid Pine Needle Scale Pine Sawflies Spruce Budworm Spruce Bud Scale Spruce Needleminer Spruce Spider Mites White Pine Weevil
Taxus	Black Vine Weevil Cottony Taxus Scale Fletcher Scale Taxus Mealybug
Viburnum	Viburnum Leaf Beetle

Turfgrass Insects

The most effective and efficient pest management programs include:

(1) **diagnosis** – correct identification of the insect(s) involved

(2) **decision-making** – a systematic process to decide if control is necessary

(3) **intervention** – selecting, targeting and integrating the most appropriate control tactics.

Most of the insect pests of turfgrass conduct some stage of their life underground. This poses challenges for their management because of how difficult it is to monitor, interpret and manipulate interactions that are being played out below the soil surface. Compared to above-ground foliar feeding insects, below-ground root feeding insects are harder to monitor and the products used to control them are harder to accurately deliver.

Finally, pest management in turf is also challenging because there are few non-chemical control options that offer reliable alternatives, and because the availability of chemical options is continually changing due to restrictions and market-driven alterations.

There are some 17 insects that can cause serious injury to turfgrass in NY State belonging to six general complexes: (1) white grubs, (2) weevils, (3) chinch bugs, (4) caterpillars, (5) leatherjackets and (6) ants.

(1) **White grubs** are scarab beetle larvae that live in the soil where they feed on grass roots or otherwise disrupt the rooting zone.

(2) **Weevil** larvae begin as stem borers, then crown feeders, and then as adults they become foliage feeders.

(3) **Chinch bugs** are small, fast-moving sucking insects that live at the soil surface.

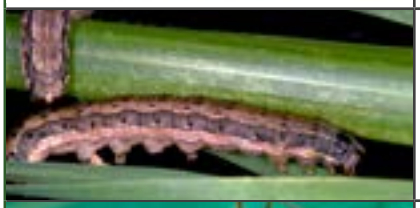
(4) **Caterpillars** include black cutworms, sod webworms, and fall armyworms that are primarily active at the soil surface where they feed on above-ground foliage.

(5) **Leatherjackets** are the soil-dwelling larvae of crane flies that injure grass both above and below-ground.

(6) **Ants** are relevant when their nests disrupt the surface of the ground.

The injury caused by these insects can be difficult to

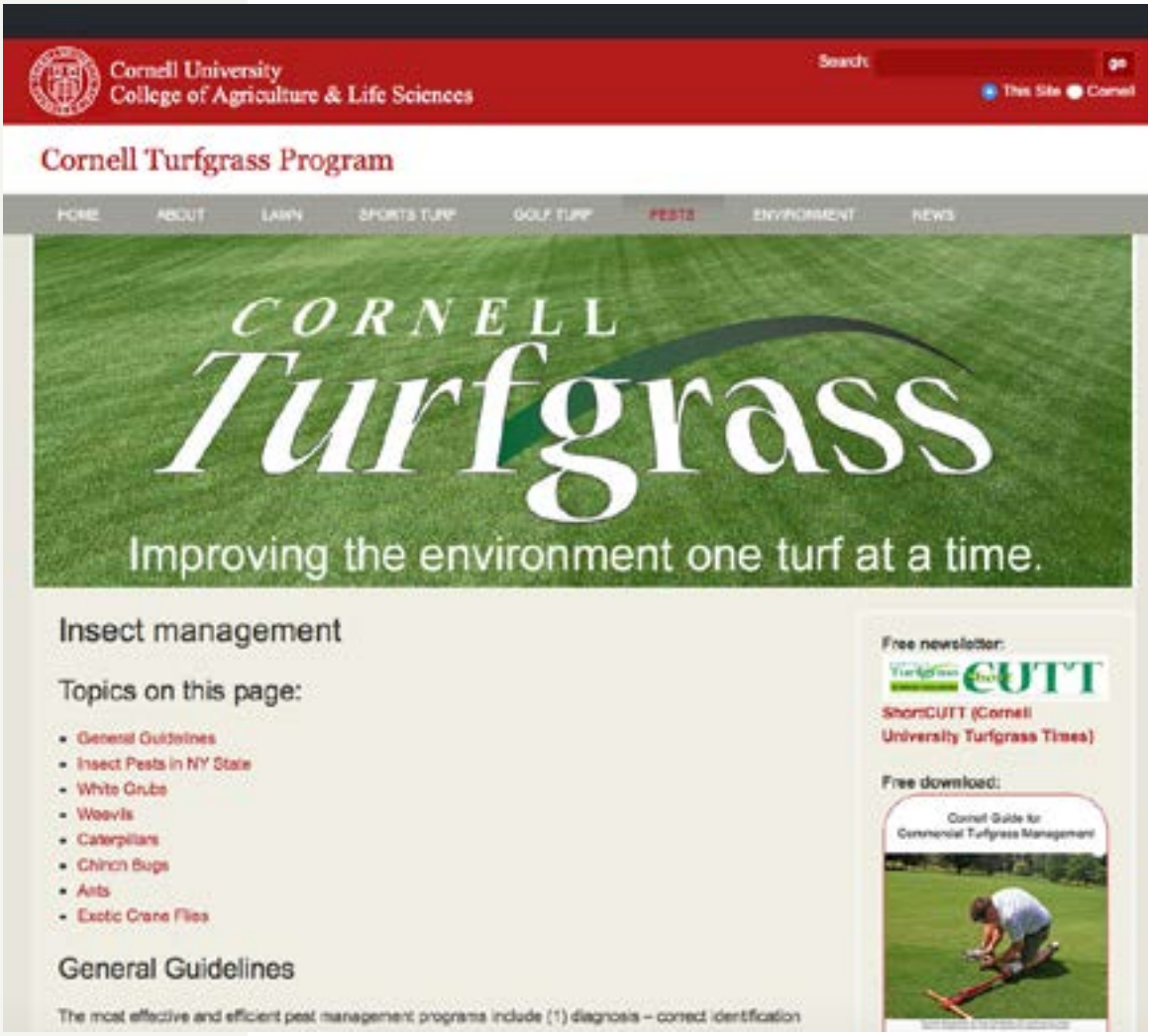
differentiate from each other and from certain plant diseases. Nevertheless, control decisions must be based on a correct identification of the insect pest, which means recognizing the injury and knowing how to identify the insect complex and insect species involved. Diagnosis is fundamental because the timing and type of control tactics will depend on the particular species involved, and moreover because chemical control products have labels specific to particular groups of insects. A misdiagnosis means that applicators will not be in full compliance.

Example of Pest	Link to Fact Sheet
	White grubs - Asiatic garden beetle, Black turfgrass ataenius, European chafer, Green June beetle, Japanese beetle, May and June beetles, Northern masked chafer, Oriental beetle
	Weevils - Annual bluegrass weevil, Bluegrass bill- bug
	Chinch bugs - Hairy chinch bug
	Caterpillars - Black cutworm, Fall armyworm, Sod web-worms
	Leatherjackets - European crane flies
	Ants - Mound-building ants

Insect Management

Diagnosing turfgrass insects can be difficult and should be confirmed by a knowledgeable person prior to making a pesticide application. For more help in diagnosing turf insects contact your county Cornell Cooperative Extension office or send an insect sample to http://idl.entomology.cornell.edu/

For a comprehensive diagnostic and intervention guidelines visit the Cornell Turfgrass Program website



Weeds of Ornamentals and Turf

Weeds are opportunistic plants, their seeds or spores germinating anywhere there is bare soil. While there are numerous definitions of what a weed is those in the lawn and landscape industry define a weed as a plant growing in the wrong place. The Weed Science Society of America defines the term weed as “Any plant that is objectionable or interferes with the activities or welfare of man”.

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What Makes a Plant a Weed

- Rapid growth rate
- Prolific seed producer
- Longevity of seed
- Tolerant of adverse growing conditions
- Grows rapidly /easily dispersed

Negative Qualities of Weeds

- Competes with other plants for water, nutrients and light
- Reduces plant biodiversity
- Reduces surrounding plant quality
- Reduce esthetic value of landscapes and turf.
- Increases labor and equipment costs
- Hosts for insects and diseases - e.g., pine needle rust and numerous viruses.
- Poisonous or irritating to people and pets

Key Features of Weeds

Weeds Propagate by: Seeds, Tubers, Corms, Rhizomes, Stolons

Weeds Spread by: People, Water, Wind, Equipment, Animals, Soil Movement

Weeds Found In: Any Disturbed Soil, Lawn Seed, Containerized and B&B Plants, Topsoil, Compost and Mulch

Classification of Flowering Weed Plants

Monocot characteristics

- Narrow leaf plants
- All grasses, sedges (nutsedge), rushes, garlic, onion, cattails
- Major leaves veins are parallel
- Flower parts in multiples of 3
- Growing points are at or just below the soil surface
- Secondary growth is absent

Dicot characteristics

- Broadleaf plants
- Dandelion, plantain, chickweed, ground ivy
- Netlike veins
- Flower parts in multiples of 4 or 5
- Growing point is above ground
- Secondary growth often present

Lifecycle

Annuals live for one growing season and are categorized as either summer annuals or winter annuals.

Summer Annuals germinate from seed in the spring, produce vegetative growth, flower and produce seeds mid-late summer, and die back in fall.

Winter Annuals germinate in the mid-late summer to early fall, produce vegetative growth, flower and produce seed in spring, and die back in summer.

Biennials are plants that live for two years; seeds germinate in the spring, summer or fall of the first year and the plants overwinter usually as a rosette of leaves. Flowering and seed production take place during the following summer of the second year. Plants then die in the fall.

Perennials produce vegetative growth that allows them to live for more than 2 years. Flowering and seed or fruit production occurs annually.

Being able to identify a weed is helpful when deciding on a management strategy, whether it's choosing an herbicide or cultural practices that will minimize growth or regrowth of weeds .

Here are some resources to aid in weed identification:

Weeds in the Lawn

Lawncare Without Pesticides

IPM Approach to Weed Management

Sustainable weed management is a proactive effort to control weeds by providing good growing conditions for the plants, thereby reducing the opportunities for weed infestation.

Weed Management before Planting

An integrated approach using several methods is the most economical and effective means of controlling weeds. Develop a weed management plan for landscapes before planting by following these five basic steps:

- Site assessment. Before soil preparation and when weeds are visible, evaluate the soil and slope of the site so problems can be corrected or future problems anticipated before planting. Site characteristics to look for include drainage, soil compaction, shading, and water infiltration rate.
- Identify weed species on site, focusing on perennial weeds.
- Site preparation. Control existing weeds, especially perennials, before any grading and development are started.
- Encourage rapid establishment of desired plants. Use the best management practices to get the plants established as quickly as possible so that they become competitive with weeds and more tolerant of herbicides applied to the site. Frequent weeding and keeping weeds from producing seeds in the land- scape will greatly reduce overall weed populations. Using mulch will reduce the growth of annual weeds.
- Use preemergence herbicides only if needed. Soon after planting, once the soil has settled and if mulch is not used, preemergence herbicides can be applied. These herbicides have specific label uses regarding types of plants on which they can safely be applied and how they should be used. The sites listed on the label determine where the herbicide can legally be used. Herbicides may damage new plantings if not used correctly.

Weed Management in Established Plantings

Effective weed control options in the landscape include

- **Hand-weeding and cultivation** - Best used in small areas and if weeds are scattered throughout the site.
- **Cultivation** can damage ornamentals with shallow roots. When cultivating, avoid deep tilling, as this brings buried weed seeds to the soil surface where they are more likely to germinate.
- **Mowing** - Mowing can be used to prevent the formation and spread of seeds from many broadleaf weeds from turf into the landscape areas by cutting off flower heads. However, weeds that flower lower than the mowing blade (such as spotted spurge or common woodsorrel) are not controlled. Repeated mowing tends to favor the establishment of grasses and low-growing perennial weeds. Mowing of some ground covers can rejuvenate them and make them more competitive against weeds.
- **Mulching** - Mulches suppress annual weeds by limiting light required for weed establishment. Check the mulching link to make sure you are applying the mulch correctly.
- **Hot water, steam, and use of propane burners** - These machines use superheated hot water or steam to kill weeds. These methods are best used on very small weeds and in specific types of sites such as side-walk joints, along fence lines, and adjacent to edging materials. Flaming and heating with propane burners are more effective on broadleaf weeds than grasses.
- **Chemical control -** both pre and post-emergence herbicides can be used on an as needed basis or for spot treating.

All of these methods may be used at one time or another as part of an integrated weed management program in landscape maintenance operations.

Invasive Plants

Invasive plants are non-native species transported from outside their native area, becoming established and spreading extensively in non-native ecosystems. Their introduction causes or is likely to cause economic or environmental harm or harm to human health.

Why are Invasive Plants Successful?

- Many invasive plant species produce large quantities of seed.
- Many invasives thrive on disturbed soil.
- Invasive plant seeds are often distributed by birds, wind, or unknowingly humans allowing seed to moving great distances.
- Some invasives have aggressive root systems that spread long distances from a single plant.
- These root systems often grow so densely that they smother the root systems of surrounding vegetation.
- Some plant species produce chemicals in their leaves or root systems which inhibit the growth of other plants around them.

Impacts of Invasive Plant Species?

- Invasive species have contributed to the decline of 42% of U.S. endangered and threatened species, and for 18% of U.S. endangered or threatened species, invasives are the main cause of their decline.1
- Invasive species compete directly with native species for moisture, sunlight, nutrients, and space.
- Overall plant diversity can be decreased
- Establishment and spread of invasive species can degrade wildlife habitat
- Results in poor quality agriculture lands
- Degraded water quality
- Increased soil erosion
- Decreased recreation opportunities

Regulated & Prohibited Invasive Species

A New York State regulation (Part 575) was adopted in July 2014, that prohibits or regulates the possession, transport, importation, sale, purchase and introduction of select invasive species.

The purpose of this regulation is to help control invasive species, a form of biological pollution, by reducing new infestations and spread of existing populations.

This regulation became effective March 10, 2015.

The majority of plants on the Prohibited and Regulated lists have no horticultural value, but there are a few that had significant value to gardeners and professionals. Here is a summary list.

Prohibited Plants:

Ampelopsis brevipedunculata, Porcelain Berry
Berberis thunbergii, Japanese Barberry
Elaeagnus umbellata, Autumn Olive
Iris pseudacorus, Yellow Iris
Lonicera japonica, Japanese Honeysuckle
Lonicera maackii, Amur Honeysuckle
Lonicera morrowii, Morrow's Honeysuckle
Lonicera tatarica, Tartarian Honeysuckle
Lonicera x bella, Fly Honeysuckle
Lysimachia vulgaris, Garden Loosestrife
Lythrum salicaria, Purple Loosestrife
Phellodendron amurense, Amur Cork Tree
Phyllostachys aurea, Golden Bamboo
Phyllostachys aureosulcata, Yellow Groove Bamboo

Regulated Plants:

Acer platanoides, Norway Maple
Clematis terniflora, Japanese Virgin's Bower
Euonymus alatus, Burning Bush
Euonymus fortunei, Winter Creeper
Miscanthus sinensis, Chinese Silver Grass
Robinia pseudoacacia, Black Locust

For the complete list and the detailed regulations Visit NYSDEC site.

For Alternatives to Invasive Ornamental Plants

Review Questions

- What is the most important first step in controlling a plant problem?
- List 5 ways insects injure plants.
- Define the term plant pathogen.
- List 5 ways diseases damage plants.
- What are nematodes and how can they injure plants?
- What are the two major groups of flowering plants?
- How do weeds affect non-weed plants?
- What do the letters IPM stand for?
- What does GDD stand for?
    - How are they used in insect control?
- What are the 3 elements that make up the disease triangle?
- Identify the body parts that are common to all insects.
- Describe the 4 actions that are the foundation of IPM.
- Name 5 characteristics used to describe a weed.
- What are the differences between annual, biennial and perennial weeds?
    - Give examples of weeds in each lifecycle.
- Give examples of cultural controls.

Additional Resources

Integrated Pest Management (IPM) Principles. United States Environmental Protection Agency. https:// www.epa.gov/safepestcontrol/integrated-pest-management-ipm-principles

Leonberger K, Jackson, K, Smith, R, Gauthier, N.W., 2016. Plant Diseases. Kentucky Master Gardener Manual Chapter 6. Cooperative Extension Service, University of Kentucky College of Agriculture, Food and Environment. http://www2.ca.uky.edu/agcomm/pubs/ppa/ppa46/ppa46.pdf

Invasive Plants. US Forest Service. https://www.fs.fed.us/wildflowers/invasives/

Wilen, C.A. 2018. Weed Management in Landscapes. University of California Statewide IPM Program. http://ipm.ucanr.edu/PMG/PESTNOTES/pn7441.html

Chandran, R. Weed Management in Lawns. 2015. WVU Extension Service, Agriculture and Natural Re- sources. https://extension.wvu.edu/files/d/29fe7afe-e8e7-450c-a11b-e9166f856ef6/weed-management.pdf

Nuisance and Invasive Plant Species. https://www.dec.ny.gov/animals/265.html

Prohibited and Regulated Invasive Plants in NYS. http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf

Berkeley, L., 2020. Step-by-Step Diagnostic Approach. Cornell Cooperative Extension Monroe County Plant and Insect Diagnostic Clinic