

# LESSON 5

SPPSL40.6

# TROUBLE- SHOOTING

12-18 YEAR OLDS

## PURPOSE

To prepare youth for possible lawn care and equipment problems.  
To develop problem solving skills that can be used for advanced lawn care management.

## OBJECTIVES

Youth will be able to:

- identify and describe the 3 major classes of turfgrass weeds.
- identify and describe major turfgrass diseases.
- identify and describe major turfgrass insects.
- describe appropriate actions to prevent and control lawn care problems.
- identify and describe major equipment difficulties.

## LIFE SKILLS

Youth will develop:

- observation and analysis skills for problem identification.
- problem-solving skills and decision-making skills.
- basic investigation and experimentation skills.

## LESSON TIME

Lesson time will vary, depending upon the learning activities selected and the size of the group. Lesson activities will also vary depending upon the number and age of youth. Most activities require approximately 30-45 minutes.

## LEARNING ACTIVITIES (with target participant age ranges)

WEED IT OUT! (12-18)

COMPETITION EXHIBITION (12-18)

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DRAWING ON EXPERIENCE (12-18)  
BUG FIND (12-18)  
LOOKING FOR TROUBLE (12-18)  
AN OUNCE OF PREVENTION (14-18)  
TROUBLE IN PARADISE (16-18)  
REPAIR FLAIR (12-18)

## ADVANCE PREPARATION

1. Read TROUBLE-SHOOTING...Background Basics.
2. Review activities and choose appropriate one(s) to use.
3. Secure necessary materials as described.

## Do

Learn to TROUBLE-SHOOT!

- ◆ Introduce TROUBLE-SHOOTING in a fun, exciting way with WEED IT OUT!
- ◆ Explore the world of weeds with WEED IT OUT and COMPETITION EXHIBITION.
- ◆ Identify insect pests with DRAWING ON EXPERIENCE and BUG FIND.
- ◆ Explore basic lawn problems with LOOKING FOR TROUBLE.
- ◆ Explore disease problems with AN OUNCE OF PREVENTION.
- ◆ Review equipment safety and maintenance as it applies to on-site difficulties in TROUBLE IN PARADISE and REPAIR FLAIR.

## REFLECT

- ◆ Define a weed, an insect, a nematode and a disease.
  - **A weed is a plant out of place.**
  - **An insect is a small animal with 3 segmented body parts and 6 legs.**
  - **Nematodes are tiny parasitic worms which are essentially invisible to the naked eye.**
  - **A disease causes a plant to stop growing as it should and lose its normal vigor, appearance and/or productivity. Diseases may be caused by many different types of plant pathogens.**

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- ◆ What lawn care practices contribute to weed, insect, nematode and disease problems?  
**Neglect, improper mowing such as scalping the grass, over-watering, over-fertilizing, planting with weedy or diseased seed, etc.**
- ◆ What is the most common lawn pest in your area?
- ◆ Which practices help to control weed, insect, nematode and disease problems?  
**Regular mowing, mowing to the correct height with a sharp and balanced mower blade, planting only certified seed, applying adequate water and fertilizer and frequent scouting of the lawn for insect and disease problems.**
- ◆ What part of a plant do nematodes damage?  
**Damage from nematodes is generally found in a plant's root system and sometimes appears as galls or swollen points on the roots. NOTE: Diagnosing damage due to nematodes is very difficult-often requiring laboratory tests. Since most plant parasitic nematodes are microscopic, this further hinders accurate diagnosis in the field.**

## APPLY

- ◆ What kinds of diseases have you had?  
**Colds, flu, strep throat, chicken pox.**
- ◆ What are some common viral, fungi and bacterial diseases in humans?  
**Viruses include the common cold, chicken pox, polio, hepatitis, influenza and HIV; athletes' foot is a common fungal problem; Bacterial diseases include strep throat and tuberculosis.**
- ◆ Do we have insect and other pest problems? What are they? How do these pests harm humans?  
**Mosquitoes, biting flies, ticks. They can carry diseases (e.g., malaria, lyme disease) and can transmit them to humans. Termites and roaches in our houses can destroy wood and carry disease.**
- ◆ What actions on your part may have contributed to disease development?  
**Improper diet, running yourself down, lack of sleep, unsanitary living conditions, eating contaminated food, close contact with infected individuals, stress.**

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- ◆ What can you do to prevent diseases from infecting you?  
**Eat from all of the food groups (a balanced diet), exercise in moderation, get enough rest, wash your hands often, clean your food thoroughly before eating it, keep your living area clean.**

## SUGGESTIONS FOR ADDITIONAL STUDY

Visit a plant disease diagnostic lab.

Bring in insect books with pictures and drawings of insects of the world.

Invite a plant pathologist, entomologist or nematologist to visit and discuss their work or special things they know about lawn diseases, insects or nematodes.

Invite an extension specialist or professional to visit and discuss their work.

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## BACKGROUND BASICS...Trouble-Shooting

In many ways, the ability to identify and handle problems will make or break your business. We don't live in a vacuum and rarely do we encounter a situation that perfectly mirrors those found in our instructional manuals. Turf can be damaged by any number of forces. Neglect, incorrect or inadequate care and maintenance, fertilizer over-application, close or infrequent mowing, drought stress, excess water, weeds, diseases, insects and nematodes all affect turf. Healthy, well-maintained turf is the best prevention for these problems. Proper care and maintenance allows turf to grow into an effective barrier against insects, diseases, weeds and nematodes. Even under the best care, occasional problems may arise. However, they can be dealt with in an environmentally sound manner.

Trouble-shooting isn't relegated simply to the realm of lawn troubles. What happens when tools break or your mower suddenly quits in the middle of a client's yard? Do you go buy another one, take it to a repair shop or try to fix the mower yourself? If you decide to try to fix it yourself, there are several clues as to what may be wrong and how to fix the problem.

A successful lawn care manager will not only know about his or her business in ideal conditions, but also will know where to get information when things don't go as planned. *Mowing for Money* focuses on 4 areas of trouble-shooting: weeds, insects, diseases and equipment. In the following activities, youth will explore some of the ways insects, diseases and weeds affect Florida lawns and possible corrective measures for what to do when lawn tools break or their mower won't go.

## WORKBOOK OVERVIEW

### WEED IT OUT Workbook page 23

This page focuses on the 3 different types of weeds and provides an activity to find examples of each.

A **weed** is a plant out of place. Weeds make a lawn less attractive and compete with the turf for nutrients, sunlight and water. The many types of weeds are classified by category and further distinguished by their life cycle. The 3 categories of weeds are **grass weeds**, **broadleaf weeds** and **sedges**; a weed's life cycle may be **annual**, **biennial** or **perennial**. Some of the most common Florida turfgrass weeds include crabgrass, goosegrass, annual bluegrass, Florida pusley and woodsorrel.

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**Grass weeds** are true grasses with rounded, hollow stems and closed, hard nodes. The leaf blades are longer than they are wide and have parallel veins. Included in this category are crabgrass, goosegrass, sandbur (sandspur) and annual bluegrass.

**Broadleaf weeds** occur in great variety and are easy to distinguish from grasses. Most have net-like veins in their leaves; many have showy flowers. Familiar broadleaf weeds in Florida include common chickweed, Florida pusley, Florida betony and pennywort or dollarweed.

**Sedges** are not true grasses and may be identified by characteristic clusters of 3 leaves arranged along the solid triangular stem. Each of the leaves in a cluster extends in a different direction. Annual sedges are frequently called “watergrasses.” Perennial sedges are difficult to control and include yellow nutsedge, purple nutsedge and globe sedge.

**Annual** weeds complete their life cycle in a single year. That is, they sprout from a seed, grow, flower, produce seed and die in 12 months or less.

**Biennial** weeds have a similar, but longer life cycle. During their first year, biennials germinate and develop a large root system with a small cluster of leaves. In the second year, they grow, flower, produce seed and die. Compared to the annuals, there are relatively few biennials.

**Perennial** weeds may live longer than 2 years. Both annuals and biennials are easier to control than perennial weeds, which often have many reproductive mechanisms. Although some set seed, perennials generally reproduce by vegetative means such as tubers, bulbs, rhizomes or stolons.

**Weed Control** is facilitated by carefully selecting a grass species and cultivar suited to the planting site. One way to control weeds is to use a fast establishment method for the lawn; although more expensive than grass seed, sod grows and spreads much faster, blotting out competing weeds in the process.

Effective weed control begins with **proper management**. Proper watering and fertilization practices will help the turf grow faster than competing weeds. Preventing damage to the turf due to excessive traffic, insect pests and disease will also keep weeds from gaining a foothold in a lawn. Mowing frequently at the right height prevents annual and biennial weeds from setting seed and creating a seed bank in the soil; a seed bank allows weeds to return year after year.

The removal of weeds which have become established in a lawn is often difficult. **Hand weeding** is an effective means of weed control if it is done before the weeds flower and set seed. Discarded weeds may be turned into compost, as the heat generated by proper composting will kill

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both weeds and their seeds. As a last resort, chemicals called **herbicides** may be used to kill weeds. Most commonly used herbicides are selective and kill only certain types of plants. Unfortunately, herbicides which kill grass weeds may harm turf, as it is also a grass. Similarly, herbicides formulated for broadleaf weeds may also damage trees and shrubs. **Leave the application of herbicides to adults and/or trained professionals.**

**INSECTS** Workbook page 24 and **BUG FIND** Workbook page 25

Workbook page 24 introduces youth to the harmful and beneficial insects found in a Florida lawn and provides discussion questions for the role of insects in the environment. **BUG FIND** on Workbook page 25 is a technique to determine infestation of the primary insect pest of St. Augustinegrass—the chinch bug.

Insects are a part of the landscape and they must be dealt with from time to time. While insects in the landscape often cause panic for homeowners, fewer than 1% of all insects are actually harmful to plants. In fact, many insects are considered beneficials, because they prey upon harmful insects. The first step in dealing with insects in the landscape is learning how to identify them.

Insects are small animals with 3 segmented body parts and 6 legs. Insects cause damage by chewing, sucking or piercing grass plant parts. Some mites (which aren't insects) may also feed on turf. Mites are characterized by having 2 body parts and 8 legs. They are not as common and are not discussed in the activities because of their size (approximately  $\frac{1}{50}$  to  $\frac{1}{30}$  of an inch). Knowing how to identify common insects harmful to turf is the essential first step towards their control.

**Mole crickets** are considered a serious pest of both lawns and pastures in Florida. They uproot turf by digging underground tunnels; once uprooted, the root system dries and the turf dies. They feed at night during warm weather, after rain or irrigation. While 4 species of mole crickets are found in Florida, only 2 (the southern and tawny mole crickets) are considered to be serious pests. Mole crickets may be detected by sprinkling a solution of 1½ ounces of liquid dishwashing soap mixed with 2 gallons of water on 4 square feet of lawn. Test several patches; if mole crickets are present, they will emerge shortly after soap is applied. Mole crickets are preyed upon by fire ants, ground beetles, *Labidura* earwigs and *Lycosa* spiders. Other natural enemies include parasitic nematodes, parasitic flies and pathogenic fungi.

**Chinch bugs** are the primary insect pest of St. Augustinegrass in Florida. These  $\frac{1}{5}$  inch insects are black as adults. They suck plant juices and create yellowish or brownish patches on lawns. Chinch bugs are primarily a problem during the warm season. They are commonly found in “hot” spots (dry areas) in your yard like along sidewalks and driveways. Parting the

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grass along the margins of yellowed areas will usually reveal chinch bugs if they are present in the lawn. Alternatively, a large coffee can with both ends cut off may be pushed into the affected turf and filled with water to a level above the height of the grass. Add water as necessary to maintain the correct water level for 5 minutes; if present, chinch bugs will float to the surface during this time. If no chinch bugs are found in the first area, check 3 or 4 other spots in the suspected areas. Chinch bugs have natural predators, including big-eyed bugs, anthocorids and *Labidura* earwigs, which help reduce their numbers.

**Spittlebugs** are about  $\frac{1}{4}$  inch long when mature. Adults are black with 2 orange stripes across their wings. They damage grass by sucking plant juices with their piercing, sucking mouthparts. They attack all turfgrass species, but appear to prefer centipedegrass. Found throughout the state, spittlebugs are most common in north and northwest Florida. Spittlebug nymphs are protected by frothy, white spittle masses, which may be found on the stems and leaves of infested grass. Damage from spittlebugs resembles that of chinch bugs, but usually appears in shady areas first. Spittlebugs require high humidity for optimum development; thatch contributes to the conditions necessary for infestation.

**Lawn caterpillars** are the larvae of moths. They feed on all species of warm season turfgrass. The most common lawn caterpillars in Florida are the **tropical sod webworm** and **fall armyworm**. Full-grown sod webworm larvae are about  $\frac{3}{4}$  inch long and greenish with numerous black spots and a dark yellowish-brown head. Armyworm larvae grow to  $1\frac{1}{2}$  inches and are dark brown with a light stripe along the back. Lawn caterpillars damage turf by feeding on grass blades, often leaving notches chewed along the sides of the blades or grass blades that are eaten back unevenly. Although the caterpillars generally do not kill the grass, they will decrease its capacity for growth. Inspect for lawn caterpillars by examining the edges of off-color grass to see if the blades have a chewed appearance. Part the grass and look for the caterpillars themselves; alternatively, the soap rinse used for mole cricket detection will also cause caterpillars to surface. Common predators of lawn caterpillars include *Labidura* earwigs, *Lycosa* spiders, ground beetles and parasitic wasps.

**White grubs** are the larval stage of several types of beetles. Although they are not considered to be serious pests of turf, grubs have become a problem in localized areas, especially in south Florida. White grubs are white with brown heads and a dark area at the rear of the abdomen. Depending upon the species, grubs are  $\frac{3}{8}$  to 2 inches in length and rest in a C-shaped position. Grubs feed on the roots of all turf species, causing the death of large patches of grass. To detect grubs, use a spade to cut and lift 3 sides of a 1 square-foot section of sod about 2 inches deep at the edge of one of the off color areas. See if the grass roots are chewed off and sift through the soil to find the grubs.

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**Insect control** starts with proper management. Cultural practices affect the susceptibility of grass to insect invasion. Correct watering, mowing and fertilization schedules will help develop a strong, insect-resistant lawn. Avoid excessive watering and fertilization; these practices foster the formation of thatch, an excellent habitat for chinch bugs, spittlebugs and lawn caterpillars.

Sometimes, an infestation becomes so bad that the use of insect-killing chemicals (pesticides) called insecticides is the only way to resolve the problem. It is best to avoid using insecticides whenever possible because many of these chemicals kill not only insect pests, but beneficial insects as well. Pesticides can be dangerous and should only be applied by adults or trained professionals. Keep in mind that if insecticides have to be used, only the areas affected (and adjoining areas) may need to be treated.

## **Nematodes**

**Nematodes** are tiny parasitic worms which are essentially invisible to the unaided eye. All species of plant parasitic nematodes feed on plant fluids through a needle-like oral stylet (mouth). Damage from nematodes is generally found in a plant's root system and sometimes appears as galls, or swollen points on the roots. The holes in plant cells caused by feeding nematodes can provide an entry point for wilt and rot diseases. Florida's sandy soils and long growing period favor the growth of several kinds of nematodes.

Above-ground symptoms of nematode infestation are generally the result of inadequate water supply due to damaged roots. Turf with a nematode problem wilts under moderate stress and recovers slowly following rain or irrigation. Grass blades may be yellow, a sign of nutrient deficiency. However, these signs should not be attributed immediately to a nematode problem; neither wilting nor yellowing are symptoms unique to nematode infection. Uneven distribution of damage around a lawn may also be a sign of nematode presence, as nematode populations are often scattered about in an area. The best indication that nematodes are feeding on a lawn is damaged roots. Roots injured by nematodes are usually dark and short with few lateral roots; often, the roots do not hold soil well when a plug is removed from the lawn. If a nematode problem is suspected, a soil sample is necessary to determine if nematodes are truly present and what steps may be taken to eliminate the problem (if any). Correcting a nematode problem is difficult and may require fumigation of soil using a nematicide, which can only be applied by trained professionals in most cases.

The best treatment for light to moderate nematode infections is to try to cope with the problem through better management of the turf. Cutting the grass to the proper height, watering sufficiently and fertilizing to prevent nutrient deficiency will help minimize other stresses upon the turf and allow it to grow despite the presence of nematodes.

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## Integrated Pest Management (IPM)

Gone are the days of blanket application of pesticides. This practice not only kills most insects, including beneficials, it also pollutes your environment. The current direction in pest control is known as **Integrated Pest Management or IPM**. IPM relies on correct plant selection, gardening practices, careful monitoring, manual control and cautious use of the least harmful pesticides if they become necessary.

While not necessarily desirable, insect pests are part of the natural balance and they provide food for beneficial insects, as well as for birds and other animals. If you inadvertently kill beneficial insects when you spray for a potentially harmful one, you could end up with a bigger pest problem than when you started. If, however, an infestation becomes severe, intervention may be necessary.

Modern IPM concepts and practices began to evolve in the late 1950's. This evolved from the mid-1940's when the modern use of pesticides began to explode. Many felt at that time that pesticides were the “silver bullet” or ultimate specific weapon needed to control all pest problems. Many traditional pest and plant ecological studies were abandoned as were non-chemical control alternatives. This led to a new generation of producers and scientists who had little experience with non-chemical approaches to pest or plant management. However, resistance to pesticides, especially insecticides, forced researchers and growers to seek alternative methods of pest control.

In recent years, turf managers have begun to realize that their escalating dependence on pesticides and the lack of research and training in the pest management arena are now affecting their industry. For example, in the early 1980s, several very effective and relatively cheap pesticides were banned from the turf market. Researchers are currently trying to find alternative methods of management and control for these pests based on pest life cycle and the use of biological control agents.

Through careful planning, homeowners can encourage the development of a natural ecosystem involving beneficials, birds and other wildlife that will help keep pest populations in check. Learn to recognize beneficials such as lady beetles, lacewings and earwigs. Keeping plants strong and healthy will reduce their susceptibility to insect infestations. Avoiding excessive fertilization and irrigation will minimize the invasion of insects and even diseases. Proper care and maintenance allows turf to grow into an effective barrier against most pests. Insecticidal soaps and horticultural oils are effective for spot-treatment of pests and they are less dangerous than broad-spectrum pesticides. If pesticides must be used, select the least toxic varieties and treat only affected plants. This will minimize environmental contamination and losses of beneficials.

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With prior planning, careful monitoring, proper gardening techniques and selected use of chemicals, homeowners can successfully deal with the problems of insect and disease pests. Look closely and act fast; you may be able to nip problems “in the bud” without resorting to chemical controls.

## LOOKING FOR TROUBLE???

Workbook page 26

This page provides discussion questions about the different forces that can affect the health of a lawn.

Just like weeds are plants out of place, **diseases** can be caused by organisms out of place. Essentially, the disease-causing organisms are **parasites** that invade and contaminate another organism and cause continuous malfunctioning in the host organism (in this case, grass). Given the right environment, these parasites can increase and spread, affecting the plant's growth, vigor, appearance and/or productivity. Common **plant pathogens** (any agent that causes plant disease) include viruses, bacteria, fungi, phytoplasmas, nematodes and certain plant species. It is estimated that over 8,000 plant pathogens exist worldwide.

It is important to remember that what we think of as a disease is actually the reaction to the invasion or symptom, not the actual pathogen. In order for a disease to develop and spread, several things must happen. First, there must be a parasite or source of contamination. Next, the parasite must come in contact with a **susceptible host**. Once contacted, the parasite must have a suitable environment to be able to grow and reproduce in or on the host.

Pathogens can be transmitted by insects, come from seeds and cuttings taken from infected plants, arrive from infested tools or even in rain water. **Bacterial infections** can be treated by some form of antibiotic which kills the bacteria-microscopic single-celled organisms. While **viruses** are also single-celled, they are not animals or plants and they cannot reproduce on their own. Viruses basically do their own thing. **Viral infections** need to “run their course.” (That's why doctors don't give out antibiotics for viral infections-it won't do any good!) Fortunately, bacterial and viral diseases are not common in Florida turfgrasses.

On the other hand, fungal infections are the major cause of disease in Florida. **Fungi** can be single or multi-celled organisms that like warm, wet, shady conditions caused by over-watering or heavy rainfall. Identification of fungal pathogens requires an understanding of their symptoms and a consideration of all the possible causes of a given symptom. Some diseases, such as dollar spot and fairy ring display distinct patches of symptoms; others including rust and gray leaf spot have non-patchy symptoms. The following is an overview of some of the more common turf diseases. Obtain a copy of the *Florida Lawn Handbook* for more detailed information (see REFERENCES).

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**Dollar spot** is caused by fungi and is most damaging to bermudagrass, bahiagrass and zoysiagrass. This disease produces straw-colored, sunken, circular spots 1-2 inches in diameter on fine-textured grasses which may spread throughout the lawn. On coarse-textured grasses, the spots may be larger. Dollar spot may be distinguished from brown patch by the presence of leaf spot-type lesions. The fungi which cause dollar spot thrive in warm temperatures; moisture is required for the initiation of the disease. Lawns with low soil moisture, high thatch buildup and low nitrogen and potassium fertility are most susceptible to dollar spot.

**Fairy ring** is caused by certain “mushroom” or “toadstool” fungi which grow over buried organic matter and thrive during warm to hot periods with ample rainfall. The breakdown of organic matter releases available nitrogen and causes a flush of green growth. Some of these fungi, however, release toxic substances which kill rings of turf. Others grow so vigorously in the turf root zone that no water reaches the roots and the turf dries up and dies.

**Pythium blight** primarily affects bermudagrass and ryegrass. It causes small irregular patches or streaks of grass which initially appear dark and water-soaked. Diseased leaves tend to mat together and feel slimy. As the disease progresses, these patches shrivel and dry to a light brown. Like other fungal diseases, Pythium blight prefers warm, wet weather and proliferates in shaded locations where little air movement occurs.

**Brown patch** appears as wilted and yellowing patches of grass. Affected leaves dry to various shades of reddish-brown to straw brown. The grass along the margins of the patches is often wilted and darker giving a characteristic “smoke ring” appearance. Affected leaves will separate easily from the base of the plant when pulled, as this fungus infects parts of the foliage nearest the soil. Brown patch is primarily a fall and winter disease in south Florida, but it is more common during the spring and fall further north.

**Rust disease** is a minor disease usually restricted to ryegrass, St. Augustinegrass and zoysiagrass. Mild to warm humid weather encourages the growth of this disease, which causes the formation of rust-colored pustules on the leaves. Leaf infection results in leaf yellowing and may cause the thinning of turf.

**Gray leaf spot** is a fungal disease of St. Augustinegrass. Beginning infection is characterized by olive-green to brown water-soaked spots on the leaf blade. These spots enlarge to form circular or elongated lesions that are brown to ash-colored with purple to brown margins. Gray leaf spot proliferates during periods of 100% relative humidity in the warm season; infections may be aggravated by the application of nitrogen fertilizer.

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**Slime mold** is not a disease at all, but it is often mistaken for one. These molds are actually primitive fungi which pass through a crawling stage during their development. They use turfgrass as support for reproduction and cause no real damage. The bright colors of slime molds, often from orange to pink to purple, cause unnecessary alarm to homeowners who discover them growing on their lawn.

**Disease prevention** is greatly simplified by keeping in mind that diseases need 3 things to progress: the right environment, the right host (grass) and a source from which the disease arises. A healthy lawn is less likely to provide the necessary ingredients for disease development. The following management practices will help prevent diseases from occurring in a lawn.

- Plant disease-resistant grass cultivars.
- Water deeply but infrequently.
- Water early in the morning.
- Prevent thatch formation and remove excess thatch.
- Mow grass to correct height with a sharp mower blade.
- Follow good fertilization practices.
- Follow suggested insect and weed control programs.
- Provide good air circulation and adequate light.

**Disease treatment** may occasionally be necessary. When a lawn is healthy it is best to leave grass clippings after mowing. However, if a disease is identified, remove lawn clippings (using a bagger attachment if possible) and thoroughly clean all lawn maintenance equipment to avoid spreading infected materials around the lawn. Most fungal diseases can be treated with a fungicide, which should be applied only by adults and/or trained professionals. Remember that disease problems cannot be reliably diagnosed by just walking by. Phases of many diseases require laboratory analysis for accurate diagnosis.

## WHY WON'T IT GO? Workbook page 27

There is nothing more frustrating than getting half-way into a job and having your mower stop! Workbook page 27 provides a few simple repair tactics to help get you through a job without having to call a professional. If your mower won't start or stops in mid-mow, take it off the lawn and allow it to cool for 10-15 minutes. Encourage youth to think about the logical reasons for the break down-common sense is the key to trouble-shooting. They have spent a lot of time learning how a mower works. They should be able to think of the places they might have trouble. Look for the easy solutions first before anything major. Of course, the cooling down period is an opportune time for youth to take a well-deserved break too.

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The most logical reason for a stopped mower is that it's "out of gas." Check fuel and oil levels, oil:gas ratios for 2-cycle mowers and the power cord, reset button or circuit breaker for electric mowers.

The next most logical reason is loose connections. Anyone who has pushed a mower for 5 minutes know they rattle and vibrate A LOT! When parts rattle, they become loose. You can save yourself a lot of difficulty by simply checking connections and tightening them where needed. These include the spark plug, throttle cable, choke position, safety devices and nuts and bolts. Be especially careful checking around the carburetor. Do not tighten carburetor screws unless you are absolutely sure of the ones that need adjustment. *Tightening the wrong ones will cause damage to the mower, so encourage youth to seek out an adult professional to consult if this is the difficulty.* However, regardless of the loose part, **REMEMBER TO DISCONNECT THE SPARK PLUG BEFORE RECONNECTING ANY PARTS.** You could have an accident if the mower suddenly started running again.

Another place to investigate is the air filter. If it is dirty, clogged or wet, clean it according to manufacturers' directions. After the filter dries, replace it and try again. Check the fuel lines—they should not be pinched or loose (have youth ask an adult to help). Also make sure nothing is wrapped around the blade (**DON'T** forget to disconnect the spark plug first).

If it still won't start, wait several more minutes—do something else and come back to the mower later. Sometimes mowers get too hot if they have not been cleaned or properly maintained or if it is a very hot, sunny day.

If you have checked everything that is logical and reasonably simple, then you may need a professional repair shop. The Trouble-shooting Guide in Activity 7 may help you and the youth determine the problem and the corrective measure needed.

## CONCLUSION

Insects, nematodes, diseases and weeds are all legitimate threats to Florida lawns. These problems detract from the beauty of the lawn and may be expensive to resolve.

The best way to control insects, diseases, weeds and nematodes is to prevent them from becoming established in the lawn by carefully following proper management recommendations. As the old saying goes, "an ounce of prevention is worth a pound of cure." A healthy lawn is the most useful "tool" for the prevention of insect, disease, weed and nematode problems. And well-maintained equipment is the best way to keep your mower and business running in tip-top shape!

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## REFERENCES

Ruppert, Kathleen C. and Robert J. Black (eds.). 1997. *Florida Lawn Handbook*. Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida.

Controlling Fungal Diseases, Controlling Outdoor Diseases and The Disease Triangle, Pests and Plant Diseases Activity Sheets, 4-H Plant Science Unit 3. Penn State College of Agricultural Sciences. 1993.

SUGGESTED AGE: 12-18 years

OBJECTIVES: Youth will be able to:

- identify common Florida weeds by type i.e. broadleaf, grass or sedge.
- describe three ways to eradicate weeds from the yard.
- list three ways weeds compete with lawn grass.

LIFE SKILL: ○ Classification skills.

MATERIALS: WEED IT OUT Workbook activity page 23  
A weedy lawn or roadside area  
Pens/pencils  
Scrap paper

TIME: 30-60 minutes

SETTING: Outdoors or an indoor shop area appropriate for “dirty” work.

SUGGESTIONS:  
If you do not have a lawn area available, bring in examples of weeds or have youth bring in as many different examples as they can find.

## INTRODUCTION

A weed is a plant out of place. Weeds make a lawn less attractive and compete with the lawn grass for nutrients, sunlight and water. Weeding is one of the lawn care services that some of your potential customers may want. It's important to know what's a weed and what's not! Weeds are classified by **type**. The 3 major types of weeds are: grass weeds, broadleaf weeds and sedges. Some of the most common Florida weeds include:

grass type:	crabgrass, goosegrass, annual bluegrass
broadleaf type:	Florida pusley, woodsorrel
sedge type:	yellow nutsedge, globe sedge

In this activity, we will find weeds in a lawn, classify them in the proper groups and draw them.

## Do

### WEED IT OUT!

- ◆ Give each youth a pencil and paper.
- ◆ Have them turn to WEED IT OUT Workbook activity page 23.

- ◆ Have each youth find 5 weeds and identify the **types** of weeds they have found (Do not confuse *type* with *species*; types include grass weed, broadleaf weed and sedge).
- ◆ Have each youth draw the weeds he/she has found and write down the **type** of weed in each drawing.
- ◆ Regroup and discuss findings.

## REFLECT

- ◆ Which **type** of weed was most common in the yard or area?
- ◆ Did you fail to find any **types** of weeds which were mentioned? Which ones?
- ◆ How do you think the types and numbers of weeds might differ if this lawn was planted with a different lawn species? Are some grasses better able to compete with weeds than others?  
**For example, bermudagrass and St. Augustinegrass form dense mats and compete well with weeds. Zoysiagrass establishes slowly and is not able to compete as well with weeds until it is fully established.**
- ◆ Can you think of any ways we might reduce the number of weeds in the yard? Name them. Make a list.  
**Pull them up; mow them before they set seeds and expand further; fertilize the grass to help it compete with the weeds; contact a lawn care professional or have an adult apply a herbicide.**
- ◆ Is corn a weed if it is growing in a peanut field?  
**Yes, a weed is a plant out of place.**
- ◆ How do weeds compete with lawn grasses?  
**Weeds take nutrients, steal water needed by turf and shade turf from the sun.**

## APPLY

- ◆ What are some characteristics that might make a plant a good weed?  
**Adaptability, fast growth and/or spreading, ability to shade out other plants, the production of toxic chemicals that inhibit other plants from growing, the formation of a dense impenetrable root mat.**

- ◆ Have you ever felt like a weed? Like a plant (or a person) out of place? Describe the situation.
- ◆ To a certain extent, the identification of a plant as a weed (a plant out of place) depends on your perspective. Can you think of an instance where your friends or family identified something or someone as a problem, but you did not think it was a problem?
- ◆ How about the other way around—where you didn't like something, but someone else did? What could you do to “solve” this problem? Develop a problem solving strategy similar to the strategy we developed to reduce the number of weeds.

**SUGGESTED AGE:** 12-18 years

**OBJECTIVES:** Youth will be able to:

- describe the effects of competition.
- describe the characteristics of a successful weed.

**LIFE SKILLS:** ○ Basic scientific investigation/experimentation.

**MATERIALS:** Copies of COMPETITION EXHIBITION EXPERIMENT #1 activity sheet for each youth  
Copies of COMPETITION EXHIBITION EXPERIMENT #2 activity sheet for each youth  
Planters or plastic pots  
Potting soil  
Soil from your yard  
Cuttings and seeds of different species of turfgrass or desirable plants  
Weed cuttings or seeds (see below)  
Labels

**TIME:** 30 minutes to plant the experiment  
4-6 weeks or more for observation  
30 minutes to compare and discuss the results

**SETTING:** Indoor shop area appropriate for working with soil and an outdoor area (sunny location) or greenhouse.

**LEADER INFORMATION:**

**WEED SEED SOURCES:**

Valley Seed Service	Azlin Seed Service
PO Box 9335	PO Box 914
Fresno, CA 93791	Leland, MS 38756
209-435-2163	601-686-4507
	601-686-4671 (FAX)

**ADVANCE PREPARATION:**

A good combination to illustrate this is crabgrass and corn (not a lawngrass, but a grass nonetheless). Both crabgrass and corn take approximately 5 to 7 days to germinate and should be planted in a greenhouse or during the warmer months of the year (generally started in February or March).

Another combination to illustrate competition is soybeans (not a grass) and sicklepod or Florida beggarweed. Make sure to ask for Group 7 or 8 soybeans when ordering. Both sicklepod (not a grass) and the Florida beggarweed seeds would need to be placed in a 1% bleach solution for 15 or 30 seconds prior to planting. This experiment would be best if started in May or June.

## INTRODUCTION

Just as people compete, plants also compete with each other for natural resources. What are some of the resources plants need?

**Water, nutrients, sunlight.**

How might one plant compete with another in order to gain access to these resources? **By shading out its neighbor, growing faster, growing taller to get the sun first, growing deep roots to come in contact with more water and nutrients, forming a dense mat to stop other plants from growing nearby, releasing chemicals into the soil to stop other plants from growing nearby.**

In this activity we will plant some grass and weed species together and look for signs of this COMPETITION EXHIBITION.

**Do**

Create a COMPETITION EXHIBITION!

- ◆ Divide youth into groups of 3.
- ◆ Give each group 3 pots with soil, seeds and cuttings (if necessary). Each group should have only 1 species of the desired plant and only 1 weed species. Each group can have a different weed and desired plant, if seeds are available.
- ◆ Only 1 youth in each group should plant the seeds or cuttings. This precaution will minimize the “experimental error” which could result from youth planting the seeds/cuttings at different depths.
- ◆ Half of the groups should water the pots as necessary for 5 to 6 weeks and use potting soil as a planting medium. The other half of the groups should use regular soil from the yard in their pots. Water as necessary for 5 to 6 weeks. Be sure to label all of the pots to indicate the treatment they received.
- ◆ In the first pot, plant 2 desired plant seeds or cuttings.
- ◆ In the second pot, plant 10 desired plant seeds or cuttings.
- ◆ In the third pot, plant 10 weed seeds or cuttings and 10 desired plant seeds or cuttings.
- ◆ Water all the pots.
- ◆ Put them in a sunny location preferably in a greenhouse.
- ◆ Ask each group to develop their “hypothesis” of what the results will be. Have youth record their different hypotheses on the COMPETITION EXHIBITION EXPERIMENT #1 activity sheet.
- ◆ Maintain a weekly log of what is happening.

## REFLECT

- ◆ Discuss the results following the 5 to 6 week time period.
- ◆ Which seeds came up first, the weeds or the desired plants?
- ◆ Which plants grew fastest, the weeds or the desired plants?
- ◆ Did the rate of growth and germination differ between groups (potting soil and yard soil)?
- ◆ Compare the health and vigor of the weeds with the desired plants planted 2 to a pot and those planted 10 to a pot. How did they differ?
- ◆ Did the desired plants compete with each other? Compare the health and vigor of the desired plant planted 2 to a pot with the desired plants planted 10 to a pot (but without weeds). Which desired plants look better?
- ◆ Review your hypotheses of expected results. How did these compare to the actual results?

## APPLY

First, help youth think and apply these concepts and principles to lawn care management:

- ◆ How would a plant which had experienced competition while growing up differ in appearance from one which had not experienced any competition? Which would be healthier?
- ◆ For an advanced or more in depth experiment to study the results, conduct COMPETITION EXHIBITION EXPERIMENT #2 (space, time and conditions) if resources are available.

Second, help youth apply similar principles to other aspects of life:

- ◆ What are some of the things humans compete for?  
**Love, money, oil and other natural resources, food, attention, fun, pride, power, prestige.**
- ◆ What human characteristics help us to compete for these things?  
**Physical strength, ingenuity, resourcefulness, motivation, communication skills, certain personality traits.**

- ◆ How would you describe a successful competitor? Is competition good, bad or both good and bad? Describe the good and bad aspects of competition.
  
- ◆ Currently the world's population is doubling every 22 years. What are some of the consequences of this increase in population on our natural resources? Will this affect how we compete and what we compete for?

# *Competition Exhibition*

## EXPERIMENT #1

- ◆ Select a “planter” to plant all the seeds or cuttings to minimize the “experimental error.”
- ◆ Be sure to label all of the pots to indicate the treatment they received.
- ◆ In the first pot, plant 2 desired plant seeds or cuttings.
- ◆ In the second pot, plant 10 desired plant seeds or cuttings.
- ◆ In the third pot, plant 10 weed seeds and 10 desired plant seeds or cuttings.
- ◆ Water all the pots. Put them in a sunny location preferably in a greenhouse.
- ◆ Half of the groups should water the pots as necessary for 5 to 6 weeks and use potting soil as a planting medium. The other groups should use regular yard soil in their pots. Water as necessary for 5 to 6 weeks.
- ◆ Develop a “hypothesis” of what the results will be.

Hypothesis: \_\_\_\_\_

- ◆ What were the results? Were they different from your hypothesis?

Results: \_\_\_\_\_

Soil Type (circle one):		Record average height here					
Potting Soil	Yard Soil	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
2 desired plant seeds or cuttings per pot							
10 desired plant seeds or cuttings per pot							
10 desired plant seeds or cuttings & 10 weed seeds or cuttings per pot	plant height						
	weed height						



# *Competition Exhibition*

## EXPERIMENT #2

### WHAT YOU NEED:

- ◆ An actively growing grassy area (about 15 × 10 feet) in an out of the way area.
- ◆ A plug cutter or sharp spade
- ◆ A tiller
- ◆ Orange or other colored flags or other markers (may make your own).

### WHAT YOU DO:

- ◆ Divide youth into 3 groups.
- ◆ Have youth divide the grassy area into 3 plots that are 5 × 10 feet each; mark off the corners of each plot with colored flags.
- ◆ Group 1 will leave the grass as it is (at this stage they can help Groups 2 and 3); Group 2 will till the soil and remove all of the grass and weeds; Group 3 will use a plug cutter or spade to cut out approximately 50 plugs (2-3 inch circular or block shaped pieces of sod) from different areas of their plot.
- ◆ Group 3 will then give their plugs to Group 2 to plant in a pattern so that the plugs are approximately 12 inches from one another. Use soil from Group 2 to refill the holes made by Group 3.
- ◆ All groups should maintain their plots in the same way for at least 4 weeks-longer if possible.
- ◆ All groups should keep records of how their plots are doing (whether the grass is spreading out, presence or absence of weeds and so on). Discuss the results.



SUGGESTED AGE: 12-18 years

OBJECTIVES: Youth will be able to:

- identify an insect found in the yard.
- describe the characteristics of the insect.
- determine if the insect is a lawn pest.

LIFE SKILLS: ○ Observation and classification skills.  
○ Investigate variety found in nature.  
○ Problem solving or diagnostic skills.

MATERIALS: INSECTS Workbook activity page 24  
INSECT CARDS from Activity 4  
Pens/pencils  
Scrap paper  
Insect identification book  
Lawn or outdoor area  
Glass jars with lids or sandwich bags with zipper locks

TIME: 30 minutes

SUGGESTIONS:

- Stereo microscopes and other magnification devices help clarify insects' distinguishing features.
- If you do not have access to an outdoor area, have youth bring in lawn insects from home.
- Insect identification sheets (see Activity 4) are available for sale through the Cooperative Extension Service.

## INTRODUCTION

Insects come in many different shapes and sizes. Some are known as economic pests because their damage to crops, forests and gardens is serious and costly to control or repair. Common insect pests of Florida lawns include mole crickets, chinch bugs, grubs, spittlebugs, armyworms and sod webworms. Some insects are predators and eat insect pests. These insects are called **beneficials**. Important beneficials include big-eyed bugs, *Labidura* earwigs, *Lycosa* spiders, ground beetles and wasps. In this exercise we will draw 1 important economic insect pest of turfgrass and 1 beneficial which could be used to control it.

## **Do**

### **DRAW ON EXPERIENCE!**

- ◆ Have youth read INSECTS Workbook activity page 24 and complete the first activity-collecting an insect from the lawn.

Note: If youth cannot find any insects, follow the suggestions in Lesson 5, Activity 4.

- ◆ Based on experience and using the INSECT CARDS in Activity 4, try to identify the insect. Is it a lawn pest?
- ◆ Describe the insect's physical and behavioral characteristics to the group.
- ◆ Have youth draw their insect as realistically as possible.

## **REFLECT**

- ◆ In what ways do insects look similar?
- ◆ In what ways are they different?
- ◆ Do you think any of these insects might be related?
- ◆ What do you think the insect eats?
- ◆ Which of these insects do you think might be economic pests? Why?
- ◆ For further discussion, have youth answer the second question on Workbook page 24.

## **APPLY**

- ◆ Find out everything you can about your insect-where it lives, what it eats, how it reproduces, life cycle stages and its natural enemies (predators and parasites). Share this information with your group.
- ◆ Are all insects in your yard damaging to your lawn?  
**No**

- ◆ What if you killed all of the insects in your yard, regardless of whether they were pests?  
**Destroy ecological balance.**
  
- ◆ What would happen if you killed all of the insect predators and the pests and then some insect pests return to your lawn?  
**They would have no competition, so possibly they could destroy your lawn.**
  
- ◆ Why is it important to identify the specific insect pests in your yard in order to organize a control technique?  
**To avoid misuse of chemicals and to be sure you do have a pest rather than a beneficial.**
  
- ◆ If you had a problem in your lawn and some of your grass was dying, how would you determine the **cause** of that damage?  
**By looking at the symptoms: are they disease symptoms or do they look more like insect damage or are they symptoms of poor management? By looking for and identifying the insects, then determining if they are considered pests for your lawn; by taking samples of the insects or their damage to your Extension office; by asking other homeowners if they have ever seen similar symptoms and, if so, asking what they did about them.**

**SUGGESTED AGE:** 12-18 years

**OBJECTIVES:** Youth will be able to:

- identify 5 common insects of Florida turfgrass.
- distinguish between beneficial and harmful insects

**LIFE SKILLS:** ○ Classification and analysis skills.

**MATERIALS:** BUG FIND Workbook activity page 25  
Copies of INSECT CARDS for each youth  
Turfgrass Insect Sheet 1 (SP 126)  
Turfgrass Insect Sheet 2 (SP 127)  
Pens/pencils  
Cardboard  
Glue  
Scrap paper  
Scissors  
Glass jars with lids, or plastic bags with zipper locks  
1 coffee can (2 or 3 lbs size) with both ends cut out for each team  
1 gallon sprinkler can for each team  
1 gallon of water for each team  
1½-2 tablespoons of liquid dishwashing detergent for each team

**TIME:** 45-60 minutes

**SETTING:** An outdoor lawn area

**ADVANCED PREPARATION:**  
Use scissors to cut apart INSECT CARDS.  
Glue each to a piece of cardboard for durability.

**SUGGESTIONS:**  
Scout an outdoor lawn area yourself first to make certain some of the insects are present. The time of day, temperature and season of the year will dictate insect behavior and their peak activity in which they can be observed.  
If you do not have access to an outdoor area, have youth bring in lawn insects from home. Also, you can contact a local entomologist to locate an insect collection.  
You could also find pictures of insects in magazines or books. The insect identification sheets found at the end of this activity are available for sale through the Cooperative Extension Service.

## INTRODUCTION

Harmful insects are serious pests in Florida lawns. Chinch bugs, mole crickets, spittlebugs, armyworms and sod webworms are some of the more common lawn pests in Florida.

**Show the insect pictures and identify each one.**

Have any of you seen these insects in your lawn or in a neighbor's lawn? They can cause serious damage to lawn areas, including completely defoliating some areas (removing all the leaves or, in this case, blades of grass) and killing off entire sections of others by chewing through plant roots. Some insects pierce the grass blades and suck the sap out of the plant leaving yellow areas. However, other insects may help us protect our lawns by eating or parasitizing harmful pests. These insects are called **beneficials**. Important beneficials include big-eyed bugs, *Labidura* earwigs, *Lycosa* spiders, ground beetles and wasps.

In this activity we will hunt for some of these insects and try to capture them in our insect jars. The study of insects is called **entomology**.

## Do

### BUG FIND!

- ◆ Give each youth an INSECT CARD and a zipper lock bag or an insect jar with a lid (They can bring a jar of any size from home, but remember, glass jars can break!)
- ◆ Have youth divide into teams to do Workbook activity page 25.
- ◆ If youth are having difficulty collecting the insects, “encourage” the insects in by swatting the ground, using the jar lid or waving their hands or a piece of cardboard over the grass.
- ◆ If youth are having difficulty finding insects:
  - Place 1½-2 tablespoons of regular liquid dishwashing detergent in 1 gallon of water.
  - Have youth use a sprinkler can to apply this solution to a small area of the lawn (approximately 2 × 2 feet).
  - Apply until the ground is saturated. Have youth watch to see what insects appear. Most of the insects in the area will appear within 3 minutes.
  - Youth can collect some of the insects by placing the bag or jar on the ground.
- ◆ They have 15 minutes to collect as many insects as possible. (They may need longer if insects aren't easily found.) In particular, they should keep a lookout for the insect on their card. The lines on the cards indicate the insect's size when mature.
- ◆ After 15 minutes, regroup.
- ◆ Give youth copies of the rest of the insect cards so they can identify all insects in their jar.
- ◆ Use the Turfgrass Insect Sheets (1 and 2) to confirm the identity of the insects the youth found.

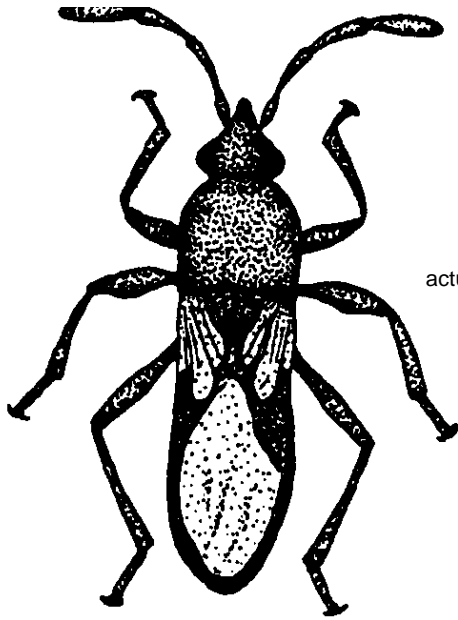
## REFLECT

- ◆ How many insects were you able to find?
- ◆ What were the most common insects?  
**Compare everyone's insect catch.**
- ◆ Which insects were most difficult to find? Which were the easiest?
- ◆ Did everyone find the insect on their card? Have each youth hold up their card and the insects they found to match.
- ◆ Look at the mouth parts of the insects which were collected. Which ones do you think pierce plant leaves and stems and suck out plant sap? Which ones might chew through leaves and roots?
- ◆ Are there any insects which we collected which might be beneficials? What do their mouth parts look like?

## APPLY

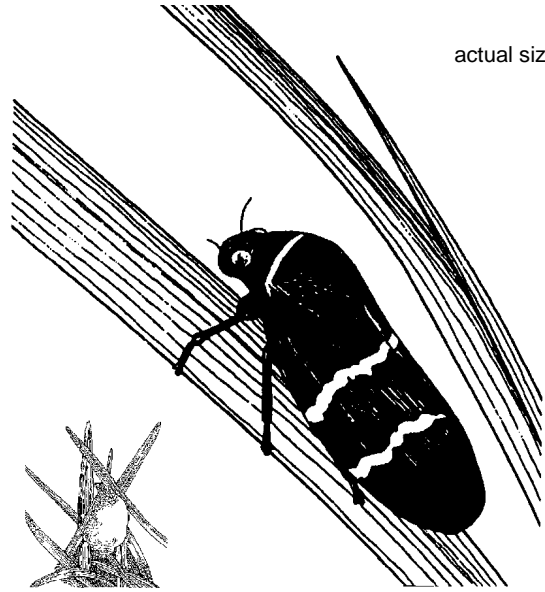
- ◆ Draw the most interesting insect you found. Look it up in an insect book and try to figure out where it lives, how it reproduces and what it eats.
- ◆ Are insects always harmful? What would happen if all of the insects in the world were killed? How might that affect the ecosystem where you live?
- ◆ Preserve the insects for later study or reference by placing them in rubbing alcohol...preferably in plastic vials made specifically to hold rubbing alcohol.

*INSECT CARDS*



actual size

Chinch Bug



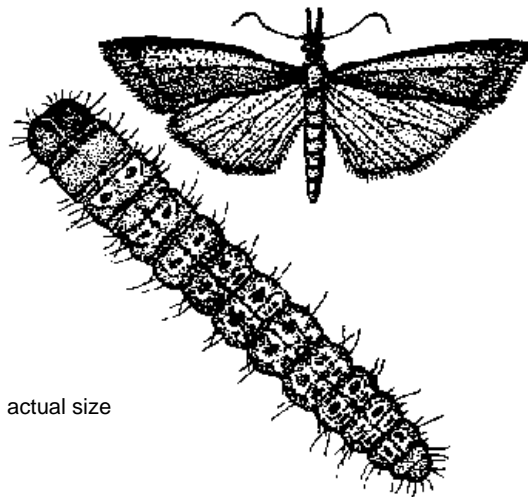
actual size

Spittlebug



actual size

Armyworm



actual size

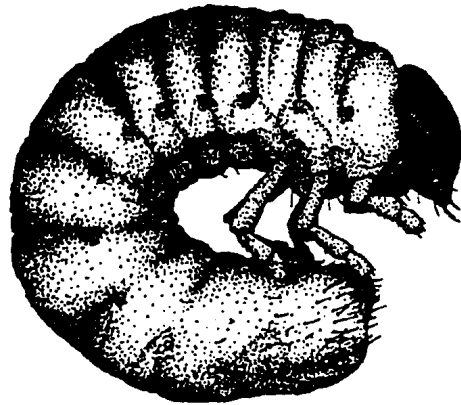
Sod Webworm

INSECT CARDS



actual size

Mole Cricket



to

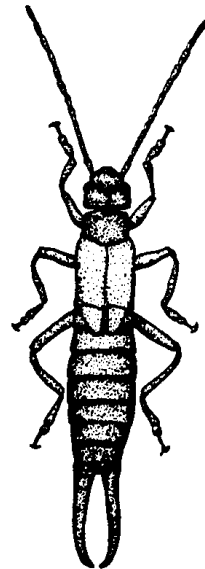
actual size

White grub



actual size

Big-eyed Bug



actual size

*Labidura* Earwig



Cooperative Extension Service  
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## Turfgrass Insects Sheet 1<sup>1</sup>

D.E. Short and J.L. Castner<sup>2</sup>

**Southern chinch bug, *Blissus insularis*.** This is the most important pest of St. Augustinegrass in Florida. Adults are 1/5" long and black with white patches on their wings. The nymphs range from 1/20" to nearly adult size. They are reddish with a white band across their backs but become black as they mature. The nymphs pass through five instars, requiring four to five weeks to reach adulthood. There are three generations per year in north Florida and seven to 10 in south Florida.

Chinch bugs withdraw the plant sap with piercing-sucking mouthparts, causing yellowish to brown patches in the turfgrass. Injury is more prevalent in full sun and under dry conditions. When chinch bugs are present in sufficient numbers to cause noticeable damage (20 to 25 per square foot) they can be found by parting the grass at the margin of the off-color areas. Examine at least three or four places in suspected areas. If chinch bugs are the problem, they will be crawling on the soil surface.

**Fall armyworm, *Spodoptera frugiperda*.** It occasionally damages turfgrass. They are more

common on golf courses and other Bermuda grass areas than on home lawns. Mature larvae are 1 1/2" long and greenish with dark stripes. Unlike webworms, fall armyworms feed during the day and occur earlier in the year. The life cycle and damage symptoms are similar to webworms.

**Tropical sod webworm, *Herpetogramma phaeopteralis*.** This is the most common caterpillar attacking turfgrass. They attack all grasses, but Bermuda is preferred and Bahia is least desirable. The larvae are greenish with numerous black spots and are 3/4" long when mature. Sod webworms are usually not a problem until June in south Florida, July in central Florida and August in north Florida. Injured grass has notches chewed along the sides of the blades or is eaten back unevenly. They feed only at night and rest in a curled position on the soil surface during the day. The life cycle requires five to six weeks and there are several generations per year.

1. This document is SP-126, one of a series of the Department of Entomology and Nematology, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. This document is available for sale as a high-quality, color publication. For ordering information or to order using VISA or MasterCard, call 1-800-226-1764. November 1992 as Sp 126, reviewed May 1996. Please visit the FAIRS Website at <http://hammock.ifas.ufl.edu>
2. D.E. Short, Professor, Department of Entomology and Nematology and J.L. Castner, Scientific Photographer, Department of Entomology and Nematology, Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, 32611.

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**Mole crickets.** Four species of mole crickets occur in Florida (from left in photo): the northern mole cricket, *Neocurtilla hexadactyla*, the short-winged mole cricket, *S. abbreviatus*, the tawny mole cricket, *S. vicinus*, and the southern mole cricket, *Scapteriscus borellii*. The southern and the tawny are the most prevalent. Mole crickets are considered the most serious pest of turfgrass in Florida. Adults are about 1 1/2" long, light-brown, and have forelegs well adapted for tunneling through the soil. They damage all grasses, but Bahia and Bermuda grasses are their favorite hosts. Their damage is primarily mechanical: they tunnel through the soil near the surface, severing the roots and uprooting the grass.

There is one generation per year in north and central Florida. Dispersal flights occur in the early spring and eggs are deposited during May. Each female deposits approximately 130 eggs in the soil. Peak egg hatch occurs in June and the nymphs are mature by October.

**Ground pearls, *Margarodes* and *Eumargarodes* spp.** They are related to mealybugs and are found throughout Florida. Each female lays about 100 eggs, which hatch into crawlers. The crawlers locate grass roots, feed, molt, shed their legs, and secrete a cream-colored, scaly covering which completely encloses their bodies. They become spherical and are gray or brown. They appear very much like small

pearls. They insert their long, slender threadlike mouthparts into the grass roots to withdraw plant juices. The nymphs vary in size, ranging from a grain of sand to about 1/16" in diameter when they are mature.

The adult female pearls are wingless, about 1/16" in length, pink, and have well-developed front legs. There is one generation per year. They most commonly infest centipede grass in north and northwest Florida. Severely infested grass turns yellow, then brown. It requires large numbers of pearls to damage the grass, and control is usually not justified.



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## Turfgrass Insects Sheet 2<sup>3</sup>

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D.E. Short and J.L. Castner<sup>4</sup>

**White grubs.** Five genera of grubs may infest any of our turfgrasses. The masked chafers, *Cyclocephala* spp. are the most common, but *Phyllophaga* spp., *Bothynis* spp., *Strategus* spp. and *Ataenius* spp. are also in Florida. These pests are the larval stage of beetles such as May or June beetles. The eggs are laid in the soil usually during May or June, one to two inches below the soil surface. The grubs feed on grass roots and remain in this stage for one to four years, depending on the species. They are white with a brown head, three pairs of small legs, and are C-shaped. In infested areas the grass consistently wilts, and mosaic areas of yellow and green grass develop.

To check for grubs, cut three sides of a one-foot-square piece of sod about two inches deep at the edge of one of the off-color areas. See if the grass roots are chewed off and sift through the soil looking for the larvae. Check several other places. If you find an average of three to five grubs per square foot, control is justified.

**Hunting billbugs, *Sphenophorus venatus vestitus*.** This insect sometimes causes injury to turf in Florida, especially to zoysia grass and

Bermuda grass. The adult beetle has a bill or snout, is black, and is about 1/2" long. Beetles lay their eggs inside the grass stem at about the soil line. The larvae hatch in one week and feed for several weeks inside the stems of the grass, then migrate to the roots. The larva, or grub, is white with a brown head, legless and about 3/8" long when mature. Damage usually first appears as yellow spots only a few inches in diameter. These areas gradually become larger and the turf has a spotted or mosaic appearance. Check for billbugs as described for grubs. If you find 10 larvae per square foot, apply an insecticide.

**Twolined spittlebugs, *Prosapia bicincta*.** Adults are 1/4" long, and black with two reddish-orange, transverse bands on the wings. Eggs are laid in the thatch. The nymphs are white and live within a mass of frothy "spittle" they secrete on the grass. The life cycle requires two and one-half months and there are two generations per year. Both adults and nymphs withdraw plant sap with their piercing-sucking mouthparts. Damaged grass tips are yellowish, and eventually curl and turn brown.

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**Banks grass mite, *Oligonychus pratensis*.** In Florida, this mite has become an occasional pest of St. Augustinegrass. These spider mites are less than 1/50" and green. The mite's color and small size make it difficult to detect. The length of their life cycle varies from eight to 25 days, depending on the temperature. Damage appears as leaf stippling that turns yellow. Damage is more severe during dry periods.

**Bermudagrass mite, *Eriophyes cynodontiensis*.** The Bermudagrass mite is sometimes a pest of Bermuda grass throughout Florida. The most severe damage occurs to the coarser varieties such as Common and Ormond. The mites are only about 1/130", yellowish-white, and somewhat wormlike in shape. Their life cycle is complete in seven days. The mite causes a characteristic type of damage: the grass blades turn light-green and curl abnormally. The internodes shorten and tissues swell. The grass becomes tufted and thins out. Injury is more pronounced during dry weather, especially when the grass is stressed. The mites prefer taller grass, such as that growing along fence rows.

**Imported fire ant, *Solenopsis invicta*.** The red imported fire ant is a small, aggressive ant that builds a rounded, conical nest, or mound, often two or three feet across. The fire ant was imported in about 1940, and since then has spread widely. All counties in Florida are infested. The ants are 1/8" to 1/4" long and reddish-brown to black. These social insects live in colonies, which may have up to 200,000 individuals.

The imported fire ant sting is a painful burning. It causes pustules that may take up to 10 days to heal. If broken, a pustule may become infected. Some people have an allergic reaction to fire ant stings. A few have died as a result of allergic responses to the stings, but this is very rare.

SUGGESTED AGE: 12-18 years

OBJECTIVES: Youth will be able to:

- identify basic lawn problems.
- distinguish between insect damage and disease and weed problems.
- describe characteristics of healthy grass.

LIFE SKILLS: ○ Observation and analysis skills.

MATERIALS: LOOKING FOR TROUBLE Workbook activity page 26  
Scissors  
Pens/pencils  
Scrap paper

TIME: 45-60 minutes

SETTINGS: A grassy area

SUGGESTIONS:  
If you don't have a grassy area or are otherwise unable to work outside, bring in examples of healthy and unhealthy grass.

## INTRODUCTION

Like humans, plants can get sick and, therefore, not grow well. Even the most carefully tended lawn can be affected by insects, diseases and weeds. However, it is important to be aware of how to combat these difficulties in an environmentally friendly way.

**Insects** are a part of the landscape and they must be dealt with from time to time. While insects in the landscape often cause panic for homeowners, fewer than 1% of all insects are actually harmful to plants. In fact, many insects are considered beneficials because they prey upon harmful insects. Pests damage plants by feeding on their leaves, roots or stems and also by transmitting diseases when they feed on them. Through careful inspection and planning, **Integrated Pest Management (IPM)** can keep pests to a minimum (review BACKGROUND BASICS for additional information on IPM).

**Diseases** are continuous malfunctioning in any organism sometimes caused by a parasitic infection by another organism. A disease can cause a plant to stop growing as it should and lose its normal vigor, appearance and/or productivity. Both **viruses** and **bacteria** can be transmitted by insects, from seeds and cuttings taken from infected plants, by infected tools or even in rain water. Fortunately, bacterial and viral diseases are not common in Florida turfgrasses.

On the other hand, fungal diseases are a big problem in Florida. **Fungi** thrive in wet, warm climates like ours. Some of the most common fungal diseases in turfgrass include dollar spot, gray leaf spot, brown patch, pythium and helminthosporium.

**Weeds** are plants out of place. Weeds compete with other plants for sunlight, water and nutrients. Some weeds also exude toxic compounds which deter competitors from growing nearby. Common Florida weeds include crabgrass, goosegrass, Florida pusley and annual bluegrass.

In this activity we will learn to identify healthy and diseased grass plants and try to determine the type of disease problems we find, based on their symptoms. It is important to remember that the only way to accurately identify a disease is in the laboratory. However, this activity will help us to distinguish between insect damage, disease and weed problems.

## Do

Go LOOKING FOR TROUBLE!

- ◆ Give each youth a copy of LOOKING FOR TROUBLE Workbook activity page 26.
- ◆ Spend 15 minutes finding healthy and diseased plants-answer questions on page 26.
- ◆ After everyone has finished, regroup.
- ◆ Divide the youth into 5 groups and assign 1 question from page 26 to each group.
- ◆ Have the groups tabulate the results of their question and combine all the answers into 1 answer representing the whole group.
- ◆ Present the results.

## REFLECT

- ◆ Is this a healthy lawn? (How did everyone vote?)
- ◆ How did you decide if this was a healthy or poor lawn? What criteria did you use?  
**List all of the criteria used: color, uniform coverage, number of weeds, etc.**
- ◆ Describe a healthy grass plant. What does it look like? Are its blades thick or thin, what color is it, what do the roots look like?

- ◆ Show the examples of diseased plants. How did everyone determine they were sick?
- ◆ Are the problems caused by poor management, an insect, or a disease? What was the most common disease problem?

## **A**PPLY

- ◆ Complete LOOKING FOR TROUBLE activity for your own lawn at home from your Workbook page 26.
- ◆ How do you know when you are sick? What do you feel like? How do you look? What do you do when you are sick? What should you do if you find sick plants?  
**Visit the doctor: call a County Agent (plant doctor) or Master Gardener at the Cooperative Extension office!**
- ◆ Collect 5 kinds of insects in your lawn. Try to determine which ones are damaging the grass and which ones are not. Some insects eat other insects and actually protect your lawn! Try to identify those “beneficial” insects as well as the pests.
- ◆ How many people here have had a cold? How about chicken pox? Malaria? Athletes' foot? Does everyone get the same diseases or get sick with the same frequency? Why not?  
**No, not everyone gets the same diseases. Some people do not come into contact with the disease; some may not live in the environment in which a certain disease flourishes; some people practice preventive medicine and get immunized or take other precautions against a disease; some people are naturally immune to a disease.**
- ◆ Are all grasses susceptible to the same diseases? Do insects eat all grasses, or do they have preferences? What are some of the food preferences which you have?  
**No, some are resistant to particular diseases. No, some insects have preferences.**

SUGGESTED AGE: 14-18 years

OBJECTIVES: Youth will be able to:

- define disease.
- identify ways diseases are spread.
- describe factors which affect the development and spread of disease.
- identify ways to prevent infection, development and spread of disease.

LIFE SKILLS: ○ Learn the benefits of preventive care and foresight.

MATERIALS: Copies of OUNCE OF PREVENTION activity sheets

Copies of KEY FOR IDENTIFICATION OF TURF DISEASES handout for each youth

Pens/Pencils

1 copy of the *Florida Lawn Handbook* as a reference (3 copies, 1 for each group, would be helpful).

TIME: 60 minutes

SETTING: A comfortable room with tables and chairs.

SUGGESTION: Review BACKGROUND BASICS.

## INTRODUCTION

What causes disease?

**Parasites invade and contaminate another organism and cause continuous malfunctioning in the host organism (in this case, grass). Given the right environment, these parasites can increase and spread, affecting the plant's growth, vigor, appearance and/or productivity. Any agent that causes disease is called a pathogen. It is estimated that over 8,000 plant pathogens exist worldwide. It is important to remember that what we think of as a disease is actually the reaction to the invasion or symptom, not the actual pathogen.**

How can a lawn get a disease?

**Somehow, the parasite must come in contact with a susceptible host. Once contacted, the parasite has to be able to grow and reproduce. Infections can be transmitted by insects, from seeds and cuttings taken from infected plants, by infested tools and equipment (like lawn mower blade or wheels) or even in rain water.**

What are the 3 most common plant pathogens?

**Fungi** single or multi-celled organisms that generally like warm, wet, shady conditions caused by over-watering or heavy rainfall (the most serious pathogen in Florida).

**Bacteria** microscopic single-celled organisms.

**Viruses** DNA or RNA covered by protein, usually considered single celled.

How come infections don't overrun the world?

**Not all pathogens are able to infect all plants equally because they are not always able to infect, grow and reproduce in all plants or at the same rate in the same kinds of plants. Some plants, just like people, have resistance to certain diseases. Factors such as temperature, humidity and rainfall can affect the rate of disease development and spread. Some diseases prefer warm, wet conditions, whereas others grow best in cool, wet conditions.**

We will explore many of these concepts in the following case studies and learn to practice AN OUNCE OF PREVENTION.

## **D**O

Practice AN OUNCE OF PREVENTION!

- ◆ Divide youth into 3 groups.
- ◆ Give each group a CASE STUDY.
- ◆ Give each youth a copy of the KEY FOR IDENTIFICATION OF TURF DISEASES.
- ◆ The groups have 15-30 minutes to read and discuss their case study and to answer the questions at the end.
- ◆ Have groups present the results of their discussions. (The answers to question 5 in each CASE STUDY should revolve around proper care and management of the lawn.)

## **R**EFLECT

- ◆ What methods of disease dispersal and spread were described in the case studies?  
**Water and possibly infested equipment.**
- ◆ What factors mentioned in the studies altered the rate of disease spread and disease development?  
**Temperature, rain (irrigation), plant health, soil fertility, improper mowing height and frequency, presence of thatch, over and under fertilization.**

- ◆ Identify ways to prevent diseases from spreading.  
**Use certified sod or seed; clean tools after each use; control insect populations; keep plants healthy by adequate fertilization but not over-fertilization. Irrigate only when needed. Mow at the proper height and frequency using a properly sharpened and balanced blade. Avoid practices that result in a build-up of thatch.**

## **A**PPLY

- ◆ Do chemical forms of disease control work to prevent the rate of infection, disease spread or disease development?  
**Most chemical forms of disease control affect disease development; they don't “cure” but instead prevent pathogens from further development.**
- ◆ What can we do to prevent ourselves from getting sick?  
**Eat right, keep in shape, exercise, sleep, reduce stress, get vaccinated.**
- ◆ Can vitamin supplements replace a balanced diet and supply us with all of our daily nutrient needs?  
**No.**
- ◆ What are some of the ways humans use to prevent diseases from spreading?  
**Washing our hands, staying away from sick people, establishing quarantine areas, regulating food quality, enforcing health codes.**
- ◆ What do vaccines prevent...disease spread, the rate of disease spread or the susceptibility of a population?  
**The susceptibility of a population.**

**CASE STUDY #1  
ANSWER SHEET**

A well-cared-for, healthy lawn is less likely to be infected by disease organisms. However, sometimes you can care for a lawn too much! Homeowners use many practices to care for their lawns. Some practices are designed to prevent disease problems from developing; other practices help keep lawn problems under control or eradicate them. Read the following case study and answer the questions at the end using the **KEY FOR IDENTIFICATION OF TURF DISEASES** if necessary.

Bill is a homeowner in a suburb of Miami and has a beautiful St. Augustinegrass lawn. Bill wants his lawn to be the most beautiful lawn in the neighborhood. He knows that fertilizer will make his grass grow healthy and strong, so he fertilizes his yard frequently. Bill believes that if a little fertilizer will help his lawn, extra fertilizer will make his lawn even healthier and more beautiful. In addition to fertilizing frequently, Bill also waters his lawn often. However, he does not always have time to mow as often as he should; sometimes, he removes more than the recommended  $\frac{1}{3}$  of the leaf at each mowing.

Unfortunately, thatch has built up in Bill's lawn. In addition, following a few days of steady rain, Bill noticed brownish water-soaked spots on the leaf blades of his lawn. These spots soon enlarged into elongated lesions. He has spent a considerable sum to plant and maintain his lawn and does not want to replant it. Bill called the local Cooperative Extension Service and discussed his problem with the home horticulture agent.

1. How does Bill manage his lawn?  
**He fertilizes and waters excessively. He frequently removes more than the recommended  $\frac{1}{3}$  of the leaf when he mows his grass.**
2. How have these management practices contributed to the formation of thatch?  
**Over-application of fertilizer and water as well as close and infrequent mowing encourages the formation of thatch.**
3. What type of disease do you think the home horticulture agent helped Bill identify in his lawn? Why?  
**Gray leaf spot. Gray leaf spot is a common disease of St. Augustinegrass characterized by olive-green to brown water-soaked spots on leaf blades. Infection is most common during wet periods and is aggravated by the application of nitrogen fertilizer.**
4. How can Bill control this problem?  
**Change his management practices. Water only when grass becomes wilted and fertilize only when soil analysis indicates that it is necessary. Mow as needed and don't clip more than  $\frac{1}{3}$  of the grass blade at a time. Collect the grass clippings to prevent reinfection of the lawn until the disease is eliminated and conditions no longer favor its development. Application of a registered fungicide may be necessary.**

**CASE STUDY #2  
ANSWER SHEET**

A well-cared-for, healthy lawn is less likely to be infected by disease organisms. However, sometimes you can care for a lawn too much! Homeowners use many practices to care for their lawns. Some practices are designed to prevent disease problems from developing; other practices help keep lawn problems under control or eradicate them. Read the following case study and answer the questions at the end using the **KEY FOR IDENTIFICATION OF TURF DISEASES** if necessary.

Sam is a homeowner in Orlando. Sam's lawn was once the envy of his neighbors, but his new job sometimes requires him to leave town for extended periods of time. Due to his busy schedule, Sam now takes minimal care of his bahiagrass lawn. He relies on Florida's sunshine and rainfall to care for his lawn. He waters and mows infrequently and rarely, if ever, fertilizes.

Following a period of heavy rain in late spring, Sam noticed that a number of straw-colored, sunken spots 2-3 inches in diameter had appeared over a large portion of his lawn. On the leaves of affected grass, Sam noticed discrete leaf spot-type lesions. In the areas where the grass had thinned, numerous weeds had sprouted. While he typically pays little attention to his lawn, Sam is distressed by this problem. He called the local Cooperative Extension Service office and explained his troubles to the home horticulture agent.

1. How does Sam manage his lawn?  
**He does the bare minimum; he rarely waters, mows or fertilizes.**
2. What type of disease do you think the home horticulture agent helped Sam identify in his lawn? Why?  
**Dollar spot. This disease may be distinguished from brown patch and other diseases by the presence of lesions on the leaves of affected grass. While dollar spot requires moisture for initiation, it is most common in lawns with low soil moisture and low nitrogen and potassium fertility.**
3. What is responsible for the weed problem Sam has noticed in his lawn? How can he treat this problem.  
**The thinning of grass due to disease infection has made the lawn susceptible to weed invasion. Elimination of the dollar spot and hand weeding should allow the lawn to recover. The application of fungicides and/or herbicides may be necessary.**
4. How can Sam prevent this problem from recurring?  
**Water and mow as needed. Fertilize on a regular basis. Remove clippings from the lawn until the dollar spot is eliminated in order to prevent reinfection.**

**CASE STUDY #3  
ANSWER SHEET**

A well-cared-for, healthy lawn is less likely to be infected by disease organisms. However, sometimes you can care for a lawn too much! Homeowners use many practices to care for their lawns. Some practices are designed to prevent disease problems from developing; other practices help keep lawn problems under control or eradicate them. Read the following case study and answer the questions at the end using the **KEY FOR IDENTIFICATION OF TURF DISEASES** if necessary.

Susan is a homeowner in Pensacola. She planted centipede sod and has a well-established centipedegrass lawn. She mows the lawn every 10-14 days, following recommendations made by the Cooperative Extension Service. Susan follows the fertilization recommendations made by the Cooperative Extension Service. She waters the lawn as needed, depending on the rain.

In September, Susan had her neighbor mow her lawn when she was out of town. When she returned, she noticed discolored areas in her lawn. Yellow and brown patches appeared in the lawn; these patches were bordered by a wilted “smoke ring.” Susan was very upset. She had always taken good care of her turf; how could this happen to her lawn? Susan called the local Cooperative Extension Service and discussed her problem with the home horticulture agent.

1. How does Susan manage her lawn?  
**She waters, fertilizes and mows according to Extension recommendations.**
2. What type of disease do you think the home horticulture agent helped Susan identify in her lawn? Why?  
**Brown patch. Brown patch is the only patchy disease with an associated “smoke ring” margin.**
3. When Susan looked at her neighbor's lawn, she noticed that the neighbor had the same problem. How could Susan's lawn have become infected?  
**The disease may have spread across the lawn from the neighbor's yard or it could have been brought over on the blades of the neighbor's lawn mower when they mowed Susan's grass during her vacation. There also may have been excessive rainfall, which helps brown patch grow and spread, while Susan was away.**
4. How can Susan get rid of the brown patch?  
**Pick up grass clippings until the disease is under control. Carefully monitor the amount of water applied to the lawn and water only when absolutely necessary. The application of a fungicide may be necessary.**

# Key for Identification of Turf Diseases\*

## A. GRASS AFFECTED IN DISTINCT PATCHES

1. Affected areas 2-3 inches in diameter. Leaf spot type lesions present ..... **Dollar spot**
2. Affected area usually larger than 2-3 inches in diameter. Leaf spot-type lesions not present.
  - a. Ring or arc of lush growth or dead grass; mushrooms may be present. May be associated with localized dry areas ..... **Fairy ring**
  - b. Patches not associated with ring of lush growth.
    - i. Affected areas tend to be in streaks. Grass blades matted together. Primarily on ryegrass and bermudagrass ..... **Pythium blight**
    - ii. Affected area circular; often with wilted "smoke ring" margin.  
Grass blades not matted ..... **Brown patch**
    - iii. Affected areas appear as patches (8-24 inches in diameter) of chlorotic and necrotic grass. Roots short and black ..... **Bermudagrass decline**  
..... **Take all root rot of St. Augustinegrass**
3. Affected area usually larger than 2-3 inches in diameter. Leaf spot-type lesions are present. May appear as necrotic rings but no mushrooms are present and is not associated with dry areas. .... **Rhizoctonia leaf and sheath spot**

## B. GRASS NOT AFFECTED IN DISTINCT PATCHES

1. Orange pustules present on leaf blades ..... **Rust**
2. Orange pustules not present on leaf blades.
  - a. Leaf Spots present.
    - i. Primarily on ryegrass and bermudagrass ..... **Helminthosporium leaf spot**
    - ii. Primarily on St. Augustinegrass
      - (1) Leaf spots oval to irregular with brown borders and tan to gray centers. .... **Gray leaf spot**
      - (2) Leaf spots linear with purple borders and tan to white centers. .... **Cercospora leaf spot**
    - iii. Primarily on centipedegrass ..... **Anthraxnose**
  - b. Leaf spots not present.
    - i. Grass covered with an easily removed crusty and/or sooty growth ..... **Slime mold**
    - ii. Slippery green to brown growths covering soil and turf ..... **Algae**
    - iii. Chlorosis or mottling of leaves associated with general decline ..... **Pythium root rot**



\*Request nematode info from your Extension Office.  
Source: Gary W. Simone from the *Florida Lawn Handbook*, page 132.  
University of Florida Cooperative Extension  
TROUBLE-SHOOTING, Activity 6

# ***OUNCE OF PREVENTION***

## **CASE STUDY #1**

A well cared-for and healthy lawn is less likely to be infected by disease organisms. However, sometimes you can care for a lawn too much! Homeowners use many practices to care for their lawns. Some practices are designed to prevent disease problems from developing; other practices help keep lawn problems under control or eradicate them. Read the following case study and answer the questions at the end using the KEY FOR IDENTIFICATION OF TURF DISEASES if necessary.

Bill is a homeowner in a suburb of Miami and has a beautiful St. Augustinegrass lawn. Bill wants his lawn to be the most beautiful lawn in the neighborhood. He knows that fertilizer will make his grass grow healthy and strong, so he fertilizes his yard frequently. Bill believes that if a little fertilizer will help his lawn, extra fertilizer will make his lawn even healthier and more beautiful. In addition to fertilizing frequently, Bill also waters his lawn often. However, he does not always have time to mow as often as he should; sometimes, he removes more than the recommended  $\frac{1}{3}$  of the leaf at each mowing.

Unfortunately, thatch has built up in Bill's lawn. In addition, following a few days of steady rain, Bill noticed brownish water-soaked spots on the leaf blades of his lawn. These spots soon enlarged into elongated lesions throughout most of his lawn. He has spent a considerable sum to plant and maintain his lawn and does not want to replant it. Bill called the local Cooperative Extension Service and discussed his problem with the home horticulture agent.

1. How does Bill manage his lawn?
2. How have these management practices contributed to the formation of thatch?
3. What type of disease do you think the home horticulture agent helped Bill identify in his lawn? Why?
4. How can Bill control this problem?
5. Write a short paragraph explaining how you would manage Bill's lawn. Be sure to include a description of what you would do to prevent the return of this disease.



# ***OUNCE OF PREVENTION***

## **CASE STUDY #2**

A well cared-for and healthy lawn is less likely to be infected by disease organisms. However, sometimes you can care for a lawn too much! Homeowners use many practices to care for their lawns. Some practices are designed to prevent disease problems from developing; other practices help keep lawn problems under control or eradicate them. Read the following case study and answer the questions at the end using the KEY FOR IDENTIFICATION OF TURF DISEASES if necessary.

Sam is a homeowner in Orlando. Sam's lawn was once the envy of his neighbors, but his new job sometimes requires him to leave town for extended periods of time. Due to his busy schedule, Sam now takes minimal care of his bahiagrass lawn. He relies on Florida's sunshine and rainfall to care for his lawn. He waters and mows infrequently and rarely, if ever, fertilizes.

Following a period of heavy rain in late spring, Sam noticed that a number of straw-colored, sunken spots 2-3 inches in diameter had appeared over a large portion of his lawn. On the leaves of affected grass, Sam noticed discrete leaf spot-type lesions. In the areas where the grass had thinned, numerous weeds had sprouted. While he typically pays little attention to his lawn, Sam is distressed by this problem. He called the local Cooperative Extension Service office and explained his troubles to the home horticulture agent.

1. How does Sam manage his lawn?
2. What type of disease do you think the home horticulture agent helped Sam identify in his lawn? Why?
3. What is responsible for the weed problem Sam has noticed in his lawn? How can he treat this problem.
4. How can Sam prevent this problem from recurring?
5. Write a short paragraph explaining how you would manage Sam's lawn. Be sure to include a description of what you would do to prevent the return of this disease.



# ***OUNCE OF PREVENTION***

## **CASE STUDY #3**

A well cared-for and healthy lawn is less likely to be infected by disease organisms. However, sometimes you can care for a lawn too much! Homeowners use many practices to care for their lawns. Some practices are designed to prevent disease problems from developing; other practices help keep lawn problems under control or eradicate them. Read the following case study and answer the questions at the end using the KEY FOR IDENTIFICATION OF TURF DISEASES if necessary.

Susan is a homeowner in Pensacola. She planted centipede sod and has a well-established centipedegrass lawn. She mows the lawn every 10-14 days, following recommendations made by the Cooperative Extension Service. Susan follows the fertilization recommendations made by the Cooperative Extension Service. She waters the lawn as needed, depending on the rain.

In September, Susan had her neighbor mow her lawn when she was out of town. When she returned, she noticed discolored areas in her lawn. Yellow and brown patches appeared in the lawn; these patches were bordered by a wilted "smoke ring." Susan was very upset. She had always taken good care of her turf; how could this happen to her lawn? Susan called the local Cooperative Extension Service and discussed her problem with the home horticulture agent.

1. How does Susan manage her lawn?
2. What type of disease do you think the home horticulture agent helped Susan identify in her lawn? Why?
3. When Susan looked at her neighbor's lawn, she noticed that the neighbor had the same problem. How could Susan's lawn have become infected?
4. How can Susan get rid of the problem?
5. Write a short paragraph explaining how you would manage Susan's lawn. Be sure to include a description of what you would do to prevent the return of this disease.



## **LESSON 5: TROUBLE-SHOOTING**

### *Activity 7: Trouble In Paradise*

**SUGGESTED AGE:** 16-18 years

**OBJECTIVES:** Youth will be able to:

- describe the 3 requirements for a small gasoline engine to start and run.
- describe the 4 basic engine tests.
- explain the implications of each type of failure on mower operation.

**LIFE SKILLS:** ○ Use a trouble-shooting guide to determine the cause of some small engine problems.  
○ Develop problem solving skills.

**MATERIALS:** Copies of TROUBLE-SHOOTING GUIDE for each youth  
WHY WON'T IT GO? Workbook page 27  
Lawn mowers (different kinds, as many as possible) with manuals  
Gas can with gas  
SAE 30 motor oil (or recommended oil listed in owner's manuals)  
Regular and phillips head screwdrivers  
Combination and needle-nose pliers  
Knife (if appropriate for audience)  
Spark plug  
Spark plug feeler gauge  
Wire brush  
Spark plug wrench  
Combination wrenches or socket set  
Clean, dry rags  
Hand cleaner  
Safety glasses

**TIME:** 30-60 minutes

**SETTING:** A large area (preferably a "shop" or garage environment) with room to accommodate mowers.

**SUGGESTIONS:**

Try to find an older youth with experience in small engine repair to demonstrate or help with this activity.

**ADVANCE PREPARATION:**

Prepare each mower to have a problem which can be resolved using the TROUBLE-SHOOTING GUIDE (e.g. loose spark plug, no gas, old spark plug). Prepare TROUBLE-SHOOTING GUIDE by copying front to back and folding in half.

**LEADER INFORMATION:**

The MOWING TROUBLE-SHOOTING GUIDE is a 2 page, double sided document. The front cover should be backed with pages 1 and 6, while pages 5 and 2 should be backed by pages 3 and 4.

## INTRODUCTION

How do you start a mower?

Let's start one together (PRACTICE).

What can you do if your mower won't start? What kind of problems can prevent a mower from starting? Where should you look to determine what is wrong? In this activity, we will learn to trouble-shoot small engines in order to determine problems which may affect mower operation.

## Do

Experience TROUBLE IN PARADISE!

- ◆ Go over BACKGROUND BASICS Small Gasoline Engine Primer from Lesson 3 with group.
- ◆ Have youth turn to WHY WON'T IT GO? Workbook page 27.
- ◆ Give each youth a copy of the MOWING TROUBLE-SHOOTING GUIDE.
- ◆ Divide youth into groups of 3 or 4.
- ◆ Provide each group with a mower which has a problem covered in the MOWING TROUBLE-SHOOTING GUIDE (loose spark plug, no gas, etc.)

Note: *Make certain youth are supervised when starting any mower!*

- ◆ While wearing appropriate safety equipment, allow each group to trouble-shoot their mower, repair the problem and start the engine (while you, as leader, are present).

## REFLECT

- ◆ Have each group describe their problem-what system was failing, how did they diagnose the problem, etc.
- ◆ What should you do first if your mower won't start? What should you do next?  
**Look for the easy solutions first. Check the fuel and oil levels. Next, disconnect spark plug. See if the blade is loose, check air filter for dirt and check for loose connections. Test the 3 major system requirements of the small engine by performing the 4 basic engine tests.**
- ◆ What do you need to know to find the cause of your mower's problem?  
**The functions of the 3 basic engine systems and how to perform the 4 basic engine tests.**

- ◆ What are some problems we can solve alone? Which problems will require the help of an experienced adult or professional small engine mechanic?

**Youth can repair plugged fuel cap vents, clogged or fouled fuel filters, fouled or damaged spark plugs. Carburetor problems and problems with compression should be repaired by adults.**

## **A**PPLY

- ◆ How can you apply problem solving skills to a problem you have in everyday life?
- ◆ What do you need to know in order to solve it?
- ◆ What “tools” will you need?
- ◆ Are there problems you can't solve on your own? Who can help you with these problems?

**SYMPTOM: Engine Overheats**

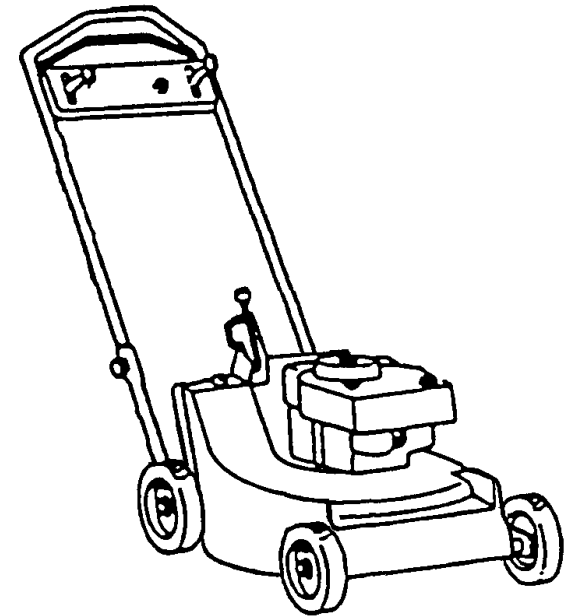
**CAUSE**

Engine dirty  
Low Oil Level  
Wrong Oil/Gas Mix  
(2-cycle)  
Engine overloaded  
Cooling Fins missing  
Shrouds missing  
Lean Fuel Mixture

**CORRECTION**

Clean Engine  
Add Oil  
  
Correct Mix  
Reduce Load  
Replace  
Replace  
See previous symptom

# MOWING TROUBLE-SHOOTING GUIDE



Mowing for Money

University of Florida Cooperative Extension  
Florida 4-H Youth Development Program

## TROUBLE-SHOOTING GUIDE

An engine requires fuel, compression and ignition in order to start and run. **Fuel** is mixed with air in the carburetor, the mixture is **compressed** in the cylinder and **ignited** by the spark plug. If any of these systems should fail, the engine will not start. Trouble-shooting involves checking these 3 basic systems to determine the cause of engine failure. By methodically examining all 3 systems, it is usually possible to determine the cause of problems and correct them.

Before checking the engine systems, do the following:

- 1) check the fuel in the tank,
- 2) check the oil level,
- 3) check to see if the blade is loose,
- 4) check the air filter for dirt or fuel,
- 5) check for loose bolts.

If no problems are found in these areas (or after correcting any you found), you are ready to perform the 4 basic engine tests:

- 1) check the fuel supply to the combustion chamber,
- 2) check the compression,
- 3) check the spark plug and
- 4) check the ignition.

Before testing any of the engine systems, remove all dangerous materials from the work area.

### CHECKING FUEL SUPPLY

Before beginning, read the owner's manual for the mower you are using. Wear safety glasses at all times.

Remove the spark plug and cover the hole with your thumb. Pull the starter 2 or 3 times. If fuel is arriving in the combustion chamber, your thumb will be wet; if your thumb is wet, fuel is

### SYMPTOM: Lacks Power Engine Smokes

#### CAUSE

Rich Fuel/Air Mixture  
Air Filter plugged  
Worn Piston Rings  
Too much Oil in Fuel  
Mix (2-cycle)

#### CORRECTION

Adjust Carburetor  
Clean Air Filter  
Overhaul Engine

Use correct mix

---

### SYMPTOM: Lacks Power

#### CAUSE

Improper Carburetor mix  
Manifold Gasket leaking  
Tank Vent plugged  
Tank Screen plugged  
Crankcase leaking

#### CORRECTION

Adjust Carburetor  
Install New Gasket  
Clean Vent  
Clean Screen  
New Seals/Gaskets

---

### SYMPTOM: Lacks Power Partial Miss

#### CAUSE

Weak Spark  
Lean Fuel/Air Mixture

#### CORRECTION

Overhaul Magneto  
See previous card. See cards titled "Fails to start - No Spark at Plug" and "Fails to start - No spark at Plug Wire"

**SYMPTOM: Fails to start  
No Spark at Plug**

**CAUSE**

Plug fouled  
Incorrect Plug Gap  
No spark at Plug Wire

**CORRECTION**

Clean Plug  
Adjust Gap  
See following symptom

---

**SYMPTOM: Fails to start  
No Spark at Plug Wire**

**CAUSE**

Points coated  
Flywheel Key sheared  
Points not open/closing  
Points burned  
Kill switch shorted out  
Condenser shorted  
Coil shorted  
Safety Switch malfunction

**CORRECTION**

Clean Points  
Install New Key  
Adjust Points  
Replace Points  
Repair Switch  
Replace Condenser  
Replace Coil  
Repair Switch

---

**SYMPTOM: Fails to start  
No Compression**

**CAUSE**

Valves Stuck (4-cycle)  
Valves Burned (4-cycle)  
Exhaust Plugged  
Piston Damaged  
Cylinder Damaged

**CORRECTION**

Free Valves  
New Valves  
Clean Exhaust  
Overhaul Engine  
Overhaul Engine

being delivered properly. If your thumb is dry, fuel is not reaching the combustion chamber; proceed with the following additional tests.

- 1) Check again to see if there is fuel in the fuel tank.
- 2) Check for plugged vents on the fuel tank cap; a plugged vent may result in engine stoppage. Check to see if the mower has a fuel shutoff valve; make sure the valve is in the "open" position.
- 3) Check the carburetor bowl for the presence of fuel. Some carburetors are equipped with a bowl drain valve, which may be depressed to test for fuel. If the carburetor is not equipped with a drain valve, it must be removed. Check your owner's manual for more information before removing the bowl. When checking the carburetor bowl, look for evidence of water or foreign matter; the presence of either substance is an indication that the carburetor will need to be serviced. If fuel is not present in the bowl, this indicates an obstruction somewhere between the fuel tank and carburetor.
- 4) Finally, check the fuel filter for dirt or a clogged element. See your owner's manual for fuel filter location. Replace fouled filters.

**TESTING COMPRESSION**

Re-read your owner's manual. Wear safety glasses at all times.

- 1) Remove the spark plug wire and secure it away from the spark plug before going any further.
- 2) Remove the protective grill from above the flywheel.

- 3) Using your hand, spin the flywheel against the compression stroke (counter-clockwise) to check for rebound. A strong rebound indicated good compression; little or no rebound indicates poor compression.

### CHECKING THE SPARK PLUG

Re-read your owner's manual. Wear safety glasses at all times.

- 1) Remove the spark plug and secure the spark plug wire. Inspect the spark plug. If it's wet, fuel is getting to the combustion chamber; if it's dry, it's a problem with the fuel system.
- 2) Inspect for fouled or damaged spark plug electrodes. Check for combustion, oil deposits, cracked or burned insulators. Replace damaged plugs. Slight carbon build-up may be cleaned using a small knife and a wire brush.
- 3) Check the spark plug gap with a feeler gauge and regap the plug to manufacturer's specifications (usually 0.030") if necessary.

### TESTING IGNITION SYSTEM

If the fuel supply and compression systems are both working properly, a problem in the ignition system is likely. Re-read your owner's manual and wear safety glasses at all times.

- 1) Disconnect the spark plug wire and remove the spark plug. Check the spark plug as described above.
- 2) Remove the spark plug and replace it with a new plug. Reconnect the spark plug wire and try to start the engine.

If the tests above have not revealed any problems with the fuel system or compression, the engine should start. If the engine does not start, a problem with the ignition system other than the spark plug is indicated.

### SYMPTOM: Fails to start No Fuel to Carburetor:

#### CAUSE

No fuel in tank  
Shut-off valve closed  
Intake screen plugged  
Fuel line plugged

#### CORRECTION

Fill Tank  
Open Valve  
Clean Screen  
Clean Line

---

### SYMPTOM: Fails to start No Fuel to Cylinder

#### CAUSE

No fuel to carburetor  
Float stuck  
Inlet Needle stuck  
Incorrect Float level  
Choke inoperative  
Fuel Passages clogged  
No Compression  
Crankcase leak  
Reed Valve leaking  
Exhaust plugged

#### CORRECTION

See previous symptom  
Clean Carburetor  
Clean Carburetor  
Adjust Float  
Overhaul Carb.  
Overhaul Carb.  
Overhaul Engine  
Replace Seals  
Replace Valve  
Clean Exhaust

---

### SYMPTOM: Fails to start Engine flooded

#### CAUSE

Float stuck  
Incorrect Float Level  
Overchoked  
No Spark at Plug

#### CORRECTION

Clean Carburetor  
Adjust Float  
Purge Engine  
See following symptom

SUGGESTED AGE: 12-18 years

OBJECTIVES: Youth will be able to:

- repair broken tools.
- perform basic maintenance tasks.

LIFE SKILLS: ○ Psychomotor skills.  
○ Following directions.

MATERIALS: Copies of REPAIR FLAIR activity sheet for each youth  
TOOL REPAIR Cards

The following broken tools:

- lawn mower (blade removed) with broken wheel
- lawn mower (blade removed) with broken throttle cable
- lawn rake with loose/broken handle
- cut/split garden hose which is missing rubber washers at fittings
- irrigation head with a broken PVC pipe attached
- grass shears with a loose pivot bolt

Basic tool box (screw drivers, adjustable wrenches, hammer, pliers, hacksaw or PVC cutters, knife, etc.)

PVC Cement and cleaner

Cotter pin(s), if needed

Replacement mower throttle cable

Garden hose couplers, clamps and rubber washers

Strong brush to remove grass clippings from tools

Light oil lubricant

Pens/pencils

TIME: 30-60 minutes

SETTING: A large shop or garage area with room for youth to make repairs.

## INTRODUCTION

Have you ever broken anything? What happens if a tool breaks? A broken tool not only slows the pace of work but can also be a danger to the operator. Unfortunately, even properly maintained and used tools break occasionally. Learning how to correctly repair tools is an essential skill for anyone who works with them. In this activity, we will learn to fix some broken tools and how to keep them from breaking again.

## Do

Demonstrate your REPAIR FLAIR!

- ◆ Divide youth into groups of 2-3.
- ◆ Give each group a TOOL REPAIR CARD and a tool to repair (remember to remove blade from all lawn mowers). Allow the youth to select the proper tools from the tool box and do as much work as possible by themselves.
- ◆ Give each youth a copy of REPAIR FLAIR! activity sheet and have them answer the questions.
- ◆ After each group has repaired a tool, have them perform routine maintenance tasks such as lubricating moving parts, check the condition of rubber washers in hose fittings, etc.
- ◆ Regroup and have groups demonstrate how they fixed their tool and the maintenance tasks required to keep tools in good shape.

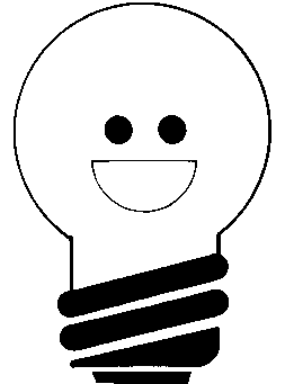
## REFLECT

- ◆ Which of the tools looked hardest to fix? Easiest?
- ◆ What are some of the most common repair problems in lawn care tools?
- ◆ What maintenance tasks were similar for all the tools?
- ◆ How much time did each maintenance task require? Is this small investment of time worth it to prevent possible breakage of the tool?
- ◆ Which task took longest? Shortest?

## APPLY

- ◆ Why do we maintain our tools?
- ◆ Do all tools require maintenance?
- ◆ What are some personal maintenance tasks you perform on a daily basis?
- ◆ How do you maintain your health? How do you keep in shape?
- ◆ How do you maintain your skills in math or sports?

# *Repair Flair!*



Name of tool: \_\_\_\_\_

What's the problem? \_\_\_\_\_

\_\_\_\_\_

Did you fix it? If so, how did you fix it? If not, why not?

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

What can you do to prevent this from happening again?

\_\_\_\_\_  
\_\_\_\_\_

# ***TOOL REPAIR CARD***

## **Broken Lawn Mower Throttle Cable**

### **Throttle cable repair**

1. Inspect the mower to see if you can access both ends of the throttle cable. If you cannot reach both ends easily, it is best to leave the repair to a professional.
2. Disconnect the spark plug to prevent the possibility of the mower accidentally starting.
3. Detach the clips which secure the throttle cable to the mower's motor and handle. This step may require the use of a wrench, a screwdriver or pliers, depending upon the mower.
4. Remove the throttle cable ends from the throttle control handle and the throttle lever on the motor.
5. Thread one end of the throttle cable into the hole on the throttle lever on the mower; insert the other end into the hole on the throttle control handle.
6. Replace the securing clips to attach the new throttle cable to the motor and handle.
7. Re-connect the spark plug.

### **Throttle cable maintenance**

Apply a drop of light oil to the cable where it meets the cable sheath to ensure that the cable slips freely through the sheath without sticking.

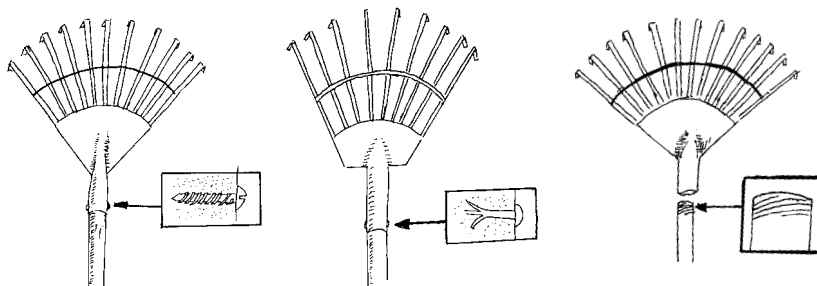


# TOOL REPAIR CARD

## Broken Rake Handle

### Rake handle repair

1. Most lawn rakes are fastened to the handle with short screws; others use rivets or screw onto a threaded handle. Determine how the handle is attached and remove the rake head from the handle. Rivets must be drilled out using an electric drill; if this is necessary, ask an adult for help.
2. Replacement handles for most tools may be purchased at a hardware store or garden shop. It is important to inspect the broken handle where it meets the head of the tool so you can select the proper replacement.
3. Fit the rake head to the new handle.
4. Fasten the handle to the rake head. Replace the screws or rivets. Drilling a small pilot hole (a hole smaller in diameter than the screw) in the handle will make it easier to turn the screws. Ask an adult for help if using an electric drill. If the rake head attaches to a threaded handle, simply screw the head onto the handle.



### Rake maintenance

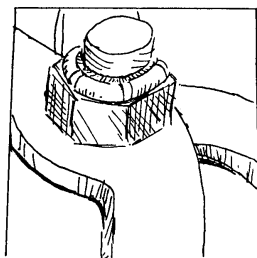
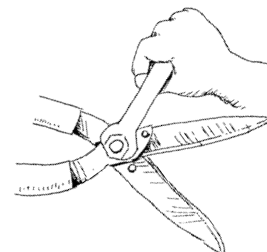
Grass clippings hold moisture, which causes damage. Brush grass clippings from the rake head after each use to prevent rust or rot.

# ***TOOL REPAIR CARD***

## **Broken Grass Shears**

### **Grass shear repair**

1. Wear gloves.
2. A loose pivot bolt prevents grass shears from cutting effectively. Use wrench to tighten the nut on the pivot bolt. Take care not to over-tighten the nut, as this will prevent the shears from closing properly.
3. If the nut is missing, replace it with an appropriately-sized nylon lock nut. Using a lock nut will help prevent the bolt from loosening in the future.



### **Grass shear maintenance**

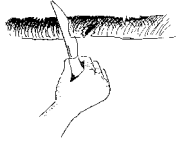
1. Periodically lubricate the pivot bolt with a drop of light oil to ensure smooth operation.
2. Clean grass and dirt from shears after each use.
3. Have the blades sharpened when necessary at a garden shop or hardware store.

# TOOL REPAIR CARD

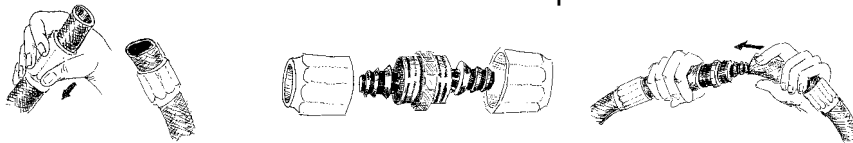
## Leaky Garden Hose

### Hose repair

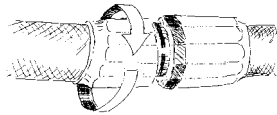
1. Purchase a garden hose repair kit. These may be plastic or brass, depending upon the manufacturer. If the hose is damaged near one end, purchase the replacement parts with the appropriate hose fitting; damage in the middle of the hose may be repaired using a coupler set.
2. Remove the damaged section of the hose by cutting the hose on each side of the damage with a sharp knife and discarding the damaged portion. If the hose fitting is damaged or the hose damage is near the end, simply cut the hose after the damage and discard the damaged end. Make all cuts as clean as possible (avoid ragged edges).



3. Push the coupler tube into the hose. For hoses damaged in the middle, it will be necessary to push both ends of the hose onto the coupler tube.



4. Secure the hose around the coupler tube using the plastic collars (clamps) provided with the repair kit or by crimping the metal "claws" onto the hose using pliers or a hammer.



### Hose maintenance

1. When not in use, coil hoses neatly and keep out of direct sun to prevent cracking.
2. Examine the inside of the large hose fitting to inspect the rubber washer inside. If this washer is dry, cracked or missing, replace it with a new washer. This washer prevents the hose from leaking at its junction with a spigot and prevents having to thread a fitting very tightly, which can cause binding.

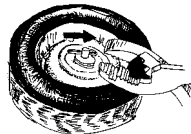
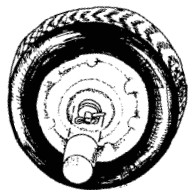


# TOOL REPAIR CARD

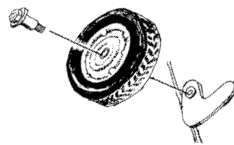
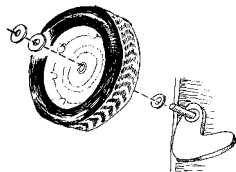
## Broken Lawn Mower Wheel

### Mower wheel repair

1. Disconnect the spark plug to prevent the possibility of the mower accidentally starting.
2. Select an appropriate-sized box wrench and remove the nut from the wheel's axle. Some wheels are attached by a cotter pin, which may be removed using pliers.



3. Remove the old wheel and the protective washers found on each side of the wheel. Examine the washers; worn or bent washers should be replaced at this time. **Be careful to note how many washers and where they are placed.**
4. In most cases, you will place a washer, then the wheel, then another washer, on the bare axle. However, you should use the same number and type as what is found on your mower.



5. Secure the wheel in place using the axle nut or a new cotter pin as necessary. Do not over-tighten the axle nut, as this will prevent the wheel from spinning freely and cause the washers to cut into the new wheel.
6. Re-connect the spark plug.

### Mower wheel maintenance

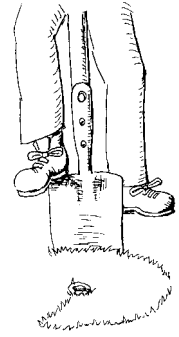
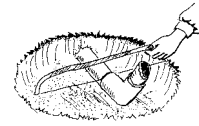
1. Apply a drop or 2 of light oil to the wheel/axle junction to reduce the damaging forces of friction.
2. Clean grass and dirt from the wheel and axle after using the mower.

# TOOL REPAIR CARD

## Broken PVC Pipe

### PVC pipe repair

1. On the site, you will have to carefully dig around the irrigation head to expose the broken pipe. Preserve the turf by cutting it out with a shovel and setting aside. In most cases, it is best to replace the entire vertical section of pipe. However, each situation should be evaluated separately.
2. Cut the horizontal pipe at its junction with the elbow using a hacksaw or PVC cutters.
3. Prepare the vertical section of pipe first. Measure the old vertical section and cut a piece of pipe the same length (including fitting insertion allowances). Be sure to use the same diameter and thickness of PVC pipe.
4. Test the fitting of all parts. In a well-ventilated area, clean both ends of the pipe, the inside of the threaded adapter and the inside of the elbow with PVC cleaner; let dry as indicated on cleaner can. Apply PVC cement to the outside of one end of the pipe and the inside of the threaded adapter. Insert the pipe into the adapter and give the joint a quarter-turn to ensure firm bonding.



5. Repeat this procedure to glue the PVC elbow to the other end of the vertical section.
6. Bond the vertical section to the horizontal pipe by gluing the horizontal pipe to the elbow. Be sure to maintain the pipe in the correct orientation, as bonding is permanent.
7. When all joints are dry, screw the irrigation head onto the threaded adapter. At the site, fill in the hole and replace the turf. Test the system for leaks before leaving the site.



### PVC maintenance

1. The best way to prevent the breakage of irrigation pipe is to know where lines and heads are located. Place plastic flags or stakes near hidden sprinkler heads to avoid breaking them with lawn care equipment.
2. To keep irrigation heads in working order, brush dirt from the top of the head and cut away grass which grows over the head.

