

Chapter 8 - Rodent-Related Health Hazards

Rodents pose a number of health and safety hazards to team members doing rodent control. It is important to protect yourself from these hazards.

You face four categories of risk when doing rodent work:

1. Bites and scratches
2. Disease
3. Allergy
4. Ectoparasites

Bites and Scratches

Rats can bite down with a force of 7000 psi and can repeatedly bite up to 6 times per second! Rodents can also scratch you when you pick them up. Typically in our services you will only handle dead rodents. Avoid picking up live rodents.

Disease

Rodents carry a number of bacterial and viral diseases. These pathogens can be transmitted:

- through a rodent's bite.
- from a rodent by a flea, tick or mite that in turn bites you.
- by direct contamination from food or water containing rodent feces or urine.

Although the incidence of rodent disease transmission is low due to modern day sanitation and antibiotics, rodents can still transmit serious diseases. For this reason, take the following precautions when dealing with rodents and their excrement:

- Wear rubber, latex or plastic gloves when cleaning out rodent stations, handling dead rodents or handling traps containing rodents.
- Wash gloves before you take them off in disinfectant and then in soap and water. Thoroughly wash your hands after removing the gloves.
- Dispose of rodent carcasses, nests, droppings, and contaminated food by inverting a plastic bag over your hand, picking up the item, then pulling the item into the bag. Seal the bag and then place the sealed bag into another plastic bag and seal it for disposal. Bring the bag back to the Service Center and place it into your industrial dumpster. If you are wearing disposable gloves, place them in the second bag before sealing it.
- When there is a known or suspected presence of hantavirus in the area (rare in the Southeast) take aggressive precautions to protect yourself. Wear coveralls, work shoes or boots, and gloves, either disposable or cleanable. If working in a confined space, wear goggles as well. Most importantly, wear a respirator equipped with an N-100 or 100-level cartridge. To avoid generating airborne particles when cleaning up or disturbing large accumulations of rodent droppings,

Chapter 8 - Rodent-Related Health Hazards

wet down the area first with a disinfectant or a mixture of at least 12 ounces of bleach per gallon of water.

- In Lyme disease areas, spray yourself with DEET or another repellent to ward off ticks and other disease vectors.

Allergy

While there have been no studies showing increased incidence of rodent allergies in pest prevention workers, it makes sense to minimize your risk of an allergic reaction. Repeated exposure to rodent urine has been shown to cause runny nose, stuffed up head, itchy dermatitis, and asthma. Typically, an attic with one or two roof rats and a dropping here and there is not a reason to take serious protective measures. At heavily infested accounts with dozens of rats or mice, wear a respirator to filter out any allergens that become airborne. If you use a vacuum, be sure it is equipped with a HEPA or 100-level filter.

Ectoparasites

Ticks, fleas, mites, and other ectoparasites are capable of transmitting a number of bacterial and viral diseases to man. Search closely around rodent harborages for these ectoparasites. If you find some, treat for these ectoparasites according to pest prevention treating protocols prior to doing your rodent work. Treating them first will prevent them from spreading to other areas and attacking people and pets.

Finally, if you have any questions or concerns about protecting yourself from the health hazards of rodents, talk with your supervisor or contact the Technical Department.



WEEKLY TRAINING SESSION

Open Proposal Portal

At Massey Services, we are dedicated to fostering innovation and creativity in the development of safer, more efficient, and more effective technologies and methods.

To support our continuous progress, we are pleased to introduce the Open Proposal Portal—a digital platform that automatically follows up with prospective customers and offers a convenient option for online purchase of open proposals, accessible from anywhere. Once a proposal has been entered into the Lead Log, the platform initiates an automated follow-up email sequence to the customer. If the customer elects to complete a purchase, a sales notification email is automatically dispatched to the designated Service Center.

This training outlines the commission structure, available services, email notification procedures, and operational protocols that all General Managers and Office Managers are expected to adhere to upon receipt of a sale through the Open Proposal Portal.

Sales Inspector Commission Structure

All open proposal submissions through the portal are governed by standard commission procedures. The Sales Inspector (SI) responsible for initially delivering the proposal will receive full commission credit for any resulting open proposal sale, regardless of the timing or method by which the customer completes the purchase.

This commission procedure emphasizes the critical importance of promptly, accurately, and comprehensively recording every proposal in the Lead Log. The platform depends solely on Lead Log data to automatically deliver proposals to customers. Failure to document a proposal prevents the platform from following up on that opportunity, resulting in the forfeiture of potential commission for the associated Sales Inspector.

Additionally, General Managers are expected to oversee and hold their administrative team members accountable for the proper management of the Lead Log, ensuring adherence to this practice as part of standard operational procedures.

Services Available on the Open Proposal Portal

The following services are currently available for customers to purchase directly through the Open Proposal Portal:

- Pest Prevention
- Landscape / Lawn Care
- Irrigation
- Mosquito
- Termite program

Important: Fumigation is not available for purchase through the Open Proposal Portal and will not be included in any proposal links sent to customers after the initial inspection. Regional Managers will communicate as additional services become available through this process.



WEEKLY TRAINING SESSION

Open Proposal Portal

Service Center Email Receipt

Upon a customer completing a purchase via the Open Proposal Portal, the Service Center will automatically receive an email notification containing all relevant account and sales information. Two sample notifications are provided below — one for Pay-In-Advance (PIA) customers and one for Autopay customers.

Sample 1: Pay-In-Advance

New Open Proposal Sale Received

Good news! You have received a new open proposal sale for your service center. See the customer information below and use the link to navigate to ServicePro and enter the correct programs and events.

Customer Name: Juliette Nichols

Account Number: 9192256

Service Address: 369 NE 77th LN, Gainesville, FL 32609

Phone Number: (999) 999-9999

Email: jnichols@masseytest.com

Proposals Purchased: Pest Quarterly; Landscape Monthly

Payment Preference: PEST=Pay-In-Advance; LAND=Pay-In-Advance (Please process payment w/discount ASAP)

Start Date: 04/24/2026 @ 11:00AM – 1:00PM

Initial Payment: PEST=XXX.XX; LAND=XXX.XX

Annual Amount: PEST=XXX.XX; LAND=X,XXX.XX

Service Pro Link: [\[Link to customer account\]](#)

Admin will add the appropriate programs and events to the account in ServicePro, based off the details on the Sales Agreement associated with the purchase. Admin will assign the initial to the proper technician route based on territory assignment, and confirm the correct Sales Inspector is set as the Primary Sales Person within the account. Morning of initial, Admin will send new customer “Welcome to Massey” email, template in online sale procedure. Admin will create a customer file including copy of email received by SC, and a copy of acknowledgement of the offering. The Sales Inspector who made the original proposal will join the Technician for the initial service. Sales Inspector will graph the property and collect the customer signature. The Technician will greet the customer at the initial and proceed with our standard procedure.



WEEKLY TRAINING SESSION

Open Proposal Portal

Sample 2: Autopay

New Open Proposal Sale Received

Good news! You have received a new open proposal sale for your service center. See the customer information below and use the link to navigate to ServicePro and enter the correct programs and events.

Customer Name: Juliette Nichols
Account Number: 9192256
Service Address: 369 NE 77th LN, Gainesville, FL 32609
Phone Number: (999) 999-9999
Email: jnichols@masseytest.com
Proposals Purchased: Pest Quarterly; Landscape Monthly
Payment Preference: PEST=Autopay; LAND=Autopay
Start Date: 04/24/2026 @ 11:00AM – 1:00PM
Initial Payment: PEST=XXX.XX; LAND=XXX.XX
Annual Amount: PEST=XXX.XX; LAND=X,XXX.XX
Service Pro Link: [\[Link to customer account\]](#)

Admin will add the appropriate programs and events to the account in ServicePro, based off the details on the Sales Agreement associated with the purchase. Admin will assign the initial to the proper technician route based on territory assignment, and confirm the correct Sales Inspector is set as the Primary Sales Person within the account. Morning of initial, Admin will send new customer “Welcome to Massey” email, template in online sale procedure. Admin will create a customer file including copy of email received by SC, and a copy of acknowledgement of the offering. The Sales Inspector who made the original proposal will join the Technician for the initial service. Sales Inspector will graph the property and collect the customer signature. The Technician will greet the customer at the initial and proceed with our standard procedure.

Operational Procedures

The procedure to follow upon notification of an Open Proposal Portal Sale are as follows:

1. Upon receipt of the email notification the administrative team member will:
 - a. Review the email and the account which will automatically be set up in ServicePro (if the sale is for an existing customer, verify the account).
 - b. Retrieve the original proposed sales agreement and review to validate:
 - i. Service type
 - ii. Pricing
 - iii. Service frequency



WEEKLY TRAINING SESSION

Open Proposal Portal

- c. Enter the program and events into ServicePro on the newly created or existing account.
 - d. Assign the services to the appropriate technician/route scheduling the initial service for the indicated date and time in the email.
2. On the morning of the initial service, the administrative team will send a Welcome to Massey / Service Confirmation email to the customer (see email template below, noting all areas highlighted will be changed based on the customer and service type). This email will contain:
 - a. A warm welcome statement thanking the customer for choosing Massey Services.
 - b. Confirmation of the scheduled service with the date and time.
 - c. The technicians name who will be servicing the property that day.
 - d. An additional thank you for choosing Massey Services.

Welcome to Massey / Service Confirmation Email Template

Email Subject Line: Confirmed Appointment with Massey Services

Thank you for choosing Massey Services – we look forward to serving you!

Your upcoming appointment is scheduled for:

Friday, January 24, 2026, at 11:00am

Our Massey Services Team Member, **NAME**, will arrive in a company vehicle and will be wearing a licensed Massey Services badge.

Your initial service will take approximately **60-90 minutes** (Pest or Termite) **30 minutes** (Lawn/Landscape). Please keep in mind that if this is a Pest Prevention or Termite Protection service, we will need access inside your home for a thorough inspection.

After your initial treatment, we will be back for your first (**quarterly, bi-monthly, or monthly**) service the following month. Your ongoing service will include proactive, seasonal treatments as well as recommendations to prevent future issues.

As a reminder, all our services are backed by our no-nonsense, money-back guarantee. If you ever have an issue between scheduled services, please contact us immediately and we'll come back at no additional cost to you.

If you have any questions or need to reschedule your appointment, please contact our Customer Care team at 1-888-2MASSEY (262-7739) or WeCare@MasseyServices.com.



WEEKLY TRAINING SESSION

Open Proposal Portal

3. Sales Inspectors (GM if SI is unavailable) will be responsible to meet the technician on-site at the initial service to obtain the following:
 - a. Signed Graph
 - b. Graphical Analysis
 - c. Consumer Notice Form
4. The administrative team will create a customer file to include:
 - a. A copy of the Open Proposal Portal email notification
 - b. The original agreement that was proposed
 - c. Termite programs will require a signed copy of the Consumer Notice Form and graphical analysis
 - d. The new signed graph
5. Service Managers will review the initial service with the technician as part the daily check-in.

Rover Ants: Hymenoptera, Formicidae, *Brachymyrmex* spp.

[The following information has been edited from Gerry Wegner's 2007 PCT Article and from field observations]

Since the late 1990's the presence of rover ants in and around homes in the Southeastern United States has been on the increase. According to ant experts who study species of ants considered to be structural pests, the rather sudden appearance of a species in and around buildings can be attributed to one of two phenomena:



1. An exotic species may be introduced to the United States from another country or from one state to another in plant material or other items in which "hitchhiking" ant colonies and reproductives are hidden (examples include red imported fire ants, Argentine ants, ghost ants and white-footed ants) or

2. An endemic (native) species that did not used to be invasive changes its behavior for survival reasons, in response to changes in the environment, and begins to forage and/or nest in structures (examples include odorous house ants, thief ants and false honey ants).

The rover ants of Genus *Brachymyrmex*, have been observed to exemplify both these phenomena.

Local pest management professionals (PMPs) frequently have been misidentifying it as the little black ant because of its dark coloration (dark brown to black) and small size (1/16 inch). However, specimens submitted to university entomologists were identified as the rover ant, *Brachymyrmex patagonicus*. This species was first reported (as *Brachymyrmex musculus*) in the United States in the 1970s and is believed to have originated in Argentina. Interestingly, other rover ant species that are endemic to the South have not yet demonstrated invasive behavior.

"In southeast Texas, the rover ant is the single-most difficult ant to control," reports Jeffrey Tucker, Entomology Associates, Houston, Texas. "PMPs spend more time fighting this ant than any other. It probably accounts for more callbacks than any other pest."

Tucker says the invasive Texas species tend to nest in the open. There is nothing to mark the entrance to the nest except a small, pencil lead size circular hole in the soil. He has even "observed winged alates running from hole to hole."



Biology and behavior

Upon magnification, rover ants have just one segment, or node, in the pedicel, or waist. This easily distinguishes it from the little black ant, which has two nodes in the pedicel. In fact, the rover ant's pedicel is flattened and hidden beneath the front of the gaster so that it appears as though the thorax and gaster touch.

In addition, the gaster of a rover ant worker is wider than the head, has a "humpbacked" appearance, and is just about as long as the head and thorax combined. The gaster of a little black ant, by contrast, is about as wide as the head and shorter than the head plus thorax.

Rover ant workers are only half as long as workers of Argentine ants and odorous house ants. Another feature of the workers of all *Brachymyrmex* species is that there are just nine antennal segments, including the long scape segment that attaches to the head. The workers of most other ant species have 12 antennal segments.

Rover ant colonies are relatively small and monogynous (have a single queen). Multiple but compatible rover ant colonies may be found in wooded environments, in soil and within and beneath decaying wood.

Workers commonly forage for honeydew (as do white-footed ants) from aphids, scale insects, treehoppers and other Homoptera on plants. Rover ants have been found to nest in damp, layered wall construction adjacent to plumbing, dishwashers, etc. and leaky window casings and sills. Several rover ant colonies may occupy the same building, wherever conditions of retained moisture and warmth occur. They are most difficult to control when their workers trail up and inside from dirt under a crack in the slab or a crack below the wall of an add-on room.

- Winged adults emerge from the holes in the ground to mate during periods before and after heavy rainstorms. Winged alates have been found following workers in a lineup out of the



ground for a few feet up the sides of buildings where the alates take flight in mass. Huge swarms can occur in localized areas. Parking lots have been inundated with swarmers dropping all over parked cars. They have swarmed over homes and have been seen dropping into pools through the screened cage. Nothing can be done to prevent such huge swarms from such infestation. Mating pairs can remain attached like love bugs for hours unless disturbed.

Pool filters need to be cleaned more frequently during these swarms. The male alates are really tiny (about 1mm) and the female alates are about ¼ inch long. During swarms, usually from May through August, female alates often land on roofs of homes and work their way up into the curved vent well above the bathroom fan, drop down onto the fan blades and then down through the grill on the bathroom ceiling and finally onto the floor where they eat off their wings and crawl aimlessly around the bathroom until they die.

Management strategies

Controlling rover ants in and around structures is as challenging as controlling ghost ants, odorous house ants and in-wall infestations of white-footed ants. Initial exterior perimeter treatments and indoor spot applications using residual liquid formulations typically result in a temporary “fix.” However, successive resurgences of activity often occur, resulting in numerous callbacks.

Outdoors: Managing rover ant colonies in the landscape surrounding structures may be accomplished via strategic perimeter placement of reservoir stations filled with sweet liquid ant bait, and/or foundation perimeter applications with appropriately labeled non-repellent residual materials. Aphid and scale activity producing honeydew on perimeter ornamental plants should be treated with appropriate residual materials. When aphid and scale activity is high this is a good time to recommend our GreenUP tree & shrub service.

Indoors: The most successful approach to eliminating rover ants nesting within structures happens to be the most painstaking one:

1. Start by baiting with Maxforce Quantum. Once ants begin to heavily feed, use a fine mist of half-strength Phantom mixture lightly over the feeding area and trails.
2. Seek out the colonies within buildings using observations of structural moisture retention, a moisture meter and “feed and follow” liquid-baiting strategies.
3. Inject or foam appropriately labeled non-repellent residual materials into the voids near the nesting sites.

Monitor indoors using sweet liquid baits to determine the efficacy of the treatment. Follow up weekly until the infestation has disappeared.

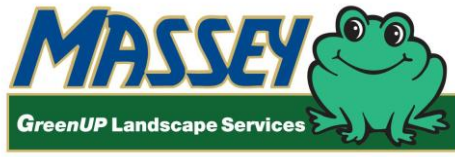


Pre & Post Test

1. By looking closely with a hand lens, rover ants can be distinguished from other local dark brown ants because they have:
 - a) 9 antennal segments
 - b) 12 antennal segments
 - c) a 2-noded abdomen
 - d) 12 antennal segments and a 2-noded abdomen
2. Rover ants are:
 - a) common throughout the southeast
 - b) common only in Florida
 - c) extremely rare when compared with ghost ant incidence
 - d) commonly found with multiple queen colonies
3. Rover ant winged males are:
 - a) much larger than winged females
 - b) much smaller than winged females
 - c) about the same size as winged females
 - d) darker than winged females
 - e) lighter than winged females
4. Rover ants most often live:
 - a) inside walls
 - b) within the folds of plants
 - c) in leaf litter and potted plants
 - d) in soil and rotting wood
5. Rover ants are thought to have been brought here from:
 - a) Africa
 - b) Australia
 - c) Argentina
 - d) the Orient
 - e) They are native ants

Answers: 1- a 2- a 3- b 4- d 5- c





WEEKLY TRAINING SESSION



Pythium Root Rot

Topic Category: Lawn

Recordable Verifiable Training Hours: 1

Objectives: This lesson is designed to teach the basics of Pythium root rot biology and management.

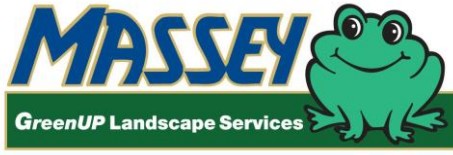
Length of lesson: Approx 60 minutes.

Materials needed:

- Training outline
- GreenUP Protocol for Pythium Root Rot
- Samples from the field, if available
 - If samples of the disease are not available, color photos can be used.
- Pre and Post tests

Training Guidelines:

- This training qualifies for Department of Agriculture ID Card Holder Training. Complete a Department of Agriculture ID Card Holder Training for each Team Member and maintain it in their personnel file at your office.
- Make copies of the tests and training materials for all Team Members attending.
- Set up the training area in an area of the office that will minimize disruptions.
- Begin the meeting by defining the training topic and handing out the pre-test
 - Allow a few minutes for all Team Members to complete the pre-test.
 - Collect the pre-test and hand out the Verifiable Training Record form.
- Distribute and review the GreenUP Protocol for Pythium root rot.
 - Use the Training outline as a guide for key points.
 - Encourage active participation from all Team Members
 - Ask probing questions to develop key points
 - Encourage group reading
- After reading and reviewing the materials in the lesson, ask questions to verify the material has been understood.
- Hand out the post-tests. When complete, grade the tests and record the score on the Verifiable Training Record form.
- Collect tests and place with the verifiable materials in the Service Center Verifiable Training File.
- Make copies of the Verifiable Training Record and place in each Team Member's personal training file.
- Complete all Weekly VTM's through Massey University.



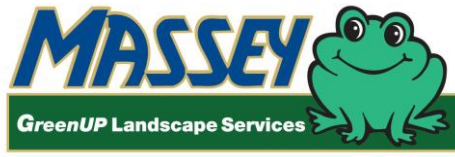
WEEKLY TRAINING SESSION



Pythium Root Rot

Training Outline

1. Review the GreenUP Protocol for Pythium root rot. Point out the key items including:
 - Description of the disease
 - Pass around samples or pictures to help in identification of the disease.
 - Host plants
 - Typical symptoms (how to ID this problem)
 - Conducive conditions
 - Control measures
 - Disease triangle and breaking the cycle by removing one of the three components
 - The importance of cultural control
 - Proactive Treatment for newly installed turf in the shade
 - The importance of proper nutrition
 - Explain proper chemical control



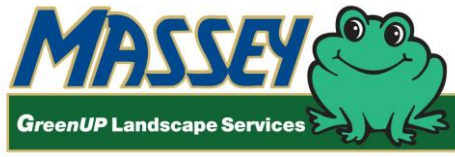
WEEKLY TRAINING SESSION



Pythium Root Rot

Pre/ Post Test

1. The three components of the disease triangle are
 - a. Plant, Pathogen, Host
 - b. Conducive Condition, Plant, Host
 - c. Conducive Condition, Host, Pathogen
 - d. Pathogen, Conducive Condition, Environmental Factors
2. T or F Wet soils and poor drainage favor the development of Pythium root rot?
3. T or F The symptoms of Pythium root rot include yellowing and irregular shaped patterns.
4. T or F Pythium flourishes during periods of prolonged drought.
5. T or F The product(s) used for the control of Pythium root rot is Subdue or Mefenoxam.
6. T or F The area treated for Pythium should be watered lightly after treatment.
7. T or F High rates of Nitrogen and low rates of Potassium will be beneficial to the recovery of the turf.
8. T or F Newly installed sod that is installed in a shady location is particularly susceptible to Pythium.
9. T or F Proactive treatment(s) should be performed for the control/prevention of Pythium on newly installed turf that is installed in a shady location.
10. T or F The application of pre-emergence herbicides should be avoided when Pythium root rot has compromised the root system.



WEEKLY TRAINING SESSION



Pythium Root Rot

Pre/ Post Test Answers

1. The three components of the disease triangle are
 - a. Plant, Pathogen, Host
 - b. Conducive Condition, Plant, Host
 - ☒ c. Conducive Condition, Host, Pathogen
 - d. Pathogen, Conducive Condition, Environmental Factors
2. ☒ T or F Wet soils and poor drainage favor the development of Pythium root rot?
3. ☒ T or F The symptoms of Pythium root rot include yellowing and irregular shaped patterns.
4. T or ☒ F Pythium flourishes during periods of prolonged drought.
5. ☒ T or F The product(s) used for the control of Pythium root rot is Subdue or Mefenoxam.
6. ☒ T or F The area treated for Pythium should be watered lightly after treatment.
7. T or ☒ F High rates of Nitrogen and low rates of Potassium will be beneficial to the recovery of the turf.
8. ☒ T or F Newly installed sod that is installed in a shady location is particularly susceptible to Pythium.
9. ☒ T or F Proactive treatment(s) should be performed for the control/prevention of Pythium on newly installed turf that is installed in a shady location.
10. ☒ T or F The application of pre-emergence herbicides should be avoided when Pythium root rot has compromised the root system.

Pythium Root Rot

Root rot diseases are by far the most damaging turf diseases in Florida lawns. They often occur in wet soils with limited soil drainage (porosity) or in areas that are over-watered or remain wet due to location of gutters and downspouts, air conditioning units and slopes, etc. Warm temperatures, excessive soil moisture and actively growing turf during summer months meet all of the requirements for a root rot disease to flourish. One of the more common root affecting diseases found in the Florida is Pythium root rot.

Pythium Root Rot

Pythium root rot is common on highly maintained and excessively moist turf. Although symptoms of Pythium root rot are typically non-distinctive, this disease can appear as yellow, irregularly shaped patches (Figure 1). The affected turfgrass is thin, off-color and declining, while the root system is stunted and rotted with reduced volume and vigor.



Figure 1. Irregular yellowing and thinning of turf

Pathogen

The organism responsible for Pythium root rot can be one of many in the Pythium species of fungi. Pythium root rot can affect Bermudagrass, Centipedegrass, Zoysiagrass and St. Augustinegrass, though infections rarely kill off large areas of established turf.

Symptoms

Pythium root rot causes poor turf growth by reducing the volume and vigor of the plant roots. Affected roots of plants can appear dark in color, soft with few or no feeder roots present. Sometimes new roots may be initiated from crown regions as older roots become diseased.

Above ground symptoms of Pythium root rot are typically non-distinctive, but this disease can appear as yellow, irregularly shaped patches of thinning turf (Figure 2). Foliage can appear chlorotic (yellowish), necrotic (dead), or, possibly, wet and 'greasy'. Affected turfgrass is thin, off-color and slow growing and

Pythium Root Rot

often starts as small, bleached patches that may evolve into large dead areas. The fungus survives as thick walled “resting structures” (oospores) in old roots, in the soil and in the thatch. Therefore, thatch management is key to managing the disease in susceptible areas.



Figure 2. Yellow, thin turf patches affected by Pythium root rot.

Conducive Conditions

Typical summertime conditions are required for the disease to thrive and spread. Environmental factors that favor infection include:

- Thrives in temperatures between 70°F and 95°F
 - Temps over 86°F are optimal growing conditions
- High humidity >80%
- Prolonged leaf wetness (3 hours or more)
 - Poorly drained or continuously wet soils are particularly susceptible
- Areas with high soil moisture, poor drainage and low light
- Low mowing height and excessive wear causes more severe infections to occur

Pythium root rot is often a secondary or advantageous disease; it becomes damaging to the turf due to another cause (or multiple causes). For example, turf that does not receive adequate sunlight is not able to produce enough food for its root system through the process of photosynthesis. Because of this, the root system is weakened. Pythium root rot takes advantage of this situation and furthers the decline of the turf.

One of the most common situations for Pythium root rot to become a decline factor is with newly installed sod. Consider that the turf has just had the vast majority of its root system cut off at the sod farm. It is then stacked on pallets and transported to the job site. If the new site is shaded, it has now gone full sun at the sod field and placed into shade. Add to this situation the daily watering practice in an effort to get the newly

Pythium Root Rot

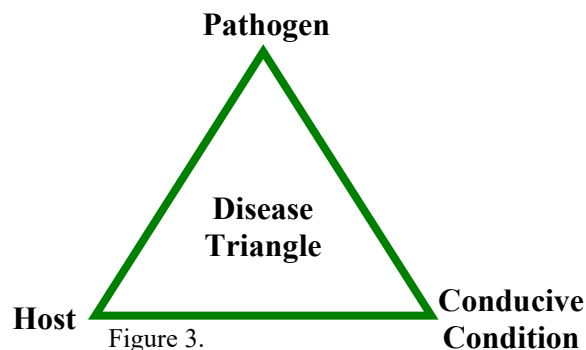
installed turf to root. Another compounding factor can be if the sod was originally grown in a muck soil and placed in a sandy location. The muck soil is highly organic and has a finer texture than the sand. Being highly organic, the roots prefer to stay in the muck as opposed growing into the sand. Being a finer texture than the sand, moisture levels will be greater in the muck layer than in the sand.

Consider all these compounding factors: Open injury to the root system, grass blades that are damaged from being stacked on the pallet, reduced light to produce food for the root system, and excessive moisture. This is the perfect conditions for Pythium root rot to begin to cause further damage to an already weakened plant. When these conditions are present, it should be assumed that Pythium is likely to become a problem and should be treated pro-actively.

Control

Once the disease has infected the plant, control is required. To control this disease, we refer to the Disease Triangle (Figure 3). In order for a disease to thrive and reproduce, it needs three things:

- The Pathogen
- The Host
- The Conducive condition

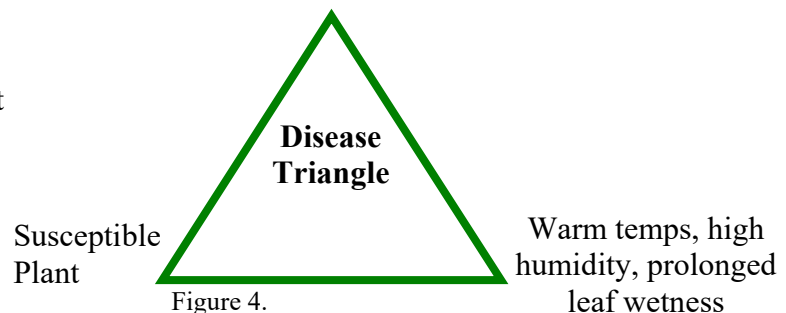


The removal of any one of these three factors will result in the control of the disease. The Disease Triangle for *Pythium* is represented by Figure 4.

Pythium spp.

Control can be achieved by:

- Replacing with another plant
- Changes in the environment
- Application of a fungicide



Cultural methods are always preferred for disease control. The cultural control methods for Pythium root rot include:



GREENUP SERVICE PROTOCOLS



Pythium Root Rot

- Increase the height of the turf. Mow it at the highest recommended height for the turf type.
- High rates of nitrogen predispose turf to infection. If nitrogen fertility is required, apply low rates from slow release sources or very low levels of quick release; light rates of 5-0-30 will work well. Additional potassium will be beneficial. Do not apply additional nitrogen to shaded turf in the summer months.
- Avoid over-watering and prolonged leaf wetness. This may be difficult during the rainy season, but educate your customers to not water in the evening. Supplemental irrigation late in the day will provide the conducive conditions even if the rain does not.
- Manage the thatch layer to allow for proper water penetration into the soil and alleviate compacted soils by aerating. Compacted soils weaken the turf making it more susceptible to disease infestation. Additionally, aeration will help improve the drainage in the root zone and facilitate the breakdown of thatch.
- Increase the amount of sunlight when possible.
- Avoid the application of any product that would inhibit rooting, such as a pre-emergence herbicide.

Chemical control via a fungicide is achieved by making applications of Subdue Maxx (Mefenoxam). Pillar G is also labeled for the prevention of Pythium, but do not assume that other fungicides will control Pythium, since many will not. After an application of Subdue, the turf should be watered lightly to move the fungicide off the leaves and down to the root system. Multiple applications may be required during periods of favorable conducive conditions.

Although this information has been written specifically for turf, it is important to know that Pythium can also affect ornamentals and trees and the concepts of this information are still applicable.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

Topic Category: Lawn

Recordable Verifiable Training Hours: 0.5

Objectives: This lesson is designed to teach our GreenUP Protocol – Growing Turfgrass in the Shade.

Length of lesson: Approx. 30 minutes.

Materials needed:

- Training Guideline
- GreenUP Protocol – Growing Turfgrass in the Shade
- Pre- and Post- tests.

Training Guidelines:

- Make copies of the tests and training materials for all Team Members attending.
- Set up the training area in an area of the office that will minimize disruptions.
- Begin the meeting by defining the training topic and handing out the Pre-test
 - Allow a few minutes for Team Members to complete the Pre-test.
 - Collect the pre-test and hand out the Verifiable Training Record Form (VTRF)
- Distribute and review the training materials on Growing Turfgrass in the Shade
- Use the Training outline as a guide for key points.
 - Encourage active participation from all Team Members
 - Ask probing questions to develop key points
 - Encourage group reading
- After reading and reviewing all materials, ask questions to verify the lesson has been understood.
- Hand out the Post-tests. When complete, grade the tests and record the score on the VTRF.
- Collect tests and place with the verifiable materials in the Service Center Verifiable Training File.
- Make copies of the VTRF and place in each Team Member's training file.
- Complete all Weekly VTM's through Massey University.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

Name _____

Date _____

PRE & POST TEST

1. T or F Proper turfgrass care will reduce the plant's requirement for sunlight.
2. T or F Turfgrass is competing with trees for space, water, nutrients and light.
3. T or F Keeping trees pruned to allow for more sunlight for the turf is a long-term sustainable solution to keep the turfgrass healthy.
4. T or F The primary factor leading to turfgrass decline in the shade is acidic soil.
5. T or F Moisture requirements for turf growing in the shade are increased.
6. T or F Proper mowing is a particularly important factor for growing turfgrass in the shade.
7. T or F Turf damaging caterpillars are more active and more damaging in shady lawns.
8. T or F Fertilizer is plant food.
9. T or F Applying additional nitrogen in the summer helps promote root growth in shady lawns.
10. T or F Applying additional nitrogen in the fall helps promote root growth in shady lawns.
11. T or F Applications of Primo Maxx in the summer will promote root growth.
12. T or F An application of Primo Maxx will reduce leaf growth for about 4 to 6 weeks.
13. T or F Applications of Primo Maxx in the fall are beneficial.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

PRE & POST TEST ANSWER KEY

PRE & POST TEST

1. T or ☒ F Proper turfgrass care will reduce the plant's requirement for sunlight.
2. ☒ T or F Turfgrass is competing with trees for space, water, nutrients and light.
3. T or ☒ F Keeping trees pruned to allow for more sunlight for the turf is a long-term sustainable solution to keep the turfgrass healthy.
4. T or ☒ F The primary factor leading to turfgrass decline in the shade is acidic soil.
5. T or ☒ F Moisture requirements for turf growing in the shade are increased.
6. ☒ T or F Proper mowing is a particularly important factor for growing turfgrass in the shade.
7. ☒ T or F Turf damaging caterpillars are more active and more damaging in shady lawns.
8. T or ☒ F Fertilizer is plant food.
9. T or ☒ F Applying additional nitrogen in the summer helps promote root growth in shady lawns.
10. ☒ T or F Applying additional nitrogen in the fall helps promote root growth in shady lawns.
11. ☒ T or F Applications of Primo Maxx in the summer will promote root growth.
12. ☒ T or F An application of Primo Maxx will reduce leaf growth for about 6 weeks.
13. T or ☒ F Applications of Primo Maxx in the fall are beneficial.



Growing Turfgrass in the Shade

An essential point to understand, as it pertains to growing turfgrass in the shade, is that there is nothing we can apply that will provide the turf with the essential carbohydrates, that the plant creates from sunlight, through the process of photosynthesis. However, we can manage factors that lead to further decline and make proper choices to manage plant energy efficiently.

The 5 Key Principles to plant health care are particularly applicable to growing turfgrass in the shade. Success of growing turfgrass in the shade is reliant on having all factors in your favor.

Key Principle #1 – Right Plant – Right Place

There is no way to change the natural requirements of light for a plant. It is always best to install landscapes that can flourish in the natural conditions of the location. In densely shaded lawns, the best option may not be grass at all. A shade tolerant ground cover such as English Ivy or Dwarf Asiatic Jasmine would be better suited to those conditions, or renovation with a shade tolerant shrub bed.

Also consider that sunlight is not the only factor when it comes to growing turf in proximity to trees. The roots of the trees and turf will compete for space, water and nutrients. The vast majority of the tree's root system that absorbs water and nutrients most efficiently is in the top 8 inches of soil; this is the same area as the roots of the turf. Trees will typically win the competition since they are much larger. Proper tree thinning and pruning should be performed for the health and structure of the tree. Tree pruning to provide light for the turf is not a long-term sustainable solution and should not be recommend, as it can weaken the health and structure of the tree. Removal of trees may be an option to consider if the customer desires turf.

If there is enough light for turf, start with a shade tolerant variety of St. Augustine. Seville and Bitter blue are best, but even they will require at least 4 or hours of direct sunlight. Floratam does not tolerate shade well at all, it requires about 7 to 8 hours of direct sunlight. Most Zoysia varieties are not very shade tolerant. Perform a site visit around noon to determine of the amount of light the turf is receiving. At this time the sun will be at its highest point. Consider the direction of movement of the sunlight and the expected shade patterns. Also consider that the shade line on the north side of any structure will extend from the fall through the winter.

Key Principle #2 – Create Healthy Soils

Check the soil pH to ensure it is in the optimum range and adjust as needed. Do not assume that the pH is low just because of the canopy of the trees. However, proper pH is particularly crucial to having all the plant health factors in your favor for the survival of the turf.

Key Principle #3 – Water Properly

Moisture requirements for turf growing in the shade will be greatly reduced compared to areas of full sun. Watering should still be done at the first signs of wilt, applying ½ inch per application. Watering once a week in the early spring, twice a week in the late spring and summer, once a week in the fall and once every other week in the winter is generally sufficient in the absence of rain. Over watering is conducive to Pythium root rot, which is detrimental to a shady lawn.



Growing Turfgrass in the Shade

Key Principle #4 – Proper Mowing

Proper mowing is a particularly important key for growing turf in the shade. People often don't understand the connection between leaf surface and plant health. Remember that a plant produces food for its root system by gathering sunlight through its leaves. With the reduced sunlight, the amount of leaf surface is particularly important. If more leaf surface is allowed, more food will be produced. Dwarf varieties should be mowed at 3 inches. Non-dwarf varieties should always be mowed at 3.5" to 4". However, frequency of mowing is equally important; never remove more than 1/3 of the leaf surface in a single mowing. It may be necessary to mow every 4 days in the summer. Frequent mowing helps produce a dense turf cover.

Key Principle #5 – Manage Pests

Lawn caterpillars can be particularly devastating to turf growing in the shade. Adult sod webworm moths are more active in the shade during the daytime, so the potential for infestation is increased. When sod webworms infest shaded turf and remove the leaves, permanent damage is highly likely. Because of this, Acelepryn should be applied in April, May or June depending on geographic location and for newly installed sod, June through September. One application of Acelepryn will provide season long control of lawn caterpillars.

Plant Energy Management

It is imperative to understand the concept that plants produce their food energy (carbohydrates) through the process of photosynthesis and that the nutrients that fertilizer provide is not "plant food". Nutrients from fertilizer provide the plant with essential elements required for proper function of the plant's systems. The nutrient that provides the plant with stimulus for vegetative growth is nitrogen.

While the proper amount of leaf surface is essential for the plant to gather sunlight and produce food, creating leaf growth requires a great amount of the plant's energy. The energy required to grow leaves is provided at the expense of the energy needed to produce and maintain healthy roots.

The natural growth habit of turf in the shade changes greatly in the warm season compared to the cool season. Due to the warm temperatures and longer daylight hours in the summer, shaded turf will tend to "stand up" and grow long leaves reaching for light. This change typically begins in May and continues through September. Excessive nitrogen applied during this time can be damaging to a shady lawn by stimulating excessive leaf production and robbing the root system of the energy necessary to survive. Do not apply nitrogen in addition to our regular program to shaded turf in the summer; not even 5-0-30. To enhance rooting in the summer, our program utilizes 0-0-1, which contains Humic acid and kelp extract. These products provide food (carbon) for microorganisms, which benefit rooting. Turfpro and sugar (yes sugar like Dixie Crystals) may also be beneficial. Typically, 9 ounces of Turfpro and 3 ounces of sugar are used per 1000 sq. ft. Additional potassium (0-0-20) is a benefit to increase the hardiness of the turf without stimulating leaf growth, but potassium does not "stimulate" root growth.



Growing Turfgrass in the Shade

Our GreenUP Agronomic Program reduces the amount of nitrogen applied in the warm season. It is designed with shady lawns in mind, so it may be necessary to apply additional nitrogen from 15-0-5 in sunny areas.

When conditions are conducive for Pythium, gray leaf spot or brown patch fungus, Armada should be applied for prevention. If disease becomes an issue in the spring or summer, use a combination of Armada and Subdue. The combination of these two will address a wide variety of fungi. In addition, Armada will act as a slight growth regulator to suppress leaf growth. The reduction of leaf growth results in a transfer of energy to root growth.

Another tool to consider is the use of Primo Maxx turf growth regulator monthly from May through the August. Primo reduces the vertical growth of turfgrasses, but promotes lateral growth and root growth. As turf top growth slows, energy is redirected to below-ground plant parts and root production increases. Primo may also enhance the performance of systemic fungicides and insecticides because mowing is less frequent and the removal of leaf material is reduced. Primo Maxx reaches the growing point by foliar uptake and is rain-fast within one hour of application. The effect of Primo Maxx will last for about 6 weeks and may need to be repeated every 6 to 8 weeks from May through August. Applications of Primo Maxx in the fall are not necessary or beneficial.

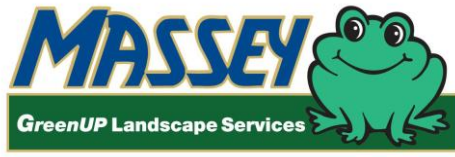
Since Primo Maxx reduces the leaf growth, an even application is particularly important. Also be aware that Primo does not reduce the growth of broadleaf weeds or sedge. Because of this, they will become more noticeable to the customer and will need to be controlled.

When Primo Maxx is used, carbohydrate levels in the leaves will increase, which makes the turf more attractive to lawn caterpillars. Because of this, Acelepryn should be applied with the first Primo application.

From September through March, a different approach to stimulating root production is taken. The shorter daylight hours and cooler temperatures will naturally reduce leaf production in the fall and winter and Primo is not necessary or beneficial. Extra nitrogen can and should be applied at this time. When nitrogen stimulates the turf, the result will be root production since the leaf production is being suppressed naturally. Additionally, instead of the turf "standing up" as it did in the summer, it will be "laying down" and be more likely to crawl and spread. Remember that frequent lighter applications of nitrogen will be utilized better than single doses applied heavily and foliar applications will work best if the root system is not functioning effectively. ½ pound of nitrogen per 1000 sq. ft. applied two to three times at three week intervals works well.

The summer can be extremely difficult to establish new sod in the shade. As previously mentioned, most of the plant energy is being utilized for leaf production so it is more difficult to establish a root system. Many fungi including Pythium root rot will try to invade as the turf declines. Follow the Sod Installation Protocol very closely.

Fall is always the best time to install new turf, especially new turf in the shade.



WEEKLY TRAINING SESSION



Pythium Root Rot

Topic Category: Lawn

Recordable Verifiable Training Hours: 1

Objectives: This lesson is designed to teach the basics of Pythium root rot biology and management.

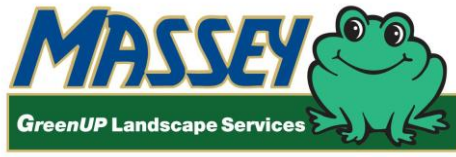
Length of lesson: Approx 60 minutes.

Materials needed:

- Training outline
- GreenUP Protocol for Pythium Root Rot
- Samples from the field, if available
 - If samples of the disease are not available, color photos can be used.
- Pre and Post tests

Training Guidelines:

- This training qualifies for Department of Agriculture ID Card Holder Training. Complete a Department of Agriculture ID Card Holder Training for each Team Member and maintain it in their personnel file at your office.
- Make copies of the tests and training materials for all Team Members attending.
- Set up the training area in an area of the office that will minimize disruptions.
- Begin the meeting by defining the training topic and handing out the pre-test
 - Allow a few minutes for all Team Members to complete the pre-test.
 - Collect the pre-test and hand out the Verifiable Training Record form.
- Distribute and review the GreenUP Protocol for Pythium root rot.
 - Use the Training outline as a guide for key points.
 - Encourage active participation from all Team Members
 - Ask probing questions to develop key points
 - Encourage group reading
- After reading and reviewing the materials in the lesson, ask questions to verify the material has been understood.
- Hand out the post-tests. When complete, grade the tests and record the score on the Verifiable Training Record form.
- Collect tests and place with the verifiable materials in the Service Center Verifiable Training File.
- Make copies of the Verifiable Training Record and place in each Team Member's personal training file.
- Complete all Weekly VTM's through Massey University.



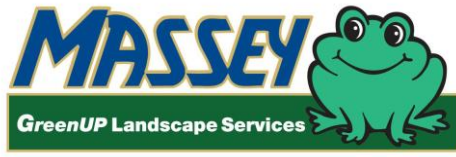
WEEKLY TRAINING SESSION



Pythium Root Rot

Training Outline

1. Review the GreenUP Protocol for Pythium root rot. Point out the key items including:
 - Description of the disease
 - Pass around samples or pictures to help in identification of the disease.
 - Host plants
 - Typical symptoms (how to ID this problem)
 - Conducive conditions
 - Control measures
 - Disease triangle and breaking the cycle by removing one of the three components
 - The importance of cultural control
 - Proactive Treatment for newly installed turf in the shade
 - The importance of proper nutrition
 - Explain proper chemical control



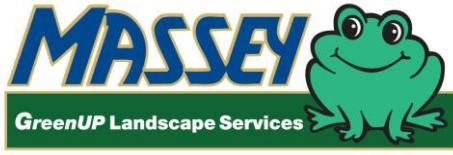
WEEKLY TRAINING SESSION



Pythium Root Rot

Pre/ Post Test

1. The three components of the disease triangle are
 - a. Plant, Pathogen, Host
 - b. Conducive Condition, Plant, Host
 - c. Conducive Condition, Host, Pathogen
 - d. Pathogen, Conducive Condition, Environmental Factors
2. T or F Wet soils and poor drainage favor the development of Pythium root rot?
3. T or F The symptoms of Pythium root rot include yellowing and irregular shaped patterns.
4. T or F Pythium flourishes during periods of prolonged drought.
5. T or F The product(s) used for the control of Pythium root rot is Subdue or Mefenoxam.
6. T or F The area treated for Pythium should be watered lightly after treatment.
7. T or F High rates of Nitrogen and low rates of Potassium will be beneficial to the recovery of the turf.
8. T or F Newly installed sod that is installed in a shady location is particularly susceptible to Pythium.
9. T or F Proactive treatment(s) should be performed for the control/prevention of Pythium on newly installed turf that is installed in a shady location.
10. T or F The application of pre-emergence herbicides should be avoided when Pythium root rot has compromised the root system.



WEEKLY TRAINING SESSION



Pythium Root Rot

Pre/ Post Test Answers

1. The three components of the disease triangle are
 - a. Plant, Pathogen, Host
 - b. Conducive Condition, Plant, Host
 - ☒ c. Conducive Condition, Host, Pathogen
 - d. Pathogen, Conducive Condition, Environmental Factors
2. ☒ T or F Wet soils and poor drainage favor the development of Pythium root rot?
3. ☒ T or F The symptoms of Pythium root rot include yellowing and irregular shaped patterns.
4. T or ☒ F Pythium flourishes during periods of prolonged drought.
5. ☒ T or F The product(s) used for the control of Pythium root rot is Subdue or Mefenoxam.
6. ☒ T or F The area treated for Pythium should be watered lightly after treatment.
7. T or ☒ F High rates of Nitrogen and low rates of Potassium will be beneficial to the recovery of the turf.
8. ☒ T or F Newly installed sod that is installed in a shady location is particularly susceptible to Pythium.
9. ☒ T or F Proactive treatment(s) should be performed for the control/prevention of Pythium on newly installed turf that is installed in a shady location.
10. ☒ T or F The application of pre-emergence herbicides should be avoided when Pythium root rot has compromised the root system.

Pythium Root Rot

Root rot diseases are by far the most damaging turf diseases in Florida lawns. They often occur in wet soils with limited soil drainage (porosity) or in areas that are over-watered or remain wet due to location of gutters and downspouts, air conditioning units and slopes, etc. Warm temperatures, excessive soil moisture and actively growing turf during summer months meet all of the requirements for a root rot disease to flourish. One of the more common root affecting diseases found in the Florida is Pythium root rot.

Pythium Root Rot

Pythium root rot is common on highly maintained and excessively moist turf. Although symptoms of Pythium root rot are typically non-distinctive, this disease can appear as yellow, irregularly shaped patches (Figure 1). The affected turfgrass is thin, off-color and declining, while the root system is stunted and rotted with reduced volume and vigor.



Figure 1. Irregular yellowing and thinning of turf

Pathogen

The organism responsible for Pythium root rot can be one of many in the Pythium species of fungi. Pythium root rot can affect Bermudagrass, Centipedegrass, Zoysiagrass and St. Augustinegrass, though infections rarely kill off large areas of established turf.

Symptoms

Pythium root rot causes poor turf growth by reducing the volume and vigor of the plant roots. Affected roots of plants can appear dark in color, soft with few or no feeder roots present. Sometimes new roots may be initiated from crown regions as older roots become diseased.

Above ground symptoms of Pythium root rot are typically non-distinctive, but this disease can appear as yellow, irregularly shaped patches of thinning turf (Figure 2). Foliage can appear chlorotic (yellowish), necrotic (dead), or, possibly, wet and 'greasy'. Affected turfgrass is thin, off-color and slow growing and

Pythium Root Rot

often starts as small, bleached patches that may evolve into large dead areas. The fungus survives as thick walled “resting structures” (oospores) in old roots, in the soil and in the thatch. Therefore, thatch management is key to managing the disease in susceptible areas.



Figure 2. Yellow, thin turf patches affected by Pythium root rot.

Conducive Conditions

Typical summertime conditions are required for the disease to thrive and spread. Environmental factors that favor infection include:

- Thrives in temperatures between 70°F and 95°F
 - Temps over 86°F are optimal growing conditions
- High humidity >80%
- Prolonged leaf wetness (3 hours or more)
 - Poorly drained or continuously wet soils are particularly susceptible
- Areas with high soil moisture, poor drainage and low light
- Low mowing height and excessive wear causes more severe infections to occur

Pythium root rot is often a secondary or advantageous disease; it becomes damaging to the turf due to another cause (or multiple causes). For example, turf that does not receive adequate sunlight is not able to produce enough food for its root system through the process of photosynthesis. Because of this, the root system is weakened. Pythium root rot takes advantage of this situation and furthers the decline of the turf.

One of the most common situations for Pythium root rot to become a decline factor is with newly installed sod. Consider that the turf has just had the vast majority of its root system cut off at the sod farm. It is then stacked on pallets and transported to the job site. If the new site is shaded, it has now gone full sun at the sod field and placed into shade. Add to this situation the daily watering practice in an effort to get the newly

Pythium Root Rot

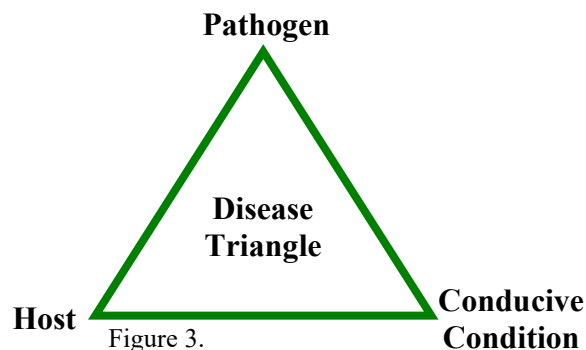
installed turf to root. Another compounding factor can be if the sod was originally grown in a muck soil and placed in a sandy location. The muck soil is highly organic and has a finer texture than the sand. Being highly organic, the roots prefer to stay in the muck as opposed growing into the sand. Being a finer texture than the sand, moisture levels will be greater in the muck layer than in the sand.

Consider all these compounding factors: Open injury to the root system, grass blades that are damaged from being stacked on the pallet, reduced light to produce food for the root system, and excessive moisture. This is the perfect conditions for Pythium root rot to begin to cause further damage to an already weakened plant. When these conditions are present, it should be assumed that Pythium is likely to become a problem and should be treated pro-actively.

Control

Once the disease has infected the plant, control is required. To control this disease, we refer to the Disease Triangle (Figure 3). In order for a disease to thrive and reproduce, it needs three things:

- The Pathogen
- The Host
- The Conducive condition

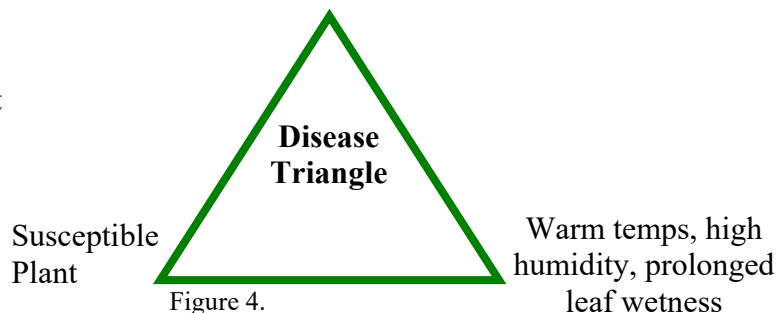


The removal of any one of these three factors will result in the control of the disease. The Disease Triangle for *Pythium* is represented by Figure 4.

Pythium spp.

Control can be achieved by:

- Replacing with another plant
- Changes in the environment
- Application of a fungicide



Cultural methods are always preferred for disease control. The cultural control methods for Pythium root rot include:



GREENUP SERVICE PROTOCOLS



Pythium Root Rot

- Increase the height of the turf. Mow it at the highest recommended height for the turf type.
- High rates of nitrogen predispose turf to infection. If nitrogen fertility is required, apply low rates from slow release sources or very low levels of quick release; light rates of 5-0-30 will work well. Additional potassium will be beneficial. Do not apply additional nitrogen to shaded turf in the summer months.
- Avoid over-watering and prolonged leaf wetness. This may be difficult during the rainy season, but educate your customers to not water in the evening. Supplemental irrigation late in the day will provide the conducive conditions even if the rain does not.
- Manage the thatch layer to allow for proper water penetration into the soil and alleviate compacted soils by aerating. Compacted soils weaken the turf making it more susceptible to disease infestation. Additionally, aeration will help improve the drainage in the root zone and facilitate the breakdown of thatch.
- Increase the amount of sunlight when possible.
- Avoid the application of any product that would inhibit rooting, such as a pre-emergence herbicide.

Chemical control via a fungicide is achieved by making applications of Subdue Maxx (Mefenoxam). Pillar G is also labeled for the prevention of Pythium, but do not assume that other fungicides will control Pythium, since many will not. After an application of Subdue, the turf should be watered lightly to move the fungicide off the leaves and down to the root system. Multiple applications may be required during periods of favorable conducive conditions.

Although this information has been written specifically for turf, it is important to know that Pythium can also affect ornamentals and trees and the concepts of this information are still applicable.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

Topic Category: Lawn

Recordable Verifiable Training Hours: 0.5

Objectives: This lesson is designed to teach our GreenUP Protocol – Growing Turfgrass in the Shade.

Length of lesson: Approx. 30 minutes.

Materials needed:

- Training Guideline
- GreenUP Protocol – Growing Turfgrass in the Shade
- Pre- and Post- tests.

Training Guidelines:

- Make copies of the tests and training materials for all Team Members attending.
- Set up the training area in an area of the office that will minimize disruptions.
- Begin the meeting by defining the training topic and handing out the Pre-test
 - Allow a few minutes for Team Members to complete the Pre-test.
 - Collect the pre-test and hand out the Verifiable Training Record Form (VTRF)
- Distribute and review the training materials on Growing Turfgrass in the Shade
- Use the Training outline as a guide for key points.
 - Encourage active participation from all Team Members
 - Ask probing questions to develop key points
 - Encourage group reading
- After reading and reviewing all materials, ask questions to verify the lesson has been understood.
- Hand out the Post-tests. When complete, grade the tests and record the score on the VTRF.
- Collect tests and place with the verifiable materials in the Service Center Verifiable Training File.
- Make copies of the VTRF and place in each Team Member's training file.
- Complete all Weekly VTM's through Massey University.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

Name _____

Date _____

PRE & POST TEST

1. T or F Proper turfgrass care will reduce the plant's requirement for sunlight.
2. T or F Turfgrass is competing with trees for space, water, nutrients and light.
3. T or F Keeping trees pruned to allow for more sunlight for the turf is a long-term sustainable solution to keep the turfgrass healthy.
4. T or F The primary factor leading to turfgrass decline in the shade is acidic soil.
5. T or F Moisture requirements for turf growing in the shade are increased.
6. T or F Proper mowing is a particularly important factor for growing turfgrass in the shade.
7. T or F Turf damaging caterpillars are more active and more damaging in shady lawns.
8. T or F Fertilizer is plant food.
9. T or F Applying additional nitrogen in the summer helps promote root growth in shady lawns.
10. T or F Applying additional nitrogen in the fall helps promote root growth in shady lawns.
11. T or F Applications of Primo Maxx in the summer will promote root growth.
12. T or F An application of Primo Maxx will reduce leaf growth for about 4 to 6 weeks.
13. T or F Applications of Primo Maxx in the fall are beneficial.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

PRE & POST TEST ANSWER KEY

PRE & POST TEST

1. T or ☒ F Proper turfgrass care will reduce the plant's requirement for sunlight.
2. ☒ T or F Turfgrass is competing with trees for space, water, nutrients and light.
3. T or ☒ F Keeping trees pruned to allow for more sunlight for the turf is a long-term sustainable solution to keep the turfgrass healthy.
4. T or ☒ F The primary factor leading to turfgrass decline in the shade is acidic soil.
5. T or ☒ F Moisture requirements for turf growing in the shade are increased.
6. ☒ T or F Proper mowing is a particularly important factor for growing turfgrass in the shade.
7. ☒ T or F Turf damaging caterpillars are more active and more damaging in shady lawns.
8. T or ☒ F Fertilizer is plant food.
9. T or ☒ F Applying additional nitrogen in the summer helps promote root growth in shady lawns.
10. ☒ T or F Applying additional nitrogen in the fall helps promote root growth in shady lawns.
11. ☒ T or F Applications of Primo Maxx in the summer will promote root growth.
12. ☒ T or F An application of Primo Maxx will reduce leaf growth for about 6 weeks.
13. T or ☒ F Applications of Primo Maxx in the fall are beneficial.



Growing Turfgrass in the Shade

An essential point to understand as it pertains to growing turfgrass in the shade is that there is nothing we can apply that will provide the turf with the essential carbohydrates that the plant creates from sunlight through the process of photosynthesis. However, we can manage factors that lead to further decline and make proper choices to manage plant energy efficiently.

The 5 Key Principles to plant health care are particularly applicable to growing turfgrass in the shade. Success of growing turfgrass in the shade is reliant on having all factors in your favor.

Key Principle #1 – Right Plant – Right Place

There is no way to change the natural requirements of light for a plant. It is always best to install landscapes that can flourish in the natural conditions of the location. In densely shaded lawns, the best option may not be grass at all. A shade tolerant ground cover such as English Ivy or Dwarf Asiatic Jasmine would be better suited to those conditions.

Also consider that sunlight is not the only factor when it comes to growing turf in proximity to trees. The roots of the trees and turf will compete for space, water and nutrients. The vast majority of the tree's root system that absorbs water and nutrients most efficiently is in the top 8 inches of soil; this is the same area as the roots of the turf. Trees will typically win the competition since they are much larger. Proper tree thinning and pruning should be performed for the health and structure of the tree; tree pruning to provide light for the turf is not a long-term sustainable solution and can weaken the health and structure of the tree. Removal of trees may be an option to consider if the customer desires turf.

If there is enough light for turf, start with a shade tolerant variety. In the transition zone, Tall Fescue varieties would be the best choice, but even they will require at least 4 or hours of direct sunlight. Most Zoysia varieties are not very shade tolerant, but will perform satisfactory in light to moderate shade. Bermuda grass is the least shade tolerant; it requires about 10 hours of direct sunlight per day. Perform a site visit around noon to determine of the amount of light the turf is receiving. At this time the sun will be at its highest point. Consider the direction of movement of the sunlight and the expected shade patterns. Also consider that the shade line on the north side of any structure will extend from the fall through the winter.

Key Principle #2 – Create Healthy Soils

Check the soil pH to ensure it is in the optimum range and adjust as needed. Do not assume that the pH is low. However, proper pH is particularly crucial to having all the plant health factors in your favor for the survival of the turf.

Key Principle #3 – Water Properly

Moisture requirements for turf growing in the shade will be greatly reduced compared to areas of full sun. Watering should still be done at the first signs of wilt, applying about 1 inch per application. Rainfall or irrigation will be needed about every 10 days in the early spring, once or twice a week in the late spring and summer, and about every 10 days in the fall is generally sufficient. Watering in the winter would almost never be needed except possibly in the case of growing Tall Fescue during prolonged periods of no rainfall. Over watering is conducive to Pythium root rot, which is detrimental to a shady lawn.



GREENUP SERVICE PROTOCOLS

Growing Turfgrass in the Shade

Key Principle #4 – Proper Mowing

Proper mowing is a particularly important key for growing turf in the shade. People often don't understand the connection between leaf surface and plant health. Remember that a plant produces food for its root system by gathering sunlight through its leaves. With the reduced sunlight, the amount of leaf surface is particularly important. If more leaf surface is allowed, more food will be produced. Tall Fescue should be mowed at 3 to 3.5 inches in the shade. Zoysia should be mowed at 2.5 to 3 inches if light is limited. However, frequency of mowing is equally important; never remove more than 1/3 of the leaf surface in a single mowing. Frequent mowing during times of active growth helps produce a dense turf cover.

Key Principle #5 – Manage Pests

Lawn caterpillars can be particularly devastating to turf growing in the shade. Adult army worm moths are more active in the shade during the daytime, so the potential for infestation is increased. When turf caterpillars infest shaded turf and remove the leaves, permanent damage is highly likely. Because of this, Acelepryn may need to be applied during times where army worm infestations are prevalent. An application of Bifenthrin would provide control of an existing infestation, but if re-infestation is likely, an application of Acelepryn will provide season long control of lawn caterpillars.

It is common for ground mosses and algae to grow on the soil surface in areas where turf has declined from shade and moisture is abundant. While these primitive plants are not parasitic and are not causing direct damage to the turf, they will interfere with turf growth. The primary method of addressing ground mosses and algae is to enhance the cultural practices that will benefit growth of the turf.

- Increase the amount of light by removing or trimming trees.
- Aerate the soil.
- Control excessive moisture
- Address soil pH issues
- Provide proper fertility

There are some materials that will provide direct control of ground mosses or algae, which can be beneficial, but the benefit will be very short lived unless the cultural practices above are implemented. Copper sulfate or copper hydroxide (Kocide 3000) will kill ground mosses and algae. Additionally, the herbicide Carfentrazone will provide some level of control for ground mosses. Carfentrazone is in the herbicide product called Speed Zone, which is used for late spring and summer broadleaf weed control.

Plant Energy Management

It is imperative to understand the concept that plants produce their food energy (carbohydrates) through the process of photosynthesis and that the nutrients that fertilizer provide is not "plant food". Nutrients from fertilizer provide the plant with essential elements required for proper function of the plant's systems. The nutrient that provides the plant with stimulus for vegetative growth is nitrogen.

While the proper amount of leaf surface is essential for the plant to gather sunlight and produce food, creating leaf growth requires a great amount of the plant's energy. The energy



GREENUP SERVICE PROTOCOLS

Growing Turfgrass in the Shade

required to grow leaves is provided at the expense of the energy needed to produce and maintain healthy roots.

The natural growth habit of turf in the shade changes greatly in the warm season compared to the cool season. Due to the warm temperatures and longer daylight hours in the summer, shaded turf will tend to “stand up” and grow long leaves reaching for light. This change typically begins in May and continues through September. Excessive nitrogen applied during this time can be damaging to a shady lawn by stimulating excessive leaf production and robbing the root system of the energy necessary to survive. Do not apply nitrogen in addition to our regular program to shaded turf in the summer. To enhance rooting in the summer, apply Turfpro and sugar (yes sugar like Dixie Crystals). These products provide food (carbon) for microorganisms, which benefit rooting. Typically, 9 ounces of Turfpro and 3 ounces of sugar are used per 1000 sq. ft. Additional potassium (0-0-20) is a benefit to increase the hardiness of the turf without stimulating leaf growth, but potassium does not “stimulate” root growth.

Our GreenUP Agronomic Program provides just the right amount of nitrogen at the right times of the year. However, situations may warrant the reduction of nitrogen for turf growing in the shade. The Lawn Specialist should use their best judgment, but should consider reducing the amount of nitrogen applied on shady lawns by 50% from May through August.

When conditions are conducive for Pythium, gray leaf spot or brown patch fungus, Pillar G should be applied for prevention. If disease becomes an issue in the spring or summer, use a combination of Armada and Subdue. The combination of these two will address a wide variety of fungi. In addition, Armada will act as a slight growth regulator to suppress leaf growth. The reduction of leaf growth results in a transfer of energy to root growth.

Another tool to consider is the use of Primo Maxx turf growth regulator when leaf growth in the shade is excessive. Primo reduces the vertical growth of turfgrasses, but promotes lateral growth and root growth. As turf top growth slows, energy is redirected to below-ground plant parts and root production increases. Primo may also enhance the performance of systemic fungicides and insecticides because mowing is less frequent and the removal of leaf material is reduced. Primo Maxx reaches the growing point by foliar uptake and is rain fast within one hour of application. The effect of Primo Maxx will last for about 4 to 6 weeks and may need to be repeated every 4 to 8 weeks. Applications of Primo Maxx to warm season grasses in the fall are not necessary or beneficial.

Since Primo Maxx reduces the leaf growth, an even application is particularly important. Also be aware that Primo does not reduce the growth of broadleaf weeds or sedge. Because of this, they will become more noticeable to the customer and will need to be controlled.

When Primo Maxx is used, carbohydrate levels in the leaves will increase, which makes the turf more attractive to lawn caterpillars. Because of this, Acelepryn should be applied if turf caterpillars are active.



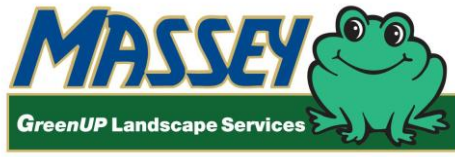
GREENUP SERVICE PROTOCOLS

Growing Turfgrass in the Shade

From September through March, a different approach to stimulating root production is taken. The shorter daylight hours and cooler temperatures will naturally reduce leaf production in the fall and winter and Primo is not necessary or beneficial. Extra nitrogen can and should be applied at this time, providing the turf is not dormant. When nitrogen stimulates the turf, the result will be root production since the leaf production is being suppressed naturally. Additionally, instead of the turf “standing up” as it did in the summer, it will be “laying down” and be more likely to crawl and spread. Remember that frequent lighter applications of nitrogen will be utilized better than single doses applied heavily and foliar applications will work best if the root system is not functioning effectively. ½ pound of nitrogen per 1000 sq. ft. applied two to three times at three week intervals works well.

The summer can be extremely difficult to establish new sod in the shade. As previously mentioned, most of the plant energy is being utilized for leaf production so it is more difficult to establish a root system. Many fungi including Pythium root rot will try to invade as the turf declines. Follow the Sod Installation Protocol very closely.

Late summer and early fall is always the best time to install turf, especially turf in the shade.



WEEKLY TRAINING SESSION



Pythium Root Rot

Topic Category: Lawn

Recordable Verifiable Training Hours: 1

Objectives: This lesson is designed to teach the basics of Pythium root rot biology and management.

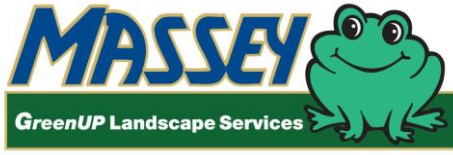
Length of lesson: Approx 60 minutes.

Materials needed:

- Training outline
- GreenUP Protocol for Pythium Root Rot
- Samples from the field, if available
 - If samples of the disease are not available, color photos can be used.
- Pre and Post tests

Training Guidelines:

- This training qualifies for Department of Agriculture ID Card Holder Training. Complete a Department of Agriculture ID Card Holder Training for each Team Member and maintain it in their personnel file at your office.
- Make copies of the tests and training materials for all Team Members attending.
- Set up the training area in an area of the office that will minimize disruptions.
- Begin the meeting by defining the training topic and handing out the pre-test
 - Allow a few minutes for all Team Members to complete the pre-test.
 - Collect the pre-test and hand out the Verifiable Training Record form.
- Distribute and review the GreenUP Protocol for Pythium root rot.
 - Use the Training outline as a guide for key points.
 - Encourage active participation from all Team Members
 - Ask probing questions to develop key points
 - Encourage group reading
- After reading and reviewing the materials in the lesson, ask questions to verify the material has been understood.
- Hand out the post-tests. When complete, grade the tests and record the score on the Verifiable Training Record form.
- Collect tests and place with the verifiable materials in the Service Center Verifiable Training File.
- Make copies of the Verifiable Training Record and place in each Team Member's personal training file.
- Complete all Weekly VTM's through Massey University.



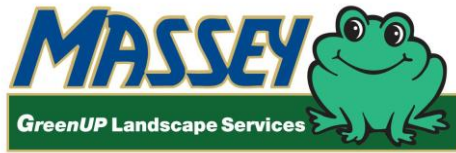
WEEKLY TRAINING SESSION



Pythium Root Rot

Training Outline

1. Review the GreenUP Protocol for Pythium root rot. Point out the key items including:
 - Description of the disease
 - Pass around samples or pictures to help in identification of the disease.
 - Host plants
 - Typical symptoms (how to ID this problem)
 - Conducive conditions
 - Control measures
 - Disease triangle and breaking the cycle by removing one of the three components
 - The importance of cultural control
 - Proactive Treatment for newly installed turf in the shade
 - The importance of proper nutrition
 - Explain proper chemical control



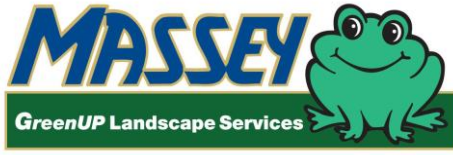
WEEKLY TRAINING SESSION



Pythium Root Rot

Pre/ Post Test

1. The three components of the disease triangle are
 - a. Plant, Pathogen, Host
 - b. Conducive Condition, Plant, Host
 - c. Conducive Condition, Host, Pathogen
 - d. Pathogen, Conducive Condition, Environmental Factors
2. T or F Wet soils and poor drainage favor the development of Pythium root rot?
3. T or F The symptoms of Pythium root rot include yellowing and irregular shaped patterns.
4. T or F Pythium flourishes during periods of prolonged drought.
5. T or F The product(s) used for the control of Pythium root rot is Subdue or Mefenoxam.
6. T or F The area treated for Pythium should be watered lightly after treatment.
7. T or F High rates of Nitrogen and low rates of Potassium will be beneficial to the recovery of the turf.
8. T or F Newly installed sod that is installed in a shady location is particularly susceptible to Pythium.
9. T or F Proactive treatment(s) should be performed for the control/prevention of Pythium on newly installed turf that is installed in a shady location.
10. T or F The application of pre-emergence herbicides should be avoided when Pythium root rot has compromised the root system.



WEEKLY TRAINING SESSION



Pythium Root Rot

Pre/ Post Test Answers

1. The three components of the disease triangle are
 - a. Plant, Pathogen, Host
 - b. Conducive Condition, Plant, Host
 - ☒ c. Conducive Condition, Host, Pathogen
 - d. Pathogen, Conducive Condition, Environmental Factors
2. ☒ T or F Wet soils and poor drainage favor the development of Pythium root rot?
3. ☒ T or F The symptoms of Pythium root rot include yellowing and irregular shaped patterns.
4. T or ☒ F Pythium flourishes during periods of prolonged drought.
5. ☒ T or F The product(s) used for the control of Pythium root rot is Subdue or Mefenoxam.
6. ☒ T or F The area treated for Pythium should be watered lightly after treatment.
7. T or ☒ F High rates of Nitrogen and low rates of Potassium will be beneficial to the recovery of the turf.
8. ☒ T or F Newly installed sod that is installed in a shady location is particularly susceptible to Pythium.
9. ☒ T or F Proactive treatment(s) should be performed for the control/prevention of Pythium on newly installed turf that is installed in a shady location.
10. ☒ T or F The application of pre-emergence herbicides should be avoided when Pythium root rot has compromised the root system.

Pythium Root Rot

Root rot diseases are by far the most damaging turf diseases in Florida lawns. They often occur in wet soils with limited soil drainage (porosity) or in areas that are over-watered or remain wet due to location of gutters and downspouts, air conditioning units and slopes, etc. Warm temperatures, excessive soil moisture and actively growing turf during summer months meet all of the requirements for a root rot disease to flourish. One of the more common root affecting diseases found in the Florida is Pythium root rot.

Pythium Root Rot

Pythium root rot is common on highly maintained and excessively moist turf. Although symptoms of Pythium root rot are typically non-distinctive, this disease can appear as yellow, irregularly shaped patches (Figure 1). The affected turfgrass is thin, off-color and declining, while the root system is stunted and rotted with reduced volume and vigor.



Figure 1. Irregular yellowing and thinning of turf

Pathogen

The organism responsible for Pythium root rot can be one of many in the Pythium species of fungi. Pythium root rot can affect Bermudagrass, Centipedegrass, Zoysiagrass and St. Augustinegrass, though infections rarely kill off large areas of established turf.

Symptoms

Pythium root rot causes poor turf growth by reducing the volume and vigor of the plant roots. Affected roots of plants can appear dark in color, soft with few or no feeder roots present. Sometimes new roots may be initiated from crown regions as older roots become diseased.

Above ground symptoms of Pythium root rot are typically non-distinctive, but this disease can appear as yellow, irregularly shaped patches of thinning turf (Figure 2). Foliage can appear chlorotic (yellowish), necrotic (dead), or, possibly, wet and 'greasy'. Affected turfgrass is thin, off-color and slow growing and

Pythium Root Rot

often starts as small, bleached patches that may evolve into large dead areas. The fungus survives as thick walled “resting structures” (oospores) in old roots, in the soil and in the thatch. Therefore, thatch management is key to managing the disease in susceptible areas.



Figure 2. Yellow, thin turf patches affected by Pythium root rot.

Conducive Conditions

Typical summertime conditions are required for the disease to thrive and spread. Environmental factors that favor infection include:

- Thrives in temperatures between 70°F and 95°F
 - Temps over 86°F are optimal growing conditions
- High humidity >80%
- Prolonged leaf wetness (3 hours or more)
 - Poorly drained or continuously wet soils are particularly susceptible
- Areas with high soil moisture, poor drainage and low light
- Low mowing height and excessive wear causes more severe infections to occur

Pythium root rot is often a secondary or advantageous disease; it becomes damaging to the turf due to another cause (or multiple causes). For example, turf that does not receive adequate sunlight is not able to produce enough food for its root system through the process of photosynthesis. Because of this, the root system is weakened. Pythium root rot takes advantage of this situation and furthers the decline of the turf.

One of the most common situations for Pythium root rot to become a decline factor is with newly installed sod. Consider that the turf has just had the vast majority of its root system cut off at the sod farm. It is then stacked on pallets and transported to the job site. If the new site is shaded, it has now gone full sun at the sod field and placed into shade. Add to this situation the daily watering practice in an effort to get the newly

Pythium Root Rot

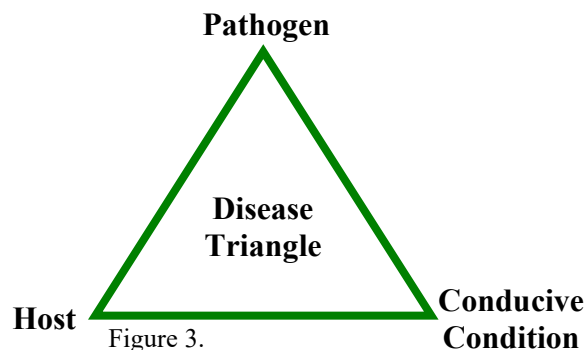
installed turf to root. Another compounding factor can be if the sod was originally grown in a muck soil and placed in a sandy location. The muck soil is highly organic and has a finer texture than the sand. Being highly organic, the roots prefer to stay in the muck as opposed growing into the sand. Being a finer texture than the sand, moisture levels will be greater in the muck layer than in the sand.

Consider all these compounding factors: Open injury to the root system, grass blades that are damaged from being stacked on the pallet, reduced light to produce food for the root system, and excessive moisture. This is the perfect conditions for Pythium root rot to begin to cause further damage to an already weakened plant. When these conditions are present, it should be assumed that Pythium is likely to become a problem and should be treated pro-actively.

Control

Once the disease has infected the plant, control is required. To control this disease, we refer to the Disease Triangle (Figure 3). In order for a disease to thrive and reproduce, it needs three things:

- The Pathogen
- The Host
- The Conducive condition

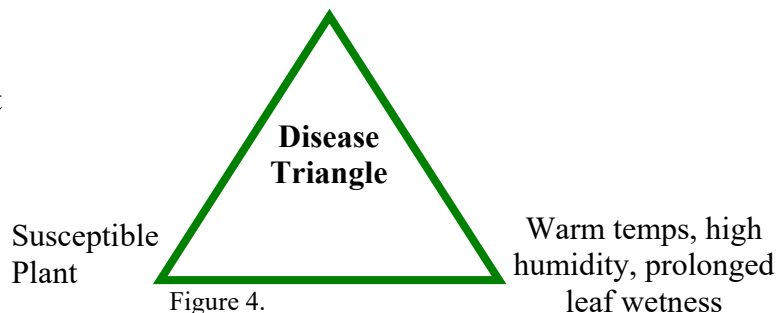


The removal of any one of these three factors will result in the control of the disease. The Disease Triangle for *Pythium* is represented by Figure 4.

Pythium spp.

Control can be achieved by:

- Replacing with another plant
- Changes in the environment
- Application of a fungicide



Cultural methods are always preferred for disease control. The cultural control methods for Pythium root rot include:



GREENUP SERVICE PROTOCOLS



Pythium Root Rot

- Increase the height of the turf. Mow it at the highest recommended height for the turf type.
- High rates of nitrogen predispose turf to infection. If nitrogen fertility is required, apply low rates from slow release sources or very low levels of quick release; light rates of 5-0-30 will work well. Additional potassium will be beneficial. Do not apply additional nitrogen to shaded turf in the summer months.
- Avoid over-watering and prolonged leaf wetness. This may be difficult during the rainy season, but educate your customers to not water in the evening. Supplemental irrigation late in the day will provide the conducive conditions even if the rain does not.
- Manage the thatch layer to allow for proper water penetration into the soil and alleviate compacted soils by aerating. Compacted soils weaken the turf making it more susceptible to disease infestation. Additionally, aeration will help improve the drainage in the root zone and facilitate the breakdown of thatch.
- Increase the amount of sunlight when possible.
- Avoid the application of any product that would inhibit rooting, such as a pre-emergence herbicide.

Chemical control via a fungicide is achieved by making applications of Subdue Maxx (Mefenoxam). Pillar G is also labeled for the prevention of Pythium, but do not assume that other fungicides will control Pythium, since many will not. After an application of Subdue, the turf should be watered lightly to move the fungicide off the leaves and down to the root system. Multiple applications may be required during periods of favorable conducive conditions.

Although this information has been written specifically for turf, it is important to know that Pythium can also affect ornamentals and trees and the concepts of this information are still applicable.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

Topic Category: Lawn

Recordable Verifiable Training Hours: 0.5

Objectives: This lesson is designed to teach our GreenUP Protocol – Growing Turfgrass in the Shade.

Length of lesson: Approx. 30 minutes.

Materials needed:

- Training Guideline
- GreenUP Protocol – Growing Turfgrass in the Shade
- Pre- and Post- tests.

Training Guidelines:

- Make copies of the tests and training materials for all Team Members attending.
- Set up the training area in an area of the office that will minimize disruptions.
- Begin the meeting by defining the training topic and handing out the Pre-test
 - Allow a few minutes for Team Members to complete the Pre-test.
 - Collect the pre-test and hand out the Verifiable Training Record Form (VTRF)
- Distribute and review the training materials on Growing Turfgrass in the Shade
- Use the Training outline as a guide for key points.
 - Encourage active participation from all Team Members
 - Ask probing questions to develop key points
 - Encourage group reading
- After reading and reviewing all materials, ask questions to verify the lesson has been understood.
- Hand out the Post-tests. When complete, grade the tests and record the score on the VTRF.
- Collect tests and place with the verifiable materials in the Service Center Verifiable Training File.
- Make copies of the VTRF and place in each Team Member's training file.
- Complete all Weekly VTM's through Massey University.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

Name _____

Date _____

PRE & POST TEST

1. T or F Proper turfgrass care will reduce the plant's requirement for sunlight.
2. T or F Turfgrass is competing with trees for space, water, nutrients and light.
3. T or F Keeping trees pruned to allow for more sunlight for the turf is a long-term sustainable solution to keep the turfgrass healthy.
4. T or F The primary factor leading to turfgrass decline in the shade is acidic soil.
5. T or F Moisture requirements for turf growing in the shade are increased.
6. T or F Proper mowing is a particularly important factor for growing turfgrass in the shade.
7. T or F Turf damaging caterpillars are more active and more damaging in shady lawns.
8. T or F Fertilizer is plant food.
9. T or F Applying additional nitrogen in the summer helps promote root growth in shady lawns.
10. T or F Applying additional nitrogen in the fall helps promote root growth in shady lawns.
11. T or F Applications of Primo Maxx in the summer will promote root growth.
12. T or F An application of Primo Maxx will reduce leaf growth for about 4 to 6 weeks.
13. T or F Applications of Primo Maxx in the fall are beneficial.



WEEKLY TRAINING SESSION



GreenUP Protocol – Growing Turfgrass in the Shade

PRE & POST TEST ANSWER KEY

PRE & POST TEST

1. T or ☒ F Proper turfgrass care will reduce the plant's requirement for sunlight.
2. ☒ T or F Turfgrass is competing with trees for space, water, nutrients and light.
3. T or ☒ F Keeping trees pruned to allow for more sunlight for the turf is a long-term sustainable solution to keep the turfgrass healthy.
4. T or ☒ F The primary factor leading to turfgrass decline in the shade is acidic soil.
5. T or ☒ F Moisture requirements for turf growing in the shade are increased.
6. ☒ T or F Proper mowing is a particularly important factor for growing turfgrass in the shade.
7. ☒ T or F Turf damaging caterpillars are more active and more damaging in shady lawns.
8. T or ☒ F Fertilizer is plant food.
9. T or ☒ F Applying additional nitrogen in the summer helps promote root growth in shady lawns.
10. ☒ T or F Applying additional nitrogen in the fall helps promote root growth in shady lawns.
11. ☒ T or F Applications of Primo Maxx in the summer will promote root growth.
12. ☒ T or F An application of Primo Maxx will reduce leaf growth for about 6 weeks.
13. T or ☒ F Applications of Primo Maxx in the fall are beneficial.



Growing Turfgrass in the Shade

An essential point to understand, as it pertains to growing turfgrass in the shade, is that there is nothing we can apply that will provide the turf with the essential carbohydrates, that the plant creates from sunlight, through the process of photosynthesis. However, we can manage factors that lead to further decline and make proper choices to manage plant energy efficiently.

The 5 Key Principles to plant health care are particularly applicable to growing turfgrass in the shade. Success of growing turfgrass in the shade is reliant on having all factors in your favor.

Key Principle #1 – Right Plant – Right Place

There is no way to change the natural requirements of light for a plant. It is always best to install landscapes that can flourish in the natural conditions of the location. In densely shaded lawns, the best option may not be grass at all. A shade tolerant ground cover such as English Ivy or Dwarf Asiatic Jasmine would be better suited to those conditions, or renovation with a shade tolerant shrub bed.

Also consider that sunlight is not the only factor when it comes to growing turf in proximity to trees. The roots of the trees and turf will compete for space, water and nutrients. The vast majority of the tree's root system that absorbs water and nutrients most efficiently is in the top 8 inches of soil; this is the same area as the roots of the turf. Trees will typically win the competition since they are much larger. Proper tree thinning and pruning should be performed for the health and structure of the tree. Tree pruning to provide light for the turf is not a long-term sustainable solution and should not be recommend, as it can weaken the health and structure of the tree. Removal of trees may be an option to consider if the customer desires turf.

If there is enough light for turf, start with a shade tolerant variety of St. Augustine. Seville and Bitter blue are best, but even they will require at least 4 or hours of direct sunlight. Floratam does not tolerate shade well at all, it requires about 7 to 8 hours of direct sunlight. Most Zoysia varieties are not very shade tolerant. Perform a site visit around noon to determine of the amount of light the turf is receiving. At this time the sun will be at its highest point. Consider the direction of movement of the sunlight and the expected shade patterns. Also consider that the shade line on the north side of any structure will extend from the fall through the winter.

Key Principle #2 – Create Healthy Soils

Check the soil pH to ensure it is in the optimum range and adjust as needed. Do not assume that the pH is low just because of the canopy of the trees. However, proper pH is particularly crucial to having all the plant health factors in your favor for the survival of the turf.

Key Principle #3 – Water Properly

Moisture requirements for turf growing in the shade will be greatly reduced compared to areas of full sun. Watering should still be done at the first signs of wilt, applying ½ inch per application. Watering once a week in the early spring, twice a week in the late spring and summer, once a week in the fall and once every other week in the winter is generally sufficient in the absence of rain. Over watering is conducive to Pythium root rot, which is detrimental to a shady lawn.



Growing Turfgrass in the Shade

Key Principle #4 – Proper Mowing

Proper mowing is a particularly important key for growing turf in the shade. People often don't understand the connection between leaf surface and plant health. Remember that a plant produces food for its root system by gathering sunlight through its leaves. With the reduced sunlight, the amount of leaf surface is particularly important. If more leaf surface is allowed, more food will be produced. Dwarf varieties should be mowed at 3 inches. Non-dwarf varieties should always be mowed at 3.5" to 4". However, frequency of mowing is equally important; never remove more than 1/3 of the leaf surface in a single mowing. It may be necessary to mow every 4 days in the summer. Frequent mowing helps produce a dense turf cover.

Key Principle #5 – Manage Pests

Lawn caterpillars can be particularly devastating to turf growing in the shade. Adult sod webworm moths are more active in the shade during the daytime, so the potential for infestation is increased. When sod webworms infest shaded turf and remove the leaves, permanent damage is highly likely. Because of this, Acelepryn should be applied in April, May or June depending on geographic location and for newly installed sod, June through September. One application of Acelepryn will provide season long control of lawn caterpillars.

Plant Energy Management

It is imperative to understand the concept that plants produce their food energy (carbohydrates) through the process of photosynthesis and that the nutrients that fertilizer provide is not "plant food". Nutrients from fertilizer provide the plant with essential elements required for proper function of the plant's systems. The nutrient that provides the plant with stimulus for vegetative growth is nitrogen.

While the proper amount of leaf surface is essential for the plant to gather sunlight and produce food, creating leaf growth requires a great amount of the plant's energy. The energy required to grow leaves is provided at the expense of the energy needed to produce and maintain healthy roots.

The natural growth habit of turf in the shade changes greatly in the warm season compared to the cool season. Due to the warm temperatures and longer daylight hours in the summer, shaded turf will tend to "stand up" and grow long leaves reaching for light. This change typically begins in May and continues through September. Excessive nitrogen applied during this time can be damaging to a shady lawn by stimulating excessive leaf production and robbing the root system of the energy necessary to survive. Do not apply nitrogen in addition to our regular program to shaded turf in the summer; not even 5-0-30. To enhance rooting in the summer, our program utilizes 0-0-1, which contains Humic acid and kelp extract. These products provide food (carbon) for microorganisms, which benefit rooting. Turfpro and sugar (yes sugar like Dixie Crystals) may also be beneficial. Typically, 9 ounces of Turfpro and 3 ounces of sugar are used per 1000 sq. ft. Additional potassium (0-0-20) is a benefit to increase the hardiness of the turf without stimulating leaf growth, but potassium does not "stimulate" root growth.



Growing Turfgrass in the Shade

Our GreenUP Agronomic Program reduces the amount of nitrogen applied in the warm season. It is designed with shady lawns in mind, so it may be necessary to apply additional nitrogen from 15-0-5 in sunny areas.

When conditions are conducive for Pythium, gray leaf spot or brown patch fungus, Armada should be applied for prevention. If disease becomes an issue in the spring or summer, use a combination of Armada and Subdue. The combination of these two will address a wide variety of fungi. In addition, Armada will act as a slight growth regulator to suppress leaf growth. The reduction of leaf growth results in a transfer of energy to root growth.

Another tool to consider is the use of Primo Maxx turf growth regulator monthly from May through the August. Primo reduces the vertical growth of turfgrasses, but promotes lateral growth and root growth. As turf top growth slows, energy is redirected to below-ground plant parts and root production increases. Primo may also enhance the performance of systemic fungicides and insecticides because mowing is less frequent and the removal of leaf material is reduced. Primo Maxx reaches the growing point by foliar uptake and is rain-fast within one hour of application. The effect of Primo Maxx will last for about 6 weeks and may need to be repeated every 6 to 8 weeks from May through August. Applications of Primo Maxx in the fall are not necessary or beneficial.

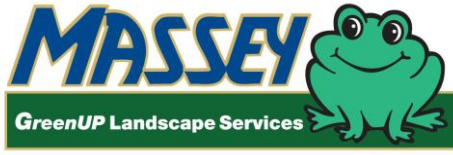
Since Primo Maxx reduces the leaf growth, an even application is particularly important. Also be aware that Primo does not reduce the growth of broadleaf weeds or sedge. Because of this, they will become more noticeable to the customer and will need to be controlled.

When Primo Maxx is used, carbohydrate levels in the leaves will increase, which makes the turf more attractive to lawn caterpillars. Because of this, Acelepryn should be applied with the first Primo application.

From September through March, a different approach to stimulating root production is taken. The shorter daylight hours and cooler temperatures will naturally reduce leaf production in the fall and winter and Primo is not necessary or beneficial. Extra nitrogen can and should be applied at this time. When nitrogen stimulates the turf, the result will be root production since the leaf production is being suppressed naturally. Additionally, instead of the turf "standing up" as it did in the summer, it will be "laying down" and be more likely to crawl and spread. Remember that frequent lighter applications of nitrogen will be utilized better than single doses applied heavily and foliar applications will work best if the root system is not functioning effectively. ½ pound of nitrogen per 1000 sq. ft. applied two to three times at three week intervals works well.

The summer can be extremely difficult to establish new sod in the shade. As previously mentioned, most of the plant energy is being utilized for leaf production so it is more difficult to establish a root system. Many fungi including Pythium root rot will try to invade as the turf declines. Follow the Sod Installation Protocol very closely.

Fall is always the best time to install new turf, **especially** new turf in the shade.



WEEKLY TRAINING SESSION



Trouble Shooting Part 2 Pump System

What to do when you have one zone with low pressure?

- First of all make sure that it is only one zone with low pressure.
- Make sure you have the pump model number and horse power to determine the flow and pressure capacities.
- Know if it is on a pressure switch or relay.
- Is it filtered or not?
- Is there a pressure relief valve already in place?
- Know the elevation of the pump from the water level(if lake pump).
- If the pump doesn't already have a pressure gauge put one on the system side of the pump.
- Turn on each zone on the property and record the dynamic pressure reading for each.
- Look for leaks at or around each head.
- If the heads are covered, pull the grass away to view the head.
- Keep in mind that a leaking head can be as much as 4GPM.
- The lower the dynamic pressure reading, the higher the water volume.
- The zones that do not have a pressure issue will have a higher dynamic pressure reading than the zone in question.
- On the zone in question, calculate the total gpm based on what type of nozzles are in place.
- Is the nozzle demand greater than the pump capacity?
- If so, you have nozzle or head changes to make.
- If not, this may help.

How do I locate a leak I can't see?

- If the zone is sprays or MPR's, the process is not too difficult.
- Change all nozzles to the 15' adjustable spray nozzles. These will turn off almost completely.
- Turn on the zone and begin to turn off each nozzle.
- As you do this, it will push the water to whatever leak may be present.
- Check the pressure gauge at the pump to see if there are any changes.
- Remember that not all leaks are seen.
- You will need to walk the areas between the heads and possibly listen for a leak.
- For a rotor zone you will need to dig up and cap each rotor. "Threaded cap".
- Turn on the zone and repeat the above steps.
- It would be a good idea to change the farthest head to a MP1000 rather than a cap. This will keep the water flowing for the pump in case the leak was heads being cross threaded at the street elle connection.