Chapter 21 - Using Pesticides

Pesticide use includes everything from the time the pesticide is purchased until you dispose of the container. Federal and state regulations define the term “pesticide use” as including:

- storage
- handling
- disposal
- transportation
- mixing
- loading
- application

The pesticide label is a binding contract between the user and the public. The EPA approves the wording on the label so that people and the environment are protected. Federal law prohibits using a pesticide “in a manner inconsistent with its labeling”.

If you use a pesticide inconsistent with the label, you will be breaking both federal and state law!

Misuse of a pesticide can lead to fines and suspension or revocation of a license for the applicator as well as the company. If the misuse causes injury or damage, it can lead to a lawsuit or even criminal charges!

As a pest professional, you are personally responsible for:

- Following the label when using pesticides
- The safe handling of pesticides
- Preventing pesticide drift
- Protection of ground water when using pesticides
- Avoiding secondary poisoning

Pesticide Drift

Drift is the movement of the pesticide away from the site into non-target areas. Avoiding pesticide drift is the responsibility of the applicator. Drift is most common outdoors, but can be experienced indoors.

In outdoor applications, drift is most often caused by winds that blow spray, dust, or granules into other areas. Other factors, such as worn spray nozzles, temperature, humidity, and droplet size also contribute to pesticide drift. When treating outdoors, technicians and specialists must identify things that could be contaminated by pesticide drift. Examples include fish ponds, play areas, vegetable gardens, sandboxes, swing sets,

intake vents, laundry on the line, lawn furniture, pet water bowls, pet runs, bee hives, vehicles, and lakes or ponds. *Care must be taken to not allow pesticide drift to contact these areas!*

It is even possible that pesticide drift, on rare occasions, can occur hours or even days after the application. For example, the day after a perimeter treatment of a home, a storm can blow piles of treated leaves into a nearby fish pond.

Pesticide drift can happen during indoor applications when fans, air conditioners, and blowers create indoor wind that moves pesticide where it is not wanted.

Protection of Ground Water

Ground water makes up 96% of the world's total fresh water resources. Approximately one-half the households in the U.S. use ground water for drinking water. Once contaminated, ground water is difficult or impossible to clean. Ground water can be contaminated by pesticides in many ways:

- Rain can carry dissolved chemicals down through the soil.
- Wells can be contaminated during termite and lawn care treatments.
- Back siphoning from pesticide tanks or equipment can contaminate water supplies.
- Through improper disposal of pesticides.

As a responsible user of pesticides, you need to protect the ground water from potential contamination from pesticides. Here are some guidelines:

- Identify the soil type. Coarse or sandy soils low in organic matter pose the greatest risk for leaching.
- Identify nearby water sources. Treat carefully, if at all, around wells, springs, canals, streams, and other routes to ground water. It is our policy never to apply a soil termiticide within 25-feet of a well or to make a lawn care application within 3-feet of a body of water.
- Choose pesticides least likely to leach. Check the label for special precautions and warnings about ground water contamination.
- Apply at the right time. Do not apply before rainfall or irrigation, or when the soil is saturated if there is a chance of leaching.
- Measure and calibrate carefully. The more pesticide applied, the greater the risk. Mix only the amount you need. Apply according to treating protocols.
- Avoid spills and back siphoning. Use caution and a backflow preventer when filling tanks.
- Dispose of pesticides and containers properly. Triple-rinse containers and return the rinse water to the spray tank. Check the label for disposal instructions.
- Use low pressure or use baits for termite treatments in high-risk areas.

Secondary Poisoning

Secondary poisoning occurs when predators or scavengers feed on a treated plant or exposed animal and are themselves poisoned by the toxic residues in their prey. The greatest risk of secondary poisoning in structural pest control comes from rodenticides and avicides for bird control.

You should take precautions to reduce the risk of secondary poisoning. Such precautions include choosing pesticides with minimal secondary poisoning hazards, picking up poisoned rodents, birds, etc., ensuring that all rodenticides are in tamper-proof stations, and using non-chemical methods in high-risk situations.

Plaster Beetles: Lathridiidae



Photo by J.Castner

Plaster beetles, also known as foreign grain beetles or new house bugs, are very small beetles, about 1-3mm in length. According to the UF IFAS EDIS publication, they get their name from infesting newly plastered walls. They feed on molds growing on walls or in wet stored grain. They are elongate and are reddish-brown to brown and rarely solid black. The wings have six to eight rows of punctures. According to the NPMA Field Guide there are about 120 different species in America.

Biology

Indoor infestations generally occur when the plaster beetle lays eggs singly in fungus, generally growing behind plaster walls. Ten eggs can be laid over 2 weeks. Developmental time from egg to adult takes about 36 days at room temperature, 54 days at 65 degrees and as long as 5 months at lower temperatures.

Habits

Because they feed on mold spores, they can be found in moldy plant material, vegetable debris, under bark, and sometimes in termite nests. They can pose a problem in the first year of newly built homes and condos when sheetrock walls are slow in drying. The dampness can cause fungal growth in wall voids. These beetles can also be associated with fungal growth on natural items stored in museums. They have also been found in damp basements on molded boots, hats, wallpaper and newsprint. Some adult species can fly. They are harmless but small enough to enter homes through window screens. According to a University of Nebraska fact sheet, these beetles get started during the construction of a new home when rain and moisture contact exposed wooden members before the roof and walls are constructed. If enough moisture accumulates, fungi starts to grow on the wood. Adult foreign grain beetles are attracted to the mold and begin laying eggs on the surface of the wood. The infestation, which is nearly unnoticeable because of their tiny size, continues even after drywall and plaster is added to the walls. Eventually larvae go through several stages and emerge as adult beetles from behind baseboards, electrical outlets and light fixtures. They are often attracted to light and, being strong fliers, will spread to all rooms of the house.

Bob Belmont
Residential Pest Technical and Training Director

Technical and Training Department
January 2008

Control

The key to their management is stopping all mold growth. Reducing relative humidity to below 20% is a cure-all, but in Florida it is extremely difficult to reduce the relative humidity below 20% but that is what is necessary. Heat can be used to lower the humidity and heat can also be used to kill adults if left at 110F for about 24 hours. If heat is not selected, then wall void injections using a 4-way tip with a non-residual aerosol is recommended followed by a similar application of a boron-based dust to kill the beetles and the mold. In most cases vacuuming regularly to remove the emerging adults for a few months as the walls dry out will often allow the infestation to decline and take its course because most infestations, according to a Ohio State circular on the subject, are self-limiting.

Bob Belmont
Residential Pest Technical and Training Director
Technical and Training Department
January 2008

Name:_____ Date:_____

PRE/POST TEST

1. Plaster beetles live on:
   a) plaster
   b) wood
   c) mold and mold spores
   d) dead insects behind walls

2. Plaster beetles are about _____ long.
   a) 7-12 mm
   b) 15-20 mm
   c) 20-25 mm
   d) 1-3 mm

3. Plaster beetles lay about _____ eggs every _____ weeks.
   a) 3,3
   b) 25,3
   c) 10,2
   d) 50,2

4. In Florida, at room temperature their entire life cycle takes about
   a) 1 week
   b) 2 weeks
   c) 1 month
   d) 2 months

5. Adult plaster beetles can be found living on mold in:
   a) basements
   b) behind a leaky window frame
   c) on boots
   d) behind sheetrock walls in a new apartment
   e) all of the above

Bob Belmont
Residential Pest Technical and Training Director
Technical and Training Department
January 2008

Answers: 1- c 2- d 3- c 4- c 5- e

Right Plant, Right Place

What is "Right Plant, Right Place?"

"Right plant, **right place"** is a concept where you choose **plants** that are well-suited to the **location.** Where they are planted, they will perform well with limited additional input.

1

Knowing Your Plant

- **Plant Identification**
  - **Visit nurseries.**
  - **Search the internet.**
  - **Talk to your fellow team members.**
  - **Take pictures for use at check-in.**
  - **Applications on your phone?**

2

Knowing Your Plant

Temperature Requirements
Hardiness Zone

Each zone indicates the average <u>lowest</u> temperature of an area, as laid out by the US Department of Agriculture.



3

Knowing Your Plant

- **Soil Condition**
  - **What pH does it prefer?**
  - **Does it like compact or loose soil?**
    - Wear tolerance
  - **Will it thrive in our sandy soils?**
- **Water Requirements**
  - **How much water does it need?**
  - **Is it salt tolerant?**
  - **What kind of drainage does it prefer?**
    - Slopes and gullies

4

Knowing Your Plant

- **Maintenance Required**
  - **How often will it need mowing and pruning?**
  - **What kind of fertilization demands does it have?**
  - **What kinds of pest prevention will it need?**
    - Deer
- **Landscape Maturity**
  - **How are its roots going to grow?**
  - **Will it change the pH?**
  - **How will it change it's surroundings?**

5

Sunlight and Shade

Plants are dependent upon sunlight to fuel their organic activities; insufficient sunlight stunts or prevents plant growth, while overexposure to sunlight is harmful.

- Too much sun and plants look visibly burnt and parched. Leaves will be brittle and break easily. Similar symptoms to that of underwatering, but watering doesn't help the health of the plant.
- Too little sun and leaves loose their vibrant color, turn yellow and/or mottled, leaves falling off plant and growth seems stunted. Plants look spindly with a lot of space between leaves. Plants lean as they grow in an effort to get more light.

6

Sunlight and Shade



7

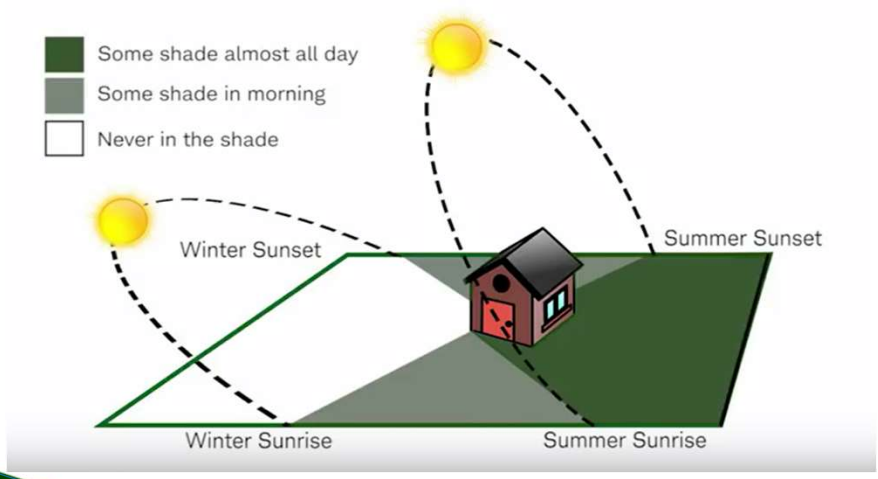
Sunlight and Shade

The levels of sunlight required by a plant are dependent upon the species of the plant. We categorize them as Full Sun, Partial sun/shade, and shade.

- **Full Sun: 6+ hours of direct sunlight**
- **Partial sun/shade: 3-6 hours of direct sunlight**
- **Shade: 3 or less hours of direct sunlight**

8

Sunlight and Shade



9

Changes to Sunlight and Shade

- **Seasonal changes will effect sun/shade.**
  - **Hurricanes**
- **As landscaping matures it will effect sun/shade.**
  - **Tree growth**
  - **Shrub bed growth**
- **Construction will effect sun/shade.**
  - **Fences**
  - **New homes/buildings**
  - **Development clear cutting**

10

Customer Communication

The cost of the Right Plant in the Wrong Place	*The advantage of the Right Plant in the Right Place*
More labor (pruning, pest management, irrigation)	Reduced labor
More greenwaste and hauling costs / composting costs	Reduced water costs
More water costs	Reduced problems (pest, safety)
More pest problems, pesticide use, pollution	Better landscape function
	Reduced pollution

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11

Customer Communication

If you find a problem do your best to offer a solution.

Reduce your requests and proactives.

Set Service Leads!

Make more money and save more time.

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12

FL/LA

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Topic Category: Lawn

Recordable Verifiable Training Hours: 1.5 to 2 hours

Objectives:

- Read and discuss our Weed Management Protocol and to identify many of the basic weed species and the typical conditions in which these weeds flourish.
- Ensure proper understanding by all Specialist of Backpack sprayer use
- To **calibrate every Specialist**
- **To ensure that every Specialist is properly equipped with the correct spray tip on the back pack sprayer, a proper measuring cup that will measure from ½ to 10 ounces, and a clear water measuring jug that will measure from ½ to 2.5 gallons of water.**
- It is also designed to ensure that everyone in Florida and Louisiana understands that we do not put post emergence herbicides into the drop tank. They used from the back pack sprayer only. This training will be used to document the fact that your Specialist know that if they use the post emergence materials from the drop tank, it could result in termination of employment and damage results, they will be paying for the damage**.**

This meeting will qualify for 1 hour of Department of Ag ID Cardholder Training. Make sure you fill out the Department of Ag ID Cardholder Training form for each Team Member. Keep a copy in the Team Members training file at your office.

KEEP A COPY OF THE GRADED POST TEST IN THE TEAM MEMBER'S TRAINING FILE AS DOCUMENTATION THAT THE TEAM MEMBER UNDERSTANDS OUR POLICY OF USING THE WEED CONTROL SLURRIES ONLY FROM A BACKPACK SPRAYER.

Length of lesson: 90 to 120 minutes.

Materials needed:

- Training Guideline (Below)
- Training Document Weed Management Protocol (GreenUp Protocols\Individual Protocols\Lawn Care Basic Application)
- 25 by 40 foot area marked for calibration
- 2 Clean backpack sprayers in good working condition with 11010 spray tips.
- A weighted string at the end of the spray wand near the nozzle measured at 20 inches long from the end of the wand to the end of the weights at the string.
- Clear 2.5 gallon jug with ½ gallon increments
- 32 ounce measuring cup
- Stopwatch to time each pass (10 seconds for each 40 foot pass)
- Collect samples of many of the weeds listed below from the field, if available.

Blanket Crabgrass, Alexandergrass, Goosegrass, Bermudagrass, Annual Jewgrass, Doveweed, Kyllinga sedge, Yellow Nutsedge, Purple Nutsedge, Globe sedge, Virginia Button weed, White Clover, Dichondra, Spurge, Chamber Bitter, Yellow Wood Sorrel, Asiatic Hawksbeard.

- Pre- and Post- tests.

FL/LA

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Training Guidelines:

- Set up the training area in an area of the office that will minimize disruptions to deliver the protocol training and the 40 by 25 foot area outside for calibration.
- Make sure all calibration materials listed above are readily available for the calibration portion of the training.
- Make copies of the tests and training materials for all Team Members attending.
- Hand out the Department of Ag ID Cardholder Training Form and have all Cardholder complete the form. The training must be a minimum of 60 minutes to qualify.
- 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 Weed Management Protocol.
    - Encourage active participation from all Team Members
    - Ask probing questions to develop key points
    - Encourage group reading and participation
- Perform the demonstration portion of the training
- **Demonstrate** that 1 gallon measured in the 2.5 gallon jug does not equal 1 gallon in the backpack sprayer and the measurements on the backpack sprayer must not be used.
    - Measure 1 gallon of water in the water measuring jug and pour it into the back pack sprayer.
- Time all Specialists to walk at 40 feet in 10 seconds.
- Perform the displacement method of Backpack Calibration with each Specialist while all Specialists critique.
    - Displacement method of calibration: Fill the backpack full of water, pump up the pressure chamber and spray into the backpack to remove any air from the chamber, refill the backpack until it will not hold any additional water. After the Specialist performs the treatment over the 1000 sq. ft. area, measure the amount of water that can be put back into the sprayer. The amount of water that can be put back into the sprayer is the amount of water that was used over the 1000 sq. ft. area.
    - Time each pass and provide feedback to the Specialist for the time taken to walk each pass.
    - Ensure the proper nozzle height by using the 20 inch weighted string
- After reading and reviewing all materials and performing the backpack calibration, 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.

FL/LA

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Name _____ Date _____

PRE & POST TEST

1. T or F A dense turfgrass cover competes with weeds for space, water, nutrients and light.
2. T or F Most severe weed problems are a result of bare or thinning areas in the turfgrass canopy or a favorable environment for growth.
3. T or F Indicator weeds are indicative of an underlying problem.
4. Blanket Crabgrass may indicate
   a. high soil moisture.
   b. Low moisture.
   c. Low light.
   d. Excessive nitrogen.
5. Alexandergrass may indicate
   a. high soil moisture.
   b. Low moisture.
   c. Low light.
   d. Excessive nitrogen.
6. T or F Goosegrass is may indicate soil compaction or traffic damage.
7. T or F Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass.
8. T or F Purple Nutsedge can be controlled with Basagran.
9. White Clover may indicate
   a. Excessive nitrogen
   b. Compacted soil
   c. Nitrogen deficiency
   d. Loose soil.
10. T or F Spurge, Chamber bitter, Florida Pusley and Creeping Beggarweed are summer annual broadleaf weeds.
11. T or F Performing post-emergent weed control out of a drop tank will result in termination of the Specialist performing the treatment (except when scheduled in North Georgia).

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

12. T or F Any damage resulting from performing post-emergent weed control out of a drop tank will result in the Specialist paying for any resulting damage in full (except when scheduled in North Georgia).

13. T or F I have been successfully calibrated to perform weed control from the backpack sprayer through the displacement method of calibration. I am properly equipped with two backpack sprayers for weed control, both of which have a 11010 spray tip. I also have a water measuring jug.

FL/LA

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Answer Sheet

1. T or F A dense turfgrass cover competes with weeds for space, water, nutrients and light.
2. T or F Most severe weed problems are a result of bare or thinning areas in the turfgrass canopy or a favorable environment for growth.
3. T or F Indicator weeds are indicative of an underlying problem.
4. Blanket Crabgrass may indicate
   a. high soil moisture.
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5. Alexandergrass may indicate
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6. T or F Goosegrass is may indicate soil compaction or traffic damage.
7. T or F Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass.
8. T or F Purple Nutsedge can be controlled with Basagran.
9. White Clover may indicate
   a. Excessive nitrogen
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FL/LA

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

12. (T) or F Any damage resulting from performing post-emergent weed control out of a drop tank will result in the Specialist paying for any resulting damage in full (except when scheduled in North Georgia).

13. (T) or F I have been successfully calibrated to perform weed control from the backpack sprayer through the displacement method of calibration. I am properly equipped with two backpack sprayers for weed control, both of which have a 11010 spray tip. I also have a water measuring jug.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

Nationally, herbicides comprise approximately 65% of all pesticides applied to lawns. This statistic underscores the fact that consumers want and expect to have relatively weed-free lawns. The best way to prevent weeds from becoming a problem in lawns is to grow a healthy, dense stand of turfgrass by providing proper fertilization, irrigation, mowing, and management of insect pests and diseases. Pre-emergent herbicide applications applied before weed germination can reduce the appearance of seasonal weeds significantly. Even under the best circumstances, however it is likely that the need for post-emergent herbicide applications will eventually arise in order to keep weeds suppressed and achieve an acceptable level of customer satisfaction.

Objectives

- Discuss the relationship between underlying issues causing turf decline and weeds;
- Setting customer expectations for weed control;
- Provide details on pre-emergent and post-emergent weed control applications;
- Discuss how to handle difficult-to-control weeds and follow-ups;
- Review how to make herbicide applications using a backpack sprayer;
- **Calibrate each Specialist as per the directions below**;
- Ensure that we have documentation to show that all Managers and Specialists understand that performing weed control using our post-emergent weed control slurries out of a drop tank is a terminable offense and any damage resulting from this practice will also result in the Specialist paying for the full amount of any resulting damage.

Underlying issues and weeds

Because soils have a lot of weed seeds already in them, there is inherently a high possibility that lawns will eventually get weeds. A dense canopy of turfgrass not only reduces the amount of sunlight reaching the soil surface reducing weed seed germination, but can out-compete most weeds trying to get established for water, space and nutrients. Most severe weed infestations are a result of bare or thinning areas in the turfgrass canopy, or a favorable environment for growth. There are many potential causes of these weed-prone areas in lawns including:

- Drought damage from poor irrigation distribution uniformity or scheduling during dry periods
- Wet conditions (heavy rainfall, over-irrigation, poor drainage)
- Damage from nematodes, insects and/or diseases
- Poor fertility
- Soil pH out of range for the particular turf species
- Poor shade adaptation

Indicator Weeds

Certain weeds can thrive in conditions which often cause turfgrasses to fail. When these weeds become established in areas of drought, excessive moisture, poor fertility, low or high soil pH, nematode damage, or anywhere turfgrasses are failing, they are referred to as *indicator weeds* because they are indicative of an underlying condition. Until the condition is alleviated, it is unlikely that the turfgrass will be able to recover and out-compete the weeds, even with herbicide applications. Once established, indicator weeds often continue to grow even when the underlying condition is corrected.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

These are some of the most common indicator weeds and the conditions in which they thrive:



****Blanket crabgrass** – high soil moisture



****Alexandergrass** – Low soil moisture



****Bermudagrass –** Often takes over drought damaged areas, but will also flourish in high moisture.



****Goosegrass –** Compacted soil. Common in traffic damaged areas.



****Annual Woodsgrass** – Low light



*****Doveweed** – High moisture and low light

**<u>These weeds are grassy weeds and have no selective control in St. Augustinegrass. Spot killing with a non-selective herbicide and renovation is needed.</u>

***Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass. In Zoysiagrass or Bermudagrass, Doveweed can be controlled with the Celsius/Dismiss South combination (below).

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GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

Sedges



Kyllinga sedge – High soil moisture



Yellow Nutsedge



****Purple Nutsedge –** Disturbed soil
Purple Nutsedge is controlled with Sedgehammer
Basagran does not control Purple Nutsedge.



Globe Sedge High soil moisture, nematodes

Perennial Broadleaf Weeds



Dollarweed – High soil moisture



Virginia Button Weed – High moisture



White Clover – Low nitrogen fertility



Purple Wood Sorrel – Thrives in cool weather



Yellow Wood Sorrel -
Thrives in the spring



Dichondra – Moist soil

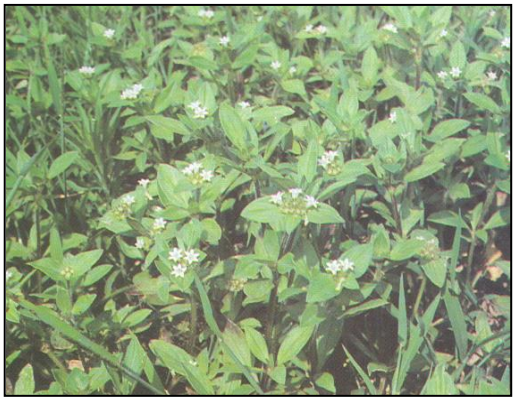
Summer Annual Broadleaf Weeds



Spurge – Drought and nematodes



Chamber Bitter – Loose soil

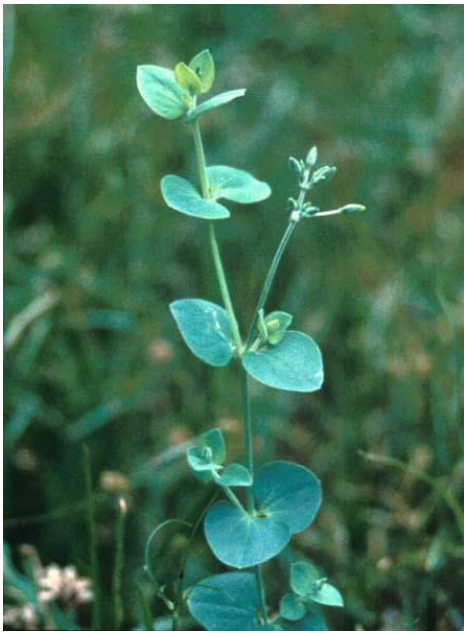


Florida Pusley – Drought



Beggarweed – Low soil fertility, drought

Winter Annual Broadleaf Weeds



Heartleaf Drymary – Moist areas



Asiatic Hawksbeard – Areas of thin turf



Carolina Geranium



Common Chick weed

WEED MANAGEMENT PROTOCOL

Setting Customer Expectations for Weed Control

Many homeowners expect that when they hire a lawn care company, there should never be ANY weeds in the lawn. A thick, healthy lawn under proper irrigation will have very few weeds overall (< 5% coverage), but may be prone to getting more weeds (up to 10%) at certain times of the year. Higher weed levels indicate underlying problems as discussed above.

Seasonal flushes of weeds occur twice per year – spring (summer annuals) and fall (winter annuals). Pre-emergent herbicides are applied twice per year beforehand to reduce weed seed germination. Though these applications help keep weeds to a manageable level, noticeable increases in weed populations still occur during the onset of warmer and cooler weather. A higher incidence of Dollarweed, sedge, and crabgrass may occur during periods of high rainfall, or if the soil holds a lot of water due to high organic or clay content.

When weed fluctuations occur, our herbicide applications reduce the weed populations back down again, however some weed seeds can germinate in between services if conditions are still conducive. Follow-up treatments may be required depending on weather conditions and weed species present.

Types of Herbicides

Pre-emergence Herbicides

Pre-emergence herbicides create a chemical barrier in the upper soil profile. As weed seeds germinate, the new seedling is killed as it reaches this barrier of herbicide. Pendimethalin (Pre-M) or Resolute is used in most of our programs for pre-emergent weed control and lasts from 6 – 8 weeks in the soil profile. It is more effective if followed with ½ inch rainfall or supplemental irrigation. Since Pendimethalin and Resolute are root inhibitors, over-application or application to lawns with compromised roots can cause damage.

Follow these instructions when making applications with Pendimethalin or Resolute

- **Calibrate spray equipment and perform a bucket check before making applications.**
- **New sod should be mowed at least 4 times and be well rooted before application with Specticle, Pendimethalin or Resolute.**
- **Do not apply pre-emergence to stressed or damaged areas.**
- **Do not make more than one pre-emergence herbicide application within at least 90 days unless specifically directed by GreenUP Protocol.**
    - **It is critically important that attention be paid to our GreenUP Protocols for new or regular services as they relate to pre-emergence herbicide applications to avoid an additional pre-emergence herbicide application.**
    - **It is critically important that attention be paid to turfgrass retreatments during the time of year when pre-emergence herbicides are being applied with liquid broadcast applications. Pre-emergence herbicides cannot be present in the droptank during a retreatment using the droptank. Otherwise, an additional pre-emergence herbicide application would result, and turf injury would occur.**

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

Pre-emergence herbicide applications should be watered in as soon as possible after application to rinse the active ingredient into the soil and prevent photo-degradation.

Post-emergence Herbicides

Herbicides from different chemical classes have different modes of action, often cause different symptoms, and have different timelines for weed damage. When mixed together, herbicides can be more effective than when applied alone. This is known as a *synergistic* effect. Detailed information on some common herbicides can be found in Table 2 including chemical class, mode of action, symptomology, and timeframe in which damage can be expected.

We have two different weed mixtures for broadleaf weeds in St. Augustinegrass. The weed mix we use is dependent on the time of year.

In the cooler months (from November 1 to February 28th), SBM1 is used. This slurry contains Basagran, Trimec Bentgrass Formula, Octane and Wetting agent. Auguzine is also added with this mixture to the backpack sprayer, but it is not mixed into the slurry.

In the warm season (from March 1 to October 31st) SBM2 is used. This slurry contains Manor/Blade, Trimec Bentgrass Formula, Octane and Wetting agent. Manor can regulate the growth of the desirable grass and should not be used in the cool season when the growth of the desirable grass is already being slowed down due to the cooler temperatures and shorter number of daylight hours.

Each slurry is combined before being issued to the Lawn Specialists by the Service Manager, supervisor or product room supervisor. Each product must be measured very precisely, since it will then be issued for use by all the Lawn Specialists and used on our customer's lawns. The containers used to hold this mixture must be labeled with the appropriate slurry label. These labels can be found on the G: Drive\Shared\Quality Assurance\GreenUp Reference Materials\Slurry Labels-Van Label Sets\Slurry Labels\Current Slurries\Back Pack Slurries\Lawn. The mixing instructions are on the label. Affix the label to a clean bottle with clear packing tape. Make sure the correct label is used depending on the mixture.
Each of these slurries is very effective on a wide variety of broadleaf weeds. When used properly, there will be no doubt that the weeds have been treated within a matter of a few days after treatment. Complete death of the weeds may take two to four weeks. Follow-ups for most broadleaf weeds should not be needed if a perfect application is performed.

From March through September, Broadleaf, sedge and grassy weeds in Zoysia, Bermuda and Centipede are treated with a combination of Celsius and Dismiss South. The rates are 0.11 ounces of Celsius and 0.28 ounces of Dismiss South per gallon of water per 1000 sq. ft. Celsius is not stable in a slurry, so no slurry is made of this mixture. Do not use this mixture on St Augustine or Bahia grasses or severe injury/death will occur. Read and follow all label directions.

Broadleaf weed control in Bahia and Seashore Paspalum are typically performed using Change UP Herbicide at 0.75 ounces per 1000 sq. ft. Do not use on St. Augustine or injury/death will occur.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

In Florida and Louisiana, post-emergence weed control is only performed using a back pack sprayer or out of the weed control injector, which only trucks built in 2010 - 2019 possess. We do not ever perform post-emergence weed control out of a drop tank (in Florida and Louisiana). There are a number of reasons for this. These products work best through foliar absorption. 4 or 5 gallons of water per 1000 sq. ft. is too high of water volume and will result in poor weed control and a huge waste of product. Additionally, we have a number of vehicles where the product put into the lawn tank can be transferred into the shrub tank or vice-versa.

Performing post-emergence weed control (in Florida or Louisiana) from a droptank will result in termination of employment. Additionally, any damage resulting from performing this practice will be paid in full by the Specialist or Manager involved.

Backpack Herbicide Applications

Successful backpack applications depend on several key calibration components. Most of them can only be controlled by the applicator. If any one of these components is out of line, the rate of herbicide applied will be incorrect and may result in poor weed control or turfgrass damage.

- **Proper rate of herbicide** – Herbicides and herbicide slurries are formulated to deliver a specific rate of herbicide per 1000 sq. ft. and will be effective if mixed and applied properly. Mix herbicide slurries according to slurry recipes provided. Herbicides and herbicide slurries need to be measured very accurately. Do not use tip and measure containers to measure the product. Use a measuring cup that is capable of measuring 1 ounces of product or less with accuracy.
- **Accurate Water Measurement** – The backpack sprayers have water measurement markings on the back. THESE MEASUREMENTS ARE NOT ACCURATE. Each Lawn Specialist must have a water measuring container that will accurately measure in 1 gallon increments. A clean/clear 2.5 gallon container with measurement markings on the side will work well. These water measuring jugs are acquired through Purchasing. Do not reuse containers that are marked not to reuse.
- **Mixing the Solution** - Make sure the herbicide solution is well agitated in the backpack sprayer. Add ½ of the water to the back pack sprayer before adding the herbicide mix and then add the remaining half of the water. Agitate well before spraying. Pump up the sprayer and spray back into the backpack to ensure the mixture has circulated through the pressure chamber. Agitate periodically while making applications.
- **Proper walking speed** - Walking speed is 2.6 MPH, or 40 ft./10 sec. Walking too fast will result in a low dose and poor weed control. Walking too slow will result in a high dose and may cause turfgrass damage.
- **Proper pressure** – The backpack sprayer is designed to supply a maximum pressure of 40 psi when pumped to full capacity. Continuous pumping of the pressure bar is necessary to maintain 40 psi during the course of an application. Allowing the pressure to lessen will result in a lower rate of herbicide and poor control of weeds.
- **Proper nozzle size** – The spray nozzle for making weed control applications, whether the backpack or weed injector, is the 11010. Using the wrong tip size would result in poor weed control or turf injury.

- **Proper nozzle height from the ground** – The tip of the flat-fan nozzle should be held parallel to and 20 in. above the ground. This height gives an application swath of approximately 42 in. (3.5 ft.). Holding the nozzle higher will result in poor coverage and poor weed control. Holding the nozzle lower will result in a greater amount of herbicide being applied per square foot and may damage turfgrass.

Backpack Applicator Calibration for Proper Applications

Keeping track of proper walking speed, pressure, proper overlap and nozzle height all at once takes some coordination and practice. A manager must check application technique on a regular basis with all Specialists to make sure the proper calibration components listed above become and stay habitual. A clean backpack has not previously been used can be used for pesticide application must be used as a practice backpack.

- Mark off an area that is 40 feet long by 25 feet wide (1000 sq. ft).
- Tie a 20 in. string to the end of the nozzle with washers or nuts to weigh the end of the sting.
    - Ensure that the string is 20 inches from the nozzle to the bottom of the weights.
- Calibration Procedure: Calibration is performed using the "displacement" method. (Water is added to the backpack applicator until it is completely full before the application is done. After the application has been completed, whatever water can be added back into the backpack, to fill it to the same point before the application was done, is the amount of water that has been used in the application.)
    - Fill the backpack with water.
    - Pump up the pressure chamber and spray back into the backpack. When the pressure chamber is completely circulated and all the air is removed, stop spraying.
    - Pump up the pressure chamber again until full pressure is reached.
    - Continue to add water until *completely full*.
- Make the application to the 1000 sq. ft. area as instructed below:
    - Time the walking pace of each pass with a stop watch. It should take 10 seconds to travel 40 feet.
    - Be sure that during the application, the weight at the bottom of the nozzle string barely or almost touches the ground.
    - Be sure that full pressure is maintained at all times during the application.
    - Each pass should overlap the last spray pattern by 6 to 8 inches.
- Check the volume of water that has been applied to the 1000 sq. ft. area:
    - Have the Lawn Specialist re-pressurize the backpack and set the backpack on the ground. Remove the backpack lid.
    - Measure 1 gallon of water in a clean/clear 2.5 gallon container.
    - Pour the gallon of water back into the backpack sprayer until it is full like it was before the application was performed.
    - Measure any water that remains from the one gallon.
        - If 16 ounces or less remains, the application is fine. It should be assumed that a Lawn Specialist may slow their pace slightly when walking through thick grass or by the end of the day.
        - If the gallon of water does not refill the backpack, too much material has been applied. If more than 16 ounces additional has been applied, this is not acceptable and the Specialist must be recalibrated.

The tanker injector application is performed the same as the backpack application in terms of wand height, walking speed and spray tip size. It is designed to address the need of mixing multiple backpacks on a single property as well as to reduce the likelihood of measuring errors of product(s) added to a backpack.

Consider that each GreenUP vehicle is required to have 3 backpack sprayers. One backpack is designated for broadleaf weed control and one backpack is designated for insect and disease. The third backpack is designated for either broadleaf weed control for a different grass type or possibly grassy weed control for turf types other than St. Augustine. Since we also need to control sedgeweeds, a fourth applicator is often necessary. For this reason, a low volume injector was added to all lawn care vehicles since 2010. An excellent use of this tanker is for sedgeweed control, but it is not limited to this purpose. More information regarding the tanker injector can be found in the GreenUP Protocol "Tanker Injector Applications". Calibration of the injector according to the protocol is imperative.

The Lawn Specialist must make all post-emergent weed control applications as outlined above. The amount of weed control material applied remains the same regardless of the quantity or type of weeds present. Turf injury will result from over application.
More information on post-emergent weed control applications may be found in the "Liquid Spot Treatment" protocol.

Difficult-to-control Weeds and Proper Follow-ups

Some weeds are more difficult to control than others and may require follow-up treatments. If a problem controlling weeds occurs, complete the following steps:

- Ensure enough time has been given for control to be achieved. Two to four weeks may be needed for complete control to be achieved. Do not retreat with the slurry containing Manor/Blade (SBM2) before four weeks have passed.
- Ensure that all calibration components are being carried out properly and that the slurry is being mixed properly.
- Re-treat using the proper weed control material. ***Do not apply herbicides to stressed turfgrass areas***.
- *If after 2 consecutive proper backpack applications, significant decline of target weed(s) has not occurred, contact the GreenUP Technical Department for further guidance.*

Some of the more difficult-to-control weeds are Dollarweed, Beggarweed, Spurge, Virginia Buttonweed, and Chamberbitter.

Table 2: Herbicide chemistry, mode of action, and symptomology.

Herbicide	Chemical Class	Mode of Action	Symptoms	Damage Timeline
Quicksilver (Contact)	Not assigned	Protox inhibitor – lipid peroxidation (damages cell walls)	Necrosis	24 hours
Blade (Manor) (Systemic)	Sulfonylurea	Meristemic inhibitor (Kills plant from growing point)	Yellowing/necrosis	Slowly kills 1 – 4 weeks. Stunting, shortened internodes, Red to purple color, Absorbed by roots and shoots. Chlorosis and necrosis progresses from growing point to rest of plant
Dismiss (Sulfentrazone) (Contact with soil activity)	Aryl Triazolinone	Photosynthesis inhibitor	Yellowing, necrosis, and death.	2 days to 1 week
0-0-7 + Atrazine (Systemic)	Triazine	Photosynthesis Inhibitor	Interveinal chlorosis, then desiccation. Leaves die in inward direction from margins and tips. Yellowing/necrosis of lower outer leaves first	Soil (primary) and foliar activity. Speed of activity depends on growth rate of plant. 2 – 6 weeks. Residual control up to 3 months.
Three-Way Ester MCPA Triclopyr Dicamba	Auxins Phenoyaliphatic acid Picolinic Acid Benzoic Acid	Growth Regulators	Bending and twisting of leaves and stems. Later, root formation on stems, misshapen leaves, and malformed roots.	Immediate to several weeks.
Drive (Quinclorac) (Systemic)	Auxin	Not fully understood	Stunting, chlorosis, followed by reddening, necrosis and death.	1 – 3 weeks
Basagran (Bentazon) (Contact)	Benzothiadiozole	Photosynthesis Inhibitor	Yellowing/necrosis	2 – 7 days
Sethoxydim (Systemic)	Cyclohexanedione	Lipid biosynthesis inhibitor	Reddening, tip burn, dieback.	1 – 3 weeks
Glyphosate (Systemic)		Amino Acid Inhibitor	Yellowing of new growth and death.	Several days to weeks
PreM (pendamethalin)	Dinitroailine	Root and shoot inhibitor (interferes with cell division & mitosis)	Sparse, club-shaped roots.	Soil activity only (pre-emergent). Residual control up to 3 months.

Right Plant, Right Place

What is "Right Plant, Right Place?"

"Right plant, **right place"** is a concept where you choose **plants** that are well-suited to the **location.** Where they are planted, they will perform well with limited additional input.

1

Knowing Your Plant

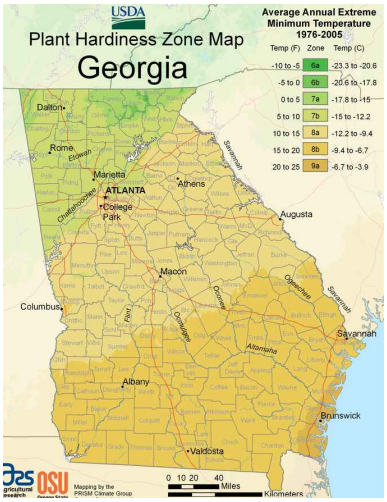
- **Plant Identification**
  - **Visit nurseries.**
  - **Search the internet.**
  - **Talk to your fellow team members.**
  - **Take pictures for use at check-in.**
  - **Applications on your phone?**

2

Knowing Your Plant

Temperature Requirements
Hardiness Zone

Each zone indicates the average lowest temperature of an area, as laid out by the US Department of Agriculture.



3

Knowing Your Plant

- **Soil Condition**
  - **What pH does it prefer?**
  - **Does it like compact or loose soil?**
    - Wear tolerance
  - **Will it thrive in our sandy soils?**
- **Water Requirements**
  - **How much water does it need?**
  - **Is it salt tolerant?**
  - **What kind of drainage does it prefer?**
    - Slopes and gullies

4

Knowing Your Plant

- **Maintenance Required**
  - **How often will it need mowing and pruning?**
  - **What kind of fertilization demands does it have?**
  - **What kinds of pest prevention will it need?**
    - Deer
- **Landscape Maturity**
  - **How are its roots going to grow?**
  - **Will it change the pH?**
  - **How will it change it's surroundings?**

5

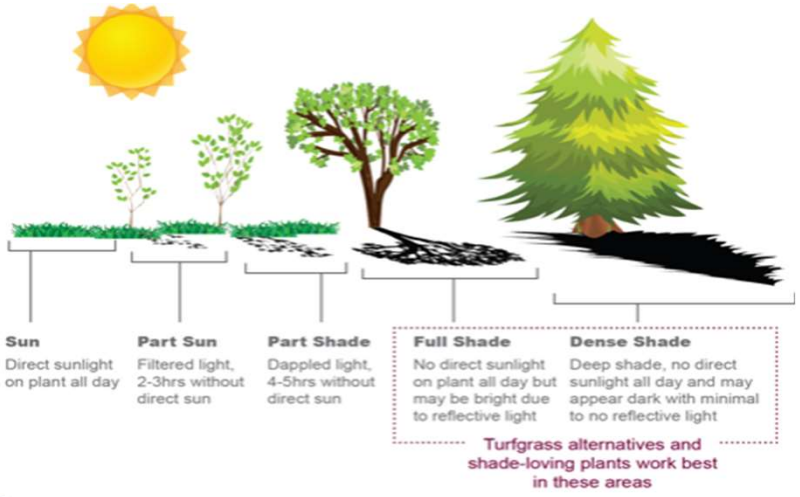
Sunlight and Shade

Plants are dependent upon sunlight to fuel their organic activities; insufficient sunlight stunts or prevents plant growth, while overexposure to sunlight is harmful.

- Too much sun and plants look visibly burnt and parched. Leaves will be brittle and break easily. Similar symptoms to that of underwatering, but watering doesn't help the health of the plant.
- Too little sun and leaves loose their vibrant color, turn yellow and/or mottled, leaves falling off plant and growth seems stunted. Plants look spindly with a lot of space between leaves. Plants lean as they grow in an effort to get more light.

6

Sunlight and Shade



7

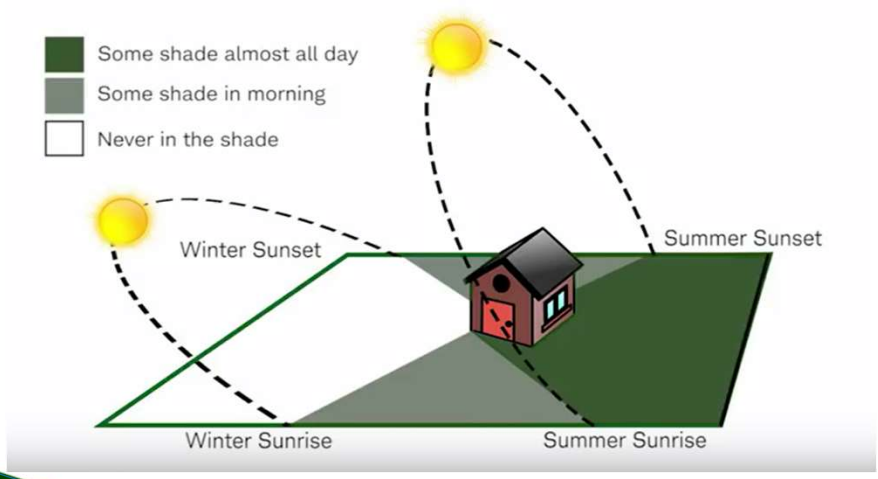
Sunlight and Shade

The levels of sunlight required by a plant are dependent upon the species of the plant. We categorize them as Full Sun, Partial sun/shade, and shade.

- **Full Sun: 6+ hours of direct sunlight**
- **Partial sun/shade: 3-6 hours of direct sunlight**
- **Shade: 3 or less hours of direct sunlight**

8

Sunlight and Shade



9

Changes to Sunlight and Shade

- **Seasonal changes will effect sun/shade.**
  - **Hurricanes**
- **As landscaping matures it will effect sun/shade.**
  - **Tree growth**
  - **Shrub bed growth**
- **Construction will effect sun/shade.**
  - **Fences**
  - **New homes/buildings**
  - **Development clear cutting**

10

Customer Communication

The cost of the Right Plant in the Wrong Place	*The advantage of the Right Plant in the Right Place*
More labor (pruning, pest management, irrigation)	Reduced labor
More greenwaste and hauling costs / composting costs	Reduced water costs
More water costs	Reduced problems (pest, safety)
More pest problems, pesticide use, pollution	Better landscape function
	Reduced pollution

11

Customer Communication

If you find a problem do your best to offer a solution.

Reduce your requests and proactives.

Set Service Leads!

Make more money and save more time.

12

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Topic Category: Lawn

Recordable Verifiable Training Hours: 1.5 to 2 hours

Objectives:

- Read and discuss our Weed Management Protocol and to identify many of the basic weed species and the typical conditions in which these weeds flourish.
- Ensure proper understanding by all Specialist of Backpack sprayer use
- To **calibrate every Specialist**
- **To ensure that every Specialist is properly equipped with the correct spray tip on the back pack sprayer, a proper measuring cup that will measure from ½ to 10 ounces, and a clear water measuring jug that will measure from ½ to 2.5 gallons of water.**
- It is also designed to ensure that everyone in Florida and Louisiana understands that we do not put post emergence herbicides into the drop tank. They used from the back pack sprayer only. This training will be used to document the fact that your Specialist know that if they use the post emergence materials from the drop tank, it could result in termination of employment and damage results, they will be paying for the damage**.**

This meeting will qualify for 1 hour of Department of Ag ID Cardholder Training. Make sure you fill out the Department of Ag ID Cardholder Training form for each Team Member. Keep a copy in the Team Members training file at your office.

KEEP A COPY OF THE GRADED POST TEST IN THE TEAM MEMBER'S TRAINING FILE AS DOCUMENTATION THAT THE TEAM MEMBER UNDERSTANDS OUR POLICY OF USING THE WEED CONTROL SLURRIES ONLY FROM A BACKPACK SPRAYER.

Length of lesson: 90 to 120 minutes.

Materials needed:

- Training Guideline (Below)
- Training Document Weed Management Protocol (GreenUp Protocols\Individual Protocols\Lawn Care Basic Application)
- 25 by 40 foot area marked for calibration
- 2 Clean backpack sprayers in good working condition with 11010 spray tips.
- A weighted string at the end of the spray wand near the nozzle measured at 20 inches long from the end of the wand to the end of the weights at the string.
- Clear 2.5 gallon jug with ½ gallon increments
- 32 ounce measuring cup
- Stopwatch to time each pass (10 seconds for each 40 foot pass)
- Collect samples of many of the weeds listed below from the field, if available.

Blanket Crabgrass, Alexandergrass, Goosegrass, Bermudagrass, Annual Jewgrass, Doveweed, Kyllinga sedge, Yellow Nutsedge, Purple Nutsedge, Globe sedge, Virginia Button weed, White Clover, Dichondra, Spurge, Chamber Bitter, Yellow Wood Sorrel, Asiatic Hawksbeard.

- Pre- and Post- tests.

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Training Guidelines:

- Set up the training area in an area of the office that will minimize disruptions to deliver the protocol training and the 40 by 25 foot area outside for calibration.
- Make sure all calibration materials listed above are readily available for the calibration portion of the training.
- Make copies of the tests and training materials for all Team Members attending.
- Hand out the Department of Ag ID Cardholder Training Form and have all Cardholder complete the form. The training must be a minimum of 60 minutes to qualify.
- 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 Weed Management Protocol.
    - Encourage active participation from all Team Members
    - Ask probing questions to develop key points
    - Encourage group reading and participation
- Perform the demonstration portion of the training
- **Demonstrate** that 1 gallon measured in the 2.5 gallon jug does not equal 1 gallon in the backpack sprayer and the measurements on the backpack sprayer must not be used.
    - Measure 1 gallon of water in the water measuring jug and pour it into the back pack sprayer.
- Time all Specialists to walk at 40 feet in 10 seconds.
- Perform the displacement method of Backpack Calibration with each Specialist while all Specialists critique.
    - Displacement method of calibration: Fill the backpack full of water, pump up the pressure chamber and spray into the backpack to remove any air from the chamber, refill the backpack until it will not hold any additional water. After the Specialist performs the treatment over the 1000 sq. ft. area, measure the amount of water that can be put back into the sprayer. The amount of water that can be put back into the sprayer is the amount of water that was used over the 1000 sq. ft. area.
    - Time each pass and provide feedback to the Specialist for the time taken to walk each pass.
    - Ensure the proper nozzle height by using the 20 inch weighted string
- After reading and reviewing all materials and performing the backpack calibration, 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

Weed Management Protocol and Backpack Sprayer Calibration

Name _____ Date _____

PRE & POST TEST

1. T or F A dense turfgrass cover competes with weeds for space, water, nutrients and light.
2. T or F Most severe weed problems are a result of bare or thinning areas in the turfgrass canopy or a favorable environment for growth.
3. T or F Indicator weeds are indicative of an underlying problem.
4. Blanket Crabgrass may indicate
   a. high soil moisture.
   b. Low moisture.
   c. Low light.
   d. Excessive nitrogen.
5. Alexandergrass may indicate
   a. high soil moisture.
   b. Low moisture.
   c. Low light.
   d. Excessive nitrogen.
6. T or F Goosegrass is may indicate soil compaction or traffic damage.
7. T or F Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass.
8. T or F Purple Nutsedge can be controlled with Basagran.
9. White Clover may indicate
   a. Excessive nitrogen
   b. Compacted soil
   c. Nitrogen deficiency
   d. Loose soil.
10. T or F Spurge, Chamber bitter, Florida Pusley and Creeping Beggarweed are summer annual broadleaf weeds.
11. T or F Performing post-emergent weed control out of a drop tank will result in termination of the Specialist performing the treatment (except when scheduled in North Georgia).

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

12. T or F Any damage resulting from performing post-emergent weed control out of a drop tank will result in the Specialist paying for any resulting damage in full (except when scheduled in North Georgia).

13. T or F I have been successfully calibrated to perform weed control from the backpack sprayer through the displacement method of calibration. I am properly equipped with two backpack sprayers for weed control, both of which have a 11010 spray tip. I also have a water measuring jug.

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Answer Sheet

1. T or F A dense turfgrass cover competes with weeds for space, water, nutrients and light.
2. T or F Most severe weed problems are a result of bare or thinning areas in the turfgrass canopy or a favorable environment for growth.
3. T or F Indicator weeds are indicative of an underlying problem.
4. Blanket Crabgrass may indicate
   a. high soil moisture.
   b. Low moisture.
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   d. Excessive nitrogen.
6. T or F Goosegrass is may indicate soil compaction or traffic damage.
7. T or F Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass.
8. T or F Purple Nutsedge can be controlled with Basagran.
9. White Clover may indicate
   a. Excessive nitrogen
   b. Compacted soil
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10. T or F Spurge, Chamber bitter, Florida Pusley and Creeping Beggarweed are summer annual broadleaf weeds.
11. T or F Performing post-emergent weed control out of a drop tank will result in termination of the Specialist performing the treatment (except when scheduled in North Georgia).

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

12. (T) or F Any damage resulting from performing post-emergent weed control out of a drop tank will result in the Specialist paying for any resulting damage in full (except when scheduled in North Georgia).

13. (T) or F I have been successfully calibrated to perform weed control from the backpack sprayer through the displacement method of calibration. I am properly equipped with two backpack sprayers for weed control, both of which have a 11010 spray tip. I also have a water measuring jug.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

Nationally, herbicides comprise approximately 65% of all pesticides applied to lawns. This statistic underscores the fact that consumers want and expect to have relatively weed-free lawns. The best way to prevent weeds from becoming a problem in lawns is to grow a healthy, dense stand of turfgrass by providing proper fertilization, irrigation, mowing, and management of insect pests and diseases. Pre-emergent herbicide applications applied before weed germination can reduce the appearance of seasonal weeds significantly. Even under the best circumstances, however it is likely that the need for post-emergent herbicide applications will eventually arise in order to keep weeds suppressed and achieve an acceptable level of customer satisfaction.

Objectives

- Discuss the relationship between underlying issues causing turf decline and weeds;
- Setting customer expectations for weed control;
- Provide details on pre-emergent and post-emergent weed control applications;
- Discuss how to handle difficult-to-control weeds and follow-ups;
- Review how to make herbicide applications using a backpack sprayer;
- **Calibrate each Specialist as per the directions below**;
- Ensure that we have documentation to show that all Managers and Specialists understand that performing weed control using our post-emergent weed control slurries out of a drop tank is a terminable offense and any damage resulting from this practice will also result in the Specialist paying for the full amount of any resulting damage.

Underlying issues and weeds

Because soils have a lot of weed seeds already in them, there is inherently a high possibility that lawns will eventually get weeds. A dense canopy of turfgrass not only reduces the amount of sunlight reaching the soil surface reducing weed seed germination, but can out-compete most weeds trying to get established for water, space and nutrients. Most severe weed infestations are a result of bare or thinning areas in the turfgrass canopy, or a favorable environment for growth. There are many potential causes of these weed-prone areas in lawns including:

- Drought damage from poor irrigation distribution uniformity or scheduling during dry periods
- Wet conditions (heavy rainfall, over-irrigation, poor drainage)
- Damage from nematodes, insects and/or diseases
- Poor fertility
- Soil pH out of range for the particular turf species
- Poor shade adaptation

Indicator Weeds

Certain weeds can thrive in conditions which often cause turfgrasses to fail. When these weeds become established in areas of drought, excessive moisture, poor fertility, low or high soil pH, nematode damage, or anywhere turfgrasses are failing, they are referred to as *indicator weeds* because they are indicative of an underlying condition. Until the condition is alleviated, it is unlikely that the turfgrass will be able to recover and out-compete the weeds, even with herbicide applications. Once established, indicator weeds often continue to grow even when the underlying condition is corrected.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

These are some of the most common indicator weeds and the conditions in which they thrive:



****Blanket crabgrass** – high soil moisture



****Alexandergrass** – Low soil moisture



****Bermudagrass –** Often takes over drought damaged areas, but will also flourish in high moisture.



****Goosegrass –** Compacted soil. Common in traffic damaged areas.



****Annual Woodsgrass** – Low light



*****Doveweed** – High moisture and low light

**These weeds are grassy weeds and have no selective control in St. Augustinegrass. Spot killing with a non-selective herbicide and renovation is needed.

***Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass. In Zoysiagrass or Bermudagrass, Doveweed can be controlled with the Celsius/Dismiss South combination (below).

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

Sedges



Kyllinga sedge – High soil moisture



Yellow Nutsedge



****Purple Nutsedge –** Disturbed soil
Purple Nutsedge is controlled with Sedgehammer
Basagran does not control Purple Nutsedge.



Globe Sedge High soil moisture, nematodes

Perennial Broadleaf Weeds



Dollarweed – High soil moisture



Virginia Button Weed – High moisture



White Clover – Low nitrogen fertility



Purple Wood Sorrel – Thrives in cool weather



Yellow Wood Sorrel -
Thrives in the spring



Dichondra – Moist soil

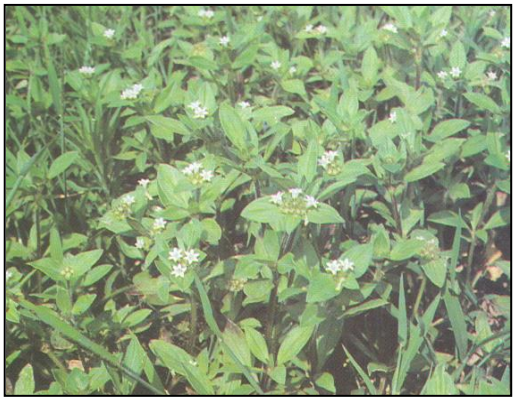
Summer Annual Broadleaf Weeds



Spurge – Drought and nematodes



Chamber Bitter – Loose soil

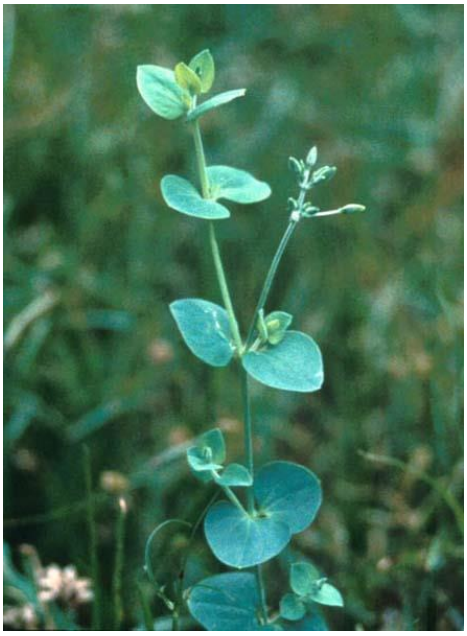


Florida Pusley – Drought



Beggarweed – Low soil fertility, drought

Winter Annual Broadleaf Weeds



Heartleaf Drymary – Moist areas



Asiatic Hawksbeard – Areas of thin turf



Carolina Geranium



Common Chick weed

WEED MANAGEMENT PROTOCOL

Setting Customer Expectations for Weed Control

Many homeowners expect that when they hire a lawn care company, there should never be ANY weeds in the lawn. A thick, healthy lawn under proper irrigation will have very few weeds overall (< 5% coverage), but may be prone to getting more weeds (up to 10%) at certain times of the year. Higher weed levels indicate underlying problems as discussed above.

Seasonal flushes of weeds occur twice per year – spring (summer annuals) and fall (winter annuals). Pre-emergent herbicides are applied twice per year beforehand to reduce weed seed germination. Though these applications help keep weeds to a manageable level, noticeable increases in weed populations still occur during the onset of warmer and cooler weather. A higher incidence of Dollarweed, sedge, and crabgrass may occur during periods of high rainfall, or if the soil holds a lot of water due to high organic or clay content.

When weed fluctuations occur, our herbicide applications reduce the weed populations back down again, however some weed seeds can germinate in between services if conditions are still conducive. Follow-up treatments may be required depending on weather conditions and weed species present.

Types of Herbicides

Pre-emergence Herbicides

Pre-emergence herbicides create a chemical barrier in the upper soil profile. As weed seeds germinate, the new seedling is killed as it reaches this barrier of herbicide. Pendimethalin (Pre-M) or Resolute is used in most of our programs for pre-emergent weed control and lasts from 6 – 8 weeks in the soil profile. It is more effective if followed with ½ inch rainfall or supplemental irrigation. Since Pendimethalin and Resolute are root inhibitors, over-application or application to lawns with compromised roots can cause damage.

Follow these instructions when making applications with Pendimethalin or Resolute

- **Calibrate spray equipment and perform a bucket check before making applications.**
- **New sod should be mowed at least 4 times and be well rooted before application with Specticle, Pendimethalin or Resolute.**
- **Do not apply pre-emergence to stressed or damaged areas.**
- **Do not make more than one pre-emergence herbicide application within at least 90 days unless specifically directed by GreenUP Protocol.**
    - **It is critically important that attention be paid to our GreenUP Protocols for new or regular services as they relate to pre-emergence herbicide applications to avoid an additional pre-emergence herbicide application.**
    - **It is critically important that attention be paid to turfgrass retreatments during the time of year when pre-emergence herbicides are being applied with liquid broadcast applications. Pre-emergence herbicides cannot be present in the droptank during a retreatment using the droptank. Otherwise, an additional pre-emergence herbicide application would result, and turf injury would occur.**

Pre-emergence herbicide applications should be watered in as soon as possible after application to rinse the active ingredient into the soil and prevent photo-degradation.

Post-emergence Herbicides

Herbicides from different chemical classes have different modes of action, often cause different symptoms, and have different timelines for weed damage. When mixed together, herbicides can be more effective than when applied alone. This is known as a *synergistic* effect. Detailed information on some common herbicides can be found in Table 2 including chemical class, mode of action, symptomology, and timeframe in which damage can be expected.

We have two different weed mixtures for broadleaf weeds in St. Augustinegrass. The weed mix we use is dependent on the time of year.

In the cooler months (from November 1 to February 28th), SBM1 is used. This slurry contains Basagran, Trimec Bentgrass Formula, Octane and Wetting agent. Auguzine is also added with this mixture to the backpack sprayer, but it is not mixed into the slurry.

In the warm season (from March 1 to October 31st) SBM2 is used. This slurry contains Manor/Blade, Trimec Bentgrass Formula, Octane and Wetting agent. Manor can regulate the growth of the desirable grass and should not be used in the cool season when the growth of the desirable grass is already being slowed down due to the cooler temperatures and shorter number of daylight hours.

Each slurry is combined before being issued to the Lawn Specialists by the Service Manager, supervisor or product room supervisor. Each product must be measured very precisely, since it will then be issued for use by all the Lawn Specialists and used on our customer's lawns. The containers used to hold this mixture must be labeled with the appropriate slurry label. These labels can be found on the G: Drive\Shared\Quality Assurance\GreenUp Reference Materials\Slurry Labels-Van Label Sets\Slurry Labels\Current Slurries\Back Pack Slurries\Lawn. The mixing instructions are on the label. Affix the label to a clean bottle with clear packing tape. Make sure the correct label is used depending on the mixture.
Each of these slurries is very effective on a wide variety of broadleaf weeds. When used properly, there will be no doubt that the weeds have been treated within a matter of a few days after treatment. Complete death of the weeds may take two to four weeks. Follow-ups for most broadleaf weeds should not be needed if a perfect application is performed.

From March through September, Broadleaf, sedge and grassy weeds in Zoysia, Bermuda and Centipede are treated with a combination of Celsius and Dismiss South. The rates are 0.11 ounces of Celsius and 0.28 ounces of Dismiss South per gallon of water per 1000 sq. ft. Celsius is not stable in a slurry, so no slurry is made of this mixture. Do not use this mixture on St Augustine or Bahia grasses or severe injury/death will occur. Read and follow all label directions.

Broadleaf weed control in Bahia and Seashore Paspalum are typically performed using Change UP Herbicide at 0.75 ounces per 1000 sq. ft. Do not use on St. Augustine or injury/death will occur.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

In Florida and Louisiana, post-emergence weed control is only performed using a back pack sprayer or out of the weed control injector, which only trucks built in 2010 - 2019 possess. We do not ever perform post-emergence weed control out of a drop tank (in Florida and Louisiana). There are a number of reasons for this. These products work best through foliar absorption. 4 or 5 gallons of water per 1000 sq. ft. is too high of water volume and will result in poor weed control and a huge waste of product. Additionally, we have a number of vehicles where the product put into the lawn tank can be transferred into the shrub tank or vice-versa.

Performing post-emergence weed control (in Florida or Louisiana) from a droptank will result in termination of employment. Additionally, any damage resulting from performing this practice will be paid in full by the Specialist or Manager involved.

Backpack Herbicide Applications

Successful backpack applications depend on several key calibration components. Most of them can only be controlled by the applicator. If any one of these components is out of line, the rate of herbicide applied will be incorrect and may result in poor weed control or turfgrass damage.

- **Proper rate of herbicide** – Herbicides and herbicide slurries are formulated to deliver a specific rate of herbicide per 1000 sq. ft. and will be effective if mixed and applied properly. Mix herbicide slurries according to slurry recipes provided. Herbicides and herbicide slurries need to be measured very accurately. Do not use tip and measure containers to measure the product. Use a measuring cup that is capable of measuring 1 ounces of product or less with accuracy.
- **Accurate Water Measurement** – The backpack sprayers have water measurement markings on the back. THESE MEASUREMENTS ARE NOT ACCURATE. Each Lawn Specialist must have a water measuring container that will accurately measure in 1 gallon increments. A clean/clear 2.5 gallon container with measurement markings on the side will work well. These water measuring jugs are acquired through Purchasing. Do not reuse containers that are marked not to reuse.
- **Mixing the Solution** - Make sure the herbicide solution is well agitated in the backpack sprayer. Add ½ of the water to the back pack sprayer before adding the herbicide mix and then add the remaining half of the water. Agitate well before spraying. Pump up the sprayer and spray back into the backpack to ensure the mixture has circulated through the pressure chamber. Agitate periodically while making applications.
- **Proper walking speed** - Walking speed is 2.6 MPH, or 40 ft./10 sec. Walking too fast will result in a low dose and poor weed control. Walking too slow will result in a high dose and may cause turfgrass damage.
- **Proper pressure** – The backpack sprayer is designed to supply a maximum pressure of 40 psi when pumped to full capacity. Continuous pumping of the pressure bar is necessary to maintain 40 psi during the course of an application. Allowing the pressure to lessen will result in a lower rate of herbicide and poor control of weeds.
- **Proper nozzle size** – The spray nozzle for making weed control applications, whether the backpack or weed injector, is the 11010. Using the wrong tip size would result in poor weed control or turf injury.

- **Proper nozzle height from the ground** – The tip of the flat-fan nozzle should be held parallel to and 20 in. above the ground. This height gives an application swath of approximately 42 in. (3.5 ft.). Holding the nozzle higher will result in poor coverage and poor weed control. Holding the nozzle lower will result in a greater amount of herbicide being applied per square foot and may damage turfgrass.

Backpack Applicator Calibration for Proper Applications

Keeping track of proper walking speed, pressure, proper overlap and nozzle height all at once takes some coordination and practice. A manager must check application technique on a regular basis with all Specialists to make sure the proper calibration components listed above become and stay habitual. A clean backpack has not previously been used can be used for pesticide application must be used as a practice backpack.

- Mark off an area that is 40 feet long by 25 feet wide (1000 sq. ft).
- Tie a 20 in. string to the end of the nozzle with washers or nuts to weigh the end of the sting.
    - Ensure that the string is 20 inches from the nozzle to the bottom of the weights.
- Calibration Procedure: Calibration is performed using the "displacement" method. (Water is added to the backpack applicator until it is completely full before the application is done. After the application has been completed, whatever water can be added back into the backpack, to fill it to the same point before the application was done, is the amount of water that has been used in the application.)
    - Fill the backpack with water.
    - Pump up the pressure chamber and spray back into the backpack. When the pressure chamber is completely circulated and all the air is removed, stop spraying.
    - Pump up the pressure chamber again until full pressure is reached.
    - Continue to add water until *completely full*.
- Make the application to the 1000 sq. ft. area as instructed below:
    - Time the walking pace of each pass with a stop watch. It should take 10 seconds to travel 40 feet.
    - Be sure that during the application, the weight at the bottom of the nozzle string barely or almost touches the ground.
    - Be sure that full pressure is maintained at all times during the application.
    - Each pass should overlap the last spray pattern by 6 to 8 inches.
- Check the volume of water that has been applied to the 1000 sq. ft. area:
    - Have the Lawn Specialist re-pressurize the backpack and set the backpack on the ground. Remove the backpack lid.
    - Measure 1 gallon of water in a clean/clear 2.5 gallon container.
    - Pour the gallon of water back into the backpack sprayer until it is full like it was before the application was performed.
    - Measure any water that remains from the one gallon.
        - If 16 ounces or less remains, the application is fine. It should be assumed that a Lawn Specialist may slow their pace slightly when walking through thick grass or by the end of the day.
        - If the gallon of water does not refill the backpack, too much material has been applied. If more than 16 ounces additional has been applied, this is not acceptable and the Specialist must be recalibrated.

The tanker injector application is performed the same as the backpack application in terms of wand height, walking speed and spray tip size. It is designed to address the need of mixing multiple backpacks on a single property as well as to reduce the likelihood of measuring errors of product(s) added to a backpack.

Consider that each GreenUP vehicle is required to have 3 backpack sprayers. One backpack is designated for broadleaf weed control and one backpack is designated for insect and disease. The third backpack is designated for either broadleaf weed control for a different grass type or possibly grassy weed control for turf types other than St. Augustine. Since we also need to control sedgeweeds, a fourth applicator is often necessary. For this reason, a low volume injector was added to all lawn care vehicles since 2010. An excellent use of this tanker is for sedgeweed control, but it is not limited to this purpose. More information regarding the tanker injector can be found in the GreenUP Protocol "Tanker Injector Applications". Calibration of the injector according to the protocol is imperative.

The Lawn Specialist must make all post-emergent weed control applications as outlined above. The amount of weed control material applied remains the same regardless of the quantity or type of weeds present. Turf injury will result from over application.
More information on post-emergent weed control applications may be found in the "Liquid Spot Treatment" protocol.

Difficult-to-control Weeds and Proper Follow-ups

Some weeds are more difficult to control than others and may require follow-up treatments. If a problem controlling weeds occurs, complete the following steps:

- Ensure enough time has been given for control to be achieved. Two to four weeks may be needed for complete control to be achieved. Do not retreat with the slurry containing Manor/Blade (SBM2) before four weeks have passed.
- Ensure that all calibration components are being carried out properly and that the slurry is being mixed properly.
- Re-treat using the proper weed control material. ***Do not apply herbicides to stressed turfgrass areas***.
- *If after 2 consecutive proper backpack applications, significant decline of target weed(s) has not occurred, contact the GreenUP Technical Department for further guidance.*

Some of the more difficult-to-control weeds are Dollarweed, Beggarweed, Spurge, Virginia Buttonweed, and Chamberbitter.

Table 2: Herbicide chemistry, mode of action, and symptomology.

Herbicide	Chemical Class	Mode of Action	Symptoms	Damage Timeline
Quicksilver (Contact)	Not assigned	Protox inhibitor – lipid peroxidation (damages cell walls)	Necrosis	24 hours
Blade (Manor) (Systemic)	Sulfonylurea	Meristemic inhibitor (Kills plant from growing point)	Yellowing/necrosis	Slowly kills 1 – 4 weeks. Stunting, shortened internodes, Red to purple color, Absorbed by roots and shoots. Chlorosis and necrosis progresses from growing point to rest of plant
Dismiss (Sulfentrazone) (Contact with soil activity)	Aryl Triazolinone	Photosynthesis inhibitor	Yellowing, necrosis, and death.	2 days to 1 week
0-0-7 + Atrazine (Systemic)	Triazine	Photosynthesis Inhibitor	Interveinal chlorosis, then desiccation. Leaves die in inward direction from margins and tips. Yellowing/necrosis of lower outer leaves first	Soil (primary) and foliar activity. Speed of activity depends on growth rate of plant. 2 – 6 weeks. Residual control up to 3 months.
Three-Way Ester MCPA Triclopyr Dicamba	Auxins Phenoyaliphatic acid Picolinic Acid Benzoic Acid	Growth Regulators	Bending and twisting of leaves and stems. Later, root formation on stems, misshapen leaves, and malformed roots.	Immediate to several weeks.
Drive (Quinclorac) (Systemic)	Auxin	Not fully understood	Stunting, chlorosis, followed by reddening, necrosis and death.	1 – 3 weeks
Basagran (Bentazon) (Contact)	Benzothiadiozole	Photosynthesis Inhibitor	Yellowing/necrosis	2 – 7 days
Sethoxydim (Systemic)	Cyclohexanedione	Lipid biosynthesis inhibitor	Reddening, tip burn, dieback.	1 – 3 weeks
Glyphosate (Systemic)		Amino Acid Inhibitor	Yellowing of new growth and death.	Several days to weeks
PreM (pendamethalin)	Dinitroailine	Root and shoot inhibitor (interferes with cell division & mitosis)	Sparse, club-shaped roots.	Soil activity only (pre-emergent). Residual control up to 3 months.

Right Plant, Right Place

What is "Right Plant, Right Place?"

"Right plant, **right place"** is a concept where you choose **plants** that are well-suited to the **location.** Where they are planted, they will perform well with limited additional input.

1

Knowing Your Plant

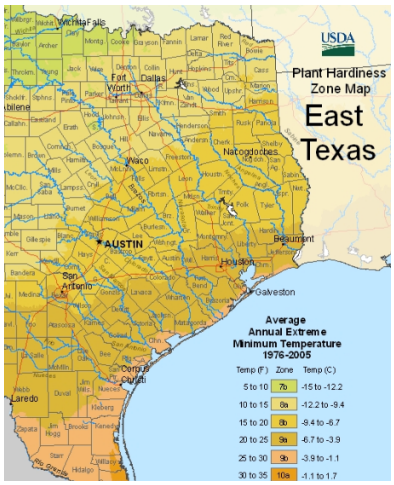
- **Plant Identification**
  - **Visit nurseries.**
  - **Search the internet.**
  - **Talk to your fellow team members.**
  - **Take pictures for use at check-in.**
  - **Applications on your phone?**

2

Knowing Your Plant

Temperature Requirements
Hardiness Zone

Each zone indicates the average lowest temperature of an area, as laid out by the US Department of Agriculture.



3

Knowing Your Plant

- **Soil Condition**
  - **What pH does it prefer?**
  - **Does it like compact or loose soil?**
    - Wear tolerance
  - **Will it thrive in our sandy soils?**
- **Water Requirements**
  - **How much water does it need?**
  - **Is it salt tolerant?**
  - **What kind of drainage does it prefer?**
    - Slopes and gullies

4

Knowing Your Plant

- **Maintenance Required**
  - **How often will it need mowing and pruning?**
  - **What kind of fertilization demands does it have?**
  - **What kinds of pest prevention will it need?**
    - Deer
- **Landscape Maturity**
  - **How are its roots going to grow?**
  - **Will it change the pH?**
  - **How will it change it's surroundings?**

5

Sunlight and Shade

Plants are dependent upon sunlight to fuel their organic activities; insufficient sunlight stunts or prevents plant growth, while overexposure to sunlight is harmful.

- Too much sun and plants look visibly burnt and parched. Leaves will be brittle and break easily. Similar symptoms to that of underwatering, but watering doesn't help the health of the plant.
- Too little sun and leaves loose their vibrant color, turn yellow and/or mottled, leaves falling off plant and growth seems stunted. Plants look spindly with a lot of space between leaves. Plants lean as they grow in an effort to get more light.

6

Sunlight and Shade



7

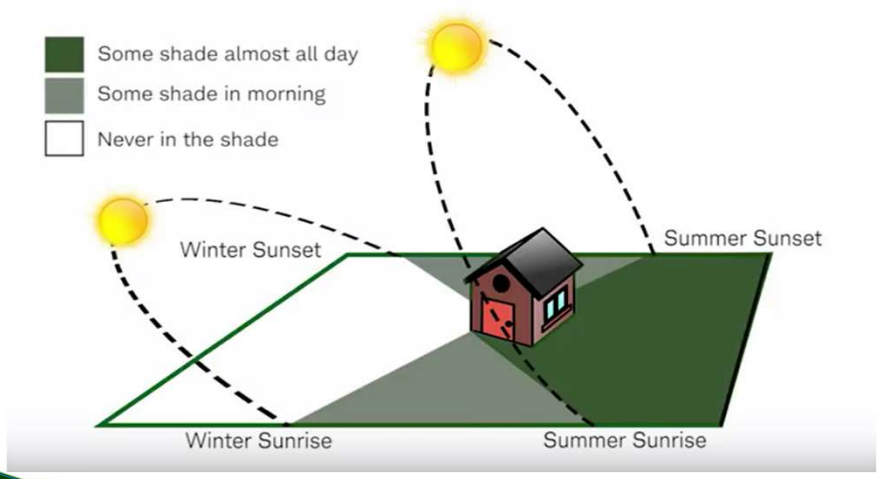
Sunlight and Shade

The levels of sunlight required by a plant are dependent upon the species of the plant. We categorize them as Full Sun, Partial sun/shade, and shade.

- **Full Sun: 6+ hours of direct sunlight**
- **Partial sun/shade: 3-6 hours of direct sunlight**
- **Shade: 3 or less hours of direct sunlight**

8

Sunlight and Shade



9

Changes to Sunlight and Shade

- **Seasonal changes will effect sun/shade.**
  - **Hurricanes**
- **As landscaping matures it will effect sun/shade.**
  - **Tree growth**
  - **Shrub bed growth**
- **Construction will effect sun/shade.**
  - **Fences**
  - **New homes/buildings**
  - **Development clear cutting**

10

Customer Communication

The cost of the Right Plant in the Wrong Place	*The advantage of the Right Plant in the Right Place*
More labor (pruning, pest management, irrigation)	Reduced labor
More greenwaste and hauling costs / composting costs	Reduced water costs
More water costs	Reduced problems (pest, safety)
More pest problems, pesticide use, pollution	Better landscape function
	Reduced pollution

11

Customer Communication

If you find a problem do your best to offer a solution.

Reduce your requests and proactives.

Set Service Leads!

Make more money and save more time.

12

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Topic Category: Lawn

Recordable Verifiable Training Hours: 1.5 to 2 hours

Objectives:

- Read and discuss our Weed Management Protocol and to identify many of the basic weed species and the typical conditions in which these weeds flourish.
- Ensure proper understanding by all Specialist of Backpack sprayer use
- To **calibrate every Specialist**
- **To ensure that every Specialist is properly equipped with the correct spray tip on the back pack sprayer, a proper measuring cup that will measure from ½ to 10 ounces, and a clear water measuring jug that will measure from ½ to 2.5 gallons of water.**
- It is also designed to ensure that everyone in Florida and Louisiana understands that we do not put post emergence herbicides into the drop tank. They used from the back pack sprayer only. This training will be used to document the fact that your Specialist know that if they use the post emergence materials from the drop tank, it could result in termination of employment and damage results, they will be paying for the damage**.**

This meeting will qualify for 1 hour of Department of Ag ID Cardholder Training. Make sure you fill out the Department of Ag ID Cardholder Training form for each Team Member. Keep a copy in the Team Members training file at your office.

KEEP A COPY OF THE GRADED POST TEST IN THE TEAM MEMBER'S TRAINING FILE AS DOCUMENTATION THAT THE TEAM MEMBER UNDERSTANDS OUR POLICY OF USING THE WEED CONTROL SLURRIES ONLY FROM A BACKPACK SPRAYER.

Length of lesson: 90 to 120 minutes.

Materials needed:

- Training Guideline (Below)
- Training Document Weed Management Protocol (GreenUp Protocols\Individual Protocols\Lawn Care Basic Application)
- 25 by 40 foot area marked for calibration
- 2 Clean backpack sprayers in good working condition with 11010 spray tips.
- A weighted string at the end of the spray wand near the nozzle measured at 20 inches long from the end of the wand to the end of the weights at the string.
- Clear 2.5 gallon jug with ½ gallon increments
- 32 ounce measuring cup
- Stopwatch to time each pass (10 seconds for each 40 foot pass)
- Collect samples of many of the weeds listed below from the field, if available.

Blanket Crabgrass, Alexandergrass, Goosegrass, Bermudagrass, Annual Jewgrass, Doveweed, Kyllinga sedge, Yellow Nutsedge, Purple Nutsedge, Globe sedge, Virginia Button weed, White Clover, Dichondra, Spurge, Chamber Bitter, Yellow Wood Sorrel, Asiatic Hawksbeard.

- Pre- and Post- tests.

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Training Guidelines:

- Set up the training area in an area of the office that will minimize disruptions to deliver the protocol training and the 40 by 25 foot area outside for calibration.
- Make sure all calibration materials listed above are readily available for the calibration portion of the training.
- Make copies of the tests and training materials for all Team Members attending.
- Hand out the Department of Ag ID Cardholder Training Form and have all Cardholder complete the form. The training must be a minimum of 60 minutes to qualify.
- 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 Weed Management Protocol.
    - Encourage active participation from all Team Members
    - Ask probing questions to develop key points
    - Encourage group reading and participation
- Perform the demonstration portion of the training
- **Demonstrate** that 1 gallon measured in the 2.5 gallon jug does not equal 1 gallon in the backpack sprayer and the measurements on the backpack sprayer must not be used.
    - Measure 1 gallon of water in the water measuring jug and pour it into the back pack sprayer.
- Time all Specialists to walk at 40 feet in 10 seconds.
- Perform the displacement method of Backpack Calibration with each Specialist while all Specialists critique.
    - Displacement method of calibration: Fill the backpack full of water, pump up the pressure chamber and spray into the backpack to remove any air from the chamber, refill the backpack until it will not hold any additional water. After the Specialist performs the treatment over the 1000 sq. ft. area, measure the amount of water that can be put back into the sprayer. The amount of water that can be put back into the sprayer is the amount of water that was used over the 1000 sq. ft. area.
    - Time each pass and provide feedback to the Specialist for the time taken to walk each pass.
    - Ensure the proper nozzle height by using the 20 inch weighted string
- After reading and reviewing all materials and performing the backpack calibration, 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

Weed Management Protocol and Backpack Sprayer Calibration

Name _____ Date _____

PRE & POST TEST

1. T or F A dense turfgrass cover competes with weeds for space, water, nutrients and light.
2. T or F Most severe weed problems are a result of bare or thinning areas in the turfgrass canopy or a favorable environment for growth.
3. T or F Indicator weeds are indicative of an underlying problem.
4. Blanket Crabgrass may indicate
   a. high soil moisture.
   b. Low moisture.
   c. Low light.
   d. Excessive nitrogen.
5. Alexandergrass may indicate
   a. high soil moisture.
   b. Low moisture.
   c. Low light.
   d. Excessive nitrogen.
6. T or F Goosegrass is may indicate soil compaction or traffic damage.
7. T or F Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass.
8. T or F Purple Nutsedge can be controlled with Basagran.
9. White Clover may indicate
   a. Excessive nitrogen
   b. Compacted soil
   c. Nitrogen deficiency
   d. Loose soil.
10. T or F Spurge, Chamber bitter, Florida Pusley and Creeping Beggarweed are summer annual broadleaf weeds.
11. T or F Performing post-emergent weed control out of a drop tank will result in termination of the Specialist performing the treatment (except when scheduled in North Georgia).

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

12. T or F Any damage resulting from performing post-emergent weed control out of a drop tank will result in the Specialist paying for any resulting damage in full (except when scheduled in North Georgia).

13. T or F I have been successfully calibrated to perform weed control from the backpack sprayer through the displacement method of calibration. I am properly equipped with two backpack sprayers for weed control, both of which have a 11010 spray tip. I also have a water measuring jug.

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

Answer Sheet

1. T or F A dense turfgrass cover competes with weeds for space, water, nutrients and light.
2. T or F Most severe weed problems are a result of bare or thinning areas in the turfgrass canopy or a favorable environment for growth.
3. T or F Indicator weeds are indicative of an underlying problem.
4. Blanket Crabgrass may indicate
   a. high soil moisture.
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   b. Compacted soil
   c. Nitrogen deficiency
   d. Loose soil.
10. T or F Spurge, Chamber bitter, Florida Pusley and Creeping Beggarweed are summer annual broadleaf weeds.
11. T or F Performing post-emergent weed control out of a drop tank will result in termination of the Specialist performing the treatment (except when scheduled in North Georgia).

WEEKLY TRAINING SESSION

Weed Management Protocol and Backpack Sprayer Calibration

12. (T) or F Any damage resulting from performing post-emergent weed control out of a drop tank will result in the Specialist paying for any resulting damage in full (except when scheduled in North Georgia).

13. (T) or F I have been successfully calibrated to perform weed control from the backpack sprayer through the displacement method of calibration. I am properly equipped with two backpack sprayers for weed control, both of which have a 11010 spray tip. I also have a water measuring jug.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

Nationally, herbicides comprise approximately 65% of all pesticides applied to lawns. This statistic underscores the fact that consumers want and expect to have relatively weed-free lawns. The best way to prevent weeds from becoming a problem in lawns is to grow a healthy, dense stand of turfgrass by providing proper fertilization, irrigation, mowing, and management of insect pests and diseases. Pre-emergent herbicide applications applied before weed germination can reduce the appearance of seasonal weeds significantly. Even under the best circumstances, however it is likely that the need for post-emergent herbicide applications will eventually arise in order to keep weeds suppressed and achieve an acceptable level of customer satisfaction.

Objectives

- Discuss the relationship between underlying issues causing turf decline and weeds;
- Setting customer expectations for weed control;
- Provide details on pre-emergent and post-emergent weed control applications;
- Discuss how to handle difficult-to-control weeds and follow-ups;
- Review how to make herbicide applications using a backpack sprayer;
- **Calibrate each Specialist as per the directions below**;
- Ensure that we have documentation to show that all Managers and Specialists understand that performing weed control using our post-emergent weed control slurries out of a drop tank is a terminable offense and any damage resulting from this practice will also result in the Specialist paying for the full amount of any resulting damage.

Underlying issues and weeds

Because soils have a lot of weed seeds already in them, there is inherently a high possibility that lawns will eventually get weeds. A dense canopy of turfgrass not only reduces the amount of sunlight reaching the soil surface reducing weed seed germination, but can out-compete most weeds trying to get established for water, space and nutrients. Most severe weed infestations are a result of bare or thinning areas in the turfgrass canopy, or a favorable environment for growth. There are many potential causes of these weed-prone areas in lawns including:

- Drought damage from poor irrigation distribution uniformity or scheduling during dry periods
- Wet conditions (heavy rainfall, over-irrigation, poor drainage)
- Damage from nematodes, insects and/or diseases
- Poor fertility
- Soil pH out of range for the particular turf species
- Poor shade adaptation

Indicator Weeds

Certain weeds can thrive in conditions which often cause turfgrasses to fail. When these weeds become established in areas of drought, excessive moisture, poor fertility, low or high soil pH, nematode damage, or anywhere turfgrasses are failing, they are referred to as *indicator weeds* because they are indicative of an underlying condition. Until the condition is alleviated, it is unlikely that the turfgrass will be able to recover and out-compete the weeds, even with herbicide applications. Once established, indicator weeds often continue to grow even when the underlying condition is corrected.

GREENUP SERVICE PROTOCOLS

WEED MANAGEMENT PROTOCOL

These are some of the most common indicator weeds and the conditions in which they thrive:



****Blanket crabgrass** – high soil moisture



****Alexandergrass** – Low soil moisture



****Bermudagrass –** Often takes over drought damaged areas, but will also flourish in high moisture.



****Goosegrass –** Compacted soil. Common in traffic damaged areas.



****Annual Woodsgrass** – Low light



*****Doveweed** – High moisture and low light

**<u>These weeds are grassy weeds and have no selective control in St. Augustinegrass. Spot killing with a non-selective herbicide and renovation is needed.</u>

***Doveweed can be controlled with granular Atrazine or Auguzine in St. Augustinegrass. In Zoysiagrass or Bermudagrass, Doveweed can be controlled with the Celsius/Dismiss South combination (below).

Sedges



Kyllinga sedge – High soil moisture



Yellow Nutsedge



****Purple Nutsedge –** Disturbed soil
Purple Nutsedge is controlled with Sedgehammer
Basagran does not control Purple Nutsedge.



Globe Sedge High soil moisture, nematodes

Perennial Broadleaf Weeds



Dollarweed – High soil moisture



Virginia Button Weed – High moisture

WEED MANAGEMENT PROTOCOL



White Clover – Low nitrogen fertility



Purple Wood Sorrel – Thrives in cool weather



Yellow Wood Sorrel -
Thrives in the spring



Dichondra – Moist soil

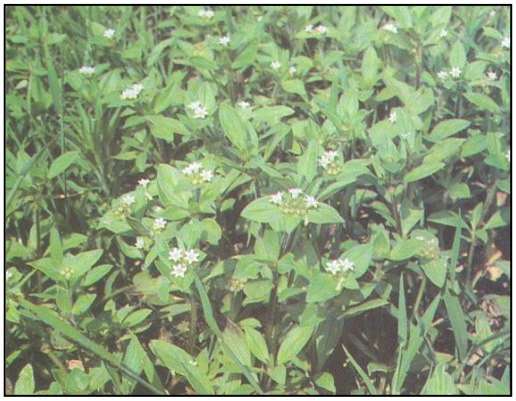
Summer Annual Broadleaf Weeds



Spurge – Drought and nematodes



Chamber Bitter – Loose soil

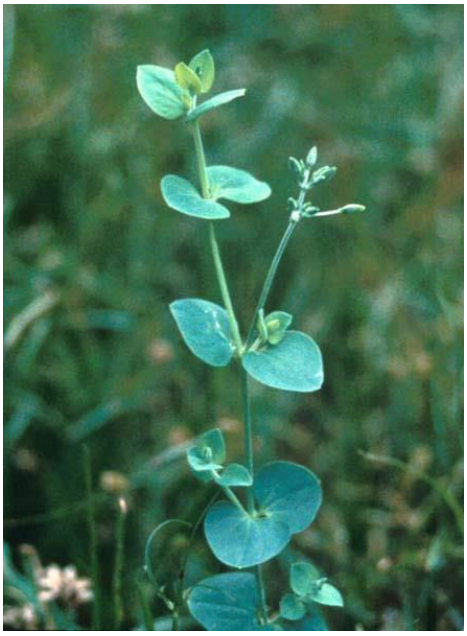


Florida Pusley – Drought



Beggarweed – Low soil fertility, drought

Winter Annual Broadleaf Weeds



Heartleaf Drymary – Moist areas



Asiatic Hawksbeard – Areas of thin turf



Carolina Geranium



Common Chick weed

WEED MANAGEMENT PROTOCOL

Setting Customer Expectations for Weed Control

Many homeowners expect that when they hire a lawn care company, there should never be ANY weeds in the lawn. A thick, healthy lawn under proper irrigation will have very few weeds overall (< 5% coverage), but may be prone to getting more weeds (up to 10%) at certain times of the year. Higher weed levels indicate underlying problems as discussed above.

Seasonal flushes of weeds occur twice per year – spring (summer annuals) and fall (winter annuals). Pre-emergent herbicides are applied twice per year beforehand to reduce weed seed germination. Though these applications help keep weeds to a manageable level, noticeable increases in weed populations still occur during the onset of warmer and cooler weather. A higher incidence of Dollarweed, sedge, and crabgrass may occur during periods of high rainfall, or if the soil holds a lot of water due to high organic or clay content.

When weed fluctuations occur, our herbicide applications reduce the weed populations back down again, however some weed seeds can germinate in between services if conditions are still conducive. Follow-up treatments may be required depending on weather conditions and weed species present.

Types of Herbicides

Pre-emergence Herbicides

Pre-emergence herbicides create a chemical barrier in the upper soil profile. As weed seeds germinate, the new seedling is killed as it reaches this barrier of herbicide. Pendimethalin (Pre-M) or Resolute is used in most of our programs for pre-emergent weed control and lasts from 6 – 8 weeks in the soil profile. It is more effective if followed with ½ inch rainfall or supplemental irrigation. Since Pendimethalin and Resolute are root inhibitors, over-application or application to lawns with compromised roots can cause damage.

Follow these instructions when making applications with Pendimethalin or Resolute

- **Calibrate spray equipment and perform a bucket check before making applications.**
- **New sod should be mowed at least 4 times and be well rooted before application with Specticle, Pendimethalin or Resolute.**
- **Do not apply pre-emergence to stressed or damaged areas.**
- **Do not make more than one pre-emergence herbicide application within at least 90 days unless specifically directed by GreenUP Protocol.**
    - **It is critically important that attention be paid to our GreenUP Protocols for new or regular services as they relate to pre-emergence herbicide applications to avoid an additional pre-emergence herbicide application.**
    - **It is critically important that attention be paid to turfgrass retreatments during the time of year when pre-emergence herbicides are being applied with liquid broadcast applications. Pre-emergence herbicides cannot be present in the droptank during a retreatment using the droptank. Otherwise, an additional pre-emergence herbicide application would result, and turf injury would occur.**

Pre-emergence herbicide applications should be watered in as soon as possible after application to rinse the active ingredient into the soil and prevent photo-degradation.

Post-emergence Herbicides

Herbicides from different chemical classes have different modes of action, often cause different symptoms, and have different timelines for weed damage. When mixed together, herbicides can be more effective than when applied alone. This is known as a *synergistic* effect. Detailed information on some common herbicides can be found in Table 2 including chemical class, mode of action, symptomology, and timeframe in which damage can be expected.

We have two different weed mixtures for broadleaf weeds in St. Augustinegrass. The weed mix we use is dependent on the time of year.

In the cooler months (from November 1 to February 28th), SBM1 is used. This slurry contains Basagran, Trimec Bentgrass Formula, Octane and Wetting agent. Auguzine is also added with this mixture to the backpack sprayer, but it is not mixed into the slurry.

In the warm season (from March 1 to October 31st) SBM2 is used. This slurry contains Manor/Blade, Trimec Bentgrass Formula, Octane and Wetting agent. Manor can regulate the growth of the desirable grass and should not be used in the cool season when the growth of the desirable grass is already being slowed down due to the cooler temperatures and shorter number of daylight hours.

Each slurry is combined before being issued to the Lawn Specialists by the Service Manager, supervisor or product room supervisor. Each product must be measured very precisely, since it will then be issued for use by all the Lawn Specialists and used on our customer's lawns. The containers used to hold this mixture must be labeled with the appropriate slurry label. These labels can be found on the G: Drive\Shared\Quality Assurance\GreenUp Reference Materials\Slurry Labels-Van Label Sets\Slurry Labels\Current Slurries\Back Pack Slurries\Lawn. The mixing instructions are on the label. Affix the label to a clean bottle with clear packing tape. Make sure the correct label is used depending on the mixture.
Each of these slurries is very effective on a wide variety of broadleaf weeds. When used properly, there will be no doubt that the weeds have been treated within a matter of a few days after treatment. Complete death of the weeds may take two to four weeks. Follow-ups for most broadleaf weeds should not be needed if a perfect application is performed.

From March through September, Broadleaf, sedge and grassy weeds in Zoysia, Bermuda and Centipede are treated with a combination of Celsius and Dismiss South. The rates are 0.11 ounces of Celsius and 0.28 ounces of Dismiss South per gallon of water per 1000 sq. ft. Celsius is not stable in a slurry, so no slurry is made of this mixture. Do not use this mixture on St Augustine or Bahia grasses or severe injury/death will occur. Read and follow all label directions.

Broadleaf weed control in Bahia and Seashore Paspalum are typically performed using Change UP Herbicide at 0.75 ounces per 1000 sq. ft. Do not use on St. Augustine or injury/death will occur.

WEED MANAGEMENT PROTOCOL

In Florida and Louisiana, post-emergence weed control is only performed using a back pack sprayer or out of the weed control injector, which only trucks built in 2010 - 2019 possess. We do not ever perform post-emergence weed control out of a drop tank (in Florida and Louisiana). There are a number of reasons for this. These products work best through foliar absorption. 4 or 5 gallons of water per 1000 sq. ft. is too high of water volume and will result in poor weed control and a huge waste of product. Additionally, we have a number of vehicles where the product put into the lawn tank can be transferred into the shrub tank or vice-versa.

Performing post-emergence weed control (in Florida or Louisiana) from a droptank will result in termination of employment. Additionally, any damage resulting from performing this practice will be paid in full by the Specialist or Manager involved.

Backpack Herbicide Applications

Successful backpack applications depend on several key calibration components. Most of them can only be controlled by the applicator. If any one of these components is out of line, the rate of herbicide applied will be incorrect and may result in poor weed control or turfgrass damage.

- **Proper rate of herbicide** – Herbicides and herbicide slurries are formulated to deliver a specific rate of herbicide per 1000 sq. ft. and will be effective if mixed and applied properly. Mix herbicide slurries according to slurry recipes provided. Herbicides and herbicide slurries need to be measured very accurately. Do not use tip and measure containers to measure the product. Use a measuring cup that is capable of measuring 1 ounces of product or less with accuracy.
- **Accurate Water Measurement** – The backpack sprayers have water measurement markings on the back. THESE MEASUREMENTS ARE NOT ACCURATE. Each Lawn Specialist must have a water measuring container that will accurately measure in 1 gallon increments. A clean/clear 2.5 gallon container with measurement markings on the side will work well. These water measuring jugs are acquired through Purchasing. Do not reuse containers that are marked not to reuse.
- **Mixing the Solution** - Make sure the herbicide solution is well agitated in the backpack sprayer. Add ½ of the water to the back pack sprayer before adding the herbicide mix and then add the remaining half of the water. Agitate well before spraying. Pump up the sprayer and spray back into the backpack to ensure the mixture has circulated through the pressure chamber. Agitate periodically while making applications.
- **Proper walking speed** - Walking speed is 2.6 MPH, or 40 ft./10 sec. Walking too fast will result in a low dose and poor weed control. Walking too slow will result in a high dose and may cause turfgrass damage.
- **Proper pressure** – The backpack sprayer is designed to supply a maximum pressure of 40 psi when pumped to full capacity. Continuous pumping of the pressure bar is necessary to maintain 40 psi during the course of an application. Allowing the pressure to lessen will result in a lower rate of herbicide and poor control of weeds.
- **Proper nozzle size** – The spray nozzle for making weed control applications, whether the backpack or weed injector, is the 11010. Using the wrong tip size would result in poor weed control or turf injury.

- **Proper nozzle height from the ground** – The tip of the flat-fan nozzle should be held parallel to and 20 in. above the ground. This height gives an application swath of approximately 42 in. (3.5 ft.). Holding the nozzle higher will result in poor coverage and poor weed control. Holding the nozzle lower will result in a greater amount of herbicide being applied per square foot and may damage turfgrass.

Backpack Applicator Calibration for Proper Applications

Keeping track of proper walking speed, pressure, proper overlap and nozzle height all at once takes some coordination and practice. A manager must check application technique on a regular basis with all Specialists to make sure the proper calibration components listed above become and stay habitual. A clean backpack has not previously been used can be used for pesticide application must be used as a practice backpack.

- Mark off an area that is 40 feet long by 25 feet wide (1000 sq. ft).
- Tie a 20 in. string to the end of the nozzle with washers or nuts to weigh the end of the sting.
    - Ensure that the string is 20 inches from the nozzle to the bottom of the weights.
- Calibration Procedure: Calibration is performed using the "displacement" method. (Water is added to the backpack applicator until it is completely full before the application is done. After the application has been completed, whatever water can be added back into the backpack, to fill it to the same point before the application was done, is the amount of water that has been used in the application.)
    - Fill the backpack with water.
    - Pump up the pressure chamber and spray back into the backpack. When the pressure chamber is completely circulated and all the air is removed, stop spraying.
    - Pump up the pressure chamber again until full pressure is reached.
    - Continue to add water until *completely full*.
- Make the application to the 1000 sq. ft. area as instructed below:
    - Time the walking pace of each pass with a stop watch. It should take 10 seconds to travel 40 feet.
    - Be sure that during the application, the weight at the bottom of the nozzle string barely or almost touches the ground.
    - Be sure that full pressure is maintained at all times during the application.
    - Each pass should overlap the last spray pattern by 6 to 8 inches.
- Check the volume of water that has been applied to the 1000 sq. ft. area:
    - Have the Lawn Specialist re-pressurize the backpack and set the backpack on the ground. Remove the backpack lid.
    - Measure 1 gallon of water in a clean/clear 2.5 gallon container.
    - Pour the gallon of water back into the backpack sprayer until it is full like it was before the application was performed.
    - Measure any water that remains from the one gallon.
        - If 16 ounces or less remains, the application is fine. It should be assumed that a Lawn Specialist may slow their pace slightly when walking through thick grass or by the end of the day.
        - If the gallon of water does not refill the backpack, too much material has been applied. If more than 16 ounces additional has been applied, this is not acceptable and the Specialist must be recalibrated.

The tanker injector application is performed the same as the backpack application in terms of wand height, walking speed and spray tip size. It is designed to address the need of mixing multiple backpacks on a single property as well as to reduce the likelihood of measuring errors of product(s) added to a backpack.

Consider that each GreenUP vehicle is required to have 3 backpack sprayers. One backpack is designated for broadleaf weed control and one backpack is designated for insect and disease. The third backpack is designated for either broadleaf weed control for a different grass type or possibly grassy weed control for turf types other than St. Augustine. Since we also need to control sedgeweeds, a fourth applicator is often necessary. For this reason, a low volume injector was added to all lawn care vehicles since 2010. An excellent use of this tanker is for sedgeweed control, but it is not limited to this purpose. More information regarding the tanker injector can be found in the GreenUP Protocol "Tanker Injector Applications". Calibration of the injector according to the protocol is imperative.

The Lawn Specialist must make all post-emergent weed control applications as outlined above. The amount of weed control material applied remains the same regardless of the quantity or type of weeds present. Turf injury will result from over application.
More information on post-emergent weed control applications may be found in the "Liquid Spot Treatment" protocol.

Difficult-to-control Weeds and Proper Follow-ups

Some weeds are more difficult to control than others and may require follow-up treatments. If a problem controlling weeds occurs, complete the following steps:

- Ensure enough time has been given for control to be achieved. Two to four weeks may be needed for complete control to be achieved. Do not retreat with the slurry containing Manor/Blade (SBM2) before four weeks have passed.
- Ensure that all calibration components are being carried out properly and that the slurry is being mixed properly.
- Re-treat using the proper weed control material. ***Do not apply herbicides to stressed turfgrass areas***.
- *If after 2 consecutive proper backpack applications, significant decline of target weed(s) has not occurred, contact the GreenUP Technical Department for further guidance.*

Some of the more difficult-to-control weeds are Dollarweed, Beggarweed, Spurge, Virginia Buttonweed, and Chamberbitter.

Table 2: Herbicide chemistry, mode of action, and symptomology.

Herbicide	Chemical Class	Mode of Action	Symptoms	Damage Timeline
Quicksilver (Contact)	Not assigned	Protox inhibitor – lipid peroxidation (damages cell walls)	Necrosis	24 hours
Blade (Manor) (Systemic)	Sulfonylurea	Meristemic inhibitor (Kills plant from growing point)	Yellowing/necrosis	Slowly kills 1 – 4 weeks. Stunting, shortened internodes, Red to purple color, Absorbed by roots and shoots. Chlorosis and necrosis progresses from growing point to rest of plant
Dismiss (Sulfentrazone) (Contact with soil activity)	Aryl Triazolinone	Photosynthesis inhibitor	Yellowing, necrosis, and death.	2 days to 1 week
0-0-7 + Atrazine (Systemic)	Triazine	Photosynthesis Inhibitor	Interveinal chlorosis, then desiccation. Leaves die in inward direction from margins and tips. Yellowing/necrosis of lower outer leaves first	Soil (primary) and foliar activity. Speed of activity depends on growth rate of plant. 2 – 6 weeks. Residual control up to 3 months.
Three-Way Ester MCPA Triclopyr Dicamba	Auxins Phenoyaliphatic acid Picolinic Acid Benzoic Acid	Growth Regulators	Bending and twisting of leaves and stems. Later, root formation on stems, misshapen leaves, and malformed roots.	Immediate to several weeks.
Drive (Quinclorac) (Systemic)	Auxin	Not fully understood	Stunting, chlorosis, followed by reddening, necrosis and death.	1 – 3 weeks
Basagran (Bentazon) (Contact)	Benzothiadiozole	Photosynthesis Inhibitor	Yellowing/necrosis	2 – 7 days
Sethoxydim (Systemic)	Cyclohexanedione	Lipid biosynthesis inhibitor	Reddening, tip burn, dieback.	1 – 3 weeks
Glyphosate (Systemic)		Amino Acid Inhibitor	Yellowing of new growth and death.	Several days to weeks
PreM (pendamethalin)	Dinitroailine	Root and shoot inhibitor (interferes with cell division & mitosis)	Sparse, club-shaped roots.	Soil activity only (pre-emergent). Residual control up to 3 months.

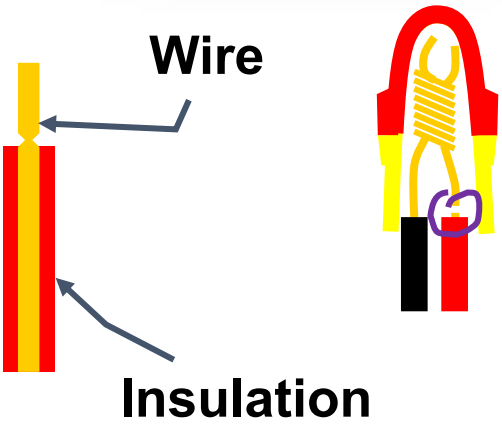
WEEKLY TRAINING SESSION

Steps To A Proper Wire Splice

Steps to a proper wire splice



- Use wire strippers not side cutters, pocket knives, or teeth.
- The splice is the weakest part of the circuit.
- Avoid poor workmanship



- Poor splicing techniques
- If a wire is damaged from not using the proper splicing techniques, it could come apart inside the wire nut, and not be seen



- Strip at least 1.5” of insulation off of each wire



- Place them at a 90 degree angle to each other and twist



- It is not necessary to twist all the way to the end

WEEKLY TRAINING SESSION

Steps To A Proper Wire Splice

- Cut the twisted conductors to fit the wire nut
  - Twist on the wire nut.



  - It is tight enough when
    The insulation begins to also twist.

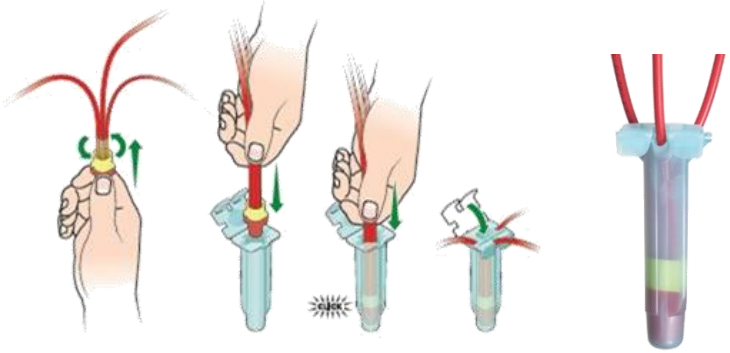


- Stranded soleniod wire onto the solid core 14 guage wire. Wrap in same direction as wire nut twists on.



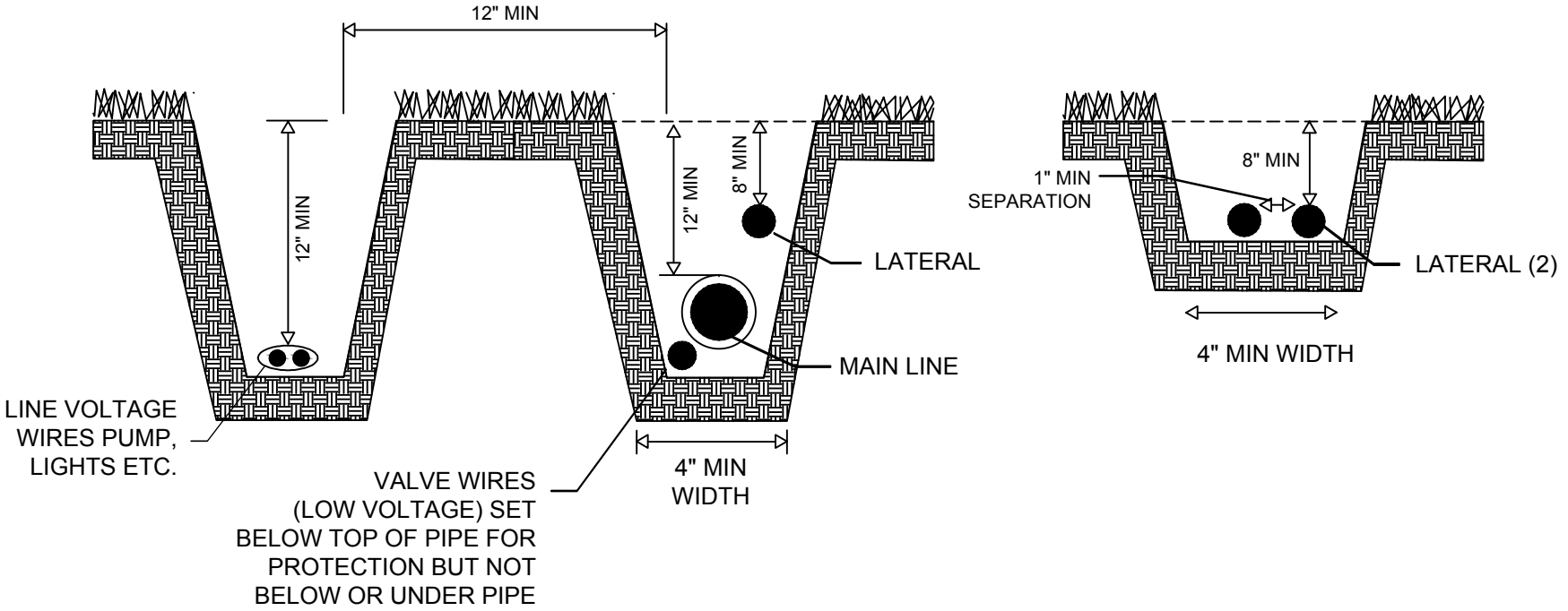


- Flip open the lid and insert wire nut Into tube
- Push through the gel to the bottom of the tube. Try to pull it out to make sure the nut secured in place
- Separate the wires into the premade Slots, close and lock the tube cap Into place.



INSTALLATION NOTES

1. 12" MINIMUM COVER OVER THE TOP OF ALL MAINLINE.
2. 8" MINIMUM COVER OVER THE TOP OF ALL LATERALS.
3. 12" MINIMUM SEPARATION BETWEEN ANY PIPE AND LINE VOLTAGE WIRES.
4. MINIMUM 18" OF COVER OVER ALL LIVE VOLTAGE WIRE.
5. HOLD DOWN PIPE WHEN BACK FILLLING TO USE THE FULL DEPTH OF TRENCH.



T1 Trenching for Pipe and Wire