Integrated Pest Management
Plan for the
University of North Florida Landscape

INTRODUCTION

Pests are populations of living organism (animals, plants, or microorganism) that damage or interfere with desirable plants or aesthetics, or impact human or ecosystem health. The goal of this integrated pest management plan is to describe University practices to prevent pest occurrence as well as to promote Integrated Pest Management methods in response to the pest occurrences that do arise.

Integrated Pest Management (IPM) is an approach that establishes a sustainable means of managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health and environmental risks to avoid the non-target effects of pesticide applications that can be damaging to the environment and human health.

The University of North Florida's (UNF) Landscape and Grounds Department has adopted this Integrated Pest Management Plan for the landscape and Botanical Garden managed by UNF. The plan outlines procedures to be followed to reduce pest infestations by evaluating the biological features contributing to an infestation, thus improving ecosystem health. The plan is designed to comply with policies and regulations published by the Florida Department of Agriculture.

The plan addresses a four-tiered approach to pest management: pest identification, monitoring for pest; intervention action when appropriate (action thresholds); and appropriate cultural, mechanical, or biological controls. Objectives of this IPM plan include:

- Elimination of significant threats caused by pests
- Prevention of loss or damage of plant material by pests.
- Protection of environmental quality.
- Continual evaluation of the strategies used to access overall cost, efficacy, and value to identify what worked well or needs to be improved.

This IPM plan will be stored in the office of the IPM Coordinator.

IPM COORDINATOR

The Physical Facilities Assistant Director of Landscape and Grounds or designee shall be the IPM Coordinator and be responsible to implement the IPM plan and to coordinate pest management-related communications between administrators, staff, and public.

The IPM Coordinator shall designate an employee to serve as the IPM Site Coordinator for the UNF landscape.

IPM COMMITTEE

The Department of Landscape and Grounds (LG) will maintain an IPM committee with responsibility for annual review of the IPM program, serving as a liaison for LG staff, and for assisting the IPM Site Coordinator in resolving pest-related issues. The committee will address IPM issues as needed and will meet at least annually to update the plan. Minutes will be taken of committee meetings and kept on file by the IPM Coordinator. Membership will include representation from each landscape team and the spray technicians.

POSTING OF PESTICIDE APPLICATIONS

LG pest control technicians shall provide notification in accordance with law, including posting a pest application flag in the treatment area to avoid human exposure. Best Management Practices will be used to avoid discharge into storm water and overspray onto hardscape.

RECORD KEEPING

Records of monitoring and treatment needs, along with spray logs (see Appendix A), will be maintained by the IPM Site Coordinator.

The chemical and fertilizer storage areas will be inspected weekly by employees to ensure organization, proper labeling, and cleanliness. Pads and or secondary containment devices will be used on shelves to prevent corrosion and spill prevention.

Chemical and fertilizer reports will be updated annually following the requirements of Environmental Health and Safety.

Spray licensure can be validated online at http://app1.flaes.org/ceu/PersonSearch.asp.

TRAINING

All LG staff will be provided with training on this IPM program and annual update training. Training will include the reasoning for the IPM program and specific elements including use of the pest identification and plan updates.

Additionally, designated staff including the IPM Coordinator, IPM Site Coordinators and those who conduct regular inspections will receive advanced training on identifying pest infestations and pest-conducive conditions. This training will improve the ability to oversee and comply with LG's IPM plan.

GENERAL IPM STRATEGIES

Pest management strategies may include education, exclusion, sanitation, maintenance, biological and mechanical controls, and pest-appropriate pesticides and herbicides (see Appendix D).

An Integrated Pest Management decision shall consist of the following steps:

1. Identify pest species.

2. Estimate pest populations and compare to established action thresholds.
3. Select the appropriate management tactics based on current on-site information.
4. Assess effectiveness of pest management.
5. Keep appropriate records.

Decisions concerning whether pesticides should be applied in each situation will be based on a review of all available options. Efforts will be made to avoid the use of pesticides by selection of pest-resistant plant materials, and appropriate horticultural practices.

When it is determined that a pesticide must be used in order to meet pest management objectives, the least-hazardous material, adequate for the job, will be chosen.

LG's IPM consists of a process to balance the use of cultural, biological, and chemical procedures that are environmentally compatible and economically feasible to reduce pest populations to tolerable levels. Prevention strategies are used to reduce pest infestations from nurseries, and inappropriate stressors caused by biological features. Monitoring involves regular checking of an area, early detection and proper identification of pests, and identification of the effectiveness of biological control agents. Assessment involves determining the potential for pest populations to reach an economic threshold or an intolerable level. Appropriate action involves using the beneficial aspects of integrated pest management to prevent loss or damage. Proper identification of a pest is important because certain management practices will control only one species or the other. Correct identification enables us to manage the real source of the problem and avoid treating only the symptoms.

All Pesticide Applicators must have a "Limited Lawn and Ornamental" license, governed by Florida Statute 482. Only authorized pesticide handlers or supervisors should be in the mixing and loading area. All handlers should be wearing proper personal protective equipment (PPE). No other persons, and no animals, should be present. Spills need to be reported immediately to Environmental Health and Safety for guidance on clean up procedures.

If a contractor is needed to help remove identified and unwanted pests, they must abide by LG's IPM plan, or request an exemption. Additionally, new plant installations and horticultural practices performed by contractors must also follow the strategies presented in this plan.

LG STAFF ROLES

LG administration will provide support to assist the IPM Site Coordinator in maintaining an IPM program that relies on minimal pesticide or herbicide use. Such support will include efforts to promptly address any structural, horticultural, or sanitation changes recommended by the coordinator to reduce or prevent pest problems.

All LG staff are expected to scout and report pest infestations to the IPM Site Coordinator. The IPM Site Coordinator, along with spray technician staff, will determine treatment based on established action thresholds, and will record action taken on the IPM board. Appendix B documents the work-flow process expected for successful IPM compliance.

PREVENTION

Prevention strategies are used to reduce the chance of pest infestations. LG will use these best

management practices to reduce pest infestation chances:

1. New Plant Material/Installation Practices
    a. Right plant, right place
    b. Understand soil PH/ nutrient availability and plant appropriately per findings
    c. Inspection of nursery stock upon arrival to campus to ensure no pest and good plant quality
    d. Plant selection will take biological factors into consideration including soil pH, exposure to light, and tolerance to conditions (right plant/right place)
2. Mowing
    a. Mowers will use alternative patterns to reduce compaction and ruts caused by repetitive mowing patterns.
    b. Mowers will avoid mowing over turf pest, if easily identified, and will report concerns immediately so appropriate action can be taken. This will reduce the spreading of nuisance pest.
    c. Mowers should be rinsed and cleaned between sites to avoid cross contamination and dedicated mowers will be used for specific turf grass species only.
3. Horticultural Practices
    a. Staff will sanitize equipment between beds, or after use in an area with an identified pest.
    b. Staff are encouraged to remain on hardscape while driving between workstations to avoid unwanted soil compaction and plant stress.
    c. Along walkways, staff should evaluate beds and hand pull weeds prior to requesting pre or post emergent use. Exceptions to this rule are when beds are overly infested or infested with highly invasive species such as torpedo grass.
    d. Mulch beds properly to reduce weeds
    e. Prune and trim ornamentals properly to avoid excess trimming and stress to plant material.
4. Fertilizing
    a. While nutrients derived from fertilizers, both chemical and organic, can be detrimental to the surface water quality, limited fertilizer use will help promote healthy turf. Reduction in weeds allows for reduced use of herbicide, which in turn reduces the potential contamination in runoff and surface water. When practicable, organic fertilizers may be used Fertilizer should be applied no later than October. Fertilizing will occur no more than three (3) times a year and will take existing soil chemistry into account when possible. Appendix C documents fertilizing schedule and N-P-K recommendations for each application. Fertilizer applications will not exceed 2 1/2 pounds of nitrogen per 1000 square feet per year unless soil sample analysis reports indicate a necessity to further amend the soil.
5. Pesticides
    a. LG uses only the safest, lowest toxicity products possible for effective control of pests. Pesticide use will comply with all local, state, and federal regulations. No "restricted use" or Red List pesticides will be used. LG is committed to protecting pollinators, and therefore mandates there will be no use of **Neonicotinoids** near any pollinator beds. Synthetic pesticides are used as required and only at specific times in a pest's life cycle. When possible, LG staff will strive to use pesticide

groups that are derived from plants or naturally occurring substances (e.g. pyrethrum, insect hormone analogues, or insect growth regulations). Surfactants will be used to help maximize the effectiveness of each appropriate pesticide treatment and to minimize the necessity of retreatment. The LG staff will primarily rely on spot treatment of pesticides. Broadcast treatments will only be used when infestation reaches extreme levels. LG staff will exclusively use low-volume spray equipment to reduce overall pesticide use and to minimize environmental impact.

Definitions:

Neonicotinoids: Neonicotinoids are a class of neuro-active insecticides that can negatively affect predatory insect populations.

Surfactants: Surfactants are a form of adjuvant that increase the efficacy and spreadability of many herbicides and pesticides.

Red List: The United States Environmental Protection Agency (EPA) rates all pesticides and assigns labeling to enable enforcement of pesticide requirements. The red list contains all of the worst in class materials that can be used for different applications. In this instance Red List is the most harmful class of pesticides as rated by the EPA.

Green List: The Green List contains all of the best in class materials that can be used for different applications. In this instance Green List is the least harmful class of pesticides as rated by the EPA.

Yellow List: The Yellow List contains materials that have some negative harmful effects, but not negative enough to be placed within the Red List. In this instance, the Yellow List is a class of somewhat harmful pesticides as rated by the EPA.

Plant Sanitation: Removal of diseased plants, and cleaning pruning shears to prevent spread of infections

Appendix A – Infestation Report Form; Spray Log

Appendix B - IPM work-flow

Appendix C – Fertilizing SOP

Appendix D – Pest Identification, Thresholds, and Actions

TURF IPM FIELD REPORT FORM

Location: _____

Date: _____

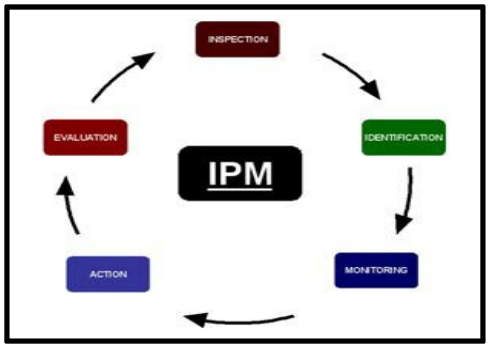
Site	Weeds Species	Weeds No. or %	Weeds Treatment	Diseases Species	Diseases No. or %	Diseases Treatment	Insects Species	Insects No. or %	Insects Treatment
Lawn									
Trees									
Ornamentals									
Flower Beds									
Notes									

UNF Spray Log

Date	Chemical	Area	Pest	Rate	Amount Product	Amount Used	Wind Speed	Temp	Hrs Spent

IPM Workflow Management Example (LG IPM Committee)

Pest knowledge/Database
Spray techs
Grounds personnel



Scouting/Monitoring
Reporting

Spray Team
Diagnose Problems
(evaluation)

Select corrective action(s) based on:

- IPM Guidelines
- Pest knowledge
- Historical Data
- Pest life cycles
- Problem Diagnosis
- Factors favoring pest development
- Predetermined pest threshold

Take appropriate corrective action/treatment

Evaluate and record results for future management decisions/ build database

LG Standard Operating Procedure for Pesticides, Herbicides and Fertilizers

Knowledge

- This SOP is in addition to LG's Integrated Pest Management Plan. Familiarity with this plan is essential to this SOP.
- Integrated Pest Management:
    - The University of North Florida's Integrated Pest Management consists of a process to balance the use of cultural, biological, and chemical procedures that are environmentally compatible and economically feasible to reduce pest populations to tolerable levels. Monitoring involves regular checking of an area, early detection and proper identification of pests, and identification of the effectiveness of biological control agents. Assessment involves determining the potential for pest populations to reach an economic threshold or an intolerable level. Appropriate action involves using the beneficial aspects of integrated pest management to prevent loss or damage. Proper identification of a pest is important because certain management practices will control only one species or the other. Correct identification enables us to manage the real source of the problem and avoid treating only the symptoms.
- Pesticides, Herbicides, and Fertilizer Applications:
    - Applicators must mix, apply, and clean tanks per label instructions.

Safety

All Pesticide Applicators must have a 482 license. Only authorized pesticide handlers or supervisors should be in the mixing and loading area. All handlers should be wearing proper personal protective equipment (PPE). No other persons, and no animals, should be present. Spills need to be reported immediately to Environmental Health and Safety for guidance on clean up procedures.

Proper Outcome

Turf and beds have good fertility, are not showing signs of nutrient stress or disorders, and have little weeds and pest.

Steps for mixing

- Read the pesticide label entirely and follow all instructions in accordance with the label.
- Ensure proper PPE is being used during mixing.
- Begin by filling the spray tank 1/3 to 1/2 full of clean water. NEVER put the chemical in first and then add the required quantity of chemical, then top with water. Start the agitator and continue agitating while filling the tanks.
- Measure accurately. **Don't guess**. Small errors in measuring can cause large errors in application rates. Mix only the amount you plan to use immediately
- Rinse product containers as soon as they are empty. When residues dry, they are difficult to remove. Triple rinse containers which held liquids and single rinse bags. Then puncture empty clean container prior to disposal.
- Rinse measuring cups and mixing equipment. Pour all rinse water into your sprayer.
    - Replace container caps and close bags. Return them to the storage area.
- Wash your gloved hands before getting onto the Gator, as your hands and forearms will have received the most exposure.

Application Schedules and Products Used

- **Application Schedules:** The table below outlines the schedules for pesticide, herbicide, and fertilizers:
- Turf applications include all irrigated turf. These applications will not be completed around pond buffers and non-irrigated turf, such as the frontages.

Beds	Turf
Spring (March, May)	
Targeted post-emergent herbicide on weeds.	Broadcast post-emergent mixed with pre-emergent herbicide.
Apply a pre-emergent herbicide and water in to activate (if needed).	March: Apply "complete" granular fertilizer (all species)
Check all plants for mites and insects and spray accordingly.	May: Apply slow-release nitrogen and iron fertilizer (all species)
March: Apply granular fertilizer	
SUMMER (June)	
Targeted post-emergent herbicide on weeds.	Targeted post-emergent herbicide on weeds.
Apply a pre-emergent herbicide and water in to activate (if needed).	Broadcast pre-emergent herbicide.
Check all plants for pest and fungus, and spray accordingly.	Check turf for pest and fungus, and spray accordingly.
Apply "complete" granular fertilizer (only Bermuda species)	
FALL (September)	
Targeted post-emergent herbicide on weeds.	Targeted post-emergent herbicide on weeds.
Apply a pre-emergent herbicide and water in to activate (if needed).	Broadcast pre-emergent herbicide.
Check all plants for pest and fungus, and spray accordingly.	Check turf for pest and fungus, and spray accordingly.
Apply granular fertilizer	Apply "complete" granular fertilizer (all species)
WINTER (December)	
Targeted post-emergent herbicide on weeds.	Targeted post-emergent herbicide on weeds
Apply a pre-emergent herbicide and water in to activate (if needed).	Broadcast pre-emergent herbicide.
Check all plants for pest and fungus, and spray accordingly.	Check turf for pest and fungus, and spray accordingly.

Fertilizer Details:

The table below outlines the schedules and products for fertilizers:

Beds	**Turf**	**Palm Trees**
SPRING (April)		
60% Synthetic 14-14-14/minors/50% Non-synthetic Sludge filler (up to 2 pounds/1000 square feet); Osmocote slow release	70% Synthetic 15-0-15/minors/ 40% Non-synthetic sludge filler/ 0.38% pre-emergent; (300lbs/acre);	Palm Fertilizer: 8-2-12 + 4% Mg, with micronutrients, Synthetic (0.5 to 1 pound to 1inch trunk dia.)
SUMMER (June)		
None	Non-synthetic Sludge filler (300lbs/acre) Synthetic /Liquid Fertilizer: 50% SRN 18-3-6/ 6% Fe (Bermuda; up to 2 gallons/50gal/water)	Palm Fertilizer: 8-2-12 + 4% Mg, with micronutrients, Synthetic (0.5 to 1 pound to 1inch trunk dia.)
FALL (September)		
60% Synthetic 14-14-14/minors/50% Non-synthetic Sludge filler (up to 2 pounds/1000 square feet)	70% Synthetic 15-0-15/minors/ 40% Non-synthetic sludge filler/ 0.38% pre-emergent; (250lbs./acre);	Palm Fertilizer: 8-2-12 + 4% Mg, with micronutrients, Synthetic (0.5 to 1 pound to 1inch trunk dia.)
WINTER (December)		
None	None	None

Products Used

Pre-emergent herbicides commonly used in landscape beds.

Trade Name	Active Ingredients	Comments
Barricade 4FL, Quail-Pro 4-FL, or Regalkade 0.5G	prodiamine	Fairly broad spectrum weed control including annual grasses, spurge, chickweed, henbit, oxalis and others. Granule (Regalkade G) is much safer than the spray (Barricade). Only a few bedding plants are on the label.
Pre-M	pendimethalin	Fairly broad spectrum weed control including annual grasses, spurge, chickweed, henbit, oxalis and others. Granular formulation much safer than spray. Used on turf. Avoid using within the drip line of trees
Freehand	Dimethenamid-P and pendimethalin	Broad spectrum preemergence weed control for a broad range of plants and site conditions. The granular formulation is much safer than the spray. Avoid using within the drip line of trees
Specticide G	Indaziflam	Broad spectrum preemergence weed control for a broad range of plants and site conditions. May damage sensitive plants if granules remain in contact with the plant. The granular formulation is much safer than the spray. Avoid using within the drip line of trees.
Ronstar	Oxydiazon	Ronstar herbicide controls weeds through shoots, not roots. Ronstar doesn't harm healthy turf.

Post-emergent herbicides commonly used in landscape beds.

Trade Name	Active Ingredients	Comments
Fusilade II	fluazifop-P	This is a post-emergent herbicide for annual grass and perennial weed control.
Lontrel	clopyralid	This post-emergent herbicide controls certain broadleaf weeds in turf and ornamentals grasses in nurseries and landscapes.
Image	imazaquin	This product is a pre-emergent or post-emergent herbicide for annual grasses, broadleaf weeds, and sedges. Avoid using within the drip line of trees.
Certainty	Sulfosulfuron	This product is a pre-emergent or post-emergent herbicide for annual grasses, broadleaf weeds, and sedges in turf grass area. Avoid using within the drip line of trees.
Panoramic 2SL	Ammonium Salt of Imazapic	Panoramic 2SL Herbicide provides long-term suppression of common roadside grasses like tall fescue, Bahiagrass and smooth bromegrass – as well as invasive/noxious species like cheatgrass and leafy spurge. Panoramic 2SL Herbicide also helps release and establish native grasses and wildflowers. reduces mowing costs by regulating smooth bromegrass growth and bromegrass seedhead suppression.
Atrazine 20-0-20	Atrazine	Prost-emergent and fertilizer used for turf. Due to documented adverse effects on animals and humans. This product is being removed from our inventory and use.
Avenue South	Penoxsulam, sulfentrazone, 2,4,d, Dicamba	Broadleaf Herbicide for Turfgrass is formulated to deliver fast broadleaf control in the South's warm weather and sensitive southern grasses – including Floratam. Do not use near any pollinator beds or water bodies.

Insecticides commonly used in landscape beds.

Trade Name	Active Ingredients	Comments
Sevin	Carbaryl	This broad-spectrum insecticide kills as a contact and stomach poison. Carbaryl is used to manage armyworms, leaf-feeding beetles, caterpillars, centipedes, cutworms, loopers, millipedes, pillbugs and sowbugs.
Advion Fire Ant Bait	Indoxacarb	For control of imported fire ants, bigheaded ants, pavement ants, and turfgrass ants on lawns, recreational areas, golf courses and fenced pastures grazed by horses and other companion animals.
Orthene Turf & Ornamental	Acephate	organophosphate: It is labeled for many insects in greenhouses and nurseries, including fire ants
Temp SC	Cyfluthrin	pyrethroid ester: This is broadly labeled for insects in greenhouses, nurseries, and landscapes.
Avalon	Bifenthrin	Avalon Insecticide controls a wide spectrum of insects and mites on trees, shrubs, foliage plants, non-bearing fruit and nut trees, and flowers.
Tenguard	Permethrin	Has a very broad label, killing many types of insects (over 75 listed insects). It is known for an effective bark beetle control product. To be applied in turf only and avoid pollinator beds

Fungicide commonly used in landscape beds.

Trade Name	Active Ingredients	Comments
Daconil ZN	chlorothalonil	This fungicide controls powdery mildew, black spot, and rust, to name a few. Great for use on ornamentals, fruits, and vegetables.
Fore 80WP or Manzate T&O	mancozeb	For control of imported fire ants, bigheaded ants, pavement ants, and turfgrass ants on lawns, recreational areas, golf courses and fenced pastures grazed by horses and other companion animals.
Subdue	medenoxam	This product offers superior control of Pythium blight.
Banner Maxx	Propiconazole	a systemic fungicide for use on turfgrasses for the control of listed diseases, including dollar spot, brown patch, and rust. Also controls numerous diseases on ornamentals and other landscape and nursery plantings. It controls powdery mildews, rusts, leaf spots, scabs, and blights.

Image of Pest	Name	Key Identification	Biological Conditions	Threshold (when to treat)	Treatment Options		
					Bio-Control	Chemical	Organic
	Amillaria	The top of the infected tree slows down in growth, dieback occurs on the branches and roots rot. Trees may appear to die quickly. White fans of fungal growth are found when the bark is peeled off the infected tree trunks near the soil line. Conifers have abundant resin flow from the trunk at the soil line.	Wet	When identified	using antagonistic fungi to preemptively colonize or to eliminate Armillaria species in the wood.	Fumigants, such as chloropicrin, carbon disulphide, and methyl bromide are sometimes used in orchard crops to help eradicate inoculum from soil,	
	Dollar Spot	Broadleaf, round silver dollar shaped leaves with scalloped edges with the stem in the middle of the leaf	Wet	Level 1 =whenever weeds approach 10 percent in any 100 square foot area Level 2 = whenever weeds approach 15 percent in any 100 square foot area	Reduce water and promote turf growth.	Fore Daconil	M-Pede Fertilize
	Frizzle Top	the leaves will become yellow, and tips fall off. The entire frond is eventually affected and will distort and curl. In some species the leaf tips fall off and leave the plant looking scorched	Dry	Drench Mg Immediately			Mg drench 3 times per year
	Gandoderma	White conch at base of Palm	Mesic Medronical Damage	Immediately	Remove		
	Ganoderma Zonatum	General decline, wilting and discoloration of leaves -Bacidocarp formation -Internal rot	Wet Unknown	Once bacidorcarp forms palm should be removed	Remove Palm. Do not replant at same site: spores in soil or fumigate soil		

Image of Pest	Name	Key Identification	Biological Conditions	Threshold (when to treat)	Treatment Options		
					Bio-Control	Chemical	Organic
	Laurel Wilt Fungus: Raffaelea Lauricola	Wilted stems and leaves -Dark streaking in wood -Discoloration	Mesic		No treatment, some preventive options, like sanitation, trap-out attract and kill macro-infusion with fungicide		
	Mushroom/Toadstool	The fleshy spore -bearing fruiting body of fungus, typically produced above ground or on its food.	Wet (Damp and Humid Region)	If it is too dry they loose water and desiccate. If it is too wet and humid they choke off	Reduce Water, Fertilize, Removal, Most lawn mushrooms do not harm your lawn nor cause any damage. They are simply, and quietly, decomposing organic matter and releasing nutrients that are then available for plant growth back into the soil		
	Powdery Mildew	Fungi Kingdom (Hyphae-Conidia) White powdery look on leaves. Requires a microscope for specific Identification.	Powdery mildew thrives in temperatures between 60 and 80 degrees. Dry, shady conditions are ideal, as are areas with poor air circulation	Level 1 as soon as spotted. As soon as needed to improve aesthetics	milk/water (1-10) ratio Contact fungicide (Neem oil)		Organic Neem oil is a broad-spectrum fungicide
	Rhizoctonia Fungus (Brown Patch)	Gray purplish bordered ring "Frogeye" appearance - Appearance: white mycelium early A.M. tan to brown lesions on leaf blades.	Extended periods of high humidity and temperature	First sign of symptoms		Daconil Fore	M-Pede
	Take All Patch	Yellowish leaves, thinning turf, 3'-20' patches dead and dying roots, black.	Wet Moderate Temperature Spring, Winter, Fall	Immediately			Organic Neem oil

Insects

Image of Pest	Name	Key Identification	Biological Conditions	Threshold (when to treat)	Treatment Options		
					Bio-Control	Chemical	Organic
	Fire Ants	Three body parts with two elbowed antennae and six legs	Mesic	Highly trafficked areas with more than **1** active mound Low traffic areas with more than 15 mounds per acre	**Phorid Flies**	Orthene Fire Ant Killer	• 4 cups water • 4 cups alcohol • 2 cups liquid dish soap
	Aphids	Also known as plant lice. Small sap sucking insects -look for cluster of little bugs on new growth and flower buds as well as on the curled and twisted leaves.	Mesic	250/per plant	**LaceBugs**	acephate--bifenthrin--beta-cyfluthrin estenvalerate--permethrin--lambda-cyhalothrin	**Dishwashing Detergent**
	Azalea Worm	The partly grown larva (caterpillar) is approximately 10 mm long and reddish to brownish black with white and yellow stripes. The mature caterpillar is about 50 mm long and black with eight near-white, longitudinal, broken stripes; the head and legs are mahogany red	Mesic	10/per plant	caterpillars can be removed by hand	acephate--bifenthrin--beta-cyfluthrin estenvalerate--permethrin--lambda-cyhalothrin	Horticultural oil Organicide Azatrol
	Armyworms, Cutworms	Mature larvae reach 1-1/2 to 2.0 inches in length. Larvae are a dull yellow to gray with stripes running lengthwise along the body	Mesic	5/sq.yd	Bacillus thuringiensis	acephate--bifenthrin--beta-cyfluthrin estenvalerate--permethrin--lambda-cyhalothrin	Horticultural oil Organicide Azatrol
	Chinch Bug	Tiny pest with a triangular head and bright red eyes. Adult chinch bugs have a black and white pattern on the back in the shape of an X and are about the size of a sesame seed (1/5"long). Expanded areas of dead or stunted grass surrounded by a halo of yellowing dying grass is an indication of chinch bugs. Sometimes confused with drought -large numbers of the insect is the best evidence of chinch bugs.	Dry	Level 1 Areas: 15-20 chinch bugs sq./ft. Visual thresholds: more than 10 individuals found in a 60-second search of 1 sq./ft. and 20-30 sq./ft. in a detailed search.	Biological Controls (natural enemies other insects) Insecticides and good cultural practices.	acephate--bifenthrin--beta-cyfluthrin estenvalerate--permethrin--lambda-cyhalothrin	Horticultural oil Organicide Azatrol
	Cottony Cushion Scale	Females -Rusty-red with black legs and antennae with an elongated, fluted white cottony egg sac. Males -Slender, reddish-purple with two blue metallic wings	Warm Unknown	During Crawler Stage		Zylam Safari Imidicloprid	Horticultural oil Organicide Azatrol

	Asian Cylad Scale	Female -Oval waxy covering. Male Elongated armored covering -Snowy look on the entire plant	Mesic	Immediately	Systemic insecticides -Combination Horticultural oil and systemic-merit	Zylam Safari Imidicloprid	Horticultural oil Organicide Azatrol
	Hunting BillBug "Zoysia BillBug"	6-11 MM in length weevil-like with short, broad, recurved snout. Gray to Black on pronotum	Mesic (impacted by drought)	When white grubs (larvae) are found in soil. When adults found using "pitfall traps". If an average of ten billbugs is found per square foot, apply an insecticide.	Bio control products	Insecticides: Talstar, Deltagard, Merit, Arena, Meridian, Aloft and Allectus.	M-Pede
	Lace Bugs	Body is 1/8" to 1'4" long, flattened, square shaped -Lace like wings folded over -brown/black young/spines young	Mesic Moderate Temperature	Once an infestation is noticed, however, it is recommended that lace bugs be controlled for the health and visual appearance of the plant/tree.	move plant -contact insecticides-no lasting damage -promote health plants.	Zylam Safari Imidicloprid	Horticultural oil Organicide Azatrol
	Mealybugs	Most adult female mealybugs are wingless, soft-bodied, grayish insects about 0.05 to 0.2 inch long.	Mesic	Greater than or equal to 10% infestation in entire bed	Wasp Mealy Bug Destroyer	Safari Acephate Merit	
	Molecricket	The common name is derived from the insect's molelike appearance and underground habits. The mole cricket has forelegs modified for shoveling, a cylindrical body, a pointed head, and a velvety coat of hairlike setae. It burrows into moist soil to depths of 15 to 20 cm (6 to 8 inches).	Mesic	**5 per sq. yard**	The Larra Wasp	Insecticides: Talstar, Deltagard, Merit, Arena, Meridian, Aloft and Allectus	
	Sod Webworm	Young pupae are approximately ½ inch long, pale yellow, and eventually turn brown prior to adult emergence	Eggs hatch in about 7 days during hot weather & larvae feed for another 4-7 weeks.	15 per sq. yard	Bio control products	Insecticides: Talstar, Deltagard, Merit, Arena, Meridian, Aloft and Allectus.	
	White Fly (Florida)	Egg spirals on the underside of leaves -Presence of heavy white waxy material -presence of honeydew around the whitefly infested area -Black sooty mold formation -leaf damage and early leaf drop.	Unknown	Level 1 areas Less than 5% infestation. Level 2 areas -5% or more infestation	Biological Controls (natural enemies other insects) Insecticides as a last resort, this could kill natural enemies of the whitefly. Early detection -high pressure water application to wash leaves.	Insecticides: Talstar, Deltagard, Merit, Arena, Meridian, Aloft and Allectus.	Horticultural oil Organicide Azatrol

Weeds

Image of Pest	Name	Key Identification	Biological Conditions	Threshold (when to treat)	Treatment Options		
					Bio-Control	Chemical	Organic
	Air Potato	Heart Shaped leaves, all leaf veins arise from leaf base. Alternate leaves.	Wet	Immediately remove and dispose of all plant parts	Air Potato Beetles	Round-up and Garlon	Scythe
	Balsam Apple	This herbaceous, tendril-bearing vine grows to 5 m. It bears simple, alternate leaves 4–12 cm across, with three to seven deeply separated lobes. Each plant bears separate yellow male and female flowers.	Dry	Immediately	manual weeding	Round-up and Garlon	Scythe
	Clover	3 leaves -flowers/balls with spiklets pink, white or yellow	Mesic Well Drained	Level 1 greater than or equal to 5%. Level 2 greater than or equal to 10%	Pre-emergent, promote healthy grass growth.	Chemical control: Atrazine, 3 Way, Imazaquin Speedzone	
	Dollar Weed	Broadleaf, round silver dollar shaped leaves with scalloped edges with the stem in the middle of the leaf	Wet	Level 1 =whenever weeds approach 10 percent in any 100 square foot area Level 2 = whenever weeds approach 15 percent in any 100 square foot area	Reduce water and promote turf growth	Chemical control: Atrazine, 3 Way, Imazaquin Lontrel	
	Florida Betony	A perennial weed that has a square stem with opposite leaves. Flowers are usually pink and have the classic mint-like structure	Mesic A Winter Weed	Level 1 =whenever weeds approach 5 percent in any 100 square foot area Level 2 = whenever weeds approach 10 percent in any 100 square foot area	manual weeding	2,4-D + MCPP + dicamba	

	Goose Grass	Dark green, coarse grass, usually flat. Most notable: lower leaf stems are white near the base	Goosegrass does well in dry, compacted soil	Because goosegrass and its seedheads are low and often escape mowing, you will want to remove them before they get too well established	Mechanical or manual removal is not recommended due to rapid reproduction of weed.	Dismiss Revovler Illoxan	Salt
	Matchweed	Matt forming perennial weed with opposing leaves on harry branching stems -Flowers are purple or white and flower heads resemble the head of a match -Long wiry stems.	Wet	Level 1 =whenever weeds approach 10 percent in any 100 square foot area Level 2 = whenever weeds approach 15 percent in any 100 square foot area		Blindside 2-4-D Speedzone	Scythe
	Mistletoe	Leafy mistletoes have green stems with thick leaves that are nearly oval in shape. Plants often develop a rounded form up to 2 feet or more in diameter. The small, sticky, whitish berries are produced from October to December. Evergreen clumps of mistletoe are readily observed on deciduous trees in winter when leaves are off the trees.	Mesic	Anytime	Remove 12" back along tree limb	Kocide	
	Nutsedge	Waxy, light green or yellow-green leaves •Leaves have a very distinctive mid-rib •Upright, triangular stems	Wet	Level 1 =whenever weeds approach 5 percent in any 100 square foot area Level 2 = whenever weeds approach 10 percent in any 100 square foot area	Shading Hand Pulling	Manor Prosedge Basagran	
	Spurge	The leaves will be oval shaped and has a red spot in their center (which is why this spurge is called spotted spurge). The flowers on the plant will be small and pink. The entire plant has a hairy appearance.	Mesic (impacted by drought)	Level 1 =whenever weeds approach 5 percent in any 100 square foot area Level 2 = whenever weeds approach 10 percent in any 100 square foot area	As almost always the best method for controlling spurge weeds is preventative maintenance.	Blindside 2-4-D Speedzone	
	Skunk vine (Florida)	A perennial twining vine that grows from woody root stock -leave and stems have a disagreeable odor especially when crushed.	Unknown	Level 1 and Level 2 areas -immediate treatment	manual weeding	Round-up and Garlon	Scythe