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Integrated Pest Management Plan

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**Master's Project
Integrated Pest Management Plan
By Bryon Kacprzyk**

Introduction

This Integrated Pest Management Plan is to provide a framework through which pest management is defined and accomplished in northern Lowndes County in Georgia and focusing on Moody AFB. The plan identifies elements of the program to include health, environmental protection, safety, training, pest identification and pest management. This plan is to be used as a tool to reduce pesticide use, enhance environmental protection, and maximize the use of integrated pest management techniques. The overall objective of the program is to provide guidance for operating an effective pest management program. Integrated Pest Management (IPM) principles are stressed and application of the plan will help ensure compliance with laws and regulations.

Integrated Pest Management Principles

IPM involves the use of both chemical and non-chemical control techniques to prevent pests from exceeding an acceptable population or economic threshold. Emphasis is placed on minimizing the effect of ecological disruption. IPM is dependent on proper surveillance in order to establish a need for control as well as to monitor the effectiveness of the control measures applied.

There are four basic principles described and they are at the heart of IPM and will be used at Moody AFB to manage pests. These principles are descriptive of the guidance promoted by Air Force policies and regulations. *All pest management efforts will employ least toxic strategies that will obtain an effective level of control.*

Even though any one of the described control methods may solve a pest problem, many times, several methods are used concurrently, especially if long-term control is desired. For example, screens may be used to prevent mosquitoes from entering buildings, breeding areas may be filled or drained to eliminate larval habitat, and pesticides may be used to kill adult mosquitoes. Screens have the potential to protect people indoors but do little to keep people from being bitten outdoors. Larval control may eliminate mosquito breeding on the installation, but may not prevent adult insects from flying onto the installation from surrounding areas. Insecticides may kill most but not all of the flying mosquitoes. Although chemical control can be effective and economic however, non-chemical control methods that are typically designed to prevent infestations are primarily used. Non-chemical control methods may initially be more expensive than chemicals but may ultimately be more cost effective. Non-chemical control methods are typically non-toxic, thereby reducing the potential risk to human health and the environment. Non-chemical and chemical controls are described below.

Mechanical/Physical Control

Examples of this type of control include: caulking or filling voids to eliminate harborage, using mechanical traps, sticky traps, or glue boards, and using screens and other barriers to prevent entry into buildings. The majority of indoor nuisance pest problems encountered at Moody AFB can be prevented or solved by using mechanical control techniques.

Cultural Control

Strategies in this method involve altering environmental conditions to suppress or eliminate pests. Elimination of food and water for pests through good sanitary practices is the most important cultural method employed under this plan. General cleanliness in buildings, break rooms, storage areas, etc., may prevent pest populations from becoming established or from increasing beyond a certain size.

Biological Control

This control strategy uses predators, parasites or disease organisms to control pest populations. Sterile flies may be released to lower reproduction. Biological control may be effective in and of itself, but is often used in conjunction with other types of control.

Chemical Control

At one time, chemical controls were considered to be the most effective control available, but with the issue of pest resistance, some pesticides have become ineffective. In recent years we have seen that the trend has been to use pesticides that have limited residual action. Since personal protection, special handling, and storage requirements are necessary with the use of pesticides, the overall cost of using chemical controls as the sole means of control can be quite expensive. Non-chemical control methods such as mechanical or cultural controls offer alternate solutions. If and when there is a need to use pesticides, priority is given to the use of non-restricted use pesticides. Non-restricted use pesticides are generally less toxic and their use has fewer environmental consequences than restricted-use pesticides.

Responsibilities

In order for a plan to work all that are part of the plan must know what they are asked or required to accomplish. I have narrowed the responsibilities down to the Pest Management Coordinator, Pest Management Personnel, facility personnel, Safety Officer and Occupational Health Manager

Pest Management Coordinator (PMC)

Implement and monitor the pest management plan. Coordinate pest management issues for all county and facility operations such as operations performed in supply warehouses, medical and safety offices. Ensure that pest surveillance and pest control operations incorporate IPM procedures.

Update the plan annually to ensure that all references, methods, and procedures are up to date and that effective management of all existing pests is included. Make any changes in pest

management requirements during annual revisions. Also, ensure that pest management records are complete and accurate including maintaining up to date records of all certified applicators.

Ensure that pesticide applications are consistent with the state requirements and follow all rules and regulations.

Pest Management Personnel

All pesticide applicators will meet all training and certification requirements set forth by the state of Georgia natural resources department. Pest management personnel will use IPM techniques to the maximum extent possible and control pests according to the provisions of this plan.

Operate in a manner that minimizes risk of contamination to the environment and minimizes risk to personnel. Inform supervisors about significant changes in pest management needs and requirements. Secure pest management supplies and equipment in a timely manner.

Maintain a good rapport with federal, state, county and city health and environmental officials. Maintain, store, and use all pest control materials and equipment in accordance with the manufacturer's directions.

Quality Assurance Evaluators (QAE)

Obtain QAE training and evaluate pest management operations to ensure specifications and quality standards are met. Inform PMC about specifications that require modification or improvements, any discrepancies in performance, and any action that may jeopardize health, safety, or the environment.

Facility Personnel

Required to apply good sanitary practices to prevent pest infestations using IPM procedures to the maximum extent possible. Cooperate fully with pest management personnel in scheduling pest control operations including preparation of the areas to be treated. Try to control common household pests on your own prior to requesting PMP assistance.

Public Health

Conduct surveillance for mosquitoes, ticks, and cockroaches and pests that could negatively affect the health and welfare of county and facility personnel. Coordinate with the PMC on the requirement and effectiveness of treatment programs. Evaluate the health aspects of the pest management program.

Safety Officer and Occupational Health Manager

Provide guidance and information on the proper storage of pesticides. Coordinate with appropriate federal and state administrators responsible for medical monitoring of employees and

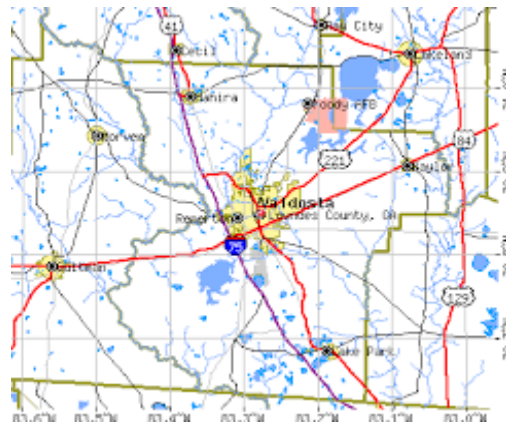
other health and safety requirements to ensure proper handling and use of pest management materials. In addition, perform health risk assessments for pest management personnel and the public. Serve as the POC for guidance and information on obtaining, maintaining and using personal protective equipment, to include the proper use of respirators. Lastly, coordinate with OSHA and other agencies for the most current information on occupational safety.

The fulfillment of the responsibilities listed above for all the persons is key to a successful pest management plan. It starts with the one who creates and goes all the way down to the pest management personnel applying the control measures. Communication is key and knowing each individual responsibility is needed for success.

Geography

Location

The Valdosta Metropolitan Statistical Area (MSA) consists of Lowndes, Lanier, Brooks, and Echols counties and has a population of 84, 874. Nearby cities include Valdosta, about 10 miles to the southwest, and Lakeland, about 6 miles northeast. Valdosta is a city of 56, 518 people located on U.S highway 41 and 84 and Interstate 75 in the extreme southern section of middle Georgia, 20 miles north of the Florida border. Lakeland has 3,366 people and located on U.S. Highway 129 and 221.



Climate

The climate is classified as humid subtropical. This results from the relatively low latitude (approximately 31 degrees north latitude) and the proximity of the Gulf of Mexico (80 miles) and the Atlantic Ocean (100 miles). These bodies of water help to produce a climate that is typified by long, humid summers with frequent convective storms, and short, mild winters interrupted by frontal storm systems. The spring and fall seasons are generally short and mild.

Mean annual precipitation recorded at Moody is 47.0 inches. This rainfall is well distributed throughout the year, although summer is generally the wettest season and fall is the driest. Summer rainfall is often poorly distributed over the base due to the localized nature of thundershower activity. During normal years, showers will occur on or in the vicinity of the base nearly every afternoon in July and August. Lake evaporation at Moody AFB is estimated to be between 40 and 45 inches per year. Evaporation over land areas may be greater or less than this depending on vegetative cover type. An average of 58 thunderstorm days per year is recorded at Moody AFB. Extreme storm events, sometimes accompanied by tornadoes, occur occasionally in the area. Tropical storm systems accompanied by several days of heavy rains occur with a frequency of about one in five years. Maximum rainfall recorded in a 24-hour period is 8.6 inches.

Relative humidity is generally high with an annual average of 68 percent. The highest daily humidity is recorded in the early morning with an average at dawn of 83 percent. The average humidity at midday in spring is generally less than 50 percent, and during the rest of the year it averages 54 percent. Mean cloud cover is approximately 60 percent during the summer and 50 percent in winter. On the average, some fog is encountered at Moody AFB 185 days per year.

Wind speed at Moody AFB averages only 4 knots (4.6 miles per hour (mph)); however, a maximum wind speed of 65 knots (74.8 mph) has been recorded. Wind direction is generally from the north during the winter, from the west during the spring and early summer, and from the east during the late summer and fall. A summary of Moody AFB climatic data obtained from Moody AFB Weather Flight is given in table 1.1.

Month	Mean Daily Temperature (F)			Monthly Precipitation (in.)		
	Max.	Min.	Monthly	Mean	Max.	Min.
January	62	42	52	3.8	8.0	0.4
February	65	45	55	4.2	11.1	1.3
March	72	51	62	4.9	12.1	0.7
April	79	58	68	3.7	11.6	0.3
May	85	65	75	3.8	11.3	0.2
June	90	71	80	4.5	11.7	0.8
July	91	73	82	6.3	11.2	1.6
August	90	73	82	5.2	15.5	1.3
September	87	70	78	3.4	9.0	0.1

October	79	59	69	2.0	7.3	0.0
November	71	50	61	2.4	6.4	0.1
December	63	44	54	3.6	9.1	0.1

Priorities

Pest management requirements vary considerable. Below is a generalized list of major pest categories of possible concern. The priority will vary according to specific sites.

Disease Vectors and Public Health Pests

Mosquito species found in the state are known to transmit several arboviral encephalitis every year. The newest mosquito borne disease of concern to the state is West Nile Virus. Potential mosquito vectors of dengue and malaria are actively present in the Caribbean and in Central America and has been identified in central Florida. Mosquitoes are a known problem around facilities where areas of standing water occur.

Ticks may transmit disease organisms within the state. These diseases include: Lyme disease, Rocky Mountain spotted fever, human ehrlichiosis, and tularemia. Rocky Mountain spotted fever is the most important tick-borne disease that occurs in Georgia.

Black Widow spiders also occur in Georgia. They are common in undisturbed places in warehouses, storage areas, foxholes and around other buildings. These spiders may produce painful bites as well as toxic reactions that can become severe. There are four species found in the state: Northern and Southern Black Widow, Brown Widow, and Red Widow.

Fire Ants are common in this area. Their venomous sting may cause an allergic reaction in hypersensitive individuals. Fire ants may also have a detrimental impact on endangered or threatened species such as ground nesting birds as well as damaging electrical equipment. Due to their damage potential, pest management will be proactive approach in an effort to maintain control.

Venomous stings from bees, hornets, yellow jackets, and wasps may produce allergic reactions in some individuals. A fatality in Dougherty Co, GA resulting from an attack of "Africanized" Honey Bees highlights the necessity for educating the public and preparing an appropriate response.

Even though not an insect, American alligators are plentiful in South Georgia lakes, streams and rivers. Generally, they represent little threat however, they will attack if provoked or if they confuse a child or a small pet for normal prey.

Economic Pests

Subterranean termites are found throughout Georgia and may cause substantial damage. The Formosan subterranean termite is considered the most aggressive and economically devastating termites in the country. They are found in many areas of the state including known infestations in Atlanta, although none have been currently been found in this area. Generally, infestations of Formosan Termites have been associated with the installation of used railroad ties. All new buildings, including modifications will be treated to prevent subterranean termite damage. Any exceptions to this requirement must be coordinated with and approved by the IPMC. Structures made of cellulose containing materials will be inspected for termites or termite damage, at the minimum, on an annual basis. Additionally, a preventative chemical treatment will be applied when the soil within 12 inches of a building is significantly disturbed due to construction or maintenance. Carpenter ants also may infest and damage wooden structures.

Stored Product Pests are of an economic concern and will be a pest management priority at food preparation and service facilities as well as the Commissary. These buildings will be inspected weekly. Additionally susceptible food items are often found in offices and snack bars and infested items are discarded when found. The most common stored product pests include beetles, moths and rodents.

Household and Nuisance Pests.

Crawling insects (such as ants and cockroaches, etc.) and spiders may require control in offices, billeting facilities, warehouses, and administrative buildings. Proper sanitation and housekeeping are emphasized to discourage these pests. Facility managers are expected to try and control themselves prior to requesting pest management assistance except when the pest poses an immediate threat to personnel or property.

Conservation for endangered species

The Endangered Species act (Title 16 USC Section 1531-1544) requires protection and conservation of federally listed threatened and endangered plants and animals and their habitats. It's required by law to regulate pesticides use in such a way as to protect endangered species. Section 7 of the ESA requires the following:

Each Federal agency shall, in consultation with and with the assistance of the Secretary, insure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary, after consultation as appropriate with affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee pursuant to subsection (h) of this section. In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available.

Subject to such guidelines as the Secretary may establish, a Federal agency shall consult with the Secretary on any prospective agency action at the request of, and in cooperation

with, the prospective permit or license applicant if the applicant has reason to believe that an endangered species or a threatened species may be present in the area affected by his project and that implementation of such action will likely affect such species.

Each Federal agency shall confer with the Secretary on any agency action which is likely to jeopardize the continued existence of any species proposed to be listed under section 4 or result in the destruction or adverse modification of critical habitat proposed to be designated for such species. This paragraph does not require a limitation on the commitment of resources as described in subsection (d).

The EPA requires that pesticide applicators be aware of endangered species considerations that are not always included on the pesticide label. Special precautions must be taken when using pest control tactics in areas where endangered species are found.

The list of Federal and State endangered and threatened species found in Georgia changes frequently as species are added or removed. Up to date information on endangered and threatened species can be found on the Georgia Department of Natural Resources, Wildlife Resources Division web site

<http://georgiawildlife.dnr.state.ga.us/content/displaycontent.asp?txtDocument=514>.

Safety Considerations

Approved dust masks, respirators, chemical resistant gloves and boots, and protective clothing (as specified by applicable laws, regulations and/or the pesticide label) will be provided to pesticide applicators. These items are used as required during the mixing and application of pesticides.

Pesticides are transported in a lockable storage compartment of an assigned vehicle(s). A dedicated vehicle is used to transport pesticides. Vehicles that have been used to transport pesticides are not used to transport food, medical supplies or other sensitive items that, if contaminated, would adversely affect human health. Transportation of pesticides is accomplished using the vehicle assigned to the Pest Controller. Pesticides are never transported in the passenger compartment of any vehicle. In addition, care is taken to secure pesticides to prevent damage to the containers and spillage. At no time are pesticides to be left in the vehicle unsecured and unattended. A portable eye lavage and spill kit is carried in each pest control vehicle.

Special consideration must be given prior to conducting pest control operations in sensitive areas identified on pesticide labels. No pesticides are applied directly to wetlands or water areas (lakes, rivers, creeks, ditches, etc.) unless its use is specifically approved on the label. In addition to aquatic habitats, sensitive areas also include critical habitat to endangered, threatened, or rare flora or fauna species, and unique geological and other natural features.

Integrated Pest Management control methods

Below are guidelines that will be followed when surveying and controlling insect pests. This is a working list and includes the most common insect pests reported in the area.

German Cockroaches – Survey with sticky traps and visual inspections. Occasionally, pyrethrin aerosol can be applied directly into harborage sites to flush roaches.

Non-chemical Techniques		
Type	Conducted by	Method
Physical Control	Building occupants, facility maintenance personnel, or Pest Management Technicians.	Use sticky traps in kitchen, bathrooms, break areas, or other areas where food and water are available. Caulk cracks, crevices, and holes to eliminate cockroach harborage sites.
Mechanical Control	Pest Management Technicians.	Vacuum cockroaches and egg capsules during evenings when cockroach activity is the greatest and facilities are typically closed.
Cultural Control	Building occupants clean areas. Facility managers handle plumbing repairs.	Practice good sanitation to reduce food and water used by cockroaches. Clean spilled food from all surfaces. Place food items in sealed containers. Keep break areas clean and wash food containers (e.g., soda cans, coffee cups, etc.) promptly. Remove papers, bags, boxes, etc. from areas where food is present to eliminate harborage areas. Repair water leaks promptly. Rinse mops after use and hang to dry.
Biological Control	NONE	

Chemical Control Techniques
Basis for treatment: Two or more cockroaches/trap/day may indicate the need for a professional treatment.
Conducted by: Pest management services are used in locations where there are more than 2-cockroaches/sticky trap/day.

Control Standards: Replace bait stations every 60 days if cockroaches continue to be found. Remove empty bait stations to eliminate cockroach harborages. Continue bait station use for at least 90 days.

Approved Pesticide	User and Source
Bait stations for small cockroaches	Applied by a certified Pest Management Technician.
Gel bait, Residual crack and crevice insecticide, Insect Growth Regulators	Applied by a certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

American, Asian, and Smokey Brown Cockroaches – Survey using sticky traps. Pyrethrin aerosol is applied directly into harborage sites to flush roaches.

Non-chemical Techniques		
Type	Conducted by	Method
Physical Control	Facility managers, or Pest Management Technicians.	Eliminate moisture in crawlspace areas that could support cockroaches. Ventilate wet or damp areas under buildings. In buildings that experience frequent invasion of American cockroaches, drains should have grates or screens over the openings with a mesh size less than 1/8-inch. Utility doors should fit tightly, and pipe chases and other entry points should be sealed. Shrubs adjacent to building exteriors should be trimmed to maintain air circulation next to buildings.
		Sticky traps may be used to help control minor infestations. Seal around plumbing that penetrates walls and floors with caulking. Outside, limit spaces where cockroaches can harbor. Such areas are bark chips, wood planks, railroad ties, wood piles and trash. These areas are especially attractive for Asian cockroaches.
Mechanical Control	Pest Management Technicians.	Vacuum cockroaches and egg capsules during evenings when cockroach activity is the greatest and facilities are typically closed.

Cultural Control	Personnel clean areas. Maintenance personnel make plumbing repairs.	Place food items in sealed containers. Keep break areas clean and wash food containers (e.g., soda cans, coffee cups, etc.) promptly. Remove papers, bags, boxes, etc. from areas where food is present to eliminate harborage areas. Repair water leaks promptly. Rinse mops after use and hang to dry.
Biological Control	NONE	

Chemical Control Techniques	
Basis for treatment: Cockroach presence and/or a sticky trap index of one or greater should initiate control methods. A threshold of no cockroaches is the control standard to achieve in food service/warehouse facilities within 4 months after pest control service is initiated. Re-application of bait stations may be required after initial bait supply is depleted.	
Conducted by: Pest Management Technicians treat if control methods failed and surveillance indicates a need for professional treatment.	
Control Standards: Replace bait stations every 3 months if cockroaches continue to be found. Remove empty bait stations to eliminate cockroach harborages. Continue bait station use for at least 90 days. If cockroaches are still observed after 90 days, or if 2 or more cockroaches/sticky trap/day are observed, contact a Pest Management Technician for assistance.	
Approved Pesticide	User and Source
Bait stations for large cockroaches	Applied by a certified Pest Management Technician.
Gel Bait, Residual crack and crevice insecticide, Insect Growth Regulators	Applied by a certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

Filth Flies – Observations of adult flies at flytraps or breeding habitats are the most common survey methods. Applicators can use sticky fly tape for a survey tool. Do not place fly tapes directly over stored food or over food preparation surfaces. Inspections should be accomplished daily.

Non-chemical Techniques		
Type	Conducted by	Method

Physical Control	Building occupants may use sticky traps. Keeping doors closed when not in use is the responsibility of building occupants and food service personnel. Pest Management Technicians may use flytraps.	Sticky flypaper or traps may be used to control minor infestations in areas that are not directly over food or food preparation surfaces. Screens are used to prevent fly entry when doors and windows are left open. Automatic self-closing devices should be placed on outer doors to reduce fly entry.
Mechanical Control	Electric flytrap devices may be used. Building maintenance personnel install, repair, and replace screens, doors, and door closing devices, air curtains, and electric fly grids.	Electric fly grids may be used in eating areas. Avoid using those fly grids that are designed to electrocute flies that cause them to explode and fragment. Air curtains may also be used at entry points, but must be installed and maintained correctly to blow flies away from entrances covering entire door widths. Use fly swatters when necessary, avoiding contaminating food, utensils, and food preparation surfaces.

Cultural Control	Building occupants are responsible for sanitation in and around the immediate vicinity of the work place. Dumpsters are emptied and cleaned by contractors.	Clean spilled food and water from work surfaces, walls and floors. Wash dirty dishes and cooking containers and do not leave exposed food in the facility overnight. Place garbage in sealed bags and place them in containers with tight-fitting lids keeping them closed. Do not place dumpsters within 50 feet of facilities. Dumpsters are emptied and cleaned biweekly during the fly breeding season.
Biological Control	NONE	

Chemical Control Techniques	
Basis for treatment: Professional treatment is used based on survey findings by pest management personnel. Additional professional treatment may be required if control standards are not achieved.	
Conducted by: Primarily a building occupant responsibility. Pest Management Technicians apply pesticides only in rare situations.	
Control Standards: Flies are killed on contact. Fewer than 5 living flies observed after treatment indoors for a period of 24 hours.	

Approved Pesticide	User and Source
Pyrethrin aerosol	Applied by a certified Pest Management Technician or building occupant.

Mosquitoes – Surveys will be accomplished by dipping or skimming in standing water that existed for three days or more. Landing/biting count surveys are used in areas where day-biting mosquitoes are a problem. Light traps can be used to survey for nocturnally active mosquitoes.

Non-chemical Techniques		
Type	Conducted by	Method
Physical Control	Facility maintenance or grounds keeping personnel	Screens should be placed in windows to exclude mosquitoes. Temporary standing water sites that hold water should be graded or filled to eliminate breeding sites. Precautions must be taken to prevent damage to wetlands. Eliminate artificial breeding sites, such as tires.
Mechanical Control	Facility maintenance or grounds keeping personnel	Mow and remove grasses and brush to reduce resting sites.
Cultural Control	Facility maintenance or grounds keeping personnel	Remove items that can hold water such as bottles, cans, and discarded tires to reduce potential breeding sites. Clean gutters to reduce standing water. Personnel should empty (weekly) or eliminate containers that hold water that may provide mosquito breeding sites. Use yellow incandescent light bulbs and high pressure sodium lights to reduce attracting mosquitoes.
Biological Control	Pest Management Technicians or facility maintenance personnel	Placement of mosquito feeding fish in water impoundment areas.

Chemical Control Techniques

Basis for treatment: The observed presence of mosquito larvae or when adult mosquito biting curtails outdoor activity of personnel, or there is a high potential or an outbreak for mosquito-borne diseases.

Conducted by: Pest Management Technicians or local mosquito control personnel.

Control Standards: Mosquitoes are reduced to an acceptable level based on their disease potential or overall mission performance. Larval mosquitoes die before emerging. In the case of adult mosquitoes, control has been achieved when mosquito numbers in light traps are less than 25 female mosquitoes/trap/night and/or incidence of mosquito-borne disease in humans has discontinued.

Approved Pesticide	User and Source
Standard issue DEET repellent	Used by all on-site personnel.
Mosquito larvacides containing methoprene (i.e. Altocid) or <i>Bacillus thuringiensis</i> Berliner variety <i>israelensis</i> (Bti) (i.e. Bactimos)	Applied by a certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
ULV applied mosquito adulticides containing permethrin (Kontrol)	Applied by a certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

Fire Ants – Incidental observations of fire ants or their mounds are accomplished by area users. This is usually done in conjunction with other maintenance of grassy areas. Pest Management technicians inspect when there is a need to assess if a treatment must be used. Surveys are best accomplished after rainfall when mound development increases.

Non-chemical Techniques		
Type	Conducted by	Method
Physical Control	Facility maintenance personnel	Caulk cracks and crevices in exterior building surfaces and maintain tight-fitting doors.
Mechanical Control	NONE	
Cultural Control	Natural resources personnel have the responsibility for grassland and forest restoration. Building occupants and area users are responsible for keeping areas free of food that attract ants.	Restoration of native tall grasses and forests may reduce some fire ant populations because it favors competing species of ants. Fire ants do not do well in heavily shaded areas under trees. Restoration of tree cover, native short grass prairies, wetlands and other habitats that are unfavorable to fire ants can help reduce numbers and limit invasion. In picnic areas and other areas with food, use tight fitting lids on containers and trash receptacles.

Biological Control	(APHIS) Animal Plant Health Inspection Services is testing biocontrols for destruction of fire ants to include pathogen and phorid flies.	Future bio controls as recommended by APHIS.
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Chemical Control Techniques

Basis for treatment: Colonies located close to buildings, electrical boxes, telephone boxes, airfield lighting, etc. Re-application may be required if acceptable control standards are not met.

Conducted by: Pest management technicians.

Control Standards: Worker ants carrying the bait back to the colony indicate there is sufficient ant activity to provide control. Fire ant population reductions will typically begin within 24 hours. Within 6 weeks after the initial application, fire ant activity should discontinue for an additional 12 weeks. Materials should be applied to all target sites per label directions. In small turf areas baits are applied using a small hand-held spreader or by sprinkling the material. Large turf areas should be treated by using a calibrated mechanical or electrical spreader. Individual mound treatment will be done using injection or drenching. For indoor infestations, chemical applications include spot treatments where infestations occur and may include exterior perimeter treatment at actual or potential entry sites.

Approved Pesticide	User and Source
Fire ant baits containing hydramethylnon (i.e. Amdro), abamectin (i.e. Ascend) or fenoxycarb (i.e. Award)	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
Residual insecticide labeled for drench/injection mound treatments or broadcast application (i.e. TopChoice)	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
Short term contact insecticide labeled for surface and entry area treatments.	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

Household Ants – The most common are Odorous house ants, pharaoh ants, and pavement ants. The method for survey is inspecting ant activity. Pre or post treatment baiting or sticky trapping may be performed to collect ants for identification, determine bait acceptance, and to determine infestations and nest sites.

Non-chemical Techniques		
Type	Conducted by	Method

Physical Control	Facility maintenance or Pest Management Technicians caulk cracks and crevices. Facility users and maintenance personnel are responsible for maintaining clean work areas.	Eliminate ant harborage and entry sites by caulking minor cracks, crevices, and holes in walls or foundations, especially at food, consumption, and preparation areas. Store food items in tight-fitting containers. Maintain tight-fitting windows and doors. Remove unnecessary ground litter (i.e. lumber, bricks, and leaves) near structures. Remove ants and wipe up ant trails using a general purpose cleaner containing alcohol or ammonia.
Mechanical Control	Grounds maintenance personnel are responsible for pruning vegetation.	Keep tree and shrub branches from contacting buildings.
Cultural Control	Building occupants and maintenance personnel have the primary Responsibility for removing food and garbage.	Clean areas where food is stored, prepared, and served. Clean spilled food immediately. Keep stored food products in sealed containers. Remove garbage from buildings on a daily basis especially where ants are a problem.
Biological Control	NONE	

Chemical Control Techniques

Basis for treatment: Ants observed in buildings.

Conducted by: Building occupants. Pest Management Technicians are sometimes required to apply outdoor barrier insecticide applications.

Control Standards: Bait acceptance by foraging ants is observed. The number of live ants observed begins to decline within 4 days after treatment began and no live ants observed 1-5 weeks after the treatment start date. For ants found indoors in an area where control is required immediately, residual barrier insecticide sprays should be used only very sparingly to prevent re-entry by ant colonies. Baits should serve as the primary means for long-term ant control.

Approved Pesticide	User and Source
Various ant bait materials and non-repellant contact insecticides	Applied by a certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

Carpenter Ants – Carpenter ants are surveyed once occupants observe specimens. Carpenter ant inspections are also included in inspections for termites. Surveys using a stethoscope or similar device can be used to locate colonies in walls. Determination of nest sites is critical for proper treatment and control. Surveys are performed by pest management technicians in conjunction with termite inspections or following complaints.

Non-chemical Techniques		
Type	Conducted by	Method
Physical Control	Facility maintenance personnel	Replace damaged wood. Because carpenter ants live in soft, damp wood, reduce moisture sources such as condensation and leaks. Caulk to minimize ant access into buildings. Clean gutters for proper drainage. Keep soffits sealed and roofing well maintained...
Mechanical Control	Grounds maintenance personnel	Trim vegetation against siding and roofs.
Cultural Control	Facility maintenance personnel	Do not place firewood or other wood against a building's outside to avoid bringing carpenter ant infested wood near a building. It also prevents infestations and moisture accumulation next to buildings.
Biological Control	NONE	

Chemical Control Techniques	
Basis for treatment: Presence of carpenter ants in buildings.	
Conducted by: Pest management technicians.	
Control Standards: When applying a residual insecticide treatment to carpenter ant nests, near immediate control should be noted. When applying baits, bait acceptance by foraging ants should be observed. The number of live ants observed begins to decline within 2 days after treatment began and no live ants observed 5 weeks after the treatment start date.	
Approved Pesticide	User and Source
Residual insecticide labeled for application to carpenter ant nests	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
Carpenter ant baits containing fipronil (i.e. Maxforce) or abamectin (i.e. Advance)	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

Residual insecticide labeled for surface and entry area treatments	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
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Wasp and Bees – Daily incidental observations by building occupants and maintenance personnel during work hours. Pest management technicians inspect when requested and following insufficient control by other methods.

Non-chemical Techniques		
Type	Conducted by	Method
Physical Control	Facility maintenance personnel and approved bee keepers.	Place screens on windows and doors, and caulk gaps or crevices to prevent access. Forced water may be used to remove mud dauber nests. Remove nests after treating with chemicals. Personnel allergic to stinging insects should avoid removing stinging insects. When controlling honeybees, remove hives, swarms, and hive materials (i.e., wax, honey, and dead bees) in walls. Beekeepers remove hives and swarms.
Mechanical Control	Pest management technician	These insects (live or dead) and nests can be removed by vacuuming, though care should be taken in doing so.
Cultural Control	Building occupants and grounds maintenance are responsible for keeping areas free of trash. Grounds maintenance personnel or contractors select vegetation and plants unattractive to these stinging insects.	Yellow jackets and hornets are attracted to meats, sweets, and putrid trash. Therefore, seal garbage in plastic bags and use tight-fitting lids on receptacles. Flowering plants that can attract bees or wasps should not be planted closely to frequently used areas such as building entrances.
Biological Control	NONE	

Chemical Control Techniques

Basis for treatment: Target pests found in utility structures, etc. Because honeybees are important economic insects, chemical control should be used only when other tactics have failed.	
Conducted by: Pest management technicians.	
Control Standards: Target pests are killed following treatment and control is maintained for 7 days. All honey beehive material must be removed (i.e., wax, dead bees, and brood) to prevent re-infestations. Repair damaged structures.	
Approved Pesticide	User and Source
Liquid dish detergent in water (approximately 2 parts detergent to 10 parts water) provides a highly effective, non-toxic knock-down for wasps and hornets. Apply directly to insects using a compressed air sprayer or misting bottle. Spray wasps on nests during early mornings or evenings for optimum efficiency. NOTE: Detergent solutions have no residual, and solution must come in direct contact with insects to be effective.	Can be applied by building occupants, utility or facility maintenance personnel, and pesticide applicators.
Residual aerosol insecticide labeled for applying directly to insects and nests. Treat nests during early mornings or evenings when most insects occupy their nests and during cool weather, when they are least active.	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
Residual insecticide labeled for surface and entry area treatments	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

Nuisance Arthropods – This would include crickets, earwigs, scorpions, or other crawling occasional invaders. Inspections are initiated when a complaint is received by a customer. Sticky traps may be used for number and type of pest.

Non-chemical Techniques		
Type	Conducted by	Method

Physical Control	Building occupants or maintenance personnel	Maintain tight-fitting doors and window screens to prevent indoor infestations. Remove unnecessary plant debris, mulches, trash, leaf piles, boards, and rocks from building perimeters. Eliminate excess moisture around building exteriors (e.g., leaking faucets or improperly installed downspouts or splash guards).
Mechanical Control	Building occupants or maintenance personnel	Small infestations can be swept up or vacuumed. Cut weeds and grass around buildings. Reduce harborage and excessive moisture by pruning shrub branches to create a minimum 4-inch space underneath the shrub.
Cultural Control	Building occupants or maintenance personnel	Reduce pest harborage through good sanitation practices. Clean areas where pests often hide: in areas with trash, old boxes, and other debris to reduce harborage areas.
Biological Control	NONE	

Chemical Control Techniques
Basis for treatment: Crickets, earwigs, scorpions, or other crawling arthropods remain after non-chemical control methods have been implemented.
Conducted by: Pest Management technicians
Control Standards: No live crickets or other crawling arthropods 24 hours after treatment and for a period of 30 days.

Approved Pesticide	User and Source
Contact aerosol insecticide labeled for surface and entry area treatments.	Applied by a certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
Residual crack and crevice insecticide	Applied by a certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

Termites – Evidence of a possible termite infestation includes termite damage (wood and cellulose material often lined with soil or dried mud), mud tubes, frass pellets, discarded wings along window sills, floors and in spider webs, or termite swarms. Certified Pest Management technicians are the primary surveyors for termite infestations and species identification.

Inspections performed by pest management technicians are recorded on floor plans drawn to scale indicating locations of infestations, termite damage and locations of possible entry sites (expansion joints, settlement cracks, and plumbing). Inspections are conducted annually.

Non-chemical Techniques		
Type	Conducted by	Method
Physical Control	Facility maintenance personnel. <i>Note: Accurate termite identification is required to determine the appropriate control action to take.</i>	Eliminate moisture sources that encourage termite colonies. Examples include leaking pipes under buildings, dripping faucets, and incorrect drainage. Ensure that crawl spaces are well ventilated. Termite shields should be used during construction. Seal expansion joints in concrete floors and around plumbing that penetrates slabs. Cover exposed soil in crawl spaces with polyethylene sheeting or roofing paper to reduce evaporation from soil and to prevent condensation on floor.
Mechanical Control	Facility maintenance personnel. <i>Note: Accurate termite identification is required to determine the appropriate control action to take.</i>	Replace or repair infested material. Cut or remove vegetation next to foundations that impairs inspection for termite tubes and encourages termite infestations
Cultural Control	Facility maintenance personnel. <i>Note: Accurate termite identification is required to determine the appropriate control action to take.</i>	Use mulches such as wood chips sparingly to eliminate food and moisture sources for termites. Lumber, pallets, and other cellulose-containing materials should not be stored directly on the ground or against buildings. Remove waste lumber from construction sites before final grading. Remove tree and large shrub stumps located near buildings and remove soil at grade level when found within 4 inches of structures to eliminate earth to wood contact.
Biological Control	NONE	

Chemical Control Techniques

Basis for treatment: Soil pre-treatment is required for all new building construction. All untreated buildings undergoing rehabilitation work, including additions or new floor work, will be treated. All active termite infestations in structures are treated, except where intra-slab heating/air conditioning ductwork is present or there are other restrictions according to law.

Conducted by: Certified Pest Management Technicians.

Control Standards: Termiticides are applied at the highest concentration and volume approved on the label. No subsequent termite infestations or damage from treated structures for five years after application. Structural modifications made such as: drilling holes, cutting tiles or linoleum, and installing bath trap access panels, are repaired, or replaced to match existing adjacent surfaces in quality and finish. All debris, including dust, caused by drilling or other work is removed from the treatment site.

Approved Pesticide	User and Source
EPA and state approved nonrepellent termiticide (i.e. Premise, Termidor)	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.
EPA and state approved structural fumigant (i.e. Vikane, methyl bromide)	Applied by certified Pest Management Technician. Insecticide product must be EPA registered for the application site.

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Also, all class work presented in each course taken while completing my degree requirements was used as references and a help in developing this IPM plan.