

Management of Imported Fire Ants in Cattle Production Systems

Imported fire ants are now a major pest problem throughout the southeastern United States, including in cattle production operations (Figures 1 and 2). No methods have been developed to successfully eradicate fire ants, but research may ultimately provide a method to eliminate this pest. Biological control can potentially suppress fire ant populations but will never achieve absolute control. The appropriate fire ant control methods should be determined by the problem that the fire ants cause in a particular area.

This publication provides information to help ranch managers develop integrated pest management (IPM) plans to address imported fire ant problems in cattle operations. The goal of integrated pest management is to control a pest only when the potential cost of the problem meets or exceeds the cost of the solution. This publication also provides tips to help reduce the cost of fire ant treatments.

The Problem

Two species of imported fire ants were accidentally introduced into the southern United States from South America in the early 1900s. The red imported fire ant, *Solenopsis invicta*, and the black imported fire ant, *Solenopsis richteri*, interbred and produced sexually active hybrid ants in areas where they occurred together, such as in the northern portions of Mississippi and Alabama and adjoining parts of Tennessee and Georgia.



Figure 1. Imported fire ants build mounds that are unsightly and that interfere with farm operations.



Figure 2. Texas A&M fire ant image gallery

Figure 2. Imported fire ant stings are painful and can cause allergic reactions and even death of livestock and humans.

Imported fire ants have two colony types: the single queen or monogyne type and the multiple queen or polygyne type. Workers in ant colonies with a single egg-laying queen are very territorial and will fight with fire ants from other colonies. Worker ants in colonies with two or more egg-laying queens do not have this territorial behavior. Therefore, these polygyne fire ants occur in much higher densities because the mounds they build can be closer together. More mounds and ants mean more problems in areas infested with the polygyne colonies. The single queen colony is predominant throughout most of the southeastern United States while the multiple queen colony is predominant throughout the eastern two-thirds of Texas.

Cost of the Problem

In 2003, the U.S. Department of Agriculture estimated that the annual cost of problems caused by imported fire ants in agriculture was \$750 million, with \$38 million in losses to livestock. Losses occur mainly where ants interfere with activities of man and where ants and vulnerable animals are found together (Figure 3). In some small operations, such as those where profit is not the goal or where the ants' impact is more emotional than economic, the decision to control ants can be subjective. Conversely, the cost of eliminating ants from an entire operation may not be justified by the economic losses caused by fire ants, particularly in large production farms and ranches. In these cases, the better option is to identify and treat those areas only where control costs are justified.

By analyzing where imported fire ants are causing problems, managers can determine where economic losses occur. The probability of serious incidents, such as

Fire Ant Losses in Livestock Production

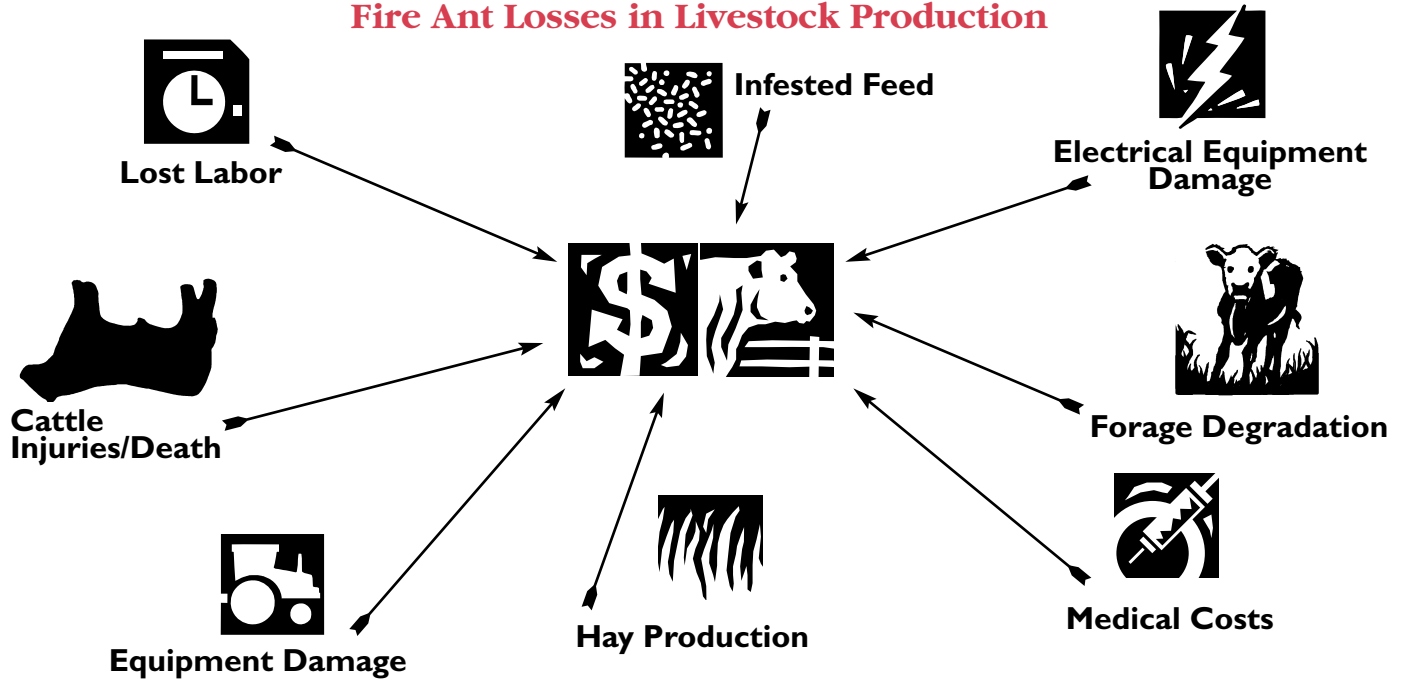


Figure 3. Types of losses due to fire ants in cattle operations. (Based on a drawing by Charles Barr, Texas A&M University)

livestock injury or death or equipment damage, is low and may only happen once over a period of years. Losses associated with these events, therefore, need to be adjusted to an annual estimate of cost. Losses that are potentially or historically serious or costly are often fairly specific to certain farming and ranching locations or operations.

Cost of Control

The type of treatment chosen will determine the cost of treating the entire cattle operation. The estimated cost for treatments using broadcast application of conventionally formulated fire ant bait products, such as hydramethylnon (Amdro Pro), fenoxycarb (Logic or Award*), or methoprene (Extinguish), is \$10 per acre. In small operations in heavily infested areas, this treatment cost may be negligible. However, in larger operations, this treatment cost may be unacceptably high and not economically justifiable. With the exception of Extinguish, products are generally not approved for all use sites that comprise a cattle operation. In these situations, a better approach to the whole-ranch treatment option is the implementation of more refined, site-specific IPM techniques that can include chemical as well as nonchemical (cultural) methods.

Regulatory Considerations

The U.S. Department of Agriculture's Animal and Plant Health Inspection Service has developed a quarantine and regulatory program to help prevent spread of this exotic species from infested to noninfested parts of the United States. If your cattle operation is located in infested counties and materials such as hay or livestock trailers are to be shipped to nonquarantined areas, contact your local Department of Agriculture office for information on how to comply with quarantine

* Fenoxycarb bait for use in horse pastures was sold under the trade name Logic. In the future, it will be sold as Award. Always make sure your site is listed on the product label.

regulations. For movement of hay bales, for instance, only bales stored in off-ground locations will be certified as ant free and approved for shipment.

Biological Control Considerations

One reason imported fire ants are so abundant in the United States is that their specific natural enemies, which help keep their population levels in check, were left behind in their native South America. Researchers across the Southeast are committed to introducing biological control agents to help provide sustainable suppression of imported fire ants. Species of parasitic flies called phorid flies (from the fly's scientific family name, Phoridae, in the insect order Diptera), have been released in Alabama and other southeastern states. These species include *Pseudacteon tricuspis* and *P. curvatus* and will possibly include others in the future. A disease of fire ants, called *Thelohania*, is also being established and monitored. Although the impact has yet to be documented, these organisms are capable of sustaining themselves in the environment and of spreading naturally. They are expected to help suppress imported fire ant colonies to some degree. The effect is expected to be similar to that of hot, dry environmental conditions that frequently cause a decline in fire ant populations.

Fire ants do have some natural enemies in the United States. Other ant species, for example, are important predators of imported fire ant queens. They can raid and destroy small imported fire ant colonies and compete for nesting sites and resources. Preservation of these competitor ant species, in addition to conserving introduced and native biological control organisms, will help provide biological resistance to prevent the formation of high densities of imported fire ants. To preserve these competitor species, avoid chemical treatment where populations are historically low, such as fewer than 20 ant mounds per acre. Spot treatment of nuisance mounds in these areas may still be necessary.

Developing a Fire Ant Management Plan for a Cattle Operation

The first step in developing a fire ant management plan for your cattle operation is to decide where you want to control fire ants. Insert economic values in the outline below to estimate the cost of losses in your cattle operation.

Category	Estimated Cost of Loss, Repair, or Treatment
Around the farmstead	
Infestation of lawns	_____
Invasion into the home	_____
Medical treatment for people and domestic pets	_____
Electrical and utility equipment damage	_____
Penned livestock	
Medical injury or death	_____
Ruined feed and hay	_____
Infested bedding	_____
Equipment replacement or repair	
Machinery breakdown (cutter, shredder)	_____
Electrical equipment and water pump damage	_____
Drip irrigation equipment	_____
Hay pastures	
Reduced yield from raising cutter height	_____
Time lost unclogging cutter	_____
Infested bales of hay	_____
Medical injury to field workers	_____
Livestock pastures, rangeland	
Livestock injury or death	_____
Other losses	
Wildlife losses	_____
Exotic game injury or death	_____
Fishing pond access	_____
Enjoyment of outdoor activities	_____
Current treatment and fire ant control costs (product and labor)	
Around farmstead	_____
Penned animals, barns, and poultry houses	_____
Hay pastures	_____
Livestock pastures, rangeland	_____
Other farming operations	
Gardens	_____
Field crops	_____
Fruit and nut orchards	_____
Hunting lands	_____
Subtotal (losses and costs)	_____
Estimated benefits from fire ant control	
Insect/arthropod infestations affected by fire ants	+ _____
Total	_____

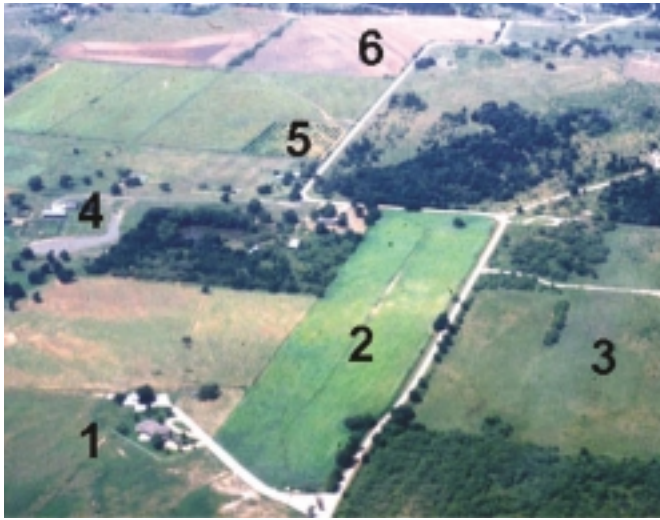


Figure 4. Cattle operation use sites: (1) farmstead or headquarters; (2) hay pasture; (3) livestock pasture or rangeland; (4) farm pond; (5) orchard; (6) field crops.

Create a rough map of your cattle operation or use an aerial photograph. Your operation will include a number of use sites besides pasture and rangeland (Figure 4). On the map, mark the areas where fire ant control is most important to you. A typical map might include the following priorities: the areas around the farmhouse that receive heavy foot traffic or where children play; the area around electrical circuit boxes; the area where frequently used farm equipment is parked outside; and any areas where cattle will be closely confined, particularly in the summer. These areas may include the most valuable hayfields, areas where hay is to be stored, and summer calving pastures.

The next step is to identify where the fire ant mounds are within what you have designated as important areas. Note the greatest concentrations of fire ant mounds. Classify the marked areas according to how quickly you need fire ant control. For instance, if fire ants are all over your picnic area and your family reunion is in two days, you would want to use a fast-acting individual mound treatment. If your family reunion is in two weeks, you could use a fire ant bait containing a slow-acting insecticide. If your family reunion is in two months, a bait containing an insect growth regulator would be appropriate.

Following are management options for each site mentioned in Figure 4.

Farmstead or Headquarters

Use sites comprising the farmstead or headquarters may include homes, barns, storage buildings, and other structures; electrical and utility fixtures such as air conditioners; and ornamental turf, bedding plant, and vegetable garden areas. The potential for economic loss as well as the loss of enjoyment or access are the greatest and the tolerance for imported fire ants is the lowest in these areas. Alternatives for fire ant control in these locations are the greatest because these are not necessarily agricultural lands.

The two-step method of fire ant control is the most suitable for treating the acre or so that constitutes the farmstead or headquarters. This method relies on the

broadcast application of a bait-formulated product once or twice per year. More labor-intensive, expensive but faster-acting mound treatments are used to treat only nuisance ant mounds that may develop between broadcast bait applications (see Bait Basics section on page 5). This approach can provide about 90 percent control that can be maintained at relatively low cost. Alternatively, a contact insecticide, such as fipronil granules, or a pyrethroid liquid or granular formulation, such as permethrin and bifenthrin, can be applied to the surface of the entire lawn as directed. Fire ant problems in sensitive areas such as compost piles and gardens may be prevented by treating around the perimeter with a bait or granular insecticide. If it is necessary to control fire ants in vegetable gardens, use only products registered for this use and with instructions for such applications in that use site (See Field Crops on page 5).

Treatment of the entire grounds around the headquarters area should prevent infestations of ants indoors and in utility boxes. If ants do cause problems in these areas, specialty products are available that can be applied to eliminate and prevent future infestations. For instance, faster-acting bait formulations such as those containing hydramethylnon or spinosad can be applied *around* utility boxes or other inaccessible areas to eliminate colonies within a few days. Conversely, insect strips such as Spectracide Bug Stop Pest Strip (dichlorvos) or Rainbow High Tech Insecticide Strip or Insect Patch (propoxur) can help prevent infestations in utility housings.

Hay Pastures

Fire ant mounds in hay pastures can cause equipment breakdowns when cutting machinery hits tall, hardened mounds. The ants may also consume seeds or seedlings of some forage crops. On the beneficial side, the ants also prey on other arthropod pests such as armyworms, and they reduce soil compaction by building nests and foraging tunnels. Some producers have replaced sickle-bar-type cutters with disc-type cutters to reduce equipment breakdown. Even these cutters, however, become jammed with grass and moist soil when cutting through ant mounds, costing a loss of time. Some producers raise the cutter, at least when approaching tall mounds, thereby losing some yield. Dull cutting blades and increased wear on machinery also cost money and lost time. Custom cutting and baling operators may charge more for their services where fire ant infestations are severe.

Infested hay is a regulated item when it is to be shipped out of quarantined areas. Field workers can be stung, particularly when handling square bales. For these reasons, some growers have shifted from producing square bales to producing round bales.

Where imported fire ants are a problem or cost more than about \$15 per acre to treat, broadcasting registered bait-formulated products, such as hydramethylnon (Amdro Pro) or methoprene (Extinguish) or the combination of the two, can reduce ant numbers and result in reduction of mound height and number. Mound treatments using registered products such as agricultural formulations of carbaryl (Sevin) or a fast-

acting bait such as hydramethylnon or spinosad should be reserved only for nuisance mounds.

Shallow disking and dragging a heavy object such as a railroad tie will reduce mound height for several weeks to months but used alone will not reduce ant or mound numbers. In areas infested with multiple queen colonies, dragging may cause the colonies to split into more but smaller colonies. Furthermore, if ants are not eliminated using an insecticide, reduced mound height will be temporary. Tall mounds can persist even after ant colonies are eliminated where grasses and other vegetation have grown into mounds.

Livestock Pastures or Rangelands

Imported fire ant foragers can quickly recruit other ants to food and moisture resources. Newborn livestock and wildlife, birds hatching from eggs, and confined animals are particularly vulnerable to attack by imported fire ants, although reported cases of injury are not common. During the hot summer months, the frequency of livestock injury and deaths increases dramatically because the ants are starved for food and moisture. For this reason, scheduling fertility programs to avoid calving during hot summer months can help prevent this problem. When calving is scheduled for the summer months, placing cows in a designated calving pasture that has been treated to reduce fire ant populations may be justifiable and cost effective.

The ants are not known to harm mature animals other than ostriches and emus that, reportedly, can go into shock when stung. Although tall ant mounds can become numerous and unsightly, they cause little economic damage. Fire ant mounds may reduce property values during land sale transactions. Imported fire ants can reduce populations of some other pests such as lone star ticks and forage-feeding caterpillar species.

Treatments for livestock pastures or rangelands include those products registered for hay pastures as well as others. For instance, fenoxycarb bait has been registered for use in horse pastures. Other products are available for use in nonagricultural land that is not being used for animal or plant production. These include pyriproxifen (Distance) or fenoxycarb. Some insecticide product labels for fire ant control, particularly those considered to be organic, do not list all approved use sites. When in doubt, contact the manufacturer for clarification.

Farm Ponds

Any bodies of water on the farm are attractive to imported fire ants, which must have access to surface or subsurface sources of water to survive. Worker ants will forage heavily along shorelines, and colonies will continually migrate closer to sources of moisture. This can create problems for fishermen who may not be able to stand on a shoreline without being attacked by stinging ants.

Most insecticides are toxic to aquatic organisms including fish. Products containing high concentrations of rotenone and pyrethrins may be particularly hazardous while others such as acephate (Orthene) have lower toxicity to aquatic animals. Orthene is not registered for use in hay or cattle pastures. Bait-formulated products, registered for the appropriate use site, such

as hay pastures, can be broadcast near water edges of farm ponds if care is taken not to broadcast particles into the water. Applications may need to be made more frequently around these areas to maintain control because of the favorable habitat for ants that the water provides.

Orchards

Debate continues on the impact of imported fire ants on orchard crops. While the ants can sting field workers, damage drip irrigation systems, and may aggravate certain pest problems such as aphid outbreaks, fire ants are beneficial in orchards because they prey on numerous chewing insect pests. Their foraging and nest building activities also can reduce soil compaction. Alternatives for treatment include broadcast-applied bait products such as methoprene (Extinguish). Additional products such as those containing fenoxycarb (Logic or Award) or abamectin (Clinch) have been registered for nonbearing orchards. Orchard floors can also be treated with some contact insecticide formulations to provide temporary elimination of ant activity on the soil surface. For example, the contact insecticide chlorpyrifos suppresses fire ant foraging for about 4 weeks.

Field Crops

Much as it is for orchards, the impact of imported fire ants and the cost effectiveness of available treatments on field crops have not been determined. Fire ants can become a medical threat to field workers, and they can damage some seeds and seedlings of some crops, such as sorghum, corn, and soybean. Tall mounds can also interfere with soybean harvesting operations. However, predatory activities of fire ants can reduce populations of many other field crop pests.

Fire ant mounds and population levels can be reduced using a broadcast application of the insect growth regulator methoprene (Extinguish) fire ant bait registered for use in cropland, when applied with sufficient lead time for this product to perform (see Bait Basics below). Some agricultural products such as those containing chlorpyrifos (Lorsban) applied at planting will also provide some measure of protection from damage to seedlings.

Bait Basics

The broadcast application of a bait product is the least toxic, most cost effective, and environmentally sound approach to reducing imported fire ants in large areas of land. These treatments are particularly suitable where fire ant mounds are numerous (20 or more per acre). In these areas, preservation of native ants is of less concern and treatments may actually increase native ant species numbers after imported fire ants have been reduced. Some ant species, such as red harvester ants, may be particularly sensitive to some bait products, such as those containing hydramethylnon.

Formulations

All bait formulations consist of an attractant soaked into a carrier particle. The conventional formulation uses soybean oil soaked into de-fatted processed corn grit. The active ingredient is dissolved in the attractive

oil, which is consumed by worker ants. It is returned to the ant colony and fed to the workers, the brood (larvae), the queen(s), and the winged reproductive male and female ants. If the oil becomes stale or rancid due to exposure to air over a period of time, the bait particle becomes unattractive to foraging ants and treatment will be ineffective. For this reason, use of a fresh and properly stored product is essential. It is advisable to work closely with your distributor to assure the product is fresh. Avoid mixing bait with seed or fertilizer since this causes bait particles to lose attractiveness. Other formulations using different attractants, carriers, and use rates are also available.

Application Timing

Imported fire ant workers forage for food only when conditions are favorable. This occurs when air temperatures range from 65 to 90 degrees F. In the heat of the summer, foraging occurs predominantly at night so baits should be applied in the late afternoon or early evening. During winter months and times when colonies are not actively producing brood, attractiveness to baits may be reduced. At certain times, some colonies may be more attracted to other available food sources and will ignore the bait. When in doubt about product freshness or presence of foraging behavior, place a potato chip or a small pile of the bait near a fire ant mound. If ants are carrying off bait particles or the potato chip within 30 minutes or so of placement, the time is right and the bait is attractive.

Broadcast Application Methods

Baits can be broadcast applied using handheld seeders or spreaders. They must be calibrated to apply the amount of product per acre as directed on the product label. Rotating or vibrating agitator mechanisms are preferable because they do not grind the bait particles, which can result in clogging. The hopper opening should be adjusted as small as possible to allow bait to drop onto a spreader fan. Calibrate by applying a known quantity of bait to an area of known size. For larger areas, use a vehicle-mounted, electrically powered applicator such as a Herd GT77 seeder specifically manufactured to broadcast apply ant bait products. Baits can also be applied aerially provided the crop duster hopper and gate are modified to achieve the low use rates for these products.



Figure 5. Herd GT77 seeder mounted on a fertilizer spreader.

Speed and Duration of Control

After broadcast application, the mode of action of the ingredient in these bait products determines the speed at which 80 to 90 percent maximum control is achieved. Metabolic inhibitors (hydramethylnon) and nerve-active products (spinosad) are faster acting, producing maximum results within several weeks after treatment. From that point, reinvasion of treated areas begins and may require additional treatments to maintain control. When used as individual mound treatments, results are even faster and often eliminate treated colonies in several days even where colonies are in inaccessible locations such as sidewalks and driveway cracks, bases of tree trunks, compost beds, and utility housings.

Insect growth regulator or IGR products (fenoxycarb, methoprene, pyriproxyfen) are synthetic chemicals that mimic an insect hormone. These ingredients do not generally kill worker ants, which must die of natural causes before a colony is eliminated. Rather, they affect queen ants and developing brood and prevent worker ants from developing for about a year following treatment. Effects vary by season. A spring or summer treatment achieves maximum control in several months while a late summer or fall application may require 6 months. These products are ideal for maintaining control, once achieved. Suppression from an IGR may last for a year or more. Abamectin containing products (Ascend, Clinch, Varsity) provide an IGR-like response when broadcast even though this ingredient affects the nervous system. When used as a mound treatment, results occur more quickly.

Cost-Saving Considerations

Applied research has documented several methods that can help reduce the cost of using broadcast applications of bait products. Some of these methods have been adapted by manufacturers and are now registered uses. Others are made available to producers as management options whereby the user assumes responsibility for results obtained.

Hopper blend treatment. A 50:50 mixture of a fast-acting bait product such as hydramethylnon (0.75 pounds Amdro Pro) with a slow-acting, long-lasting IGR such as methoprene (0.75 pounds Extinguish) applied at 1.5 pounds blended product per acre can provide a performance profile characteristic of both products: 80 to 90 percent control in 3 to 6 weeks sustained for a number of months. This use pattern now appears on product labels or supplement labels. Blends using combinations of other fast-acting and slow-acting IGR products may also provide this effect.

Skip-swath application. IGR products can be applied to every other 20- to 25-foot swath at the use rate directed on the product labels. This leaves every other strip untreated. In this application method, only half the use rate product is applied per acre and half the time is needed to apply the product to the land area. The effects of these stable, slow-acting baits have been shown to produce levels of control similar to those achieved by the conventional application pattern. This use pattern, however, is not supported by the manufacturers and does not constitute a recommendation by

Extension. In Oklahoma, regulations do not allow producers to apply pesticides at rates below those on the product label. In most other states, however, the user can choose to apply at reduced rates.

Tandem application. Blending bait products with seed or fertilizer to save a trip across the field is discouraged because this method can quickly dilute or reduce attractiveness of the bait product. However, a bait applicator such as a Herd GT77 seeder can be mounted on a dry fertilizer spreader or seeder and calibrated so that both materials are applied simultaneously (Figure 5). Swath width differences between lighter bait versus heavier fertilizer particles may, however, result in a skip-swath treatment of ant bait.

Individual Mound Treatments With Contact Insecticides

Individual mound treatments are generally considered the most labor intensive and costly treatment methods, and they give the shortest fire ant free period. However, fast-acting methods are the most desirable in some situations. Where imported fire ant mound numbers are small (fewer than 20 mounds per acre) or where preservation of native ant species such as red harvester ants and other competitor ant species is desired, this may be a preferred method. Some products, such as those containing pyrethrins, pyrethroids, or d-limonene, can provide almost immediate control when and where necessary. Individual mound treatments are most effective when the queen and her brood are near the top of the mound. During cold, hot, or dry conditions, the queen may be deeper in the ground and survive the treatment. Finding all of the mounds in an area may be a challenge and colonies that do not have visible mounds will be missed so you may have to retreat in a short time.

Acephate products such as Orthene Turf, Tree, and Ornamental Spray can be diluted in water and poured over a mound. This is known as a mound drench. The dust formulation can also be used straight from the container by sprinkling a measured amount of powder on top of the mound. Use on lawns and noncrop areas. Retail and agricultural formulations of carbaryl (Sevin) are available for use as a mound drench on lawns, noncrop areas, pastures, and hayfields. It is one of the least expensive mound treatments available for treating ant mounds in pastures (about \$.10 per mound for the cost of the chemical) when the diluted product is poured onto mounds from a nurse tank. Many more ant mound treatment products are available for use in nonagricultural sites in a cattle operation. Some are considered organic. Some cost pennies per treated mound; others could cost more than \$1.00 per treated mound. Time from treatment to control varies. IGR bait products, for instance, have mound treatment instructions on product labels. Speed of control compared to the broadcast application of these materials, however, does not increase when applying material to individual mounds. **Always read and follow instructions on the product label.**

More Information on Fire Ants

For more information on fire ant management in Alabama, see the following publications from the Alabama Cooperative Extension System: ANR-175, "Imported Fire Ants in Lawns, Turf, and Structures"; ANR-175-A, "Fire Ant Control Materials for Homeowners"; ANR-1149, "Biological Control of Fire Ants"; ANR-1161, "Getting the Most Out of Your Fire Ant Bait"; and ANR-1185, "The Hidden Truth About Red Imported Fire Ants," an activity book for children. You can also visit <http://www.aces.edu/dept/fireants/>. For the latest in fire ant control materials in pastures and hayfields, see the forage chapter in ANR-500-A, *The Alabama Pest Management Handbook, Volume 1*, or IPM-28, "IPM Guide for Forages," which are updated each year.

For more information on fire ant management in Texas, see Texas Cooperative Extension Service publications B-6043, *Managing Red Imported Fire Ants in Urban Areas*; B-6076, *Managing Red Imported Fire Ants in Agriculture*; B-6099, *Broadcast Baits for Fire Ant Control*; or L-5070, *The Texas Two-Step Method Do-It-Yourself Fire Ant Control for Homes and Neighborhoods*. Also visit <http://fireant.tamu.edu>.



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For more information, call your county Extension office. Look in your telephone directory under your county's name to find the number.

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