

USDA Agricultural Research Service
Areawide Fire Ant Suppression



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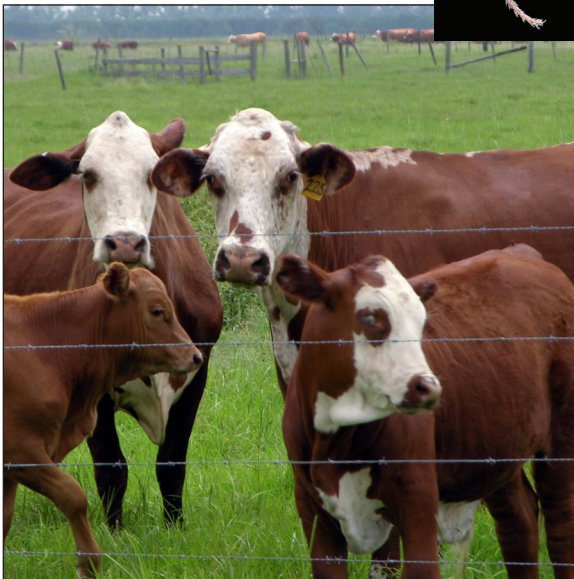
AREAWIDE FIRE ANT PROJECT

\$2.4 BILLION
 POTENTIAL
 STAKEHOLDER
 ANNUAL
 BENEFIT

SUCCESS



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The USDA-ARS Imported Fire Ant and Household Insects Research Unit and cooperators from five states (Florida, Texas, Oklahoma, Mississippi, and South Carolina) created the single most successful long-term areawide fire ant control program in history. The Program's participants developed a classical integrated pest management program that utilized fire ant natural enemies and insecticide baits.

SUMMARY

The USDA-ARS Imported Fire Ant and Household Insects Research Unit (IFAHIRU) and cooperators from five states (Florida, Texas, Oklahoma, Mississippi, and South Carolina) created the single most successful long-term areawide fire ant control program in history. The Program's participants developed a classical integrated pest management program that utilized fire ant natural enemies and insecticide baits. The fire ant is listed among the world's 100 worst invasive species. In the United States, it currently infests more than 320 million acres in 13 southern tier states and Puerto Rico (see map below). This invasive ant is estimated to be responsible for over \$6 billion annually in damage repair, medical care, and control costs. The affected economic sectors are broad ranging and include households, electric service and communications, agriculture, schools and recreation areas. As is the case for most exotic species, invasive fire ants were introduced without most of their natural enemies from their native South American range. As a consequence, fire

ant populations in the United States are five to ten times denser than in South America.

In the last decade the fire ant, *Solenopsis invicta*, has changed from an invasive pest ant in the United States to a global problem, with infestations occurring in Australia, Taiwan, China, Mexico, and many Caribbean Island countries. More than 30% of the people in infested areas are stung each year and hundreds of thousands require medical attention; over 80 deaths have been documented. In addition, this aggressive ant reduces native ant and other beneficial insect populations. Furthermore, they kill many small animals including endangered species.

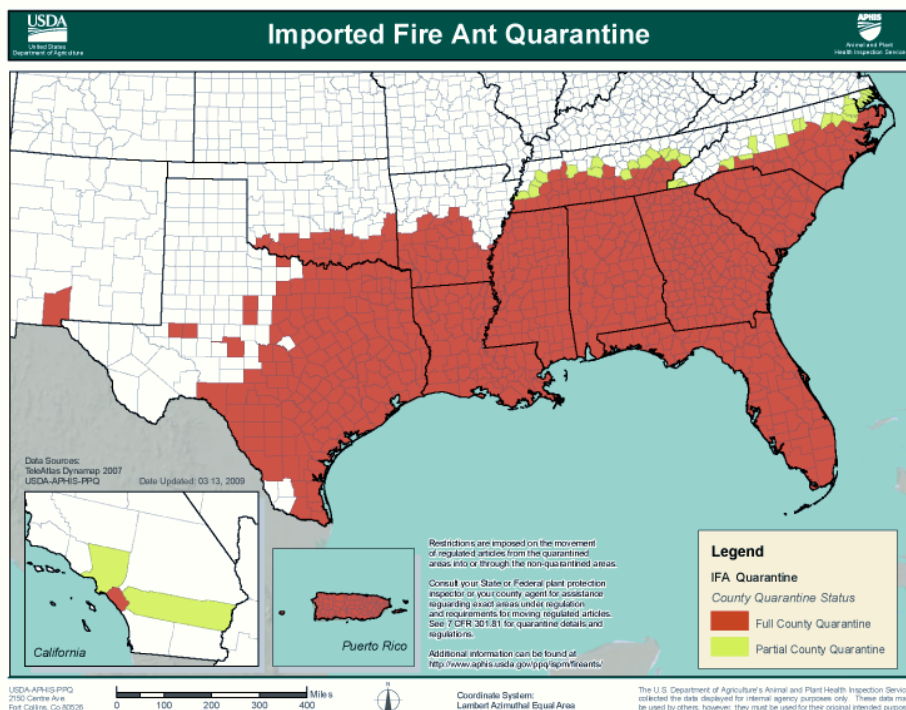
Virtually all fire ant bait products commonly available today were derived from IFAHIRU basic and applied research efforts, but that provided only one part of the fire ant integrated management puzzle. Areawide integrated fire ant management was made possible because of IFAHIRU's decades of persistent efforts to discover, import, and release fire ant-specific,

self-sustaining natural enemies, such as decapitating phorid fly (*Pseudacteon*) parasites and a microsporidian pathogen called *Thelohania* fire ant disease. The flies cause direct mortality, reduce ant foraging, and inhibit mating flight activities, resulting in weakened fire ant colonies and reduced reproductive potential. *Thelohania* fire ant disease from South America further stresses infected colonies, resulting in reduced colony lifespan and greater colony susceptibility to bait toxicants.

This variety of fire ant control tools made possible the implementation of a USDA-ARS funded Areawide project to 1) suppress fire ant population levels below target thresholds in pastures and 2) release sustainable natural enemies into demonstration sites in the five participating states. Initial focus was on maintenance of high levels of fire ant control in large pasture areas using the self-sustaining natural enemies and insecticidal baits, but as the Project progressed, focus was shifted to small-area High Value sites, defined as areas that had a low tolerance for fire ants, e.g. golf courses, cemeteries, parks, nursing homes, and schools that would benefit from the knowledge gained from our large area demonstration project and utilize a targeted treatment approach that offered multiple options. In all cases fire ant natural enemies and insecticidal baits were instrumental in achieving success.

Insecticidal Baits

The Areawide Project Core Committee decided, based on previous experience, at the onset of the Project that combining two commercially available baits, one using hydramethylnon, a fast-acting fire ant bait insecticide and the other using methoprene, a slow-acting insect growth regulator gave longer lasting fire ant control than either alone. The two baits were blended



and applied at the normal application rate of a single bait. Consequently, the insecticide (hydramethylnon) and insect growth regulator (methoprene) baits were applied at one half of the standard rate. The blend of the two baits in the Areawide Project gave excellent results, achieving better than 90% control in all five states. These results and other factors led to significant commercial interest in the blended bait approach, resulting in the development and availability of a commercial product, “Extinguish Plus,” now available to the general public for fire ant control!

Fire Ant Natural Enemies

Phorid fly parasite rearing is complex, labor intensive, and not likely to be taken on by private industry. Thus, APHIS provided funding to transfer ARS-developed phorid fly rearing technology to the Florida Division of Plant Industry (DPI), in Gainesville, Florida. Similar rearing technology was also transferred to the University of Texas, Austin; Louisiana State University, Baton Rouge; and the ARS, Biological Control of Pests Research Unit, Stoneville, Mississippi. The mass production and distribution of decapitating phorid fly parasites from DPI facilitated the release and establishment of the parasites at Areawide demonstration sites, and the two initiatives resulted in numerous requests to release flies in the United States from extension researchers not directly involved with the Areawide program! Similarly, methods to inoculate fire ant colonies with *Thelohania* fire ant disease were developed and transferred to Project cooperators and other university and state department of agriculture cooperators throughout the fire ant infested area. The resulting distribution of phorid flies and *Thelohania* fire ant disease went far beyond our initial expectations: Phorid flies occupy over 400,000 square miles and the disease covers 159,000 square miles, benefiting 32,943,000

and 16,000,000 people, respectively. Conservative annual dollar benefits are over 100 million dollars! The beauty of these self-sustaining natural enemies is that they will continue to spread naturally to all fire ant populations in the infested areas of the United States.

In addition to these successes and demonstrated impact outlined above, other accomplishments are:

- Sustained fire ant control at more than 80% over 3,600 acres for four to five years. These properties are now



serving as examples for neighboring property owners, providing for a continuing expansion of interest in fire ant integrated pest management (IPM) in different regions of the United States.

- Native ant abundance was greater in treated areas with natural enemies than without natural enemies — native ants are predators of newly mated fire ant queens, and slow reinfestation.
- Improved human safety by reducing exposure to fire ants.
- Implementation of a targeted treatment approach for high-value areas, yielded reduced management costs and lowered pesticide risks with efficacious targeted treatments.

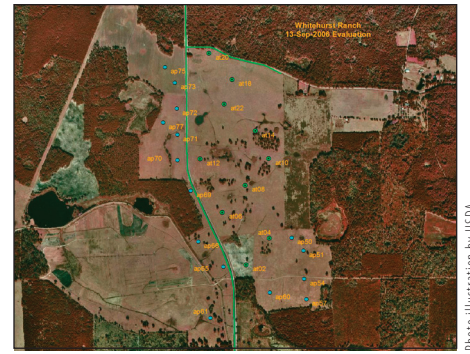
The following pages provide additional detailed information and accomplishments.

Fire ant natural enemy

Left: A decapitating phorid fly, circled, attacks a fire ant. The fly lays an egg that will develop inside the ant's head.

Right: As the fly larva develops, the fire ant's head falls off.

Main Project: PASTURE DEMONSTRATIONS



Aerial view shows a pasture site used for Areawide study in Florida. Fire ant populations within and around treatment area were monitored for five years after bait applications and biological control agents were released.



THE GOAL: TO DEMONSTRATE A FIRE ANT CONTROL PROGRAM THAT INTEGRATES BIOLOGICAL CONTROL AND CHEMICAL BAITS

PROJECT PARTNERS

USDA-ARS-Center for Medical, Agricultural, and Veterinary Entomology

USDA-ARS-Jamie Whitten Delta States Research Center

USDA-APHIS-Gulfport Imported Fire Ant Station

University of Florida

Texas A&M University

Clemson University

Oklahoma State University

FIRE ANTS cause serious problems for the cattle industry because of their potent sting and large populations. Damage to pastures is especially difficult because fire ants are expensive to control over the large acreage needed to feed livestock. To fight fire ant problems USDA/ARS initiated a project in 2001: “Areawide Suppression of Fire Ant Populations in Pastures.” The project’s goal was to demonstrate an integrated fire ant control program using self-sustaining natural enemies and chemical baits. To reduce fire ant populations, chemical baits were applied as needed through the course of five years. The biocontrol agents were introduced to pasture sites to slow, limit, or prevent reinfestation of the treated area. This integrated approach was expected to establish natural enemies of fire ants within the United States and ease the financial burden on farmers and ranchers.

Sites of about 300 acres each were established in Florida, Texas, Oklahoma, South Carolina, and Mississippi to allow testing of the integrated approach under different climatic and environmental conditions. The biological control agents, phorid flies and *Thelohania* fire ant disease, were introduced and established in the demonstration areas, and chemical baits were applied to designated areas. Data on fire ant populations at all field sites were collected and analyzed.

Outcomes of the Areawide Fire Ant Project include:

- Improved recommendations for applications of a bait combination including rapid and slow-acting ingredients (hydramethylnon plus methoprene) in pastures and an integrated fire ant control strategy that can be adapted to other agricultural and urban systems;
- Methodologies for efficient production, release, spread and detection of the biocontrol agents used in fire ant control;
- Release, establishment and spread of biological controls within demonstration areas and elsewhere in cooperating states;
- Sustained fire ant control with lower livestock production costs, increased farm-worker safety, and reduced pesticide risk;
- Restored ecological balance among native ants, birds, and wildlife.

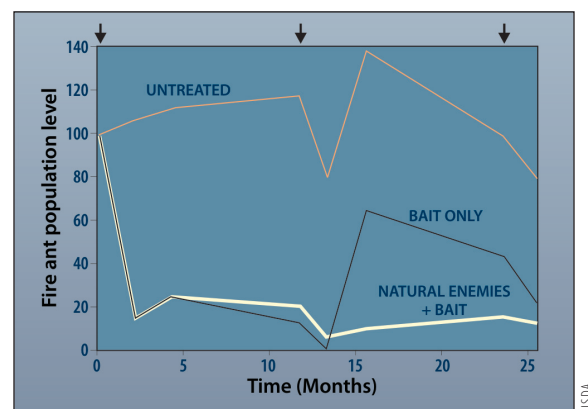
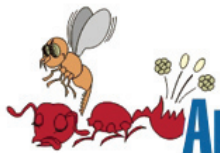


Figure 1. Comparison of the results for areawide bait plus natural enemies; bait and no natural enemies; and control — no bait or natural enemies. The bait and natural enemies effort gave more consistent results between 0 and 25% fire ants remaining and in this case the bait only treatment showed more erratic results. The arrows indicate times at which treatments were applied.



USDA Agricultural Research Service Areawide Fire Ant Suppression

A NATURALLY SUSTAINED Program for Cooperators



Fire ant damage to pastures is especially difficult because fire ants are expensive to control over the large acreage needed to feed livestock.



RANCHERS CAN KICK BACK AND RELAX, KNOWING THAT THEY NOW HAVE EFFECTIVE TOOLS FOR FIRE ANT CONTROL: BAITS AND NATURAL ENEMIES.

When the Program started, the two baits were available only as individual products, to be applied separately. Producers had to choose either a bait that 1) killed fast but had to be applied many times during the year, or 2) killed slowly so protection from fire ants did not occur for months, but lasted a long time.

THE AREAWIDE Fire Ant Program treated about 3,000 acres of pastureland across the southeastern United States. The program's research scientists worked in cooperation with ranchers in five states to demonstrate the innovative treatment methods. They combined insecticidal baits — applied aerielly to provide widespread coverage — with fire ant natural enemies that were released at each site.

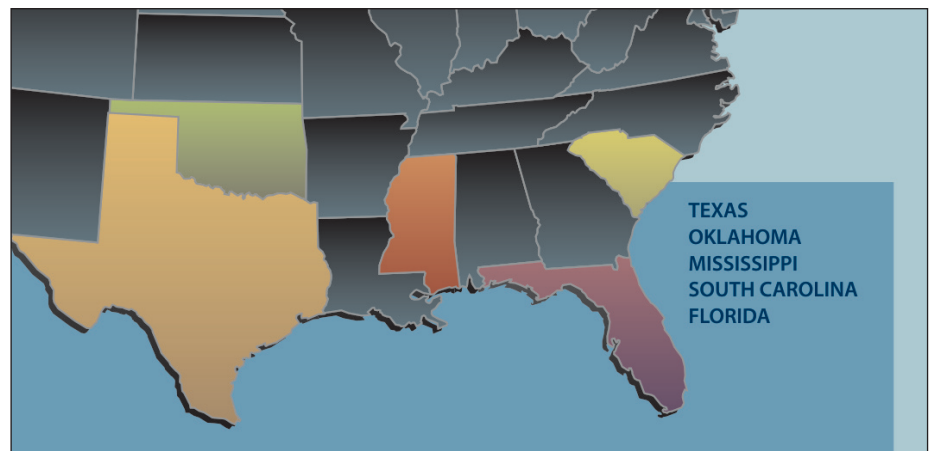
The natural enemies released by the research scientists at the ranch sites included *Thelophania* fire ant disease and decapitating phorid flies. USDA-ARS imported, isolated, and released these biological control organisms. Now, as nature takes its course, these natural enemies sustain the program on their own by building their populations and spreading every year.

As the ranchers adopt the bait treatment methods they learned, they can gain further success in the ongoing battle against fire ants. Baits are a very

effective method of controlling existing fire ant colonies. Baits do not harm wildlife because they break down in sunlight.

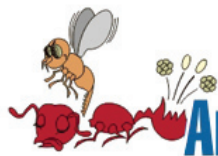
Two baits were combined to provide fast-acting, long-term control of fire ants. When the Program started, the two baits were available only as individual products, to be applied separately. Producers had to choose either a bait that 1) killed fast but had to be applied many times during the year, or 2) killed slowly so protection from fire ants did not occur for months, but lasted a long time. Hydramethylnon bait kills ants within three to five weeks. Methoprene bait sterilizes ant reproductives and prevents larvae from developing normally. Its effects are slow, but control lasts for months.

Areawide efforts helped make the new bait blend available to the general public. The combination of the bait blend and the spreading populations of natural enemies provides better, more sustained fire ant control than either method used alone.



Map 1. Cooperating ranchers in five states worked with the Areawide project to learn treatment methods for fire ants in pastures.

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Areawide Fire Ant Suppression: **ECONOMIC BENEFITS**

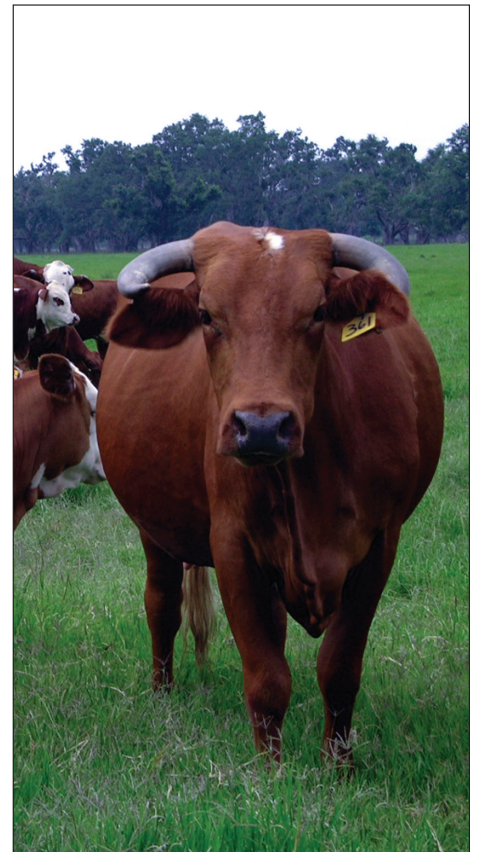


THE AREAWIDE FIRE ANT SUPPRESSION — USING NATURAL ENEMIES AND BAITS — IS PROJECTED TO SAVE \$2.3 BILLION A YEAR.

THE AREAWIDE Fire Ant Suppression Program is designed as a package of control- and cost-effective strategies to reduce the impact of fire ants that can be implemented in a variety of situations, from homeowners to large-scale land managers.

Imported fire ants have cost more than \$5.6 billion annually in damage and control in 13 southern states and Puerto Rico since the pest became established in the U.S. in the 1930s. In addition, fire ants affect almost 100 million people at a price of about \$58 per person in the infested states. Florida has suffered the largest economic loss from fire ants at \$1.3 billion. Arkansas has the highest per person cost at \$101 (Table 1).

Using baits and natural enemies to manage fire ant populations over large areas, this innovative, easily sustainable program is projected to save more than \$2 billion a year in fire ant damage as natural enemies spread and kill fire ants and treatments continue. There are also major environmental benefits as the program substantially reduces the use of insecticides.



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We may have adapted to living in areas infested with fire ants, but we still pay the price. Fire ants harm people, pets, buildings, wildlife, crops, livestock, and equipment.

Photos, from top:

Ants feed on and damage livestock. Agricultural crops also are lost to fireants.

Ants invade homes and other buildings as they seek food and moisture.

Fire ant stings can cause serious health problems for humans and animals.



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State	Economic Impact (\$)	Affected Population	Fire Ant Impact Per Person	Expected Benefit Per Person
Alabama	257,700,890	4,627,851	55.68	23.16
Arkansas	128,325,920	1,268,190	101.19	42.10
California	844,913,484	14,949,158	56.52	23.51
Florida	1,333,773,358	18,251,243	73.08	30.40
Georgia	565,626,807	9,544,750	59.26	24.65
Louisiana	307,706,245	4,293,204	71.67	29.81
Mississippi	236,239,704	2,918,785	80.94	33.67
New Mexico	1,742,875	198,791	8.77	3.65
North Carolina	194,270,988	5,788,092	33.56	13.96
Oklahoma	26,004,008	283,850	91.61	38.11
Puerto Rico	229,035,602	3,941,459	58.11	24.17
South Carolina	220,430,214	4,407,709	50.01	20.80
Tennessee	101,801,876	4,248,648	23.96	9.97
Texas	1,204,216,194	21,962,694	54.83	22.81
Total	\$ 5,651,788,765	96,684,424	\$ 58.46	\$ 24.32

Table 1. Annual Fire Ant Economic Impact and Expected Benefit of Areawide Program by State

Areawide Program Benefits Many Economic Sectors

FIRE ANTS cause damage to many sectors of the American economy. Among the sectors that stand to significantly benefit from the Areawide Program are houses and multi-family residences, schools, cities and other municipalities, churches, electric and communications facilities, airports, cemeteries, commercial businesses, golf courses and other recreational areas, and agriculture (Table 2). Agriculture includes farms, nurseries, sod producers, fruit, vegetable and nut producers, field crops, animal production, pastureland, cropland, hay production, and farmsteads.

The areawide management of fire ants program is helping to stop damage in these sectors by: initiating the release and spread of natural enemies for fire ants; integrating the use of baits to provide 80 percent sustained, areawide fire ant control; reducing reliance on repeated applications of insecticide for fire ant control; and restoring the ecological balance in the natural environment.

Sector	Economic Impact (\$)	Expected Benefit (\$)
Agriculture	428,286,974	178,167,381
Airports	84,346,455	35,088,125
Cemeteries	98,721,385	41,068,096
Churches	42,394,283	17,636,022
Cities	6,969,202	2,899,188
Commercial Businesses	90,598,908	37,689,146
Golf Courses	318,604,130	132,539,318
Institutions	6,035,784	2,510,886
Multi-Family Households	33,437,968	13,910,195
Nurseries	45,435,710	18,901,255
Residential Households	3,674,675,482	1,528,665,001
Schools	130,188,066	54,158,235
Sod Producers	54,514,446	22,678,010
Electric and Communications	637,650,370	265,262,554
Total	\$ 5,651,859,165	\$ 2,351,173,413

Table 2. Fire Ant Economic Impact and Expected Benefit of Areawide Program by Sector



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Invasive populations of the red imported fire ant have a far-reaching negative impact.



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Ants interfere with outdoor activities.



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Ants kill wildlife and endangered species.



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Ants damage mowers and agricultural equipment.



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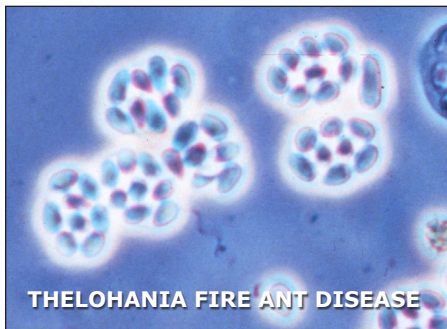
Mounds are unsightly and can reduce property values.



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Ants infest electrical equipment, and their bodies cause short circuits.

SPREADING the NATURAL ENEMIES



THE AREAWIDE PROGRAM RELEASED DECAPITATING PHORID FLIES AND THELOHANIA FIRE ANT DISEASE; BOTH ARE NOW ESTABLISHED THROUGHOUT THE SOUTHEAST.

IMPORTED FIRE ANTS first came to the United States around 1930. Seventy years later there were five to 10 times more ants per acre here in the States than in their native land of South America. Free to spread, the fire ant populations soared in the States because they had no natural enemies established here.

The Areawide Fire Ant Suppression Program worked to release and establish fire ant natural enemies. The phorid fly populations (Figure 1) and *Thelohania* fire ant disease (Figure 2) have spread to cover hundreds of thousands of acres, benefiting the human populations residing in those areas. The more these natural enemies flourish, the more people will benefit.



Table 1. The benefit of self-sustaining fire ant biocontrol agents. The expected benefit is calculated based on (a) the area currently occupied by decapitating flies (Fig. 1) and *Thelohania* fire ant disease (Fig. 2), (b) the human populations associated with those areas, and (c) the mean cost of control and damage repair per person (\$58.46, Lard et al. unpublished).

DECAPITATING PHORID FLIES	
Area Covered (Square Miles)	404,525
Benefiting Population	56,352,660
Expected Benefit*	\$32,943,000/yr
THELOHANIA FIRE ANT DISEASE	
Area covered (Square Miles)	158,852
Benefiting Population	16,804,407
Expected Benefit**	\$ 162,093,000/yr
FLIES AND FIRE ANT DISEASE	
Area covered (Square Miles)	462,677
Benefiting Population	59,863,995
Total Expected Benefit	\$195,036,000/yr

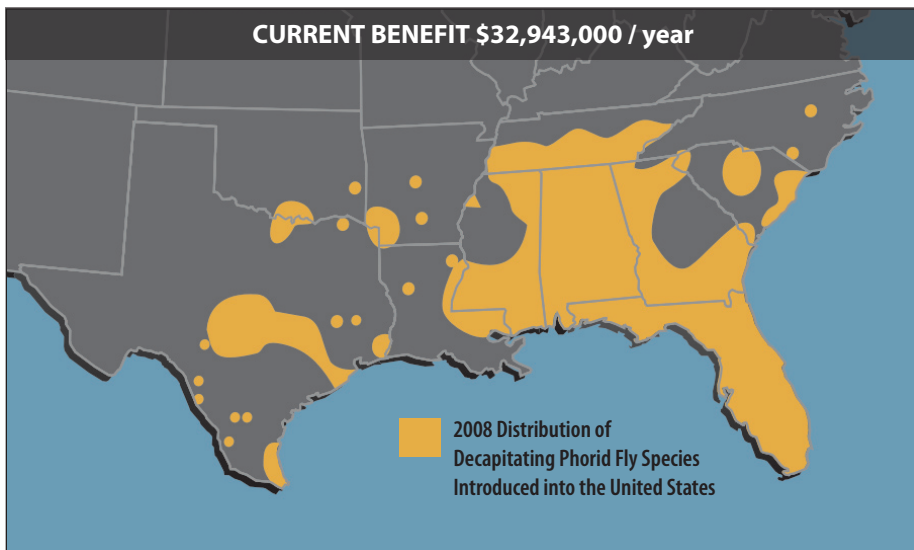


Figure 1. Phorid flies were introduced from South America and are now found throughout the Areawide Program's states. The Areawide program promoted decapitating fly releases throughout the fire ant infested area. Releases were conducted with the help of state cooperators and the USDA/APHIS rearing and release program.

* Expected benefit is based on the direct effect of parasitism for a single fly species (1% population reduction). Negative effects of additional species of decapitating flies and their effects on fire ant foraging, mating flights, and their potential as disease vectors have not been factored into the expected benefit.

** Expected benefit is based on field data showing an average 33% reduction of polygynous fire ant populations when infected with the *Thelohania* fire ant disease and the assumption that 50% of polygynous colonies are infected at any given time.

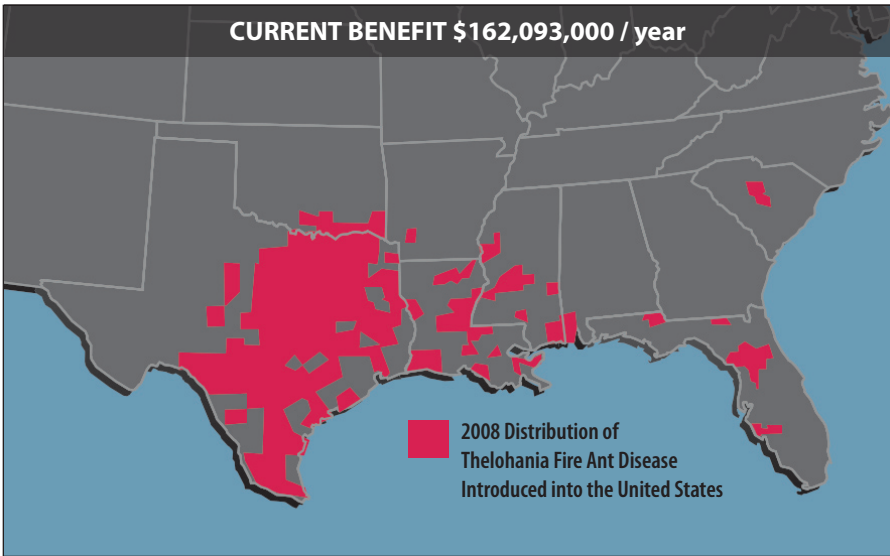


Figure 2. *Thelohania* fire ant disease distribution (2008). *Thelohania* fire ant disease inoculations were conducted through the Areawide Project and by others researchers. The self-sustaining pathogen has spread through fire ant populations.

THELOHANIA FIRE ANT DISEASE weakens fire ant colonies and results in 60 percent fewer ants per acre.



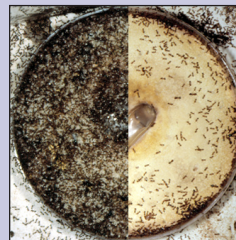
Researcher places infected larvae on the fire ant mound. Ants adopt and raise infected larvae. The disease spreads to workers and the queen.



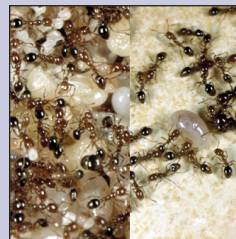
In the queen, the disease multiplies, causing the abdomen to shrink. This is a healthy queen, left, and a diseased queen.



Diseased queens have dark cysts in their ovaries and produce 90 percent fewer eggs. These queens are dissected to show healthy and diseased ovaries.



The few eggs the queen produces are diseased. Only a few larvae and workers develop. The workers in a healthy colony, left, greatly outnumber workers in a diseased colony.



A diseased-weakened colony cannot defend itself. Stronger, raiding colonies, left, carry off and adopt the diseased larvae.



Strong colonies produce many winged sexuals, left, but when diseased and weak they produce only a few winged sexuals, decreasing the number of new queens.

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DECAPITATING PHORID FLIES

Decapitating phorid flies not only remove ants' heads, they weaken colonies because remaining ants — trying to avoid fly attack — stop looking for food outside their nest.



Female flies are released near mounds, attack ants, and lay eggs inside them. The egg hatches into a tiny maggot that burrows into the ant head.



Inside the head, the maggot causes the fire ant head to fall off, killing the ant.



The maggot pupates inside the head, and the adult fly squeezes out the ant's mouth.

WHY NATURAL ENEMIES?

A reasonable solution for fire ants is release of natural enemies to provide biological control. Natural enemies of fire ants have been found in South America and have proven safe and effective. Natural enemies spread on their own.

Two effective natural enemies of fire ants have been utilized as biological control agents: *Thelohania* fire ant disease and decapitating phorid flies.

Natural enemies can provide control wherever ants are. The *Thelohania* fire ant disease and the decapitating flies affect *only* fire ants, not other species. They also can improve and extend the effectiveness of insecticide treatments.

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PRECISION BAITING and MONITORING for Fire Ants

FIRE ANT BAIT TREATMENTS are highly effective if used correctly. But these treatments can be a waste of time and money if the bait is used in areas with no fire ants, areas with few fire ants, or areas where fire ants are not actively foraging. Even worse, the bait may kill native ants that compete with fire ants for food and nesting sites. In order to deliver fire ant treatments efficiently and effectively, the Areawide Fire Ant Suppression Program implemented a precision treatment approach.

This approach targeted areas known to have fire ants and timed the treatments to occur when those ants were most active. Furthermore, the treatments avoided areas where native ants occurred, because these ants could impede reinfestation by fire ants.

The Program evaluated ways that might lure the fire ants effectively. Hot dogs were found to be effective at monitoring for fire ants in a wide variety of settings. Furthermore, hot dogs were readily available and inexpensive. Researchers scouted out fire ant nests in acreage thought to harbor large populations of the ants. They placed small hot dog pieces at measured intervals across the area and marked each of these monitoring sites with a wire flag. Often, they recorded a GPS reading on the spot for future assessments.

Preliminary monitoring occurred within an hour of placing lures: Each hot dog lure was observed for the presence or absence of fire ants. A threshold for treatment was established at 35% (Figure 1). Treatments were initiated at or above this level and withheld below. This threshold was empirically determined to be the level at which minimal harm would occur to native ants, while allowing them to successfully compete with fire ants for resources.

Highland Park Cemetery in Durant, Oklahoma, was a city-maintained site that achieved excellent control of its fire ant populations using the precision treatment approach. In May 2005, fire ants were found on nearly 70 percent of the hot dog lures — well above the treatment threshold. The Program immediately treated the acreage with blended bait, which succeeded in dropping the fire ant population below the 35 percent treatment threshold. Fire ants resurged in late summer, and a second treatment further dropped the fire ant numbers. Later, a third cycle nearly eliminated the area's fire ant population (Figure 1).

Baits should be applied only when and where they are needed. When used as recommended, the precision treatment approach kills fire ants and preserves the native ants. This approach protects people, animals and equipment from fire ant damage, and puts less insecticide into the environment.



Treated evaluation plot at the Highland Park Cemetery in Durant, Oklahoma.

R.I.P., FIRE ANTS:
THE AREAWIDE PROGRAM'S
PRECISION TREATMENT
APPROACH FOUND SUCCESS
USING STRATEGIC TARGETING
— AND A FEW HOT DOGS



Hot dogs proved to be a readily available, effective lure for monitoring fire ants in a variety of settings.

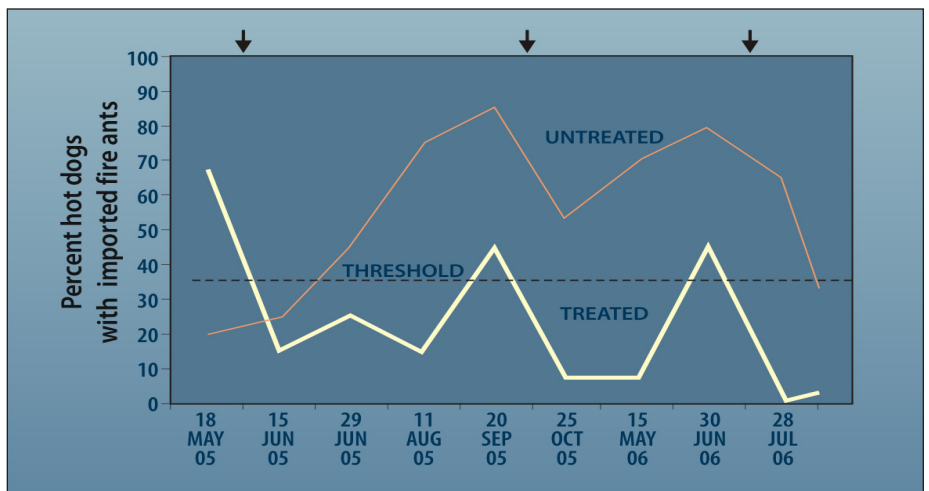
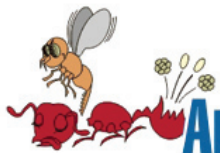


Figure 1. Percentage of hot dog lures with fire ants at the Highland Park Cemetery, Durant, Oklahoma. Treatments, indicated with arrows, were on May 18 and Sept. 28, 2005, and June 30, 2006.



USDA Agricultural Research Service Areawide Fire Ant Suppression

BLENDDED Fire Ant Baits



Pasture treatments called for aerial application of two chemical baits blended together for quick knockdown and sustained control of fire ants.

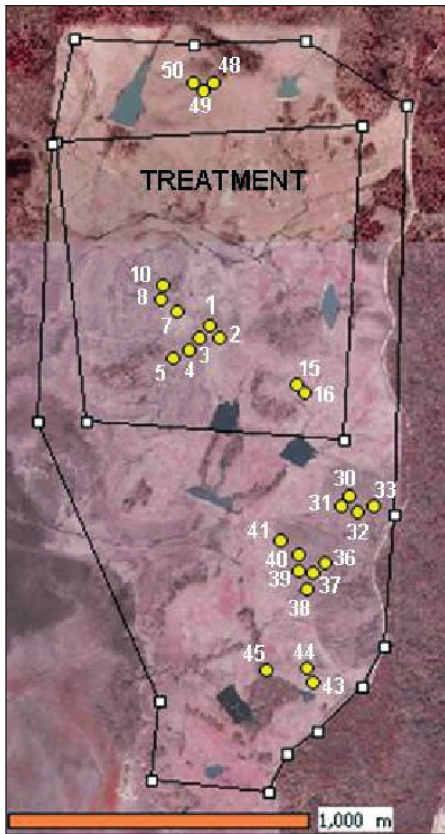


Photo illustration by USDA

THE AREAWIDE Fire Ant Program integrated biological control agents with chemical bait products. Baits usually consist of an active ingredient that is dissolved in a vegetable oil (normally soybean oil) that also acts as a fire ant feeding stimulant. To get this active ingredient/oil to the ants it is absorbed into defatted corn grits (up to 30% by weight), resulting in a flowable, spreadable formulation that can be distributed for typical commercially available spreaders, including via aircraft. Fire ants are capable of foraging up to 100 feet from their nests. They find the grit/bait particles and quickly distribute the oil/active ingredient from the grits to their nestmates. At the onset of the Project the Core Committee decided, based on previous experience, that two chemical baits with very different active ingredients would provide effective and longer-lasting fire ant control than either of them separately, especially if they were combined.

One active ingredient, hydramethlnon, is a fast-acting insecticide whose toxic effects are delayed enough to allow transfer of the active ingredient throughout the colony, including the queen, resulting in death of the colony in two to three weeks. The other active ingredient, methoprene, is a slow-acting insect growth regulator that does not directly kill the workers;

instead it affects the egg-laying capacity of the queen (by up to 2,000-3,000 eggs a day) and the development of larvae to adults. As workers die of old age they are not replaced, and in time the colony dies off.

By blending the two baits each is applied at one-half the rate of a normal application. The environmental advantage is that less insecticide (hydramethlnon) is going into the environment, without sacrificing fast action, and gaining longer sustained control (Figure 1). The large areas being treated (about 300 acres) dictated that aircraft needed to be used for distribution of the bait (see photos left and top). The blended bait was applied to 13 large acreage pasture sites in five states across the southeastern United States. Imported fire ant suppression lasted up to 10 months before fire ant monitoring indicated that treatment was needed again. The High-Value site part of the Project involved smaller acreage that could be treated using ATVs or hand-held spreaders, depending on the situation. The advantage of blended baits was recognized by commercial entities, and it is now available to the public at home and garden stores around the country.

AERIAL APPLICATIONS PROVIDE EXCELLENT PARTICLE DISTRIBUTION TO DENSE FIRE ANT POPULATIONS SPREAD OVER PASTURE ACREAGE.

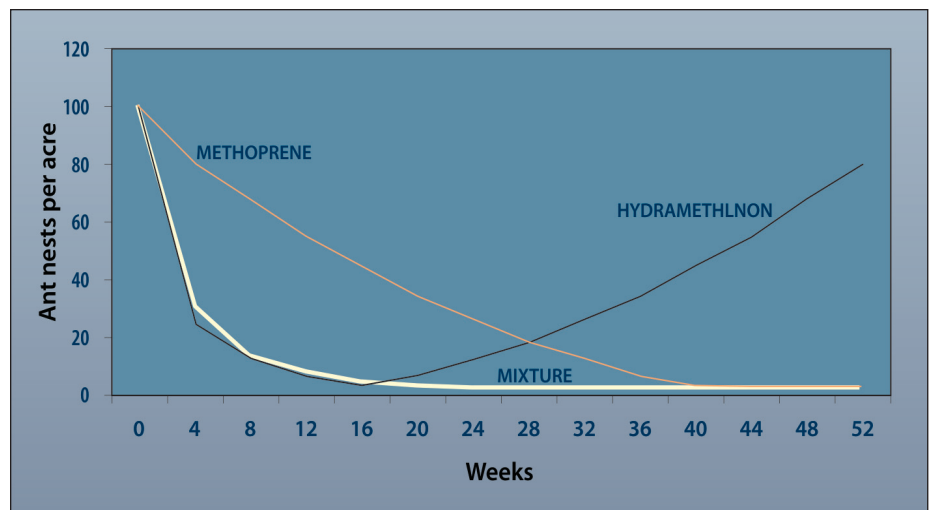
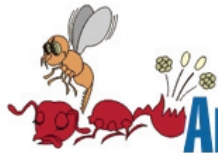


Figure 1. The Program's bait blend provides fast-acting, long-lasting fire ant control in pastures.

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ECOLOGICAL BALANCE

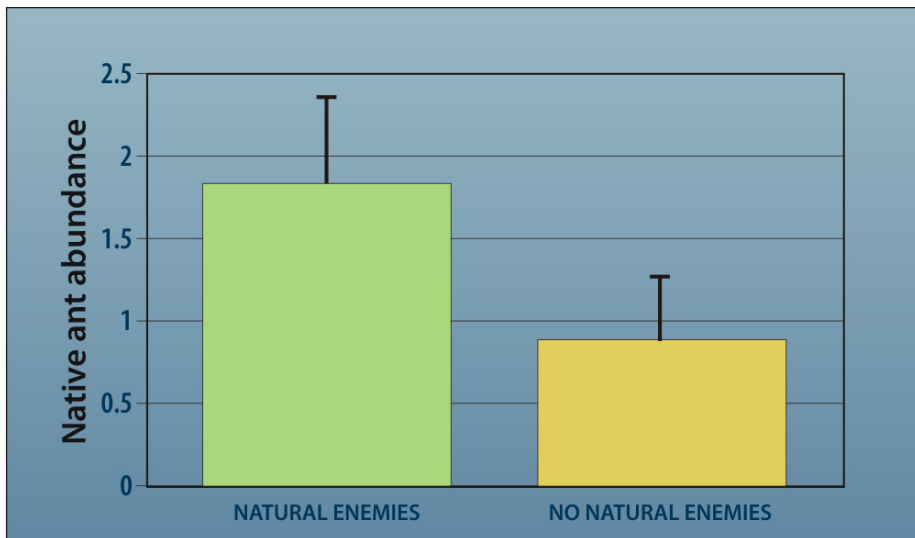


USDA

FIRE ANTS DOMINATE NATIVE WILDLIFE POPULATIONS SO THOROUGHLY THAT EVENTUALLY, FIRE ANTS ARE THE MOST PREVALENT LIVING CREATURES LEFT IN AN AREA.

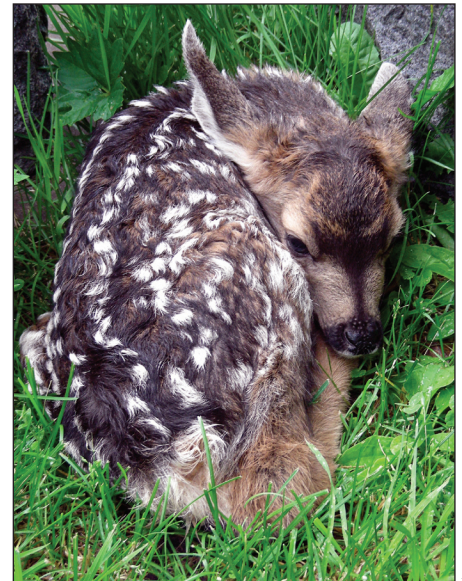
NATIVE WILDLIFE, even endangered species, can suffer greatly when fire ants invade their environment. Fire ants are known to swarm over, attack and devour defenseless creatures large and small, warm-blooded and cold-blooded alike. If left unchecked, fire ants dominate native wildlife populations so thoroughly that eventually, fire ants are the most prevalent living insects left in an area.

The Areawide Program has worked to preserve native wildlife and restore the ecological balance that was lost to fire ants. As indicated in Figure 1, in areas where natural enemies were introduced, native ant populations were more abundant. Furthermore, in areas treated under the Areawide Project, fire ant populations were lowered (Figure 2). In summary, the methods employed in the Areawide Program successfully reduced imported fire ant populations while improving native ant diversity. The key to the Program's success has been the sustained reduction of fire ants, which gave native wildlife populations the chance to rebound.



USDA

Figure 1. Abundance of beneficial native ants in the areawide program between areas with natural enemies (*Thelohania* fire ant disease and phorid flies) and areas without natural enemies.



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Fire ants attack and kill wild animals that inhabit the same level of the environment as the fire ant. Deer, quail and other birds, rabbits, turtles, lizards, snakes, snails and insects regularly fall prey to the voracious fire ants.



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Photos, from top:

Newborn and young deer, quail and rabbits benefit the most from the areawide program.



UFL/IFAS

Fire ants attack butterflies as vulnerable caterpillars. And competitor ant species fall victim to fire ants.



Univ. of Ga.

Endangered species get no special treatment. Fire ants stress these already-struggling populations: Stock Island tree snail, saltmarsh rabbits, and nesting sea turtles (shown).



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Ecological imbalance

FIRE ANTS attack a diversity of native wildlife populations. They include prevalent wild animals like deer, quail and rabbits. They also include smaller animals like butterfly caterpillars and other insects. Native ants are important because they compete with fire ants for food and are excellent predators of newly mated fire ant queens. Native ants help decrease the spread and repopulation of fire ants.

The most important wildlife to save fire ants from are endangered species like gopher tortoises, nesting sea turtles, and saltmarsh rabbits. Fire ants are especially damaging to newborn or hatching young of these and other species. The Areawide Project has provided sustained control aiding native wildlife populations.

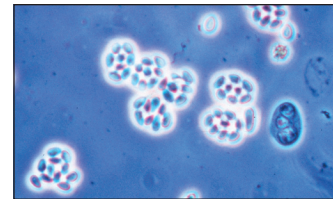
Integrated management preserves native wildlife

The Areawide Fire Ant Suppression Program demonstrated the use of new blended baits with natural enemies. First, the bait immediately reduced the fire ant populations. Then natural enemies were introduced to help maintain lower populations over time. Due to sustained fire ant control over large areas, wildlife populations were not stressed by fire ants.

Blended baits and natural enemies — specifically targeted to attack only the fire ants — have provided sustained fire ant control and have worked to preserve native wildlife and endangered species. The Areawide Fire Ant Suppression Program has helped restore the natural ecological balance that existed before the invasive fire ants arrived.



Native quail, once decimated by imported fire ants, have repopulated the Areawide Program plots.



Phorid flies, left, and *Thelohania* fire ant disease are just two of the natural enemies that have been put to work managing fire ants in the Areawide Fire Ant Suppression Program. These natural enemies were introduced to reduce fire ant populations, and allow native wildlife to rebound.

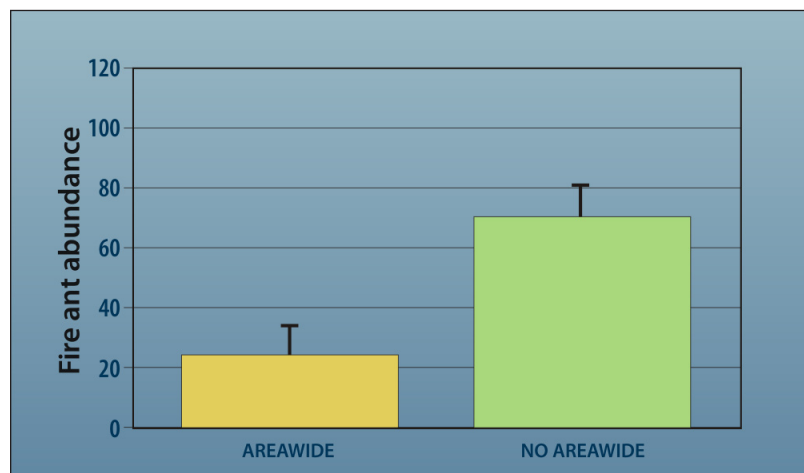


Figure 2. Fire ants are less abundant during the Areawide Program. Wildlife benefits when there are fewer fire ants.

HIGH-VALUE SITE DEMONSTRATIONS



Caldwell High School

FIRE ANTS are serious pests that affect human activities and resources valued by people including wildlife, crops, and livestock. For the first four years, the Areawide Fire Ant Suppression Program focused on fire ant control for large rangeland ecosystems. For the final three years, the Program has focused on people-priority sites, where fire ant control would be especially valuable to community activities (Figure 1).

The Areawide Program selected 14 demonstration sites in Florida, Mississippi, Oklahoma, South Carolina, and Texas, where a wide range of human activities take place. These included schools, city parks, scout camps, wildlife refuges, cemeteries, golf courses, research stations, and orchards (Figure 1).

THE GOAL: DEVELOP AND DEMONSTRATE MANAGEMENT APPROACHES THAT FIT THE NEEDS AND BUDGETS OF HIGH-VALUE SITES REQUIRING FIRE ANT CONTROL

PROGRAM ACCOMPLISHMENTS

- Successfully established fire ant natural enemies;
- Implemented targeted treatment approaches;
- Reduced management costs;
- Improved human safety by reducing exposure to fire ants;
- Lowered pesticide risks with more efficacious targeted treatments;
- Improved multi-state cooperation that reduced fire ant impact in specific areas by combining selective insecticides and biological control agents;
- Increased public awareness of integrated fire ant management with the successful introduction of biological control agents.



Figure 1. High-value sites were located in five states: Florida, Mississippi, Oklahoma, South Carolina, and Texas.

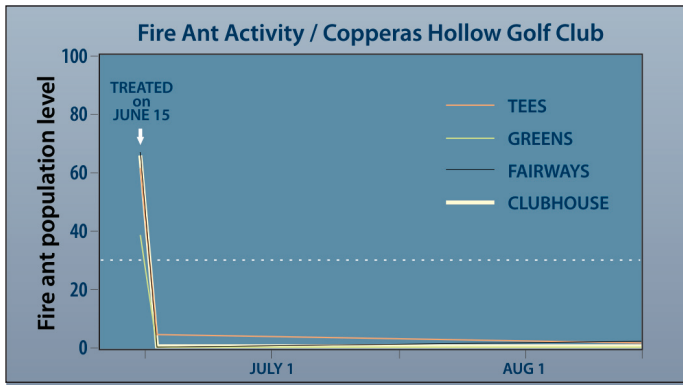


Figure 2. Summer 2005 fire ant activity at Copperas Hollow Country Club, Burleson Co., Texas.

A customized concept with wide appeal

SEVERAL TARGETED treatment approaches were considered by ARS and managers for each site. For example, on golf courses in Texas, managers had the option of treating fire ants to achieve maximum control, moderate control, or monitored control. The costs of these approaches ranged from \$2,000 to \$300.

Using the simple monitoring and targeted approaches developed by the Areawide Program, Copperas Hollow Golf Course experienced a dramatic reduction of its fire ant populations (Figure 2). The course manager was extremely pleased with the reduction of fire ants throughout the course, and he intends to continue treatment in a similar fashion as resources permit.

The Longland Plantation, SC, a location managed primarily for bobwhite quail hunting, served as an overall demonstration of the lessons learned throughout the Areawide Program. This site served as a training location for county extension agents, landowners, land managers, and other stakeholders.

Baits and phorid flies were used at this site (Figure 3). The landowner reports that this area now has the highest quail population anywhere on his plantation. He is very excited

that the phorid fly biocontrol may one day help him keep the fire ant population in check to increase the quail population without continued treatments.

At Kanapaha Park, Gainesville, Florida, Alachua County park personnel lowered fire ant activity throughout the park in 2006 and 2007 by following the Program (Figure 4). The Park developed a “fire ant control team” that now has the experience to continue monitoring and managing fire ants (Figure 5). Excess bait from the Areawide Project was donated to the Alachua County Parks Department and will be used to continue the control program.

The need to evaluate priorities and to combine different approaches to achieve sustainable control of fire ants was emphasized at each demonstration site, which represents a significant improvement for fire ant control in the United States. This concept is now being practiced throughout other states and has the potential to improve the quality of life for many Americans affected by this invasive species.

For more information on establishing Areawide fire ant management and control, see WWW.ARS.USDA.GOV/FIREANT.



Figure 3. Phorid fly releases at Longland Plantation, South Carolina.

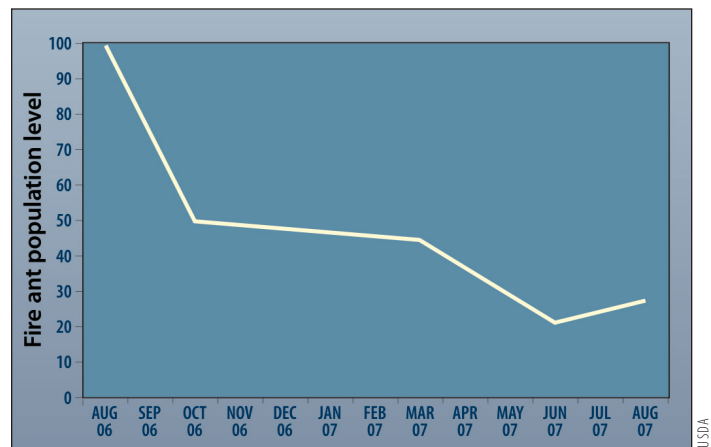


Figure 4. Annual Fire Ant Activity Monitored at Kanapaha Park.



Figure 4. Alachua County Parks Department “Fire Ant Control Team” employees get hands-on training in monitoring fire ants with food lures (A) and the application of baits with a spreader ATV system (B). Parks Department employees load the bait (C) that will expedite the continuation of this high-value site project.

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