

Fire Ants: Research Activities and New Regulations

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HISTORY

Imported fire ants are unique pests causing a wide variety of problems ranging from medical, to agricultural, to structural, to ecological. The imported fire ant has been in the United States only a short time, as the first specimens of the black imported fire ant (BIFA), *Solenopsis richteri*, were collected in Mobile in 1928. They were introduced into the port of Mobile around 1918, possibly from discarded ballast or packing from cargo ships. Until 1912 and the passage of the Plant Quarantine Act, it was common practice to discard packing from ships once they were unloaded. *Solenopsis richteri* spread very slowly after its introduction into the United States. By 1931, BIFA was found in only three counties, Mobile and Fairhope in Alabama and Baldwin County, Florida. Sometime within the next 10 years, another species of imported fire ant arrived on our shores, again in Mobile. This new invader, the red imported fire ant (RIFA), *S. invicta*, proved to be much more adaptable and rapidly displaced *S. richteri*. By the late forties, it was the dominant species of imported fire ant. Alabama (along with its neighbor Mississippi) holds the distinction of having both species within its borders. All other states within the USDA quarantine has only the red imported fire ant. As if these

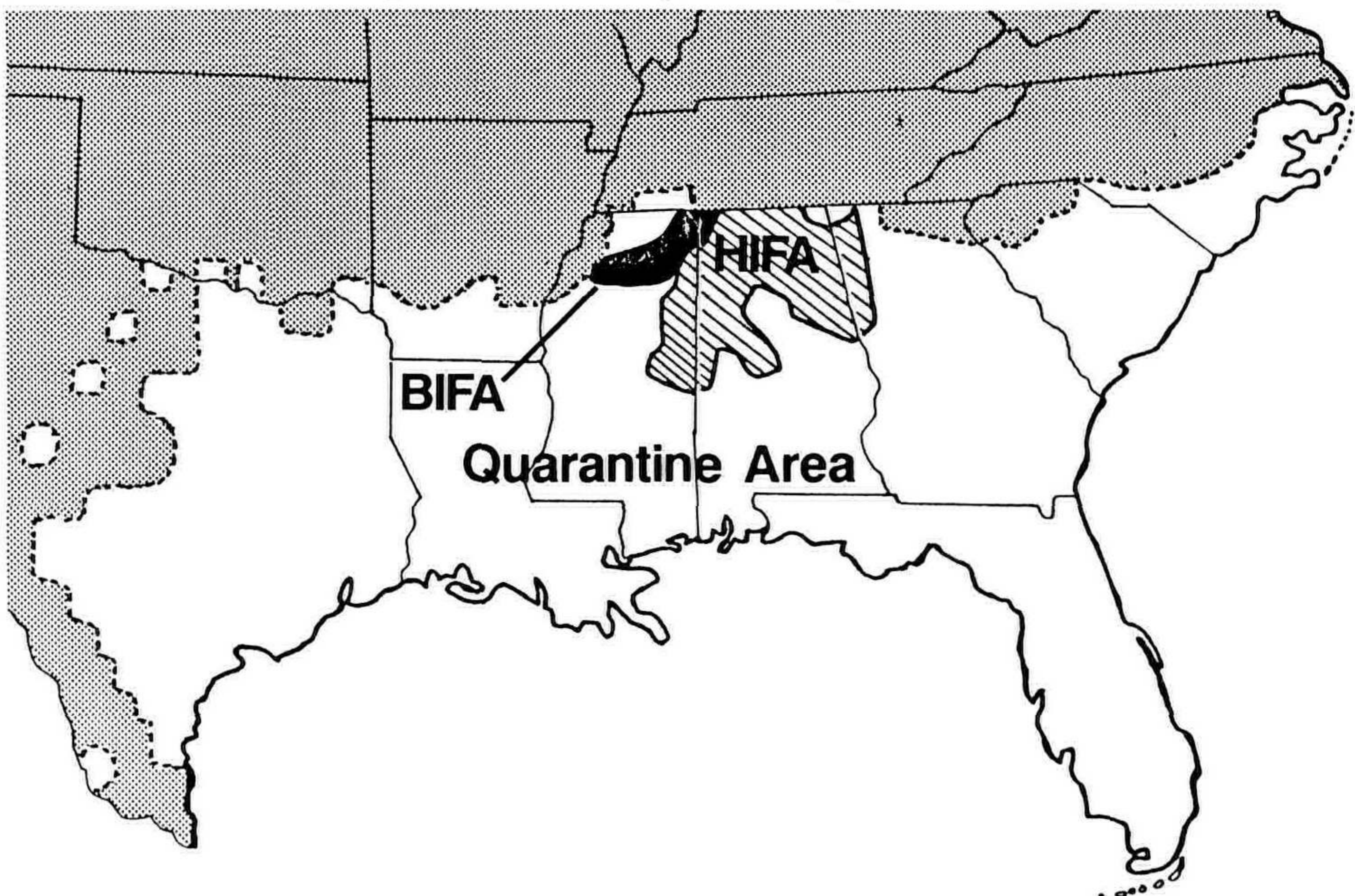
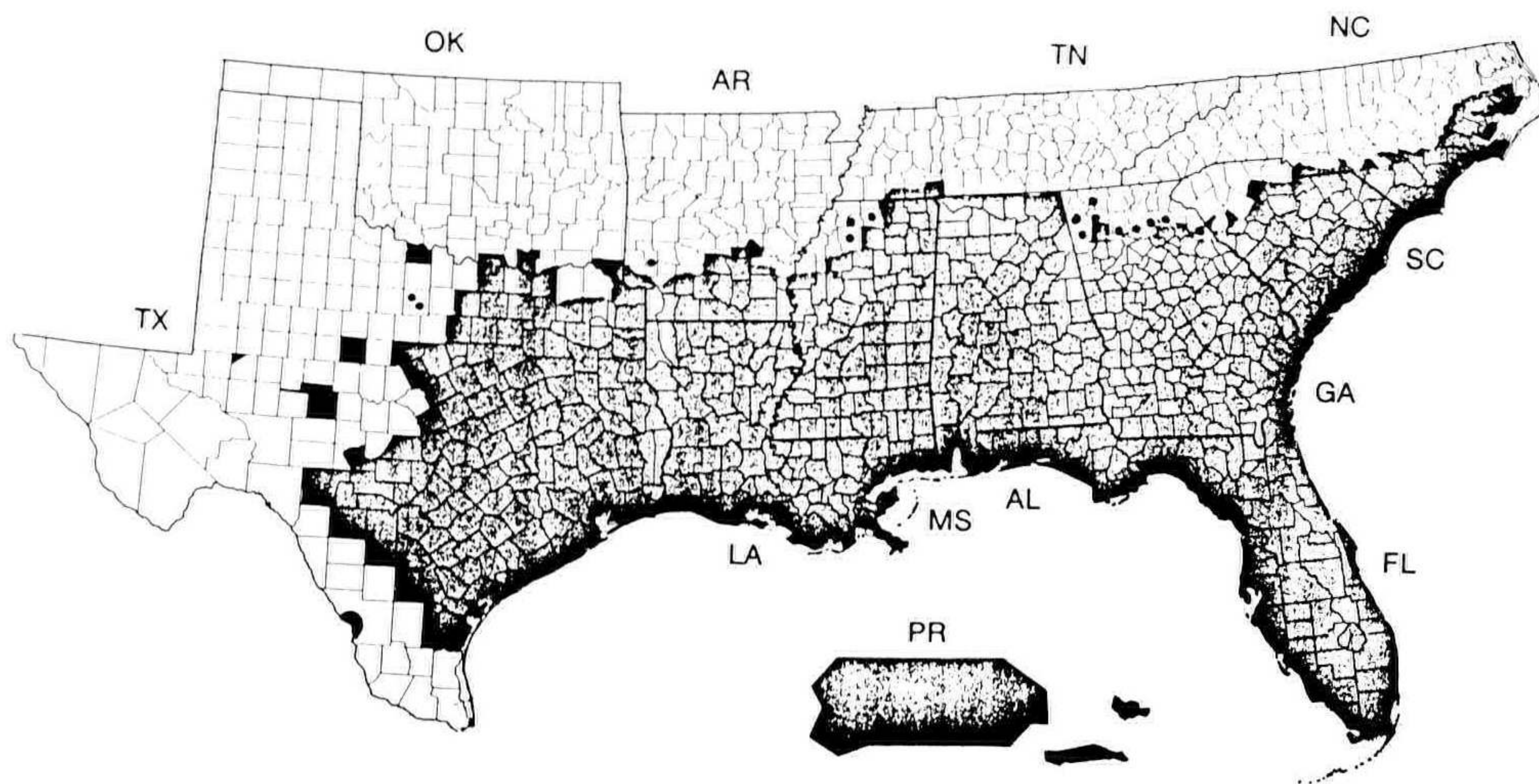


Figure 1. Current known distribution of the black imported fire ant (BIFA) and the hybrid imported fire ant (HIFA) within the currently delineated quarantined area.

were not bad enough, in recent years, analysis of specimens has revealed the existence of a hybrid (HIFA) between the two imported fire ants. This hybrid has, for the most part, displaced the black imported fire ant. Data indicates that this viable hybrid is as cold-hardy as BIFA (from which it cannot be distinguished morphologically) and has the aggressiveness and high adaptability of RIFA. Again, Alabama (along with Mississippi and northwest Georgia) have been singled out for the dubious distinction of having this pest within their borders (Fig. 1).

How did we spread these pests throughout the Southeast? Unfortunately, through nursery stock. There would have been a steady advance of these ants



Conditions of Movement

Counties entirely colored are completely regulated; counties partially colored are partially regulated.

Regulated area

Restrictions are imposed on the movement of regulated articles as follows: From red areas into or through white areas.

Consult your State or Federal plant protection inspector or your county agent for assistance regarding exact areas under regulation and requirements for moving regulated articles. For detailed information see 7CFR 301.81 for quarantine and regulations.

Figure 2. Imported fire ant quarantines

through normal mating flights (ca. 20 km/year). However, establishment of secondary infestations through movement of infested nursery stock in the 1950s rapidly distributed them through much of the present range (Fig. 2). We fully expect RIFA to expand its territory north and west. From our current knowledge, we can expect them to infest most of California as well as parts of Oregon, Washington and British Columbia. They could even reach as far north as ca. 50 km south of Juneau, Alaska. Along the eastern coast of the United States, they could expand their range as far north as Staten Island, NY. Figure 3 illustrates the potential of RIFA to infest rural areas. They also pose a threat as an urban pest. We have already seen them in urban areas far outside their normal climatic range. Isolated infestations of RIFA have been eliminated from Newton, KS; Washington, DC; Philadelphia, PA; and St. Louis, MO. Currently, RIFA are established in

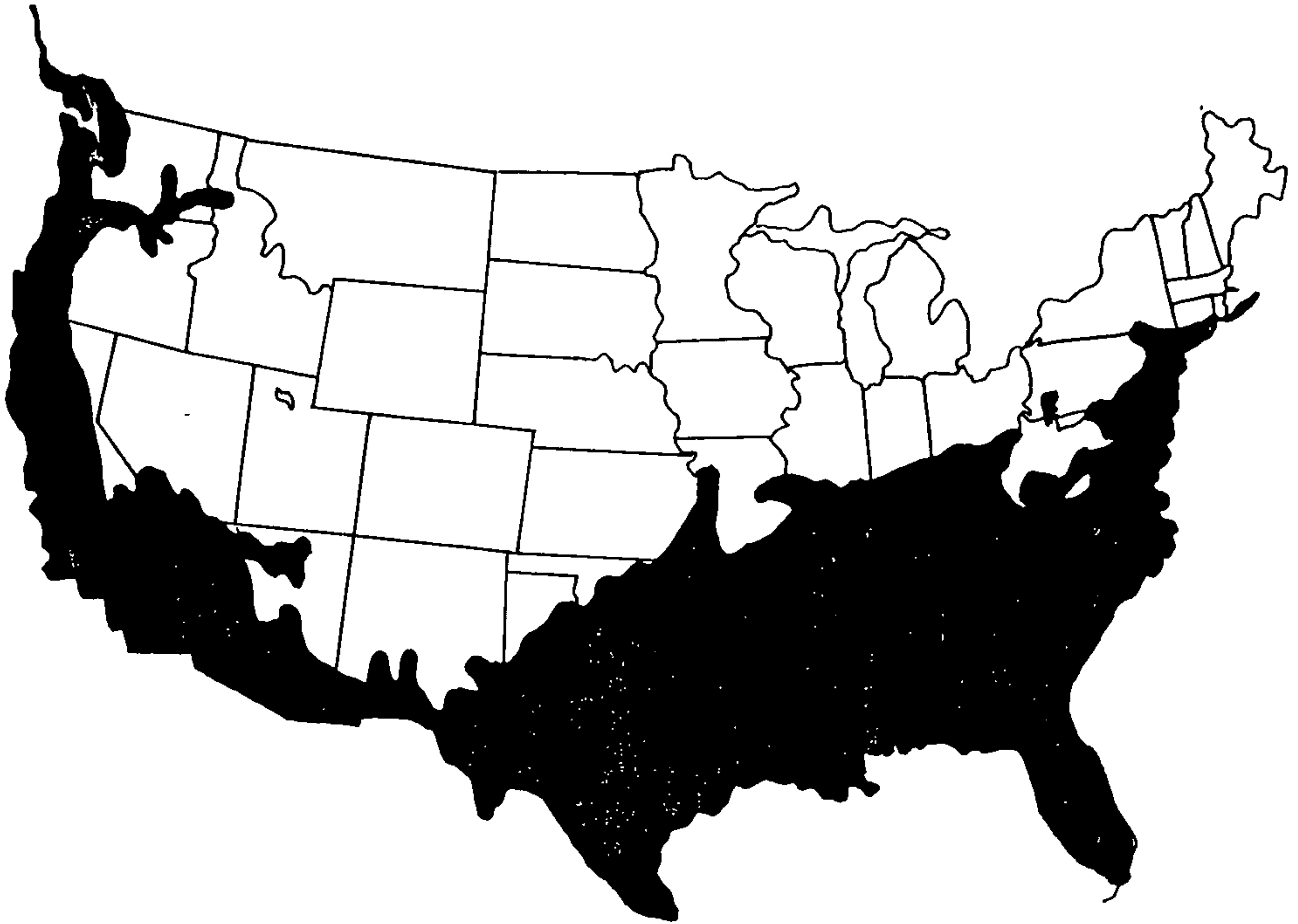


Figure 3. Potential area of infestation for the red imported fire ant in North America north to Mexico

Nashville, TN and Lubbock, TX.

CURRENT RESEARCH ACTIVITIES

There are a very limited number of chemicals labeled for imported fire ant quarantine. We are constantly screening candidates for possible use. Recently, a new synthetic pyrethroid, bifenthrin produced by FMC Corporation has shown exceptional potential.

Bifenthrin has a wide spectrum of activity against mites and insects on field, fruit and nut crops as well as on ornamentals. Formulations include 2EC, 10WP, 0.2G and a flowable. Chemically, bifenthrin is known as cyclopropanecarboxylic acid, (2-methyl [1,1'-biphenyl]-3-yl) methyl 3-(2-chloro-3,3,3-trifluoro-1-propenyl)-2,2-dimethylcyclopropanecarboxylate).

A liquid formulation, marketed as Capture 2EC, is currently registered for foliar application on cotton for a wide range of pests including spider mites, the boll weevil, the cotton bud worm, plant bugs, pink boll worm and armyworms. Application rates range from 0.02-0.1 lb AI/acre.

A powdered formulation (Talstar 10WP) is registered for foliar use on ornamentals and non-bearing fruit and nut trees. It is labeled for use against numerous pests including aphids, scales, lacebugs, caterpillars, leafminers, Japanese beetles, spider mites, et cetera. Rates of application range from 0.004-0.02 lb AI/10 gallon of finished spray. More recently, Talstar 80% Flowable (0.66 lb AI/gal flowable formulation) was registered for similar ornamental use, pest spectrum and rate range. A granular formulation (Capture 0.2G) is currently being tested and

evaluated for consideration for use in IFA quarantine.

Bifenthrin is very stable in sterile water under acidic, neutral and basic pH conditions. Bifenthrin has a low water solubility (less than 0.1 ppb). The compound is bound tightly to soil and possesses a low mobility in sand and is immobile in other soils.

We began our first trials with bifenthrin in December of 1988. In the 34 months since then, numerous other evaluations have been initiated and most remain on-going at this time. Evaluations have been made concerning dose rates, formulations, application techniques, and varying geographic/environmental conditions. The majority of trials were carried out at the Imported Fire Ant Station in Gulfport, MS. However, several other trials have been conducted at other sites including Miami, FL; Whiteville, NC, Campo, TX; Tifton, GA; Mobile, AL; and Monticello, FL.

Incorporation of insecticides into media is the most common method of application utilized by the IFA quarantine due to cost and labor involved. Both granular

Table 1. Residual activity of various formulations of bifenthrin incorporated into potting media

| Trial no | Date initiated | Trial location | Formulation | Initial theoretical dose (ppm) | Potting media | Residual activity* in months |
|----------|----------------|----------------|-------------|--------------------------------|---------------|------------------------------|
| I | Dec 88 | Gulfport, MS | 0.3G | 72.6 | Stronglite | 34 |
| II ** | Nov 89 | Gulfport, MS | 0.2G | 100.0 | Stronglite | 19 |
| | Miami, FL | 0.2G | 100.0 | Stronglite | 19 | |
| | Whiteville, NC | 0.2G | 100.0 | Stronglite | 16*** | |
| III ** | Dec 89 | Gulfport, MS | 10WP | 12.5 | Stronglite | 23 |
| | | | | 25.0 | Stronglite | 23 |
| | | | | 50.0 | Stronglite | 23 |
| | | | | 100.0 | Stronglite | 23 |
| IV | Jan 90 | El Campo, TX | 0.2G | 25.0 | Nursery Mix | 22 |
| | | | | 50.0 | Nursery Mix | 22 |
| | | | 10WP | 25.0 | Nursery Mix | 22 |
| | | | | 100.0 | Nursery Mix | |
| V | Mar 90 | Gulfport, MS | 0.2G | 12.5 | Stronglite | 20 |
| | | | | 25.0 | Stronglite | 20 |
| | | | | 50.0 | Stronglite | 20 |
| | | | | 75.0 | Stronglite | 20 |
| | | | | 100.0 | Stronglite | 20 |
| VI | Sep 90 | Gulfport, MS | 10WP | 25.0 | Stronglite | 13 |
| | | | | 16.6 | Baccto | 13 |
| | | | | 30.1 | Dodd's | 13 |
| | | | | 8.9 | Lab Mix | 13 |

* Number of months showing 100% queen mortality in standard laboratory bioassay, trials on-going unless otherwise stated

**Results final

*** Trial accidentally destroyed

and wettable powder formulations of bifenthrin can be used in this manner. In the trials conducted to date, a predetermined quantity of bifenthrin (based upon amount of soil to be treated, bulk density of the soil and formulation of bifenthrin) was incorporated into media using a 2 cu ft capacity cement mixer. The mixture was blended for at least one hour to assure a thorough mix. The media were placed in standard gallon containers and subjected to normal horticultural practices.

The trials summarized here (Table 1) are arranged in more or less chronological order. Five of the six trials are still on-going. The longest residual activity to date is 33 months and was achieved with the 0.3G formulation. The 0.2G formulation has reached 19-months residual activity at 100 ppm. This trial was terminated after we ran out of media to evaluate. At dose rates as low as 12.5 ppm, 22 months residual activity has currently been achieved. Because of our relative success at 12.5 ppm and above, a further evaluation was undertaken using even lower rates of 2.5, 5.0 and 10.0 ppm. The 10 ppm rate achieved 100% efficacy through 11 months post-treatment. The lower rates have shown extremely variable results. We believe the cause of this variability is due to the unevenness of the blend caused by the small amount of material used to achieve those rates.

Another method of application is the drench treatment. These can be formulated using either EC or WP formulations of bifenthrin. Nursery pots are filled with media and drenched using various rates of solution (based on amount of soil to be treated, bulk density of the soil and formulation). The amount of finished solution was 1/5 the volume of the container.

The initial drench trial showed 100% efficacy for 6 months. This trial had to be terminated due to lack of material. The second trial was begun in June of last year using both the 2EC and 10WP formulations applied at 100 and 200 ppm. Results to date continue to show 100% efficacy.

Bifenthrin is a highly effective, residual treatment for control of IFA in containerized nursery stock. A variety of use patterns have been evaluated for treatment of containerized plants. Due to registration status, as well as efficacy, a recommendation has been made that Talstar 10WP be adopted for IFA quarantine program use on containerized plants as soon as possible. Consideration is being made by USDA, with input from the Imported Fire Ant Working Group, on how best to accomplish this. A FIFRA Section 24C (state and local needs) label has been granted at this writing by all the state of Louisiana within the quarantine area. Recommended use patterns, dose rates and certification periods are as follows:

| USE PATTERN | FORMULATION | DOSE RATE | CERTIFICATION PERIOD |
|---------------|-------------|-----------|----------------------|
| Incorporation | 10WP | 50 ppm | 1 year |
| Drench | 10WP | 25 ppm | 6 months |
| Topical | 10WP | 25 ppm | 6 months |

Following completion of current and future trials, it should be possible to offer additional certification periods based on lower dose rates and use patterns. Studies are also underway evaluating the efficacy of bifenthrin on grass sod and balled -and- burlapped nursery stock.