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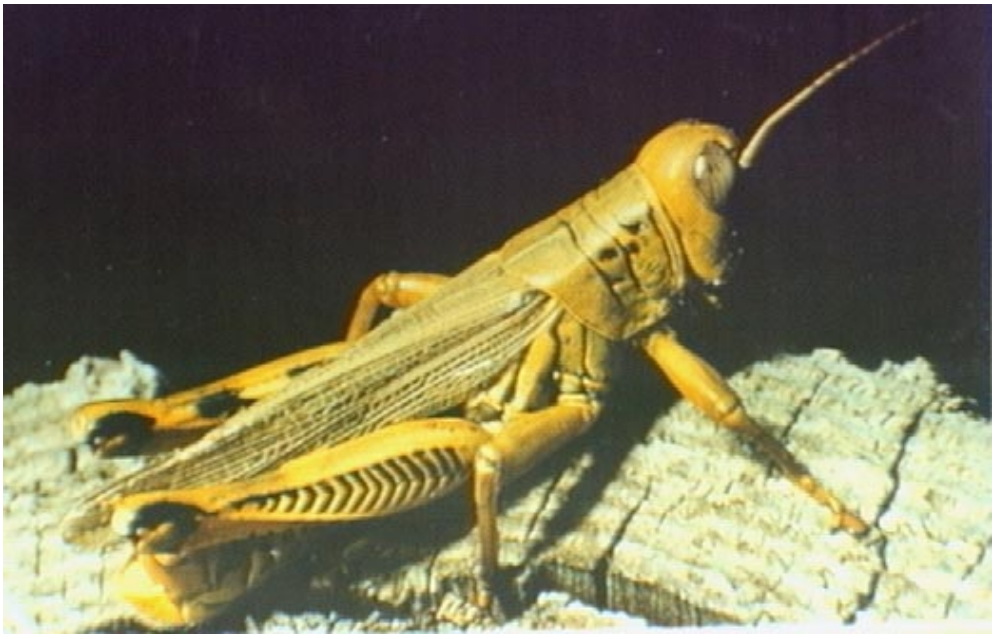
# Summary of Losses from Insect Damage and Costs of Control in Georgia 1996



D.G. Riley, G.K. Douce, and R.M. McPherson

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## Introduction

This publication summarizes the economic losses resulting from insect damage and cost of their control in 1996. The loss estimates are prepared by subcommittees of The University of Georgia, College of Agriculture and Environmental Sciences, Department of Entomology Special Committee on Insect Surveys and Losses. Original loss estimates have been rounded to the nearest $1,000 in this summary report, with the exception of those in the Vegetable section where rounding to the hundreds unit was used. Statistical data for commodity acreage, production, and value are taken from published reports of the Georgia Crop Reporting Service. Those interested in the methodology by which loss estimates are derived should refer to Suber and Todd (1980). The estimates of yield loss on units treated and untreated for a given insect pest can vary greatly between commodities. This reflects differences in pest populations pressure, efficacy of control, management practices, etc., and the loss is not always lower for the treated units. Those interested in the series of publications containing annual loss estimates to insects in Georgia should refer to Suber and Todd (1980), Todd and Suber (1980), Suber et al. (1981a, 1981b, 1982, 1983, 1984, 1985), Douce and McPherson (1988, 1989, 1991, 1992, 1995, 1996), Douce and Suber (1985, 1986, 1988), McPherson and Douce (1992, 1993), and McPherson, Douce and Riley (1996).

**This publication is available on the World Wide Web at:**
**http://www.bugwood.caes.uga.edu/SL96**

**Acknowledgements**

Many people other than the members of the University of Georgia Department of Entomology Special Committee on Insect Surveys and Losses have contributed significantly in this publication. Committee members had considerable aid from representatives of agribusiness, the United States Department of Agriculture, research and extension workers in other states, and County Extension Directors and Agents of the University of Georgia Cooperative Extension Service; the Committee thanks them all. The Committee expresses special appreciation for the labors of Jenny Nelms and Carol Ireland who helped to type, format, and proofread the final draft of the manuscript. The editors also express appreciation to the staff of the Research Information Unit at the Coastal Plain Experiment Station for publishing our 1996 results.

# Subcommittee Reports

## I. Apiculture

Keith S. Delaplane

The number of managed bee hives in Georgia increased from 70,000 in 1995 to 75,000 in 1996[1]. This welcome upswing follows a general increase in honey prices due to decreasing world honey stocks. Overall honey production in Georgia, including the 1996 crop year, has stayed uniform over ten years[2]. Thus, production efficiency is good. Parasitic tracheal mites and Varroa mites continue to kill colonies and cost beekeepers large sums for control. There remains only one registered miticide for varroa mite control, Apistan™. There is concern for chemical resistance in mites but so far there are no data from North America to suggest this is a problem.

Conditions were good for honey production in 1996. Beekeepers with five or more hives harvested 5,100,000 pounds of honey, up from 4,340,000 in 1995. Production per hive (68 pounds) was up slightly from 1995 (62 pounds). Value of the 1996 crop was $4,539,000 compared to $3,081,000 in 1995. In 1996, average price per pound rose to $0.89, up from $0.71 in 1995[1]. The estimated annual value of honey bee products and crop pollination to Georgia's agriculture economy is $70,870,400[3].

Extension programs reached 1,876 people in educational efforts aimed at honey bee parasite biology and control, optimum bee management, and public awareness of the value of bee pollinators. The fifth annual Young Harris College/University of Georgia Beekeeping Institute drew 99 participants. Research focused on identifying economic treatment thresholds for Varroa mites and the pollinators and their flower-visiting behavior in rabbiteye blueberry.

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[1]Georgia Agric. Statistics Service, Mar. 4, 1997

[2]Hoff, F.L. 1995. Honey. U.S.D.A. Agric. Econ. Rep. 708

[3]Georgia Bee letter, vol. 7(1), 1997, Univ. of Georgia Coop. Ext. Service

## II. Apple Insects

D.L. Horton, J.D. Dutcher, HC Ellis

Georgia's 1996 apple crop was valued at $3.68 million, from 21 million lbs of fruit which averaged $0.175/lb. There are an estimated 390,000 bearing trees in Georgia.*

Extreme spring cold resulted in a variable crop, but most blocks cropped well enough to receive season-long insecticide programs. Acreage typically received pesticide applications for San Jose scale, rosy apple aphid, plant bugs, leafminers, leafhopper, codling moth, leafrollers and mites. Pheromone trapping suggested an increase in tufted bud moth pressure. Control of tufted bud moth was variable, but efficacy in "problem" blocks appeared to improve when timing was refined with pheromone monitoring. Control cost estimates reflect only the estimated cost of materials.

*Georgia Farm Report. 1997. Volume 97, Number 02.

**Estimates of Losses and Control Costs**

| Rank | Insects | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Leafrollers[1] | $122,000 | $72,000 | $194,000 |
| 2 | Codling moth | 125,000 | 11,000 | 136,000 |
| 3 | European red mite[3] | 19,000 | 20,000 | 39,000 |
| 4 | Aphids[2] | 9,000 | 15,000 | 24,000 |
| 5 | San Jose scale | 11,000 | 10,000 | 21,000 |
| 6 | Plant bugs | 5,000 | 3,000 | 8,000 |
| | *Total* | *$291,000* | | *$422,000* |

1. Primarily tufted apple budmoth.
2. Primarily the rosy apple aphid.
3. Primarily the European red mite, with some two-spotted spider mite.

**Information Pertaining to Control of Major Apple Insect Pests in Georgia in 1996**

| Insects | No. Units Needing Control | No. Units Treated | No. of Units Applic.[1] | Avg. Cost per Unit Treated | Yield Loss on Unit Treated[2] | Yield Loss on Unit Untreated[2] |
|---|---|---|---|---|---|---|
| Leafrollers | 390,000 | 371,000 | 3.0 | $0.11 | 399,000 | 0 |
| Codling moth | 390,000 | 390,000 | 4.0 | $0.08 | 63,000 | 0 |
| European red mite[3] | 156,000 | 156,000 | 1.0 | $0.12 | 59,000 | 52,000 |
| Aphids[4] | 126,000 | 105,000 | 1.0 | $0.09 | 28,000 | 56,000 |
| San Jose scale | 420,000 | 357,000 | 1.0 | $0.03 | 58,000 | 0 |
| Plant bugs | 78,000 | 59,000 | 1.0 | $0.09 | 16,000 | 0 |

[1] Excluding application costs
[2] Yield units measured in pounds
[3] Primarily the European red mite, with some two-spotted spider mite
[4] Primarily the rosy apple aphid

## III. Blueberry Insects

D.L. Horton, HC Ellis, Ann Amis* and Danny Stanaland**

Georgia's 1996 blueberry crop was valued at $4.125 million, from 5.5 million lbs of fruit that averaged $0.803/lbs.*** Cold injury reduced production by perhaps 45%.

Reduced production encouraged as-need insecticide application. Control measures were effective when applied in a timely fashion. Cranberry fruitworm remains our most important fruit attacking pest.

Growers are concerned about two potential pests of Georgia blueberries--blueberry maggot (*Rhagoletis mendax*) and blueberry gall midge (*Dasineura oxycoccana*). Blueberry maggot infestations are extremely uncommon in cultivated Georgia blueberries, but the flies are common on wild blueberry species. Our current recommendations suggest as-needed insecticide applications for blueberry maggot on a block-to-block basis. Blueberry gall midge is a cecidoymiid that is ubiquitous, innocuous vegetative feeder on blueberry species across much of the eastern U.S. Concern exists over early-season losses that may be attributable to flower bud feeding by the blueberry gall midge. Blueberry gall midge injury to flower buds has not been confirmed in Georgia, but it is known to take place in the Gainesville, FL area and the injury can easily be mistaken for cold injury. Research is needed on both of these potential pests. Control cost estimates reflect only the estimated cost of materials.

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* USDA/ARS, Southeast Fruit and Tree Nut Research Lab, Byron, Georgia.
** Bacon County Extension Director, Alma, Georgia.
*** Georgia Farm Report 1997. Volume 97, Number 2.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Fire ants and wasps | $3,900 | $0 | $3,900 |
| 2 | Cranberry fruitworm | 3,800 | 0 | 3,800 |
| 3 | Defoliating caterpillars[1] | 2,100 | 0 | 2,100 |
| 4 | Stem borers | 0 | 0 | 0 |
| | *Total* | *$9,800* | *$0* | *$9,800* |

[1] Primarily *Datana* spp.

**Information Pertaining to Control of Major Blueberry Insect Pests in Georgia in 1996**

| Insect | No. Units Needing Control | No. Units Treated | No. of Unit Applic. | Avg. Cost per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Fire ants & wasps | 900 | 600 | 1.0 | $6.00 | 0 | 0 |
| Cranberry fruitworm | 500 | 600 | 1.0 | 6.00 | 0 | 0 |
| Defoliating caterpillar[3] | 400 | 300 | 1.0 | 8.60 | 0 | 0 |
| Stem borers | 100 | 0 | 0 | 0 | 0 | 0 |

[1] Excluding application costs.
[2] Yield units are expressed in pounds.
[3] Primarily *Datana* spp.

## IV. Canola

**G. D. Buntin, R. D. Hudson, and J. N. All**

Canola, *Brassica napus*, is a new winter field crop being grown as an oilseed crop. Virtually all production is in the spring-type varieties that are grown in the Coastal Plain region. Most of canola acreage is contract production of laurate canola. About 15,000 acres was planting in fall 1995, but severe freezing temperatures in December, February and March destroyed most of the crop. About 2,000 acres were harvested. Grain yield averaged 23 bu/acre (1150 lb/acre) and had a market price of $6.00/bu.

Three species of aphids (turnip, green peach, and cabbage aphids) occur in canola. Aphids, primarily turnip aphid, were an economic problem in some fields especially in southeastern Georgia. The cabbage seedpod weevil, *Ceutorhynchus assimilis*, occurs only in the Piedmont region and is not a major pest in most new plantings. However, it did severely damage fields on a few farms where canola has been produced for a number of years.

*Dr. John Woodruff, Extension Agronomist, University of Georgia, Tifton, GA, personal communication.

**Estimated Losses and Control Costs**

| Rank | Insect | Control | Damage | Total |
|---|---|---|---|---|
| 1 | Aphids | $4,000 | $3,000 | $7,000 |
| 2 | Cabbage seedpod weevil | 3,000 | 0 | 3,000 |
| | **Total** | **$7,000** | **$3,000** | **$10,000** |

**Information Pertaining to Control of Major Canola Insect Pests in Georgia in 1996.**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Acres Applic. | Avg. Cost per Unit Treated[1] | Bu. Loss on Units Treated | Bu. Loss on Units Nontreated |
|---|---|---|---|---|---|---|
| Aphids | 600 | 500 | 1 | $7.00 | 0.7 | 2.3 |
| Cabbage Seedpod Weevil | 400 | 400 | 2 | 4.00 | 0 | 2.3 |

[1] Excluding application costs.

## V. Cotton Insects

P.M. Roberts, G.A. Herzog, D.C. Jones, and J.R. Ruberson

The 1996 season will not only be remembered for the introduction of transgenic Bt cotton, but also as one of the lightest cotton insect pests seasons in recent times. A continuing trend towards reduced insect pest pressure has been observed since the elimination of the boll weevil as an economic pest in Georgia.

Thrips populations were near normal and at planting applications of in-furrow insecticides generally provided adequate control. Beet armyworms were found on seedling cotton in late May and June. Populations built to high levels in some areas and triggered an emergency exemption allowing the use of Confirm and Pirate insecticides for control of beet armyworm. Hot and dry conditions which are conducive for a beet armyworm outbreak, persisted in late June and early July. However, populations crashed. Except in isolated fields, beet armyworm posed few problems for the remainder of the season.

Plants were stressed by heat and drought in June and square retention dropped in some areas. Plant bug populations were low and did not appear to be the cause of the square shed. Plant bugs were not considered a problem by most producers. Cotton fleahoppers were present in most areas of the state in July. High fleahopper populations were observed in some fields during bloom, but damage to the crop was minimal. Aphids never reached economic populations and were eventually controlled by a naturally occurring fungus.

The first tobacco budworm flight occurred in early June and was light (unusually light pressure was also observed on tobacco). The second flight, which is generally expected around the Fourth of July and often is the most difficult to control, did not materialize. Very few tobacco budworm moths were observed or captured in pheromone traps for the remainder of the season. Bollworm pressure increased in mid - late July. Moths appeared to be depositing eggs deeper in the canopy than normal and this behavior made scouting difficult. Control was good with pyrethroids when timely applications were made. Bt cotton performed well in most parts of the state. However, supplemental sprays for bollworm were needed on a portion of the acreage. Increased stink bug damage was observed in some fields, possibly due to the reduction of broad spectrum insecticides applied.

Fall armyworms were reported in several areas, but most problems occurred in southwest and east Georgia. Control of fall armyworm with insecticides was fair at best. Soybean loopers were a problem in a few isolated areas.

The Boll Weevil Eradication Program continued to make progress towards making Georgia "weevil free". The 1995 outbreak in Brooks county appears to be cleaned up. Minimal spraying was needed in this area during 1996. Weevils were detected in a Dougherty county field in July. BWEP personnel reacted quickly and effectively to this outbreak, intensifying trapping and spraying efforts to prevent its spread.

Overall, Georgia farmers harvested an above average crop of 747 lbs lint/A on 1,345,000 acres.

**Estimates of Losses and Control Costs 1996**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Bollworm[3] | $15,540,000 | $13,983,000 | $29,523,000 |
| 2 | Thrips | 11,250,000 | 0 | 11,250,000 |
| 3 | Tobacco budworm[1] | 10,350,000 | 0 | 10,350,000 |
| 4 | Boll weevil[2] | 7,397,000 | 0 | 7,397,000 |
| 5 | Fall armyworm | 1,800,000 | 2,148,000 | 3,948,000 |
| 6 | Beet armyworm | 1,000,000 | 2,148,000 | 3,148,000 |
| 7 | Stink bugs | 525,000 | 2,612,000 | 3,137,000 |
| 8 | Plant bugs | 210,000 | 0 | 210,000 |
| 9 | Soybean looper | 120,000 | 0 | 120,000 |
| 10 | Aphids | 70,000 | 0 | 70,000 |
| 11 | Cutworms | 35,000 | 0 | 35,000 |
| 12 | Whiteflies | 0 | 0 | 0 |
| 13 | Spider mites | 0 | 0 | 0 |
| | **Total** | **$48,297,000** | **$20,891,000** | **$69,188,000** |

[0] Estimated average price received $0.72/lb. lint.

[1,3] Bt transgenic cotton costs: $32.00/A technology fee plus $1/A seed premium on 400,000 acres. Seventy-five percent of total costs charged to tobacco budworm ($9,900,00) and 25% to bollworm ($3,300,000).

[2] Grower costs of Boll Weevil Eradication Program

**Information Pertaining to Control of Major Cotton Insect Pests in Georgia in 1996**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Acres Applic. | Avg. Cost per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Bollworm[4] | 900,000 | 850,000 | 1.6 | $9.00 | 15,400,000 | 4,021,000 |
| Thrips | 20,000 | 1,250,000 | 1.0 | 9.00 | 0 | 0 |
| Tobacco budworm[4] | 50,000 | 50,000 | 1.0 | 9.00 | 0 | 0 |
| Boll weevil[3] | 1,345,000 | 1,345,000 | ---- | 5.50 | 0 | 0 |
| Fall armyworm | 150,000 | 150,000 | 1.0 | 12.00 | 2,000,000 | 984,000 |
| Beet armyworm | 50,000 | 125,000 | 1.0 | 8.00 | 500,000 | 2,484,000 |
| Stink bugs | 125,000 | 75,000 | 1.0 | 7.00 | 750,000 | 1,862,000 |
| Plant bugs | 40,000 | 35,000 | 1.0 | 6.00 | 0 | 0 |
| Soybean looper | 10,000 | 10,000 | 1.0 | 12.00 | 0 | 0 |
| Aphids | 10,000 | 10,000 | 1.0 | 7.00 | 0 | 0 |
| Cutworms | 5,000 | 5,000 | 1.0 | 7.00 | 0 | 0 |
| Whiteflies | 0 | 0 | 0 | ----- | 0 | 0 |
| Spider mites | 0 | 0 | 0 | ----- | 0 | 0 |

[1] Including application costs.

[2] Yield units measured in pounds of lint.

[3] Grower costs of eradication program. All cotton produced in Georgia is required to participate in the Boll Weevil Eradication Program. The annual per acre assessment for participation equaled $5.50 per acre. A minor outbreak of boll weevil was detected and treated in Dougherty County. Ninety nine boll weevils were captured in traps and infestations were confined to 1,500 acres.

[4] Does not include costs of Bt transgenic cotton; foliar sprays only.

# VI. Field Corn Insects

R. D. Hudson and J. N. All

Field corn was harvested from 525,000 acres in 1996. This was up from 350,000 acres in 1995. Corn yields for 1996 averaged 95 bushels per acre, up 5 bushels from 1995. The 1996 corn price sold for a statewide average of $3.55 per bushel, a slight decrease over 1995 farm levels.

Stink bugs and soil insects continue to be the two primary insect problems in field corn. Losses to stink bug totaled nearly $5.2 million dollars in 1996. This was followed closely by soil insects at $4.7 million. Western corn rootworm continues to develop across north Georgia corn plantings.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control[1] | Damage | Total |
|---|---|---|---|---|
| 1 | Stink bugs | $ 772,000 | $4,426,000 | $5,198,000 |
| 2 | Soil insects[2] | 1,638,000[3] | 3,098,000 | 4,786,000 |
| 3 | Corn earworm | 252,000 | 620,000 | 872,000 |
| 4 | Fall armyworm | 42,000 | 283,000 | 325,000 |
| | ***Total*** | ***$2,704,000*** | ***$8,427,000*** | ***$11,131,000*** |

[1]Excluding application costs.
[2]Primarily the billbug, lesser cornstalk borer, wireworms and southern corn rootworm.
[3]This is an estimate of the cost of all at-planting insecticide-nematicide usage.

**Information Pertaining to Control of Major Field Corn Insect Pests in Georgia in 1996**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Unit Applic. | Avg. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Stink bugs | 263,000 | 110,000 | 1.0 | $ 7.00 | 200,000 | 1,047,000 |
| Soil insects[3] | 263,000 | 137,000 | 1.0 | 12.00[4] | 249,000 | 623,000 |
| Corn earworm[5] | 53,000 | 32,000 | 1.0 | 8.00 | 50,000 | 125,000 |
| Fall armyworm[5] | 26,000 | 21,000 | .3 | 8.00 | 30,000 | 50,000 |

[1]Excluding application costs.
[2]Yield units measured in bushels.
[3]Primarily the billbug, lesser cornstalk borer, wireworms and southern corn rootworm.
[4]This is an estimate of the cost of all at-planting insecticide-nematicide usage.
[5]It is currently not economically feasible to prevent ear damage in field corn.

## VII. Fire Ants

B. L. Sparks and K. G. Ross

Imported fire ants are primarily a people pest. Fire ants interfere with hay harvesting, maintenance of pastures, and some crops but present the greatest problem around dwellings where direct contact with humans is most frequent. Concern arises from multiple stings often experienced by young children.

Hybrid fire ants have pushed the northern boundary into Tennessee. Red imported fire ants can be found in Georgia as far north as Murray County on the Tennessee Border. Imported fire ants have been reported in 156 of 159 counties in Georgia as of 1994. Polygynous populations are present in eight Georgia counties; Barrow, Clarke, Clay, Early, Greene, Morgan, Oconee and Walton. Polygynous fire ant colonies reach higher densities than monogynous colonies and may be harder to control.

**Estimates of Losses and Control Costs**

| Insect | Cost of Control[1,2] | Damage[3,4] | Total |
|---|---|---|---|
| Imported fire ants | $35,962,500 | $12,505,000 | $48,467,500 |

[1] Average treatment costs per Georgia household for lawns and other surrounding areas was $20.90 (Diffie & Sheppard. 1991. In Imported Fire ant Management: Results of applied Research/Results Demonstrations 1987-1990. The University of Georgia.) 2.5 million households in the infested area x 65% yards x $20.90 = $33,962,500 spent by homeowners for control.

[2] Treatment costs for quarantine requirements in nursery and sod. Approximately $125 per acre are spent on 16,000 acres, $2,000,000.

[3] Average medical costs related to fire ant stings were $4.95 per household according to Diffie & Sheppard (1991). Assuming 2.5 million households are in the infested area x $4.95 = $12,375,000.

[4] Equipment damaged; mower, balers, etc., assume one incident for each 1,000 acres of infested crop or pasture land. Approximately 2.6 million acres divided by 1000 acres x $50 per incident = $130,000.

[5] Ants (excluding fire ants), billbugs, leafhoppers, and mites.

## VIII. Forest Insects

C.W. Berisford and G.K. Douce

Southern pine beetle activity was low during 1996, although there was some early season activity in the southwestern portion of the state. Infestations in the Piedmont Plateau were rare and no epidemic populations were reported. The south wide monitoring system based on spring trapping predicted declining or static populations at all trap locations.

Black turpentine beetles were locally abundant where other bark beetle infestations had occurred and in areas which had mechanical damage from construction, fire, logging, etc. Statewide populations were about average.

Localized heavy attacks by *Ips* spp. beetles were reported from several areas in the coastal plain, usually in associated with hot prescribed bums or wildfires. Other infestations were centered around lightning strikes.

Pine tip moths, mostly Nantucket pine tip moth, were common throughout the state. Attacks were particularly heavy in Christmas tree plantations where chemical control was inadequate. High infestation levels frequently were found in plantations which had been established on land previously used for row crops or pasture and in stands which had received intensive mechanical and/or chemical site preparation prior to planting. Tip moths have become serious pests in pine plantations where intensive management is practiced.

Scale insects and aphids typically increased late in the season and required additional chemical control in some Christmas tree plantations. Losses to coneworms and seedworms were essentially the same as those experienced in 1995 with some increased in certain seed orchards.

Reproduction weevils caused severe localized damage to seedling pines in some areas, particularly where planting of new seedlings had occurred shortly after stand harvest. Overall, populations were similar to the previous year.

High localized infestations of forest tent caterpillar again caused some defoliation of oaks, tupelo gum, and sweetgum in the coastal plain, particularly in the Chattachoochee river drainage. Heavy localized infestations of fall webworm were also common in the coastal plain. Light defoliation by the fall cankerworm was reported at scattered locations on high mountain ridges.

Four thousand seven hundred and ten (4710) gypsy moth pheromone traps were set and monitored in Georgia as part of the 1996 national gypsy moth detection and monitoring program. Seventy-seven (77) male moths were captured in eight of the forty seven counties in which traps were operated. In locations where more than one moth was captured, additional pheromone trap

monitoring and on-site inspection were/will be conducted to determine if an isolated infestation is present. The Georgia Forestry Commission has primary responsibility for gypsy moth program in Georgia in cooperation with USDA-APHIS-PPQ and other state and federal agencies.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Pine tip moths[1] | $980,000 | $3,750,000 | $4,730,000 |
| 2 | *Ips* spp. beetles[4] and Black turpentine beetle | 425,000 | 2,658,000 | 3,083,000 |
| 3 | Defect and degrade causing insects[2] | 100,000 | 2,870,000 | 2,970,000 |
| 4 | Seed and cone insects[3] | 86,000 | 2,700,000 | 2,786,000 |
| 5 | Reproduction weevils[5] | 965,000 | 1,170,000 | 2,135,000 |
| 6 | Other insects[6] | 86,000 | 1,215,000 | 1,301,000 |
| 7 | Southern pine beetles | 23,000 | 742,000 | 765,000 |
| 8 | Gypsy moth[7] | 180,000 | | 180,000 |
| | **Total** | **$2,845,000** | **$15,105,000** | **$17,950,000** |

[1] Includes Nantucket pine tip moth, pitch pine tip moth and subtropical pine tip moth.
[2] Includes carpenter ants, ambrosia beetles, lepidopterous wood borers, shothole borers and various other cerambycid, buprestid and scolytid beetles.
[3] Includes coneworms, seedworms, seed bugs and cone beetles.
[4] *Ips avulsus*, *I. grandicollis*, *I. calligraphus* and *I. pini*.
[5] Pales weevil and pitcheating weevil.
[6] Mostly aphids, scale insects, lace bugs, sawflies, and lepidopterous defoliators.
[7] The gypsy moth is not generally established in Georgia, although isolated infestations have been detected. Therefore, there are no damage estimates and only monitoring and/or control costs are included.

# IX. Grain Sorghum Insects

R. D. Hudson and J. N. All

In 1996 grain sorghum was harvested from 40,000 acres, this was 10,000 acres more than 1995. Yields averaged 41 bushels per acre. The average price for grain sorghum was $2.85 per bushel, down from $3.05 in 1995.

Chinch bug continues to be the number one insect pest of grain sorghum in Georgia. Sorghum midge, foliage, head feeding caterpillars, soil insects, and stink bugs continue to cause sporadic but significant injury in some locations across Georgia.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Chinch bug | $35,000 | $79,000 | $114,000 |
| 2 | Sorghum midge | 17,000 | 23,000 | 40,000 |
| 3 | Corn earworm | 13,000 | 7,000 | 20,000 |
| 4 | Fall armyworm | 13,000 | 7,000 | 20,000 |
| 5 | Soil insects | 5,000 | 10,000 | 15,000 |
| 6 | Stink bugs | 8,000 | 4,000 | 12,000 |
| | ***Total*** | ***$91,000*** | ***$130,000*** | ***$221,000*** |

**Information Pertaining to Control of Major Grain Sorghum Insect Pests in Georgia in 1996**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Acres Applic. | Avg. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Chinch bug | 10,000 | 10,000 | 1.0 | $8.00 | 3,000 | 25,000 |
| Sorghum midge | 4,000 | 4,000 | 1.0 | 7.00 | 2,000 | 7,000 |
| Corn earworm | 2,000 | 2,000 | 1.0 | 8.00 | 1,000 | 2,000 |
| Fall armyworm | 2,000 | 2,000 | 1.0 | 8.00 | 1,000 | 2,000 |
| Soil insects | 2,000 | 2,000 | 1.0 | 8.00 | 1,000 | 3,000 |
| Stink bugs | 1,000 | 1,000 | 1.0 | 7.00 | 1,000 | 1,000 |

[1]Excluding application costs.
[2]Yield units expressed in bushels; only sorghum losses for grain were calculated.

## X. Grape Insects

D.L. Horton, HC Ellis, J.N. All, and J.D. Dutcher

Georgia's 1996 grape crop was valued at $3.5 million from production of 3,300 tons valued at $1070 per ton.* Production from north Georgia's limited acreage was dramatically reduced by cold injury, but state-wide production was up. Grape root borer remains our most important grape insect pest. Green June beetles, Japanese beetles (north GA), grape curculio, aphids, and at-harvest pests such as bees, wasps, fire ants and birds were sporadic problems. Control cost estimates reflect only the estimated cost of materials.

*Georgia Farm Report 1997. Volume 97, Number 2.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Grape root borer | $9,000 | $74,200 | $83,200 |
| 2 | Japanese & green June beetles | 1,400 | 8,400 | 9,800 |
| 3 | Grape curculio | 300 | 9,400 | 9,700 |
| 4 | Wasps & fire ants | 1,200 | 5,400 | 6,600 |
| 5 | Aphids | 600 | 3,000 | 3,600 |
| | *Total* | *$12,500* | *$100,400* | *$112,900* |

**Information Pertaining to Control of Grape Insects in Georgia in 1996**

| Insect | No. of Units Needing Control | No. Units Treated | No. of Unit Applic. | Avg. Cost per Unit Treated | Yield Loss on Units Treated[1] | Yield Loss on Units Untreated[1] |
|---|---|---|---|---|---|---|
| Grape root borer | 700 | 500 | 1.0 | $17.00 | 0 | 0 |
| Japanese & green June beetles | 400 | 300 | 1.0 | 4.35 | 0 | 0 |
| Grape curculio | 100 | 100 | 1.0 | 4.35 | 0 | 0 |
| Wasps & fire ants | 300 | 300 | 1.0 | 4.35 | 0 | 0 |
| Aphids | 200 | 100 | 1.0 | 4.35 | 0 | 0 |

[1] Yield units are expressed in pounds.

## XI. Household and Structural Insects

M.P. Nolan, Jr. and B.T. Forschler

In 1996, cockroaches, primarily German cockroaches and Smoky Brown cockroaches, were the most important household pests followed by ants, fleas, clothes moths, carpet beetles and pantry pests. Occasional invaders (ants, millipedes, roaches and spiders) invaded homes during the year. The most important ant encountered was the Argentine ant. The subterranean termite was the most important structural pest followed by "powder post beetles" (anobiid beetles, old house borers, lyctid beetles), carpenter ants, and carpenter bees. Most of the structural insect control performed by licensed pest control operators involved subterranean termite control. Fumigation treatments were most often directed toward old house borers. Major fabric pests encountered were clothes moths and carpet beetles. The most important pantry pests were cigarette beetles, drugstore beetles, sawtoothed grain beetles and Indian meal moths.

### Estimates of Losses and Control Costs

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 (53%)[1] | Termites | $ 58,600,000 | $17,000,000 | $ 75,600,000 |
| 2 (19%) | Cockroaches | 22,437,500 | 5,000,000 | 27,437,500 |
| 3 (11%) | Ants | 12,762,500 | 3,000,000 | 15,762,500 |
| 4 (10%) | Fleas | 7,925,000 | 5,000,000 | 12,925,000 |
| 5 ( 8%) | Miscellaneous[2] | 8,187,500 | 3,000,000 | 11,187,500 |
| | **Total** | **$109,912,500** | **$33,000,000** | **$142,912,500** |

[1]The percentage represents the proportion of each insect pest assigned to the total losses caused by the household and structural pest complex.
[2]Anobiid beetles, old house borers, lyctid beetles, carpenter bees, fabric pests, spiders, silverfish, pantry pests, ticks, millipedes, drywood termites, scorpions, flies, etc.

In 1996, the Georgia pest control industry consisted of 950 company offices, 6,696 employed by pest control companies, (4,000 registered employees, 1,294 office workers, and 1,600 certified operators), $158,380,209 paid in salaries and benefits, $225,000,000 annual revenue production and 200,000 wood-destroying organism inspection reports (figures compiled with cooperation of the Georgia Department of Agriculture, the Cooperative Extension Service University of Georgia and the Georgia Pest Control Association).

Figures were based on the following estimates:

a. 200,000 wood-destroying organism reports at $50 each = $10,000,000
b. 950 pest control companies in Georgia with an estimated 500 accounts for each company at $60 per account = $28,500,000 (½ of the accounts are for cockroaches, 1/4 for ants, 1/4 for fleas)
c. Each pest control company handles an estimated 5 miscellaneous treatment jobs each week at $50 per job = $12,350,000 (1/4 each for cockroaches, ants, fleas, and miscellaneous pests)
d. An estimated average of one can of aerosol insecticide was applied in each residence to control household and structural pests, 2,400,000 residences times $4.25 per can = 10,200,000 (½ of the accounts are for cockroaches, 1/4 for ants, 1/4 for fleas)
e. 75 fumigation jobs at $3,500 each = $262,500
f. 17,000 post-construction termite treatments at $800 each = $13,600,000
g. 20,000 pre-construction termite treatments at $500 each = $10,000,000
h. 500,000 households with termite contract renewals at $50 each = 25,000,000
i. Damage caused by termites was estimated at 17,000 households at $1,000 each = $17,000,000 for other household pests damage due to food contamination, structural damage, damaged to carpets, clothing, books, furniture, etc. was estimated to be $6.66 per residence for 2,400,000 residences = $16,000,000
j. Control costs (a+b+c+d+e+f+g+h) $109,912,500
   Damage costs (i) $ 33,000,000
   Total costs $142,912,500

# LIVESTOCK AND POULTRY INSECTS

M. P. Nolan, Jr. and D. C. Sheppard

During 1996, horn flies on beef cattle; and stable flies on beef cattle, dairy cattle and horses were major concerns to livestock producers in Georgia. Lice, primarily blood sucking lice on swine and beef cattle, caused production problems. Mites, mostly northern fowl mites on poultry breeders and layers and sarcoptic mites on swine, were damaging. In broiler operations, litter beetles were of most concern. House flies caused public relations and nuisance problems near some livestock and poultry facilities.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Darkling beetles | $ 1,371,000 | $ 8,476,000 | $ 9,847,000 |
| 2 | Horn fly | 2,311,000 | 7,117,000 | 9,428,000 |
| 3 | House fly | 1,222,000 | 2,991,000 | 4,213,000 |
| 4 | Stable fly | 932,000 | 3,065,000 | 3,997,000 |
| 5 | Lice | 715,000 | 2,204,000 | 2,919,000 |
| 6 | Northern fowl mite | 451,000 | 797,000 | 1,248,000 |
| 7 | Mites (animal) | 222,000 | 575,000 | 797,000 |
| 8 | Grubs and bots | 66,000 | 170,000 | 236,000 |
| 9 | Face fly | 43,000 | 137,000 | 180,000 |
| 10 | Horse fly | 29,000 | 42,000 | 71,000 |
| | Total: | $ 7,362,000 | $ 25,575,000 | $ 32,937,000 |

**Estimates of Losses and Control Costs for Each Group of Livestock and Associated Pests in Georgia in 1996**

| Pest | Control Cost | Damage | Total |
|---|---|---|---|
| **BEEF CATTLE** | | | |
| Horn fly (68%) | $2,274,600 | $6,838,760 | $9,113,360 |
| Lice (15%) | 501,750 | 1,508,550 | 2,010,300 |
| Stable fly (15%) | 501,750 | 1,508,550 | 2,010,300 |
| Grubs (1%) | 33,450 | 100,570 | 134,020 |
| Face fly (1%) | 33,450 | 100,570 | 134,020 |
| Subtotal | $3,345,000 | $10,057,000 | $13,402,000 |
| **DAIRY CATTLE** | | | |
| Stable fly (40%) | $147,200 | $1,112,800 | $1,260,000 |
| House Fly (38%) | 139,840 | 1,057,160 | 1,197,000 |
| Lice (10%) | 36,800 | 278,200 | 315,000 |
| Horn fly (10%) | 36,800 | 278,200 | 315,000 |
| Grubs (1%) | 3,680 | 27,820 | 31,500 |
| Face fly (1%) | 3,680 | 27,820 | 31,500 |
| Subtotal | $368,000 | $2,782,000 | $3,150,000 |
| **HORSES** | | | |
| Stable fly (45%) | $258,300 | $379,800 | $638,100 |
| House fly (40%) | 229,600 | 337,600 | 567,200 |
| Horse fly (5%) | 28,700 | 42,200 | 70,900 |
| Bots (5%) | 28,700 | 42,200 | 70,900 |
| Lice (4%) | 22,960 | 33,760 | 56,720 |
| Face fly (1%) | 5,740 | 8,440 | 14,180 |
| Subtotal | $574,000 | $844,000 | $1,418,000 |
| **POULTRY** | | | |
| Layers | | | |
| House flies (60%) | $754,200 | $1,341,000 | $2,095,200 |
| Northern Fowl mites (35%) | 439,950 | 782,250 | 1,222,200 |
| Darkling beetles (5%) | 62,850 | 111,750 | 174,600 |
| Subtotal | $1,257,000 | $2,235,000 | $3,492,200 |
| Broilers | | | |
| Darkling Beetles (100%) | $1,292,000 | $8,343,000 | $9,635,000 |
| Turkeys | | | |
| Darkling Beetles (60%) | $16,000 | $21,600 | $37,600 |
| Northern Fowl mites (40%) | 11,000 | 14,400 | 25,400 |
| Subtotal | $27,000 | $36,000 | $63,000 |
| **SWINE** | | | |
| Mites (45%) | $221,850 | $574,650 | $796,500 |
| Lice (30%) | 147,900 | 383,100 | 531,000 |
| House fly (20%) | 98,600 | 255,400 | 354,000 |
| Stable fly (5%) | 24,650 | 63,850 | 88,500 |
| Subtotal | $493,000 | $1,270,000 | $1,770,000 |

**Information Pertaining to Control of Major Arthropod Pests of Livestock and Poultry in Georgia in 1996**

| Animal and Pest Complex[1] | Production Inventory Total (1000)[2] | Average Yield[2] | Average Price[2] | No. Treated/ Untreated Head | No. Treatments | Average Cost of Treatment | Yield Loss Treated/ Untreated |
|---|---|---|---|---|---|---|---|
| **Cattle** | | | | | | | |
| *Beef* | 3,230 | 993 lbs./hd. | Calves - | 1,115,000 (50%) | 3/hd. | $3/hd. | 2.4 lbs./hd. |
| Horn fly (68%) | | $0.342/lb. | $0.492/lb. | | | | $0.82/hd. |
| Lice (15%) | | | | | | | |
| Stable fly (15%) | | | Cows - | 1,115,000 (50%) | | | 24 lbs./hd. |
| Grubs (1%) | | | $0.30/lb. | | | | $8.20/hd. |
| Face fly (1%) | | | | | | | |
| *Dairy* | 97 | 15,320 lbs. | $16.30/100 | 92,150 (90%) | 6/hd. | $4/hd. | 153 lbs. |
| Stable fly (40%) | | milk/cow | lb. milk | 4,850 (10%) | | | milk/hd. |
| House fly (38%) | | | | | | | $24.94/hd. |
| Lice (10%) | | | | | | | 612 lbs. |
| Horn fly (10%) | | | | | | | milk/hd. |
| Grubs (1%) | | | | | | | $99.76/hd. |
| Face fly (1%) | | | | | | | |
| **Horses** | 225 | N/A | $1,000 | 191,250 (85%) | 6/hd. | $3/hd. | $2.50/hd. |
| Stable fly (45%) | | | | 33,750 (15%) | | | $25/hd. |
| House fly (40%) | | | | | | | |
| Horse fly (5%) | | | | | | | |
| Bots (5%) | | | | | | | |
| Lice (4%) | | | | | | | |
| Face fly (1%) | | | | | | | |
| **Poultry** | | | | | | | |
| *Layers* | 18,626 | 244 | $1.00/dzn. | 16,763,000 (90%) | 1/bird | $0.075/layer | 1 egg/layer |
| | | eggs/layer | | | | | $0.08/layer |
| | | | | | | | 6 eggs/layer |
| *Breeders* | 7,948 | | $1.36/dzn. | 1,863,000 (10%) | | | $0.48/layer |
| | | 229 | | | | | |
| *Commercial eggs* | 10,678 | eggs/layer | $0.645/dzn | | | | |
| House flies (60%) | | | . | | | | |
| N. fowl mite (35%) | | 259 | | | | | |
| Darkling beetles (5%) | | eggs/layer | | | | | |
| *Broilers* | 1,154,000 | | | 807,800,000 birds (70%) | 1/bird | $0.0016/ | 0.01lb./bird |
| Darkling beetles (100%) | | | $0.39/lb. | | | bird | $0.0039/bird |
| | | | $1.91/bird | 346,200,000 birds (30%) | | | 0.04lb./bird |
| | | 4.9 lb./bird | | | | | $0.015/bird |
| *Turkeys* | 550 | | | 275,000 (50%) | 4/bird | | 0.05 lb./bird |
| N. fowl mites (60%) | | | $0.43lb. | 275,000 (50%) | | $0.10/bird | $0.02/bird |
| Darkling beetles (40%) | | | | | | | 0.25 lb./bird |
| | | 30.9 lbs./bird | | | | | $0.11/bird |
| **Swine** | 2,348 | 250 lbs./hd. | $0.490/lb. | 1,644,000 (70%) | 2/hd. | $0.30/hd. | 0.3 lb./hd. |
| Mites (45%) | | | | 704,000 (30%) | | | $0.147/hd. |
| Lice (30%) | | | | | | | 3 lbs./hd. |
| House fly (20%) | | | | | | | $1.47/hd. |
| Stable fly (5%) | | | | | | | |

[1] Estimated percent importance each insect has to control.

[2] Georgia Farm Report, Georgia Agricultural Statistics Service, Athens, GA 30613-5099

## XIII. Ornamental, Lawn and Turf Insects

W. G. Hudson, S. K. Braman, R. D. Oetting, and B. L. Sparks

Ornamental production of floricultural crops is primarily under greenhouse culture and has spring and fall pest problems. There is a limited amount of field production of cut flowers with similar problems as greenhouse production. The most difficult pest to manage on floricultural crops was western flower thrips. Failure to control thrips was reported with all management strategies reported. This is primarily a spring problem but can be severe in the fall. Mites are increasing in difficulty to manage with insecticides especially in warm seasons. The greenhouse whitefly is more prevalent on fall crops. This increase is believed to be a result of less susceptibility to imidacloprid, the primary insecticide used to control silverleaf whitefly. Other strategies must be used to control greenhouse whitefly. The use of good sanitation, exclusion and other cultural practices are encouraged to reduce the incidence of pest problems and the need for pesticides.

In 1996, the major insect problems on woody ornamentals, both in home landscapes and commercial landscape maintenance, included various species of borers, scale insects, mites, lace bugs, foliage feeding beetles and whiteflies. Borer damage was noted on many different species of ornamental trees and shrubs during the year. Damage due to the Asian ambrosia beetle, *Xylosandrus crassiusculus*, was found in greater incidence and on a wide range of host plants in nursery production and landscapes. An increase in perennial production resulted in an increase in aphids, thrips and whiteflies as well as leaf and flea beetles. Japanese beetle populations were higher in 1996 than in previous years in the northern half of the state, and associated damage and control costs in both nursery production and landscape situations increased significantly. Spider mite aphid and scale insect problems were severe and widespread throughout the state all year.

The turf industry in Georgia (includes production, sales, installation and maintenance) is estimated to be worth in excess of $1.4 billion annually. There are currently 368 golf courses in operation in the state, with more under construction or in planning. There are over 740 football fields, over 16,000 acres of turf on school grounds (public and private), and over 25,000 acres of turf in parks. All total, there are an estimated 1.3 million acres of turfgrass in the state. Increasing urbanization and emphasis on expanding recreational opportunities statewide should lead to continued strong demand for quality sod in the future. Sod production accounts for over 15,000 acres in Georgia, and the trend toward increasing acreage devoted to this crop will continue as long as the demand is there.

Although mole crickets are found only in the coastal plain region of Georgia, they are so destructive and difficult to control that almost half of the losses from insect pests in turf statewide are due to these pests. Dry weather during the spring and early summer affected survival of young nymphs in 1996 but some significant problems developed later. Caterpillar problems were widespread but sporadic in 1996. Spittlebugs continue to be severe pests, and problems from these insects in centipede grass were significantly higher in 1996. Damage from Japanese beetle continues as populations of this introduced pest continue to increase.

**Numbers of Units Considered in Preparing Loss Estimates for 1996**

| | |
|---|---|
| **Private** | |
| Households | 2,500,000 |
| Greenhouse units (12.1 million ft.$^2$) | 750 |
| Nursery stock dealers | 2,000 |
| Nurseries (5,189 acres) | 1,800 |
| Sod farms (18,000) | 150 |
| **Public Units (Landscaped)** | |
| Public and private schools | 6,300 |
| Industrial sites | 11,000 |
| Hotels and motels | 1,600 |
| Financial institutions | 2,000 |
| Hospitals | 260 |
| Municipal and private parks | 380 |
| Shopping centers | 400 |
| Colleges, Universities and Vo. Tech. | 100 |
| Churches | 8,200 |
| Cemeteries (perpetual care) | 300 |
| Golf courses | 368 |

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| **Ornamentals** | | | | |
| 1 | Scale insects & mealybugs | $43,502,000 | $ 55,156,000 | $ 98,658,000 |
| 2 | Mites | 24,545,000 | 31,725,000 | 56,270,000 |
| 3 | Aphids | 5,612,000 | 10,688,000 | 16,300,000 |
| 4 | Thrips | 6,371,000 | 6,960,000 | 13,331,000 |
| 5 | Whiteflies | 5,867,000 | 7,060,000 | 12,927,000 |
| 6 | Lepidopterous larvae[1] | 5,290,000 | 2,815,000 | 8,105,000 |
| 7 | Slugs and snails | 2,712,000 | 1,148,000 | 3,860,000 |
| 8 | Beetles[2] | 1,389,000 | 1,912,000 | 3,301,000 |
| 9 | Lace bugs | 1,138,000 | 269,000 | 1,407,000 |
| 10 | Spittlebugs | 719,000 | 178,000 | 897,000 |
| | Miscellaneous[3] | 7,155,000 | 3,579,000 | 10,734,000 |
| | ***Subtotal*** | ***$104,300,000*** | ***$121,490,000*** | ***$225,790,000*** |
| **Lawns and Turf** | | | | |
| 1 | Mole crickets | $ 12,304,000 | $ 13,263,000 | $ 25,567,000 |
| 2 | White grubs | 3,284,000 | 6,021,000 | 9,305,000 |
| 3 | Caterpillars[4] | 2,908,000 | 6,092,000 | 9,000,000 |
| 4 | Chinch bugs | 1,347,000 | 2,664,000 | 4,011,000 |
| 5 | Spittlebugs | 987,000 | 1,915,000 | 2,902,000 |
| | Miscellaneous[5] | 2,193,000 | 2,232,000 | 4,425,000 |
| | ***Subtotal*** | ***$ 23,023,000*** | ***$ 32,187,000*** | ***$ 55,210,000*** |
| | ***Grand Total*** | ***$127,323,000*** | ***$153,677,000*** | ***$281,000,000*** |

[1] Primarily cutworms, corn earworm, loopers, azalea caterpillars, and leaf rollers.
[2] Primarily leaf beetles, Japanese weevils, Fuller Rose weevil, Japanese beetle, whitefringed beetle, borers, and carpenterworm.
[3] Includes grasshoppers, fungus gnats, millipedes, sowbugs, psocids, springtails, ants, earwigs, and leafminers.
[4] Sod webworms, armyworms, cutworms.
[5] Ants (excluding fire ants), billbugs, leafhoppers, and mites.

## XIV. Pasture and Forage Insects

G. D. Buntin, R. D. Hudson, and W. A. Gardner

Acreages of forage and pasture crops have declined in recent years to about 1.3 million acres of grass pastures and an additional 600,000 acres of grass hay pastures in 1996. Although losses per acre generally are low and treatment thresholds are large, this extensive acreage produces large combined losses for forage and pasture insects in Georgia. Losses are greater for hay than pastures because hay crops have greater yield potential and market value.

Rainfall was below normal which reduced forage yields later in the summer. The number one pest of perennial grass forages, primarily bermudagrass was mole crickets. Mole crickets damaged grass pastures in southern Georgia especially in the Flatwoods region often requiring replanting. Mole cricket damage has declined in some fields in four counties where the parasitic nematode *Steinernema scapterisci* has been released. The white grub complex, mostly *Phyllophaga* spp., *Cyclocephala* sp. and Green June beetle larvae caused damage in some fields, with damage levels not changing much from the previous year. Green June beetle larvae were particularly damaging to fescue pastures in northern Georgia. Fall armyworm and the 2-lined spittlebug caused damage in some fields.

Alfalfa acreage in Georgia was about 30,000 acres on 1996. The alfalfa weevil was the number one pest of alfalfa with most fields being treated to control this insect. Dry weather induced damage by the potato leafhopper in some fields.

**Estimated Losses and Control Costs in 1996**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| **GRASS HAY PASTURES** | | | | |
| 1 | Mole crickets | $360,000 | $6,525,000 | $6,885,000 |
| 2 | White grubs | 420,000 | 792,000 | 1,212,000 |
| 3 | Fall armyworm | 60,000 | 54,000 | 114,000 |
| 4 | Two-lined spittlebug | 42,000 | 54,000 | 96,000 |
| | Subtotal | $882,000 | $7,425,000 | $8,307,000 |
| **GRASS PASTURES** | | | | |
| 1 | Mole crickets | $468,000 | $3,253,000 | $3,721,000 |
| 2 | White grubs | 910,000 | 629,000 | 1,539,000 |
| 3 | Fall armyworm | 130,000 | 43,000 | 173,000 |
| 4 | Two-lined spittlebug | 91,000 | 43,000 | 134,000 |
| | Subtotal | $1,599,000 | $3,968,000 | $5,567,000 |
| **ALFALFA** | | | | |
| 1 | Alfalfa weevil | $189,000 | $403,000 | $592,000 |
| 2 | Potato leafhopper | 0 | 36,000 | 36,000 |
| | Subtotal | $189,000 | $439,000 | $628,000 |
| | **GRAND TOTAL** | **$2,670,000** | **$11,832,000** | **$14,502,000** |

**Information Pertaining to Control of Major Pasture and Forage Insect Pests in Georgia in 1996.**

| Insect | No. Acres Needing Control | Total No. Acres Treated | Avg. Cost Per Unit Treated[1] | Tons Loss on Units Treated | Tons Loss on Units Not Treated |
|---|---|---|---|---|---|
| **GRASS HAY PASTURES** | | | | | |
| Mole crickets | 192,000 | 30,000 | $12.00 | 7,500 | 101,250 |
| White grubs | 60,000 | 42,000 | 10.00 | 4,200 | 9,000 |
| Fall armyworm | 12,000 | 6,000 | 10.00 | 150 | 750 |
| Spittlebug | 12,000 | 6,000 | 7.00 | 150 | 750 |
| **GRASS PASTURES** | | | | | |
| Mole crickets | 260,000 | 39,000 | 12.00 | 3,900 | 55,250 |
| White grubs | 130,000 | 91,000 | 10.00 | 3,640 | 7,800 |
| Fall armyworm | 26,000 | 13,000 | 10.00 | 130 | 650 |
| Spittlebug | 26,000 | 13,000 | 7.00 | 130 | 650 |
| **ALFALFA HAY** | | | | | |
| Alfalfa weevil | 28,500 | 27,000 | 7.00 | 2,160 | 1,200 |
| Potato leafhopper | 1,500 | 0 | 7.00 | 0 | 300 |

NOTE: Hay crops consisted of 600,000 acres of grasses (hybrid bermudagrass 75%; tall fescue 20%; and other grasses 5%), with an average yield of 2.5 tons per acre. Alfalfa acreage was 30,000 acres with an average yield of 3.5 tons per acre. Grass and clover hay were valued at $60 per ton and alfalfa hay was worth $120 per ton. Permanent pasture consisted of 500,000 acres of bahiagrass and 800,000 acres of fescue, fescue/clover mixtures and fescue/common bermudagrass. Average yield was estimated at 1.0 ton per acre with a value of $55 per ton. An additional 400,000 acres of temporary pasture (mostly small grains and sorghum) was grazed. There was 150,000 acres of sorghum, and millet silage was harvested. Silage and temporary pasture crops were included as pasture grasses (Troy Johnson, Extension Agronomist, Athens, GA, personal communications).

[1] Application cost not included. Unit = 1 acre

## XV. Peach Insects

D.L. Horton, Ann Amis and HC Ellis

Georgia's 1996 peach crop was valued at $3.4 million from 10 million lbs. of fruit that averaged $0.33/lb.* Georgia's 1996 peach crop experienced a series of severe cold events which reduced the crop to its lowest level since 1955, an estimate volume reduction of 94%. Peach insect pest management efforts in 1996 were made on a block-to-block basis. Numerous blocks received insecticide 2-3 times post-bloom, only to be abandoned as cold injured fruit continued to abort for some 2 months.

Alternate-row-middle insecticide application was used extensively. Insecticide programs were greatly reduced, but most blocks received insecticide during the key period from late-March through mid-April. Insect control was surprisingly good, which has encouraged interest in insect pest management. Control cost estimates reflect only the estimated cost of materials.

*Georgia Farm Report 1997. Volume 97, Number 2.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Scale | $180,000 | $371,000 | $551,000 |
| 2 | Peachtree Borer and Lesser Peachtree Borer[1] | 220,000 | 35,000 | 255,000 |
| 3 | Fruit Feeders | 69,000 | 68,000 | 137,000 |
| 4 | Leafhoppers | 0 | 55,000 | 55,000 |
| | *Total* | *$469,000* | *$529,000* | *$998,000* |

1. Control cost included under cover sprays and peachtree borer sprays.

**Information Pertaining to Control of Major Peach Insect Pests in Georgia in 1996**

| Insects | No. Trees Needing Controls | No. Trees Treated | No. of Unit Applic. | Avg. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Scale | 2,667,000 | 2,000,000 | 1.0 | $0.09 | 348,000 | 742,000 |
| Peachtree Borer and Lesser Peachtree Borer[3] | 1,600,000 | 1,467,000 | 1.0 | $0.15 | 77,000 | 28,000 |
| Fruit Feeders | 575,000 | 460,000 | 3.0 | $0.05 | 160,000 | 40,000 |
| Leafhoppers | 267,000 | 133,000 | 0 | $0.00 | 116,000 | 46,000 |

1. Excluding application costs
2. Yield units measured in pounds
3. Control cost included under cover sprays and peachtree borer sprays

## XVI. Peanut Insects

S. L. Brown, D.C. Jones, and J. W. Todd

In 1996, Georgia produced 1,439,150,000 lbs. of peanuts on 535,000 acres for an average yield of 2690 lbs per acre. Farmers received an average of $0.27 per pound for a total crop value of $388.5 million.

In most peanut fields, insect pests were not a major yield-limiting factor in 1996. However, costs of control did significantly increase total production costs in many fields.

Thrips pressure was average to slightly above average in most fields. However, thrips feeding damage to new growth was evident much longer into the season than the normal 4 to 6 weeks after emergence. Thrips populations were high even in late July. This late feeding pressure was thought to contribute to an extremely high incidence of tomato spotted wilt virus in August and September.

A lesser cornstalk borer outbreak occurred early in the season (May) and some seedling plants were damaged. June rains helped reduce the threat from this insect and overall impact was low compared to that seen in drier years. Wireworms continue to cause low levels of damage in most Georgia peanut fields.

Three-cornered alfalfa hoppers and leafhoppers were again a problem in 1996. With little research available on these pests, yield losses are difficult to estimate but numerous observations suggest that yield losses are common.

Foliage feeders were of little significance in 1996. An outbreak of fall armyworm in the southwestern corner of the state caused a few insecticide applications, but damage was generally very light.

**Losses and Control Costs Crop Year 1996**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Thrips | $4,815,000 | $1,170,000* | $5,985,00 |
| 2 | Wireworms | 2,461,000 | 1,677,000 | 4,138,000 |
| 3 | Lesser cornstalk borer | 1,354,000 | 1,833,000 | 3,187,000 |
| 4 | Southern corn rootworm | 861,000 | 1,092,000 | 1,953,000 |
| 5 | Three-cornered alfalfa hoppers | 0 | 1,560,000 | 1,560,000 |
| 6 | Fall armyworm | 214,000 | 78,000 | 292,000 |
| 7 | Velvetbean caterpillar | 144,000 | 117,000 | 261,000 |
| 8 | Corn earworm | 161,000 | 78,000 | 239,000 |
| 9 | Leafhoppers | 27,000 | 640,000 | 667,000 |
| | Total | $10,037,000 | $8,245,000 | $18,282,000 |

*Does not include losses due to tomato spotted wilt virus which is transmitted by thrips

**Information pertaining to control of major pests in Georgia in 1996**

| Insect | No. Units Needing Control | No. Units Treated | No. of Unit Applications | Avg. Cost Per Unit Treated | Yield Loss on Units Treated | Yield Loss on Units Untreated |
|---|---|---|---|---|---|---|
| Thrips | 428,000 | 482,000 | 1.0 | $10.00 | 0 | 4,317,000 |
| Wireworms | 80,000 | 107,000 | 1.0 | 23.00 | 1,151,000 | 5,037,000 |
| Lesser cornstalk borer | 34,000 | 59,000 | 1.0 | 23.00 | 288,000 | 6,476,000 |
| Southern corn rootworm | 43,000 | 37,000 | 1.0 | 23.00 | 1,439,000 | 2,590,000 |
| three-cornered alfalfa hopper | 54,000 | 0 | 1.0 | 5.00 | 0 | 5,757,000 |
| Fall armyworm | 27,000 | 27,000 | 1.0 | 8.00 | 0 | 288,000 |
| Velvetbean caterpillar | 27,000 | 48,000 | 1.0 | 3.00 | 0 | 432,000 |
| Corn earworm | 11,000 | 32,000 | 1.0 | 5.00 | 0 | 288,000 |
| Leafhoppers | 107,000 | 5,000 | 1.0 | 5.00 | 0 | 640,000 |

# XVII. Pecan Insects

H C Ellis and J. D. Dutcher

Georgia's pecan production was 90 million pounds in 1996, 15 million pounds more than 1995 production. Because of a reported increase in carry-over and supply, prices were lower in 1996, averaging $0.622 per pound. The total crop value was $56 million, 70 percent of the value of the 1995 crop.

Overall, losses to pecan arthropods decreased slightly in 1996. However, losses to pecan nut casebearer and pecan weevil increased significantly. Pecan nut casebearer populations reached a 25-year high in 1996. Pecan weevil numbers were also higher and emergence was prolonged. Weevils required ca. one additional spray, on the average. Spittlebugs were also significantly worse in 1996. Yellow aphid problems increased slightly. Black pecan aphids, mites, and hickory shuckworms caused fewer problems in 1996. However, these pests were heavier than normal in 1995, and the occurrence of high populations of black pecan aphid in early season remains a concern. Losses in the "others" category were primarily due to phylloxera and Asian ambrosia beetles. Estimated total losses to arthropod pests in 1996 were 3% lower than the 1995 estimates.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Pecan weevil | $ 4,050,000 | $ 2,099,000 | $ 6,149,000 |
| 2 | Pecan nut casebearer | 990,000 | 4,478,000 | 5,468,000 |
| 3 | Yellow aphids[1,2] | 1,707,000 | 3,219,000 | 4,926,000 |
| 4 | Hickory shuckworm | 1,620,000 | 2,071,000 | 3,691,000 |
| 5 | Black pecan aphids | 1,620,000 | 1,120,000 | 2,740,000 |
| 6 | Mites[3] | 855,000 | 896,000 | 1,751,000 |
| 7 | Spittlebugs | 720,000 | 812,000 | 1,532,000 |
| 8 | Others[4] | 540,000 | 392,000 | 932,000 |
| 9 | Kernel feeding hemipterans[5] | 68,000 | 252,000 | 320,000 |
| | ***Total*** | ***$12,170,000*** | ***$15,339,000*** | ***$27,509,000*** |

[1]"Yellow aphids" include the yellow pecan aphid and the blackmargined aphid.
[2]The cost of control of yellow aphids includes $60 per acre for application of aldicarb on 10,000 acres and $10.00 per acre for foliar sprays on 103,000 acres.
[3]"Mites" refers primarily to the pecan leaf scorch mite.
[4]"Others" include the pecan bud moth, pecan spittlebug, pecan leaf casebearer, leaf miners, fall webworm, phylloxeras, walnut caterpillar, boring insects, *Prionus* spp., hickory nut curculio, and hickory shoot curculio.
[5]"Kernel feeding hemipterans" include the southern green stink bug, the brown stink bug, the leaffooted bug and others.

**Information Pertaining to Control of Major Pecan Insect Pests in Georgia in 1996**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Acre Applic.[1] | Avg. Cost Per Unit Treated[2] | Yield Loss On Units Treated[3] | Yield Loss On Units Untreated[3] |
|---|---|---|---|---|---|---|
| Pecan weevil | 113,000 | 90,000 | 3.0 | $15.00 | 1,350,000 | 2,025,000 |
| Pecan nut casebearer | 120,000 | 90,000 | 1.0 | $11.00 | 2,700,000 | 4,500,000 |
| Yellow aphids[4] | 143,000 | 113,000 | 1.0 | $15.17 | 3,375,000 | 1,800,000 |
| Hickory shuckworm | 128,000 | 90,000 | 2.0 | $9.00 | 1,080,000 | 2,250,000 |
| Black pecan aphids | 135,000 | 120,000 | 1.5 | $9.00 | 1,440,000 | 360,000 |
| Mites[5] | 45,000 | 30,000 | 1.5 | $19.00 | 720,000 | 720,000 |
| Spittlebugs | 113,000 | 60,000 | 1.0 | $12.00 | 360,000 | 945,000 |
| Others[6] | 75,000 | 45,000 | 1.0 | $12.00 | 270,000 | 360,000 |
| Kernel feeding hemipterans[7] | 38,000 | 8,000 | 1.0 | $9.00 | 45,000 | 360,000 |

[1]Some applications control more than one pest and the number of applications indicated were not made in all orchards.
[2]Excluding application costs.
[3]Yield units measured in pounds.
[4]"Yellow aphids" include the yellow pecan aphid and the blackmargined aphid.
[5]"Mites" refers primarily to the pecan leaf scorch mite.
[6]"Others" include the pecan bud moth, pecan leaf casebearer, leaf miners, fall webworm, pecan spittlebug, walnut caterpillar, phylloxeras,
boring insects, *Prionus* spp., hickory nut curculio and hickory shoot curculio.
[7]"Kernel feeding hemipterans" include the southern green stink bug, the brown stink bug, the leaffooted bug and others.

## XVIII. Public Health and Recreational Area Insects

M.P. Nolan, Jr., S.K. Braman, W.G. Hudson and B.L. Sparks

In 1996, flies were the most expensive public health insects to control. Most of the costs involved garbage management and screening to exclude various filth flies from buildings. The house fly was the most common filth fly encountered.

Government agencies that were dedicated to the control of a single insect pest were primarily concerned with mosquitoes. Some counties in the state had one or more mosquito control programs. Mosquito numbers were moderate most of the season. There were two human cases of anthropod borne encephalitis reported in 1995 and two in 1994; two human cases of EEE in 1991 but no cases for EEE or any of the other arthropod borne encephalitides reported in 1992, 1993 or 1996. In 1991 there were 24 imported malaria cases, 17 in 1992, 25 in 1993, 43 in 1994, 41 in 1995 and 38 in 1996.

Ticks, mostly lone star ticks, American dog ticks and black legged ticks, were present in many sections of the state. Their bites and their ability to serve as vectors of Lyme disease and Rocky Mountain Spotted Fever (RMSF) made them important public health arthropods. There was 1 reported case of Lyme disease in 1996 compared to 14 in 1995, 127 in 1994, 63 in 1993, 48 in 1992, 25 in 1991, 161 in 1990, 715 in 1989, 59 in 1988, 4 in 1987 and none in previous years. There were 66 cases of RMSF in 1996 as compared to 9 cases in 1995, 62 cases in 1994, 45 cases in 1993, 42 cases in 1992, 41 cases in 1991 (including one death), 18 in 1990 (including one death), and 25 in 1989. (Data on vector borne diseases provided by the Office of Epidemiology and Prevention Branch, Georgia Department of Human Resources).

**Summary of Insect Control and Loss Estimates - 1996**

| Rank | Insect | Cost of Control |
|---|---|---|
| 1 | Flies (non-biting) | $25,301,000 |
| 2 | Mosquitoes | 15,656,000 |
| 3 | Others[1] | 3,527,000 |
| 4 | Ticks and chiggers | 2,601,000 |
| 5 | Head lice | 2,503,600 |
| 6 | Eye gnats | 2,316,000 |
| 7 | Yellow jackets | 1,815,000 |
| | ***Total*** | ***$53,719,000*** |

[1]Others includes spiders, biting flies, bees and other stinging insects (other than yellow jackets).

**Cost of Control**

| Insect | Item | Cost |
|---|---|---|
| Flies | window screens | $ 3,599,008 |
| | screened doors | 5,758,413 |
| | aerosol sprays | 1,919,471 |
| | garbage removal | 11,996,695 |
| | garbage dumpsters | 119,966 |
| | garbage cans | 1,199,669 |
| | fly swatters | 707,805 |
| | | **$25,301,027** |
| Mosquitoes | window screens | $3,599,008 |
| | screened doors | 5,758,413 |
| | aerosol sprays | 1,919,471 |
| | repellents | 1,259,652 |
| | abatement programs | 2,948,150 |
| | hospitalization | 152,000 |
| | doctor fees | 15,200 |
| | druggist fees | 3,800 |
| | | **$15,655,694** |
| Others[1] | window screens | $899,752 |
| | screened doors | 1,439,603 |
| | aerosol sprays | 479,867 |
| | repellents | 359,900 |
| | doctor fees | 248,503 |
| | druggist fees | 99,401 |
| | | **$3,527,026** |
| Ticks and chiggers | repellents | $1,079,702 |
| | doctor fees | 26,800 |
| | druggist fees | 6,700 |
| | hospitalization | 268,000 |
| | acaracides (residential) | 1,199,669 |
| | acaracides (organizations) | 20,000 |
| | | **$2,600,871** |
| Head Lice | doctor fees | $ 1,291,640 |
| | druggist fees | 1,210,932 |
| | | **$2,502,572** |
| Yellow jackets | window screens | $ 449,876 |
| | screened doors | 719,801 |
| | aerosol sprays | 239,933 |
| | doctor fees | 324,576 |
| | druggist fees | 81,144 |
| | | **$1,815,330** |

**Cost of Control Estimates**

| | | |
|---|---|---|
| | Mosquitoes - 40%, Flies, - 40%, Eye gnats - 5%<br>Yellow jackets - 5%, Others - 10%[1,2] | |
| 1. | Window screens - 10 screens/residence x $10.00/screen = $100/residence x 2,399,339[3] residences = $239,933,900. 20 year life/ screen = $11,996,695/year x 75% who have window screens | $ 8,997,521 |
| 2. | Screened doors - 2 screened doors/ residence x $60/screened door = $120/ residence x 2,399,339 residences = $287,920,680. 15 year life span/screen door = $19,194,712/year x 75% who have screened doors | $14,396,034 |
| 3. | Aerosol sprays - ½-15 oz. aerosol insecticide spray can/residence. $4/can x ½ can x 2,399,339 residences = $4,798,678 | $ 4,798,678 |
| | | $28,192,233 |
| | Mosquitoes - 35%, Ticks and Chiggers - 30%,<br>Eye gnats - 25%, Others - 10%[1] | |
| 4. | Repellents - ½-15 oz. aerosol spray can/ residence. $3/can x ½ x 2,399,339 residences = $3,599,008 | $ 3,599,008 |
| | Mosquitoes - 100% | |
| 5. | Mosquito Abatement Program | |
| | (a) Six abatement districts (Chatham, Bibb, Glynn, Dougherty, Richmond and Muscogee Counties) | $ 2,421,650 |
| | (b) About 117[4] county/city programs, $4,500/program | $ 526,500 |
| | | **$ 2,948,150** |

| | | |
|---|---|---|
| 6. | Doctor fees - 0 encephalitis cases, 38 imported malaria cases $400[5] / case x 38 cases = $15,200 | $15,200 |
| 7. | Hospitalization - $4,000[5]/case x 38 cases = $152,000 | $152,000 |
| 8. | Druggist Fees - $100[5]/case x 38 cases = $3,800 | $3,800 |
| | | **$3,119,150** |

Flies - 100%

| | | |
|---|---|---|
| 9. | Garbage removal - $50/residence/year x 2,399,339 residences = $119,966,950 x 10% (portion attributed to insect control) = $11,996,695/year | $11,996,695 |
| 10. | Garbage disposal units (dumpsters - county, commercial and industrial) - $500/ unit; 1 unit/100 residences. 23,993 units x $500 x 10% (portion attributed to insect control) = $1,199,669. 10 year life span/ unit = $119,966/year | $ 119,966 |
| 11. | Garbage cans (residential) - 2/residence = $15/can x 2 x 2,399,339 residences = $71,980,170 x 10% (portion attributed to insect control) = $7,198,017. 6 year life span/can = $1,199,669 | $ 1,119,669 |
| 12. | Fly swatters - ½ fly swatter/residence $0.59/fly swatter x ½ x 2,399,339 residences = $707,805 | $ 707,805 |

Ticks and Chiggers - 100%

| | | |
|---|---|---|
| 13. | Acaracides (residential) - of 2,399,339 residences, estimated 5% purchase $10.00 acaracide for tick control in yards | $1,199,669 |
| 14. | Acaracides (public and private organizations) | $ 20,000 |
| 15. | Doctor fees - 66 RMSF cases and 1 Lyme case $400[5] /case x 67 cases = $26,800 | $ 26,800 |
| 16. | Hospitalization - $4000[5]/case x 67 cases = $268,000 | $ 268,000 |
| 17. | Druggist fees - $100[6]/case x 67 cases = $6,700 | $ 6,700 |
| | | **$1,521,169** |

Yellow jackets - 40%, Others[1] - 49%, Eye gnats - 1%, Mosquitoes - 10%

| | | |
|---|---|---|
| 18. | Doctor fees (bites and stings) 1 visit/100 residences at $40/visit = 20,286 residences x $40/visit = $811,440 | $ 811,440 |
| 19. | Druggist fees - 1 visit/100 residences at $10/ visit = 20,286 residences x $10 = $202,866 | $ 202,860 |
| | | **$ 1,014,300** |

Head lice - 100%

| | | |
|---|---|---|
| 20. | Doctor fees - 4% of 807,288[6] school children in ages 5-10 = 32,291 at $40/visit x 32,291 = $1,291,640 | $ 1,291,640 |
| 21. | Druggist fees - pediculicides for head lice - $10/pediculicide x 807,288[6] school children in ages 5-10 15% estimated infestation = $1,210,932 | $ 1,210,932 |
| | | **$ 2,502,572** |

[1] Others includes spiders, biting flies, bees and other stinging insects (other than yellow jackets).
[2] Estimated percent importance insect has to control
[3] 1990 (Jan. 1991) Census data
[4] Based on 1988 county agent survey for mosquito control programs by county
[5] Based on New York State Department of Health report of over $4,000 hospital cost/ case of Lyme disease reported by CDC, Lyme Disease Surveillance, Vol. 4, No. 2, March 1993.
[6] Based on 1988 Georgia County Guide, Cooperative Extension Service

# XIX. Small Grain Insects

R. D. Hudson and G. D. Buntin

Georgia's small grain producers increased plantings in 1996. Wheat was harvested for grain from 350,000 acres from 1995. Yields of wheat averaged 48 bushels per acre, a near all time record for most Georgia wheat producers. Wheat prices increased as a result of continued world grain shortages. Prices for wheat averages $4.40 per acre for top quality.

Barley yellow dwarf, an aphid vectored virus, continues to increase in importance in some areas of Georgia. Populations were somewhat lower than 1995, but still of significant importance. As a result, aphids have become the primary insect pest problem associated with small grains. Hessian fly continues to be a problem in some fields planted to the older wheat varieties. Cereal leaf beetle continues to increase in importance in the northern part of Georgia.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Aphids | $420,000 | $ 850,000 | $1,270,000 |
| 2 | Hessian fly | 252,000 | 924,000 | 1,176,000 |
| 3 | Cereal leaf beetle | 105,000 | 155,000 | 260,000 |
| 4 | Armyworms | 105,000 | 103,000 | 208,000 |
| 5 | Stink bugs | 53,000 | 103,000 | 156,000 |
| 6 | Chinch bug | 26,000 | 96,000 | 122,000 |
| | ***Total*** | ***$961,000*** | ***$2,231,000*** | ***$3,192,000*** |

**Information Pertaining to Control of Major Small Grain Insect Pests in Georgia in 1996**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Unit Applic. | Avg. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Aphids | 88,000 | 56,000 | 1.0 | $12.00 | 25,000 | 168,000 |
| Hessian fly | 35,000 | 21,000 | 1.0 | 7.50 | 42,000 | 168,000 |
| Cereal leaf beetle | 18,000 | 14,000 | 1.0 | 7.50 | 2,000 | 25,000 |
| Armyworms | 18,000 | 14,000 | 1.0 | 7.50 | 10,000 | 13,000 |
| Stink bugs | 14,000 | 11,000 | 1.0 | 5.00 | 7,000 | 17,000 |
| Chinch bug | 14,000 | 4,000 | 1.0 | 7.50 | 10,000 | 20,000 |

[1]Excluding application costs.
[2]Yield units measured in bushels.

NOTE: These estimates were derived from 400,000 acres of wheat.

## XX. Soybean Insects

R.M. McPherson, R.D. Hudson, and D.C. Jones

Soybeans were harvested from 390,000 acres in 1996, an increase of 80,000 from the previous year. Georgia's average yield in 1996 was 26 bushels per acre, down one bushel from the 1995 production. Soybean prices were up, averaging $7.50 per bushel, making the value of the crop $76 million.*

Stink bugs were the number one pest in Georgia soybeans in 1996. Heaviest infestations were in the southeastern and southern parts of the state. Total losses due to this pest were nearly $2.3 million in 1996, up slightly from 1995 levels. Control was good at most locations, but treatments were applied late, or not at all, in some fields that were heavily infested late in the season.

Velvetbean caterpillar losses were also up some in 1996, costing growers nearly $1.2 million, making this the number two pest. Caterpillar populations were later than usual and thus damage was not as severe as expected. Insecticide control was very good for this pest.

Lesser cornstalk borers (LCSB) were the third most costly soybean insect pest in 1996. Economically damaging populations of borers were primarily associated with late-planted soybeans growing under droughty conditions. Total losses due to LCSB excceded $0.7 million, which was about equally divided between control costs and crop damage.

Soybean looper populations, and the resulting losses continued to be low in 1996. Total loss due to this pest was $0.4 million, mostly due to cost of controls. Corn earworm losses were also relatively low in 1996, totalling just over $0.2 million, about the same as 1995 losses.

All other insect pests accounted for $215,000 in 1996. Most of these losses were due to threecornered alfalfa hoppers, whiteflies, beet armyworms, and Mexican bean beetle. Most of these pests were in localized or isolated areas.

*Georgia Farm Report. 1997. Volume 97. Number 4.

**Estimates of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Stink bugs[1] | $1,832,000 | $443,000 | $2,275,000 |
| 2 | Velvetbean caterpillar | 856,000 | 338,000 | 1,194,000 |
| 3 | Lesser cornstalk borer | 400,000 | 307,000 | 707,000 |
| 4 | Soybean looper | 310,000 | 135,000 | 445,000 |
| 5 | Corn earworm | 173,000 | 75,000 | 248,000 |
| 6 | Other[2] | 148,000 | 67,000 | 215,000 |
| | **Total** | **$3,719,000** | **1,365,000** | **$5,084,000** |

[1] Includes the southern green, green and brown stink bugs.

[2] Others include threecornered alfalfa hoppers, whiteflies, beet armyworms and Mexican bean beetles.

**Information Pertaining to Control Of Major Soybean Insect Pests in Georgia in 1996**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Acre Appl. | Ave. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Stink bugs[3] | 195,000 | 175,500 | 1.2 | $8.70 | 34,000 | 25,000 |
| Velvetbean caterpillar | 117,000 | 107,000 | 1.0 | 8.00 | 19,000 | 26,000 |
| Lesser Cornstalk borer | 58,000 | 47,000 | 1.0 | 8.50 | 12,000 | 29,000 |
| Soybean looper | 35,000 | 31,000 | 1.0 | 10.00 | 8,000 | 10,000 |
| Corn earworm | 23,000 | 21,000 | 1.0 | 8.25 | 5,000 | 5,000 |
| Others[4] | 20,000 | 18,000 | 1.0 | 8.25 | 4,000 | 5,000 |

[1] Includes application costs.

[2] Yield units measured in bushels.

[3] Includes the southern green, green and brown stink bugs.

[4] Others include threecornered alfalfa hoppers, whiteflies, beet armyworms, Mexican bean beetles.

## XXI. Tobacco Insects

D.C. Jones and R.M. McPherson

Tobacco was harvested from 46,000 acres in 1996, up 10 percent from the 1995 acreage. Georgia's average yield was a record high 2,470 pounds per acre. The average price received in 1996 was $181.30 per cwt, up $5.40 from the 1995 price, marking the value of the crop over $205 million.

For the first time in many years, the tobacco budworm was not the number one insect pest on flue-cured tobacco in Georgia. The tobacco hornworm was the number one pest of the crop, with total losses exceeding $2.6 million. This was up significantly from 1995, when this pest caused only $0.3 million in losses. Most of the losses in 1996 were due to the cost of controlling this pest.

Wireworms were the next most economically damaging pest, costing Georgia producers over $1.1 million. Nearly two-thirds of these losses were due to control costs. Flea beetles and mole crickets were the third and fourth most costly insect pests, costing producers nearly $0.9 and $0.8 million, respectively.

Tobacco budworms were the fifth ranked insect pest in 1996, costing producers $0.6 million. Aphids and thrips were also reported as economic pests in 1996, totalling $0.5 and $0.1 million in losses, respectively. All of the reported thrips losses were due to costs of control, although spotted wilt virus was a serious problem in many producer's fields. This pathogen is vectored only by certain thrips species. All other pests accounted for $70,000 in losses in 1996. These other pests were primarily stink bugs, splitworms, cutworms, whitefringed beetles, and grasshoppers.

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*Georgia Farm Report. 1997. Volume 97, Number 10.

**Estimate of Losses and Control Costs**

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| 1 | Tob. hornworm | $1,574,000 | $1,101,000 | $2,675,000 |
| 2 | Wireworms | 702,000 | 404,000 | 1,106,000 |
| 3 | Flea beetles | 345,000 | 540,000 | 885,000 |
| 4 | Mole crickets | 372,00 | 400,000 | 772,000 |
| 5 | Tobacco budworm | 138,000 | 479,000 | 617,000 |
| 6 | Tobacco aphid | 106,000 | 391,000 | 497,000 |
| 7 | Thrips | 112,000 | 0[1] | 112,000 |
| 8 | Other pests[2] | 53,000 | 17,000 | 70,000 |
| | Total | $3,402,000 | $3,332,000 | $6,734,000 |

[1] Does not include losses due to spotted wilt virus.
[2] Includes stink bugs, grasshoppers, splitworms, cutworms, and whitefringed beetles.

**Information Pertaining to Control of Major Tobacco Insect Pests in Georgia in 1996**

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Acres Treated | Ave. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| Tobacco budworm | 41,400 | 39,100 | 3.5 | $11.50 | 439,875 | 155,250 |
| Wireworms | 27,600 | 27,000 | 1.0 | 26.00 | 146,250 | 72,000 |
| Mole crickets | 13,800 | 14,300 | 1.0 | 26.00 | 135,000 | 81,000 |
| Flea beetles | 23,000 | 20,000 | 1.5 | 11.50 | 225,000 | 67,500 |
| Tobacco budworm | 11,500 | 11,500 | 1.0 | 12.00 | 258,000 | 0 |
| Tobacco aphid | 9,200 | 9,000 | 1.0 | 11.75 | 202,500 | 9,000 |
| Thrips | 9,000 | 9,500 | 1.0 | 11.75 | 25,312 | 0 |
| Other pests[3] | 5,000 | 4,600 | 1.0 | 11.60 | 0 | 9,000 |

[1] Includes application costs.
[2] Field units measured in pounds.
[3] Others include stink bugs, splitworms, cutworms, whitefringed beetles, and grasshoppers.

## XXII. Vegetable Insects

D. B. Adams and D. G. Riley

Vegetables were planted on an estimated 178,000 acres, or a 2% increase over the 1994 acreage. The top five vegetables in terms of dollar value in 1996 were (1) onions, $54 milion, (2) tomatoes, $44 million, (3) cabbage, $34 million, (4) watermelon, $32 million, and (5) sweet corn, $24 million. The estimated control costs and crop damage associated with vegetable arthropod pests totaled $28,844,000. The total value of vegetables based on USDA estmates was approximately 22% less than the $434 million in 1995 because of price drops, or an estimated $340 million, so losses were averaging less than 10% over all vegetables. However, certain vegetable pests, such as thrips vectored tomato spotted wilt virus (TSWV) in tomatoes and peppers, caused much higher losses in certain locations in south Georgia.

Insect management in vegetables is a very dynamic and often difficult process in Georgia because of the diversity of crops and associated pests in the state, the long growing seasons (particularly in the south), the constant change in pest status from season to season, the movement of pests into and across the state, and the interaction of insect pests with virus and other diseases. The following lists of pests by crop illustrates in part the complexity of insect pests in vegetables. Some of the estimates of damage, for example thrips + TSWV in tomatoes, are probably too conservative and do not reflect the seriousness of this pest complex which has the potential to destroy 30% or more of the tomato crop annually. Besides the existing vegetable pests that occur annually in the State, some potential upcoming pests in Georgia vegetables include root aphids in fall cole crops and broad mites in peppers and various other crops. Whitefly, beet armyworm, and diamondback moth and others can display high levels of resistance to various insecticides and therefore become serious problems when insecticide applications are made without before-hand knowledge of the product's efficacy and side effects on the vegetable pest and beneficial complex.

**The 1996 estimated acreage planted, average yield, and average season prices for each commercial crop in Georgia were as follows:**

| Crop | Planted Acreage | Average Yield | Average Price Yield-Unit |
|---|---|---|---|
| Cabbage | 9,791 | 497 boxes | $ 6.20 |
| Cantaloupe | 6,938 | 185 cartons | 7.39 |
| Cucumbers | 10,147 | 379 cartons | 9.10 |
| Leafy greens | 19,439 | 363 cartons | 8.20 |
| Okra | 1,563 | 500 bushels | 6.00 |
| Onions | 17,196 | 275 bags | 16.20 |
| Peppers | 5,688 | 832 boxes | 8.20 |
| Beans (snap, pole and Lima) | 13,209 | 105 bushels | 13.80 |
| Southern peas | 5,886 | 125 pounds | 10.50 |
| Squash (summer) | 15,772 | 460 boxes | 9.80 |
| Sweet corn | 18,919 | 385 crates | 6.70 |
| Sweetpotatoes | 1,092 | 470 cartons | 8.70 |
| Tomatoes | 5,729 | 1538 boxes | 6.80 |
| Watermelons | 35,622 | 304 cwt | 5.20 |

## Estimates of Losses and Control Costs

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| **Peppers** | | | | |
| 1 | Pepper weevil | $ 410,000 | $ 3,927,000 | $ 4,337,000 |
| 2 | Thrips | 455,000 | 2,805,000 | 3,260,000 |
| 3 | Beet armyworm | 662,000 | 533,000 | 1,195,000 |
| 4 | Corn earworm | 17,000 | 112,000 | 129,000 |
| 5 | Tarnished plant bug | 3,000 | 50,000 | 53,000 |
| | **Subtotal** | **$ 1,547,000** | **$ 7,427,000** | **$ 8,974,000** |
| **Squash (Summer)** | | | | |
| 1 | Aphid (virus) | $ 647,000 | $ 2,720,000 | $ 3,367,000 |
| 2 | Sweetpotato whitefly (silverleaf) | 505,000 | 543,000 | 1,048,000 |
| 3 | Cucumber beetles | 55,000 | 527,000 | 582,000 |
| 4 | Pickleworm | 156,000 | 217,000 | 373,000 |
| | **Subtotal** | **$ 1,363,000** | **$ 4,007,000** | **$ 5,370,000** |
| **Sweet corn** | | | | |
| 1 | Corn earworm/fall armyworm | $ 2,705,000 | $ 1,087,000 | $ 3,792,000 |
| 2 | Stink bugs | 62,000 | 44,000 | 106,000 |
| | **Subtotal** | **$ 2,767,000** | **$ 1,131,000** | **$ 3,898,000** |
| **Leafy greens** | | | | |
| 1 | Diamondback moth/cabbage looper | $ 1,155,000 | $ 315,000 | $ 1,470,000 |
| 2 | Aphids | 350,000 | 608,000 | 958,000 |
| 3 | Grasshoppers | 82,000 | 405,000 | 487,000 |
| 4 | Silverleaf whitefly | 17,000 | 3,000 | 20,000 |
| 5 | Yellowmargined leaf beetle | 6,000 | 1,000 | 7,000 |
| | **Subtotal** | **$ 1,610,000** | **$ 1,332,000** | **$ 2,942,000** |
| **Southern peas** | | | | |
| 1 | Cowpea curculio | $ 205,000 | $ 1,627,000 | $ 1,832,000 |
| 2 | Thrips | 34,000 | 0 | 34,000 |
| 3 | Beet armyworm | 8,000 | 17,000 | 25,000 |
| 4 | Stink bugs | 6,000 | 1,000 | 7,000 |
| 5 | Aphids | 4,000 | 2,000 | 6,000 |
| | **Subtotal** | **$ 257,000** | **$ 1,647,000** | **$ 1,904,000** |
| **Tomatoes** | | | | |
| 1 | Thrips (+TSWV) | $ 284,000 | $ 891,000 | $ 1,175,000 |
| 2 | Fruitworm (corn earworm) | 114,000 | 95,000 | 209,000 |
| 3 | Stink bugs | 15,000 | 105,000 | 120,000 |
| 4 | Sweetpotato whitefly | 29,000 | 89,000 | 118,000 |
| 5 | Pinworm | 8,000 | 55,000 | 63,000 |
| 6 | Leafminer | 26,000 | 24,000 | 50,000 |
| | **Subtotal** | **$ 479,000** | **$ 1,259,000** | **$ 1,735,000** |

## Estimates of Losses and Control Costs

| Rank | Insect | Cost of Control | Damage | Total |
|---|---|---|---|---|
| **Cabbage** | | | | |
| 1 | Diamondback moth/loopers | $ 705,000 | $ 392,000 | $ 1,097,000 |
| 2 | Silverleaf whitefly | 12,000 | 45,000 | 57,000 |
| 3 | Seedcorn maggot | 14,000 | 39,000 | 53,000 |
| 4 | Aphids | 6,000 | 10,000 | 16,000 |
| | **Subtotal** | **$ 737,000** | **$ 486,000** | **$ 1,223,000** |
| **Watermelon** | | | | |
| 1 | Cucumber beetles | $ 481,000 | $ 169,000 | $ 650,000 |
| 2 | Aphids | 68,000 | 79,000 | 147,000 |
| 3 | Rindworms (corn earworm/loopers) | 35,000 | 12,000 | 47,000 |
| | **Subtotal** | **$ 584,000** | **$ 260,000** | **$ 844,000** |
| **Snap beans** | | | | |
| 1 | Thrips | $ 296,000 | $ 43,000 | $ 339,000 |
| 2 | Corn earworm | 99,000 | 51,000 | 150,000 |
| 3 | Stink bugs | 39,000 | 50,000 | 89,000 |
| | **Subtotal** | **$ 434,000** | **$ 144,000** | **$ 578,000** |
| **Cucumber** | | | | |
| 1 | Pickleworm | $ 137,000 | $ 104,000 | $ 241,000 |
| 2 | Cucumber beetles | 134,000 | 47,000 | 181,000 |
| | **Subtotal** | **$ 271,000** | **$ 151,000** | **$ 422,000** |
| **Sweet potatoes** | | | | |
| 1 | Soil insects | $ 63,000 | $ 239,000 | $ 302,000 |
| 2 | Beet armyworm/soybean looper | 3,000 | 13,000 | 16,000 |
| | **Subtotal** | **$ 66,000** | **$ 252,000** | **$ 318,000** |
| **Onions** | | | | |
| 1 | Seedcorn maggot | $ 184,000 | $ 38,000 | $ 222,000 |
| 2 | Thrips | 66,000 | 16,000 | 82,000 |
| | **Subtotal** | **$ 250,000** | **$ 54,000** | **$ 304,000** |
| **Cantaloupe** | | | | |
| 1 | Cucumber beetles | $ 83,000 | $ 119,000 | $ 202,000 |
| 2 | Pickleworm | 14,000 | 1,000 | 15,000 |
| | **Subtotal** | **$ 97,000** | **$ 120,000** | **$ 217,000** |
| **Okra** | | | | |
| 1 | Stink bugs | $ 12,000 | $ 72,000 | $ 84,000 |
| 2 | Corn earworm | 15,000 | 16,000 | 31,000 |
| | **Subtotal** | **$ 27,000** | **$ 88,000** | **$ 115,000** |
| | ***GRAND TOTAL*** | ***$10,486,000*** | ***$18,358,000*** | ***$28,844,000*** |

## Information Pertaining to Control of Major Vegetable Insect Pests in Georgia in 1994

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Unit Applic. | Avg. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| **Peppers** | | | | | | |
| Pepper weevil | 4,000 | 5,000 | 8.0 | $10.00 | 478,000 | 0 |
| Thrips | 6,000 | 6,000 | 8.0 | 10.00 | 341,000 | 0 |
| Beet armyworm | 5,000 | 6,000 | 8.0 | 15.00 | 65,000 | 0 |
| Corn earworm | 0 | 1,000 | 2.0 | 10.00 | 14,000 | 0 |
| Tarnished plant bug | 0 | 0 | 1.0 | 10.00 | 3,000 | 3,000 |
| **Squash (Summer)** | | | | | | |
| Aphid (virus) | 10,000 | 13,000 | 5.0 | $10.00 | 135,000 | 174,000 |
| Sweetpotato whitefly (silverleaf) | 10,000 | 10,000 | 5.0 | 10.00 | 22,000 | 39,000 |
| Cucumber beetles | 3,000 | 6,000 | 1.0 | 10.00 | 5,000 | 54,000 |
| Pickleworm | 5,000 | 5,000 | 3.0 | 10.00 | 10,000 | 15,000 |
| **Sweet corn** | | | | | | |
| Corn earworm/fall armyworm | 18,000 | 18,000 | 15.0 | $10.00 | 162,000 | 0 |
| Stink bugs | 4,000 | 6,000 | 1.0 | 10.00 | 5,000 | 1,000 |
| **Leafy greens** | | | | | | |
| Diamondback moth/cabbage looper | 19,000 | 19,000 | 6.0 | $10.00 | 35,000 | 4,000 |
| Aphids | 7,000 | 9,000 | 4.0 | 10.00 | 74,000 | 0 |
| Grasshoppers | 3,000 | 3,000 | 3.0 | 10.00 | 49,000 | 0 |
| Silverleaf whitefly | 0 | 1,000 | 1.5 | 10.00 | 0 | 0 |
| Yellowmargined leaf beetle | 0 | 1,000 | 1.0 | 10.00 | 0 | 0 |
| False chinch bug/stink bugs | 0 | 0 | 1.0 | 10.00 | 0 | 0 |
| **Southern peas** | | | | | | |
| Cowpea curculio | 4,000 | 4,000 | 5.0 | $10.00 | 128,000 | 27,000 |
| Thrips | 1,000 | 2,000 | 2.0 | 10.00 | 0 | 0 |
| Beet armyworm | 0 | 0 | 2.0 | 10.00 | 1,000 | 1,000 |
| Stink bugs | 0 | 1,000 | 1.0 | 10.00 | 0 | 0 |
| Aphids | 0 | 0 | 1.5 | 10.00 | 0 | 0 |
| **Tomatoes** | | | | | | |
| Thrips | 6,000 | 6,000 | 5.0 | $10.00 | 131,000 | 0 |
| Fruitworm (corn earwom) | 5,000 | 6,000 | 2.0 | 10.00 | 14,000 | 0 |
| Stink bugs | 2,000 | 3,000 | 1.0 | 5.50 | 2,000 | 13,000 |
| Sweetpotato whitefly | 1,000 | 1,000 | 3.0 | 10.00 | 13,000 | 0 |
| Pinworm | 0 | 1,000 | 1.5 | 10.00 | 6,000 | 2,000 |
| Leafminer | 1,000 | 2,000 | 1.5 | 10.00 | 3,000 | 0 |
| **Cabbage** | | | | | | |
| Diamondback moth/loopers | 8,000 | 9,000 | 8.0 | $10.00 | 39,000 | 24,000 |
| Silverleaf whitefly | 0 | 1,000 | 1.0 | 20.00 | 2,000 | 5,000 |
| Seedcorn maggot | 0 | 2,000 | 1.0 | 8.00 | 1,000 | 5,000 |
| Aphids | 0 | 0 | 1.5 | 10.00 | 0 | 1,000 |
| **Watermelon** | | | | | | |
| Cucumber beetles | 21,000 | 32,000 | 1.5 | $10.00 | 32,000 | 0 |
| Aphids | 2,000 | 7,000 | 1.0 | 10.00 | 4,000 | 11,000 |
| Rindworms (corn earworm/looper) | 2,000 | 3,000 | 1.0 | 10.00 | 1,000 | 1,000 |

## Information Pertaining to Control of Major Vegetable Insect Pests in Georgia in 1994

| Insect | No. Acres Needing Control | No. Acres Treated | No. of Unit Applic. | Avg. Cost Per Unit Treated[1] | Yield Loss on Units Treated[2] | Yield Loss on Units Untreated[2] |
|---|---|---|---|---|---|---|
| **Snap beans** | | | | | | |
| Thrips | 11,000 | 12,000 | 2.5 | $ 9.50 | 3,000 | 0 |
| Corn earworm | 2,000 | 10,000 | 1.0 | 10.00 | 4,000 | 0 |
| Stink bugs | 3,000 | 5,000 | 1.0 | 8.50 | 3,000 | 0 |
| **Cucumber** | | | | | | |
| Pickleworm | 5,000 | 5,000 | 3.0 | $10.00 | 2,000 | 10,000 |
| Cucumber beetles | 8,000 | 9,000 | 1.5 | 10.00 | 3,000 | 2,000 |
| **Sweetpotatoes** | | | | | | |
| Soil insects | 1,000 | 1,000 | 2.0 | $30.00 | 25,000 | 3,000 |
| Beet armyworm/soybean looper | 0 | 0 | 1.0 | 10.00 | 2,000 | 0 |
| **Onions** | | | | | | |
| Seedcorn maggot | 1,000 | 8,000 | 2.0 | $12.00 | 1,000 | 1,000 |
| Thrips | 0 | 6,000 | 1.5 | 8.00 | 1,000 | 0 |
| **Cantaloupe** | | | | | | |
| Cucmber beetles | 6,000 | 6,000 | 1.5 | $10.00 | 10,000 | 6,000 |
| Pickleworm | 0 | 0 | 3.0 | 10.00 | 0 | 0 |
| **Okra** | | | | | | |
| Stink bugs | 1,000 | 1,000 | 1.5 | $ 8.00 | 11,000 | 1,000 |
| Corn earworm | 0 | 1,000 | 2.0 | 10.00 | 2,000 | 0 |

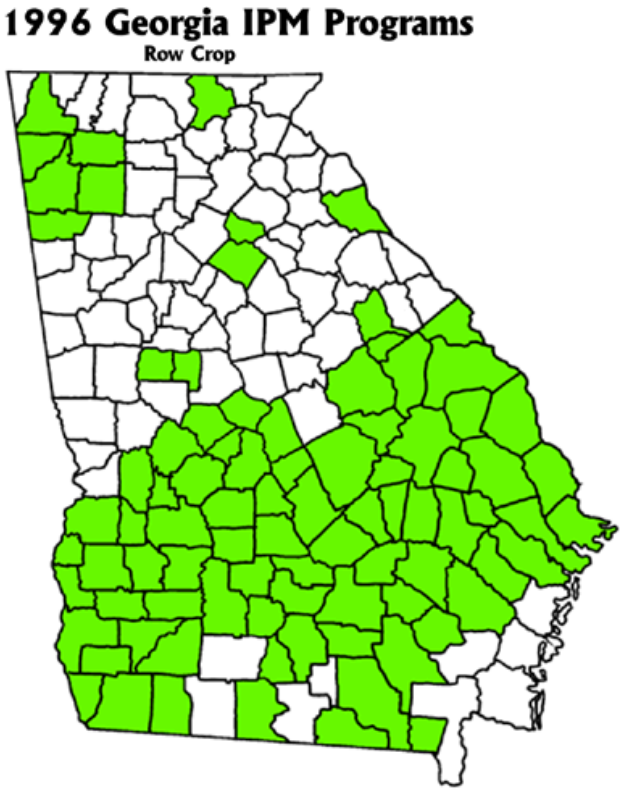
[1]Includes application costs.
[2]See Note 1 for specific yield units.

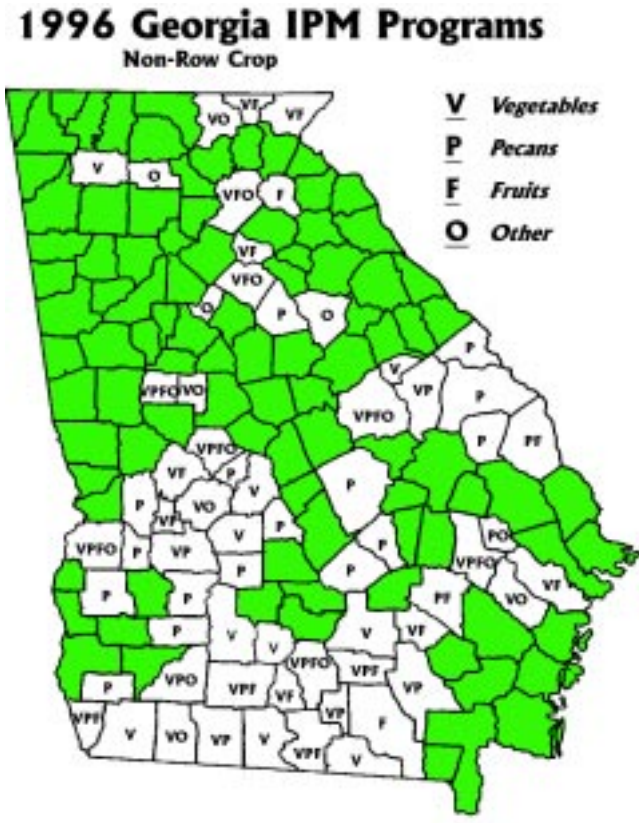
## XXIII. Integrated Pest Management

G.K. Douce and L.P. Guillebeau

In 1996, over one thousand five hundred and twenty-eight (1,528) individuals received formal training in Integrated Pest Management (IPM) by attending IPM Schools sponsored by The University of Georgia, College of Agricultural and Environmental Sciences, Cooperative Extension Service faculty. Six hundred and eighty (680) of these people attended the Cotton, Peanut, Soybean and Pecan IPM Schools held in Tifton. Four area schools taught by Extension faculty were held in East Georgia with around two hundred and sixty-five (265) attendees. At least five hundred and fifteen (515) individuals received IPM training by attending sessions held in several other Georgia locations hosted by local County Extension Agents.

Over 1,880,000 acres of Georgia crops were grown under IPM practices in 1996[1]. Figures 1 and 2 identify the county locations for crops grown under IPM practices broken out by row crops (cotton, peanuts, soybeans, tobacco, grain sorghum and field corn) and non-row crops (includes vegetables, pecans, fruits, nursery crops, home gardens and poultry).



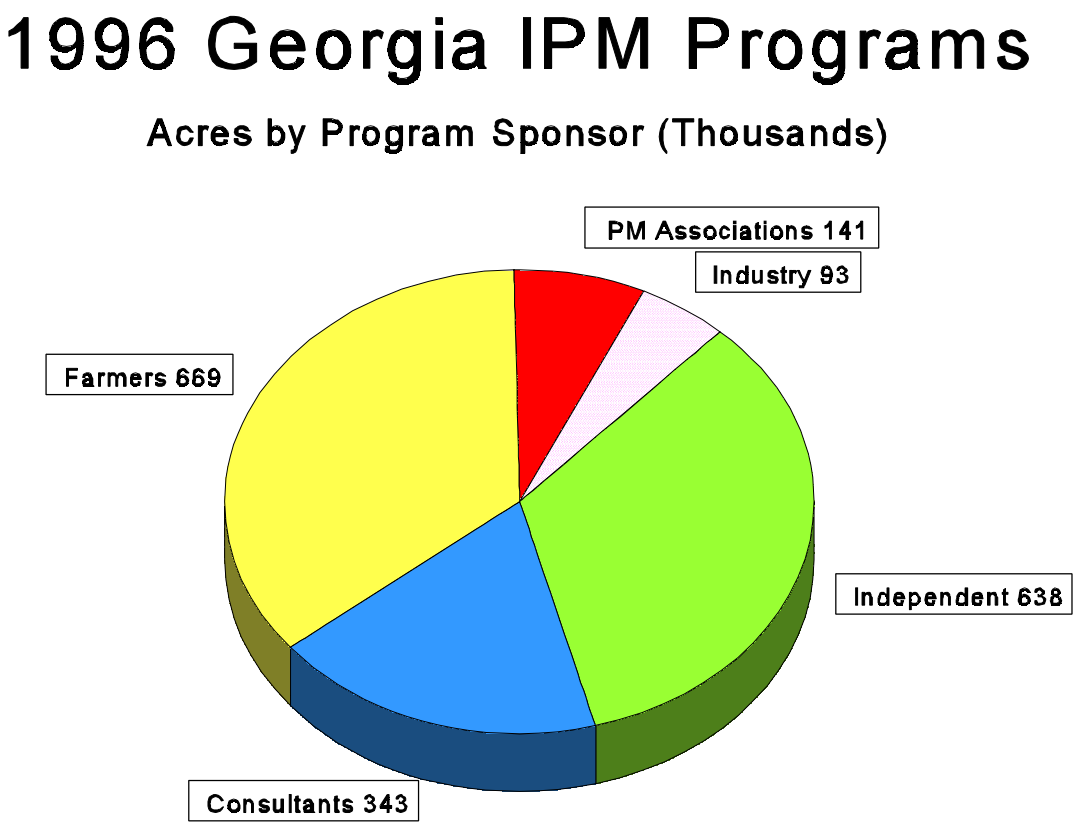

In 1996 cotton, peanuts, soybeans, pecans and vegetables accounted for over 95% of the commodity acreages grown under IPM practices. The number of counties with IPM programs

for each of the major commodity groups and the number of growers, scouts and acres produced under IPM program practices are given in Table 1.

**Table 1. 1996 Georgia Integrated Pest Management Program By Commodity**

| Commodity | No. Counties | No. Growers | No. Scouts | No. Acres |
|---|---|---|---|---|
| Cotton | 89 | 3,352 | 1,737 | 1,245,100 |
| Peanuts | 51 | 1,716 | 1,243 | 295,300 |
| Soybeans | 46 | 728 | 655 | 172,000 |
| Pecans | 37 | 291 | 259 | 72,030 |
| Vegetables | 41 | 740 | 666 | 56,310 |
| All Others | 18 | 922 | 873 | 43,847 |
| **TOTALS** | **102** | **7,749** | **5,433** | **1,884,587** |

Figure 3 depicts the 1996 commodity acreages grown under IPM practices by program sponsor.




Total Acres = 1,884,587

**Table 2. 1996 Georgia Integrated Pest Management Program By Sponsor**

| Sponsor | No. Counties | No. Growers | No. Scouts | No. Acres |
|---|---|---|---|---|
| County Pest Management Associations | 27 | 496 | 191 | 140,614 |
| Independent Scouts | 71 | 1,857 | 718 | 638,017 |
| Grower/Family Scout | 92 | 4,183 | 3,992 | 669,314 |
| Industry Scouts | 36 | 450 | 148 | 93,451 |
| Consultants | 51 | 763 | 384 | 343,191 |
| **TOTALS** | **102** | **7,749** | **5,433** | **1,884,587** |

Definition IPM program sponsor groupings are:

*County pest management association* programs were implemented by an elected board of growers. Each County Association (non-profit) was responsible for collecting and managing of funds, hiring (and firing, if necessary), supervision and paying the scouts. In contrast to private consultants, these scouts provided only the results of their field surveys to growers and did not make pesticide or management recommendations. The County Extension Agent coordinated training and provided technical assistance to the Pest Management Association and scouts.

*Independent scouts* contracted directly with the growers. These scouts generally did not provide pesticide recommendations and did not work through a County Pest Management Association. Scouting was a "summer job" for these individuals.

*Grower or family program scouts* were generally a member of the grower's family or an employee of the grower. Established scouting techniques and methods were used, but scouting often occurred somewhat irregularly.

*Industry scouts* were employed by agricultural chemical firms. Agricultural sales firms provided IPM information (primarily scouting reports) to their clients as a service.

*Private consultants* worked directly for the growers. Either the consultant or one of his representatives carried out routine field surveys with the consultant providing interpretation and management recommendations to the grower. For consultants, providing IPM services was a primary occupation.

[1] G. K. Douce. Personal communication. IPM Program data used in preparation of this report were collected from results of a mailout questionnaire sent to (and received back from) every county extension office in Georgia. Attendance at IPM Training sessions were obtained from records maintained by personnel coordinating each of the training sessions.

**Summary of Losses Resulting from Insect Damage and Control Costs in Georgia in 1996 by Commodity or Other Category**

| Commodity | Control | Damage | Total Losses |
|---|---|---|---|
| Apples | $291,000 | $131,000 | $422,000 |
| Blueberries | 9,800 | 0 | 9,800 |
| Canola | 7,000 | 3,000 | 10,000 |
| Cotton | 48,297,000 | 20,891,000 | 69,188,000 |
| Field Corn | 2,704,000 | 8,427,000 | 11,131,000 |
| Fire Ants | 35,962,500 | 12,505,000 | 48,467,500 |
| Forest | 2,845,000 | 15,105,000 | 17,950,000 |
| Grain sorghum | 91,000 | 130,000 | 221,000 |
| Grapes | 12,500 | 100,400 | 112,900 |
| Household and Structural | 109,912,500 | 33,000,000 | 142,912,500 |
| Lawn and turf | 23,023,000 | 32,187,000 | 55,210,000 |
| Livestock and poultry | 7,362,000 | 25,575,000 | 32,937,000 |
| Ornamentals | 104,300,000 | 121,490,000 | 225,790,000 |
| Pasture and forages | 2,670,000 | 11,832,000 | 14,502,000 |
| Peaches | 469,000 | 529,000 | 998,000 |
| Peanuts | 10,037,000 | 8,245,000 | 18,282,000 |
| Pecans | 12,170,000 | 15,339,000 | 27,509,000 |
| Public health and recreational areas | 53,719.000 | N/A | 53,719,000 |
| Small grains | 961,000 | 2,231,000 | 3,192,000 |
| Soybeans | 3,719,000 | 1,365,000 | 5,084,000 |
| Tobacco | 3,402,000 | 3,332,000 | 6,734,000 |
| Vegetables | 10,486,000 | 18,358,000 | 28,844,000 |
| **Total** | $432,450,300 | $330,775,400 | $763,225,700 |

**List of the 20 Most Damaging Insect Species or Complexes in Georgia in 1996**

| Rank | Insect | Control | Damage | Total |
|---|---|---|---|---|
| 1 | Scale & mealybugs[2] | 43,513,000 | 55,166,000 | 98,679,000 |
| 2 | Termites[3] | 58,600,000 | 17,000,000 | 75,600,000 |
| 3 | Mites[17] | 26,092,000 | 34,013,000 | 60,105,000 |
| 4 | Imported fire ants[5] | 35,962,500 | 12,505,000 | 48,467,500 |
| 5 | Flies[9] | 29,838,000 | 13,352,000 | 43,094,000 |
| 6 | Mole Crickets[6] | 13,504,000 | 23,441,000 | 36,945,000 |
| 7 | Thrips[7] | 23,683,000 | 11,885,000 | 35,568,000 |
| 8 | *Heliocoverpa zea*[10] | 19,101,000 | 16,196,000 | 35,297,000 |
| 9 | Cockroaches[3] | 22,437,500 | 5,000,000 | 27,437,500 |
| 10 | Aphids[8] | 9,003,600 | 18,588,000 | 27,591,600 |
| 11 | Ants[3] (excluding fire ants) | 12,762,500 | 3,000,000 | 15,762,000 |
| 12 | Mosquitoes[9] | 15,656,000 | | 15,656,000 |
| 13 | Fleas[3] | 7,925,000 | 5,000,000 | 12,925,000 |
| 14 | White grubs[13] | 4,614,000 | 7,442,000 | 12,056,000 |
| 15 | Plant & Stink bugs[16] | 3,610,000 | 8,165,000 | 11,775,000 |
| 16 | Tobacco budworm[4] | 10,488,000 | 479,000 | 10,967,000 |
| 17 | Horn Fly[14] | 2,311,000 | 7,117,000 | 9,428,000 |
| 18 | Whiteflies[11] | 5,853,000 | 3,495,000 | 9,348,000 |
| 19 | Boll Weevil[15] | 7,397,000 | | 7,397,000 |
| 20 | Pecan weevil | 4,050,000 | 2,099,000 | 6,149,000 |

[1] Apple and ornamental.
[2] Apple, ornamental, and peach (not including whitefly).
[3] Household and structural.
[4] Cotton and tobacco.
[5] Fire ant.
[6] Lawn and turf, pasture and forage, and tobacco.
[7] Cotton, ornamental, peanut, tobacco, and vegetable.
[8] Apple, canola, cotton, grapes, ornamental, pecan, small grain, tobacco, and vegetable.
[9] Public health and recreational areas.
[10] Cotton, field corn, grain sorghum, peanut, soybean, and vegetable (sweet corn includes fall armyworm in estimate).
[11] Cotton, ornamental, and vegetable.
[12] Forest
[13] Lawn and turn, and pasture and forage.
[14] Livestock and poultry.
[15] Cotton.
[16] Apple, cotton, field corn, grain sorghum, peach, pecan, small grain, soybean, and vegetable.
[17] Apple, cotton, livestock & poultry, ornamentals, and pecans.

**Scientific Names or Other Taxonomic Classifications of the Insect Species or Insect Complexes for Which Economic Loss Estimates Have Been Made In Georgia**

| Insect or Insect Complex | Scientific Name or Other Taxonomic Classification |
|---|---|
| Alfalfa weevil | *Hypera postica* (Gyllenhal) |
| Almond moth | *Ephestia cautella* (Walker) |
| Ambrosia beetles | various species of Scolytidae |
| Angoumois grain moth | *Sitotroga cerealella* (Olivier) |
| Anobiid beetle | Anobiidae |
| Aphids | various species of Aphididae |
| Apple aphid | *Aphis pomi* DeGeer |
| Arctiid larvae | various species of Arctiidae |
| Armyworm | *Pseudaletia unipuncta* (Haworth) |
| Asian ambrosia beetle | *Xylosandrus crassiusculus* |
| Azalea caterpillar | *Datana major* (Grote & Robinson) |
| Bagworm | *Thyridopteryx ephemeraeformis* (Haworth) |
| Bahiagrass borer | *Derobrachus brevicollis* (Audinet-Serville) |
| Bandedwinged whitefly | *Trialeurodes abutilonea* (Haldeman) |
| Bees | various species of Hymenoptera |
| Beet armyworm | *Spodoptera exigua* (Hubner) |
| Billbug | various species of Curculionidae |
| Bird cherry-oat aphid | *Rhopalosiphum padi* (Linnaeus) |
| Biting midge | primarily *Culiocoides* species |
| Blackmargined aphid | *Monellia caryella* (Fitch) |
| Black pecan aphid | *Melanocallis caryaefoliae* (Davis) |
| Black turpentine beetle | *Dendroctonus terebrans* (Olivier) |
| Blister beetles | species of Meloidae |
| Blueberry gall midge | *Dasineura oxycoccana* |
| Blueberry maggot | *Rhagoletis mendax* Curran |
| Boll weevil | *Anthonomus grandis grandis* Boheman |
| Bollworm | *Helicoverpa [=Heliothis] zea* (Boddie) |
| Bollworms | *Heliothis virescens* and *Helicoverpa zea* |
| Borers (on ornamentals) | various Coleoptera and Lepidoptera spp. |
| Bots | various species of Oestridae |
| Broad Mite | Polyphagotarsanemus latus |
| Brown stink bug | *Euschistus servus* (Say) |
| Cabbage root aphid | Pemphigus populartransversus |
| Cabbage aphid | *Brevicoryne brassicae* (Linnaeus) |
| Cabbage looper | *Trichoplusia ni* (Hubner) |
| Cabbage seedpod weevil | *Ceutorhynchus assimilis* (Paykull) |
| Cabbageworms | mostly *Pieris rapae* (Linnaeus) and *Plutella xylostella* (Linnaeus) |
| Cadelle | *Tenebroides mauritanicus (*Linnaeus*)* |
| Carpet beetles | various species of Dermestidae |
| Carpenter ants | *Camponotus* spp. |
| Carpenter bees | *Xylocopa virginica* (Linnaeus) |
| Carpenterworm | *Prionoxystus robiniae* (Peck) |
| Cattle grub | *Hypoderma lineatum* (Villers) |
| Chinch bug | *Blissus leucopterus leucopterus* (Say) |
| Cigarette beetle | *Lasioderma serricorne* (Fabricuis) |
| Clothes moth | primarily *Tinea pellionella* L. and *Tineola bisseliella* (Hummel) |

***Scientific Names of Classifications (continued)***

| | |
|---|---|
| Cockroaches | various species of Blattelidae |
| Codling moth | *Cydia pomonella* (Linnaeus) |
| Colorado potato bettle | *Leptinotarsa decemlineata* (Say) |
| Coneworms | *Dioryctria* spp. |
| Corn earworm | *Helicoverpa [=Heliothis] zea* (Boddie) |
| Corn leaf aphid | *Rhopalosiphum maidis* (Fitch) |
| Corn rootworm | *Diabrotica undecimpunctata howardi* (Barber) |
| Cotton aphid | *Aphis gossypii* Glover |
| Cowpea curculio | *Chalcodermus aeneus* Boheman |
| Cranberry fruitworm | *Acrobasis vaccinii* Riley |
| Cutworms | primarily *Feltia subterranea* (Fabricius) |
| Darkling beetle complex | various species of Tenebrionidae |
| Diamondback moth | *Plutella xylostella* (Linnaeus) |
| Disease vectors (on corn) | various species of Aphididae and Cicadellidae |
| Dogwood borer | *Synanthedon scitula* (Harris) |
| Earwigs | various species of Dermaptera |
| Eastern tent caterpillar | *Malacosoma americanum* (Fabricius) |
| English grain aphid | *Sitobion avenae* (Fabricius) |
| European corn borer | *Ostrinia nubilalis* (Hubner) |
| European red mite | *Panonychus ulmi* (Koch) |
| Eye gnats | *Hippelates* spp. |
| Face fly | *Musca autumnalis* De Geer |
| Fall armyworm | *Spodoptera frugiperda* (J.E. Smith) |
| Fall webworm | *Hyphantria cunea* (Drury) |
| False chinch bug | *Nysius raphanus* Howard |
| Field crickets | *Gryllus* spp. |
| Fire Ants | *Solenopsis* spp. |
| Flat grain beetle | *Cryptolestes pusillus* (Schnherr) |
| Flea beetles | various species of Alticinae |
| Fleas | various species of Siphonaptera |
| Forbes scale | *Quadraspidiotus forbesi* (Johnson) |
| Forest tent caterpillar | *Malacosoma disstria* Hubner |
| Fuller rose beetle | *Asynonychus godmani* Crotch |
| Fungus beetles | various species of Tenebrionidae |
| Fungus gnats | various species of Mycetophilidae and Sciaridae |
| Garden webworm | *Achyra rantalis* (Guenee) |
| German cockroach | *Blattella germanica* (Linnaeus) |
| Granulate cutworm | *Agrotis subterranea* (Fabricius) |
| Grape root borer | *Vitacea polistiformis* (Harris) |
| Grasshoppers | various species of Orthoptera |
| Green cloverworm | *Plathypena scabra* (Fabricius) |
| Green fruitworm | *Lithophane antennata* (Walker) |
| Green June beetle | *Cotinis nitida* (Linnaeus) |
| Green peach aphid | *Myzus persicae* (Sulzer) |
| Greenbug | *Schizaphis graminum* (Rondani) |
| Grub (cattle) | *Hypoderma lineatum* (Villers) |
| Gypsy moth | *Lymantria dispar* (Linnaeus) |

***Scientific Names of Classifications (continued)***

| | |
|---|---|
| Hessian fly | *Mayetiola destructor* (Say) |
| Hickory nut curculio | *Conotrachelus hickoriae* (Schoof) |
| Hickory shoot curculios | *Conotrachelus* spp. |
| Hickory shuckworm | *Cydia caryana* (Fitch) |
| Honey bees | *Apis mellifera* (Linnaeus) |
| Honey bee (tracheal) mite | *Acarapis woodi* (Rennie) |
| Horn fly | *Haematobia irritans* (Linnaeus) |
| Horse flies | various species of Tabanidae |
| House fly | *Musca domestica* Linnaeus |
| Imported cabbageworm | *Pieris rapae* (Linnaeus) |
| Inidan mealmoth | *Plodia interpunctella* (Hubner) |
| *Ips* beetles | *Ips avulsus, I. grandicolis, I. calligraphis* and *I. pini* |
| Iris borer | *Macronoctua onusta* Grote |
| Japanese beetle | *Popillia japonica* Newman |
| Lacebugs | various species of Tingidae |
| Leafminers | various species of Coleoptera, Diptera and Lepidoptera |
| Leaf rollers | various species of Lepidoptera |
| Leaffooted bugs | various species of Coreidae |
| Leafhoppers | various species of Cicadellidae |
| Lesser appleworm | *Grapholitha prunivora* (Walsh) |
| Lesser cornstalk borer | *Elasmopalpus lignosellus* (Zeller) |
| Lesser peachtree borer | *Synanthedon pictipes* (Grote & Robinson) |
| Lice (on livestock) | various species of Anoplura and Mellophaga |
| Lyctid beetles | Lyctidae |
| Magnolia borer | *Euzophera magnolialis* Capps |
| May beetles | various species of Scarabaeidae |
| Mealworms | *Tenebrio* spp. and *Alphitobius* spp. |
| Mealybugs | various species of Pseudococcidae |
| Mexican bean beetle | *Epilachna varivestis* Mulsant |
| Millipedes | various species of Diplopoda |
| Mites (on livestock) | various species of Acari |
| Mites (on plants) | various species of Acari |
| Mole crickets | primarily *Scapteriscus* spp. |
| Mosquitoes | various species of Culicidae |
| Moth flies | Psychodidae |
| Nantucket pine tip moth | *Rhyacionia frustrana* (Comstock) |
| Northern fowl mite | *Ornithonyssus sylviarum* (Canestrini & Fanzago) |
| Oak skeletonizer | *Bucculatri ainsliella* Murtfeldt |
| Old house borer | *Hylotrupes bajulus* (Linnaeus) |
| Onion maggot | *Delia antiqua* (Meigen) |
| Oriental fruit moth | *Grapholita molesta* (Busck) |
| Pales weevil | *Hylobius pales* (Herbst) |
| Pea aphid | *Acyrthosiphon pisum* (Harris) |
| Peachtree borer | *Synanthedon exitiosa* (Say) |

***Scientific Names of Classifications (continued)***

| | |
|---|---|
| Pecan bud moth | *Gretchena bolliana* (Slingerland) |
| Pecan leaf casebearer | *Acrobasis juglandis* (LeBaron) |
| Pecan leaf phylloxera | *Phylloxera notabilis* Pergande |
| Pecan spittlebug | *Clastoptera achatina* Germar |
| Pecan weevil | *Curculio caryae* (Horn) |
| Pepper weevil | *Anthonomus eugenii* Cano |
| Pickleworm | *Diaphania nitidalis* (Stoll) |
| Pitch-eating weevil | *Pachylobius picivorus* (Germar) |
| Pitch pine tip moth | *Rhyacionia rigidana* (Fernald) |
| Plant bugs | various species of Miridae |
| Planthoppers | various species of Delphacidae and Fulgoridae |
| Plum curculio | *Conotrachelus nenuphar* (Herbst) |
| Powderpost beetles | various species of Lyctidae |
| Prionus borers | *Prionus* spp. |
| Psocids | various species of Psocoptera |
| Red flour beetle | *Tribolium castaneum* (Herbst) |
| Red imported fire ant | *Solenopsis invicta* Buren |
| Redbanded leafroller | *Argyrotaenia velutinana* (Walker) |
| Rice weevil | *Sitophilus oryzae* (Linnaeus) |
| Rosy apple aphid | *Dysaphis plantaginea* (Passerini) |
| San Jose scale | *Quadraspidiotus perniciosus* (Comstock) |
| Sawflies | various species of Symphyta |
| Sawtoothed grain beetle | *Oryzaephilus surinamensis* (Linnaeus) |
| Scale insects | various species of Homoptera |
| Seed bugs | *Nysius* spp. |
| Seedcorn maggot | *Delia platura* (Meigen) |
| Seedworms | *Cydia* spp. |
| Shield bugs | various specis of Scutelleridae |
| Shothole borers | species of Scolytidae |
| Silverfish | *Lepisma saccharina* Linnaeus |
| Slugs | various species of Stylommatophora |
| Smokybrown cockroach | *Periplaneta fuliginosa* (Serville) |
| Snails | various species of Stylommatophora |
| Sod webworms | *Crambus* spp. |
| Sorghum midge | *Contarinia sorghicola* (Coquillett) |
| Sorghum webowrm | *Nola sorghiella* (Riley) |
| Southern corn rootworm | *Diabrotica undecimpunctata horwardi* Barber |
| Southern green stink bug | *Nezara viridula* (L.) |
| Southern pine beetle | *Dendroctonus frontalis* Zimmerman |
| Sowbugs | various species of Isopoda |
| Soybean looper | *Pseudoplusia includens* (Walker) |
| Spiders | Araneida |
| Spider mites | *Tetranychus* spp. |
| Spittlebugs (on ornamentals) | various species of Cercopidae |
| Spotted tentiform leafminer | *Phyllonorycter blancardella* (Fabricius) |
| Springtails | various species of Collembola |
| Squash vine borer | *Melittia cucurbitae* (Harris) |

***Scientific Names of Classifications (continued)***

| | |
|---|---|
| Stable fly | *Stomoxys calcitrans* (Linnaeus) |
| Stink bugs | various species of Pentatomidae |
| Sugarcane beetle | *Eutheola humilis rugiceps* (LeConte) |
| Sugarcane borer | *Diatraea saccharalis* (F.) |
| Sweetpotato whitefly | *Bemisia tabaci* (Grennadius) |
| Tarnished plant bug | *Lygus lineolaris* (Palisot de Beauvois) |
| Termite (eastern subterranean) | *Recticulitermes flavipes* (Kollar) |
| Threecornered alfalfa hopper | *Spissistilus festinus* (Say) |
| Thrips | various species of Thripidae |
| Ticks | various species of Argasidae and Ixodidae |
| Tip moths | primarily *Dioryctria* spp. and *Rhyacionia* spp. |
| Tobacco aphid | *Myzus nicotianae* Blackman |
| Tobacco budworm | *Heliothis virescnes* (F.) |
| Tobacco hornworm | *Manduca sexta* (L.) |
| Tobacco splitworm | *Phthorimaea operculella* (Zeller) |
| Tomato fruitworm | *Helicoverpa [=Heliothis] zea* (Boddie) |
| Tufted apple budmoth | *Platynota idaeusalis* (Walker) |
| Turkey chigger | *Neoschoengastia americana* (Hirst) |
| Turnip aphid | *Lipaphis erysimi* (Kaltenbach) |
| Twolined spittlebug | *Prosapia bicincta* (Say) |
| Twospotted spider mite | *Tetranychus urticae* Koch |
| Varroa mite | *Varroa jacobsoni* Oudemans |
| Vectors (of corn diseases) | various species of Aphididae and Cicadellidae |
| Velvetbean caterpillar | *Anticarsia gemmatialis* Hubner |
| Walnut caterpillar | *Datana integerrima* Grote & Robinson |
| Wasps | various species of Hymenoptera |
| Webbing coneworm | *Dioryctria disclusia* Heinrich |
| Western flower thrips | *Frankliniella occidentalis* (Pergande) |
| White grubs | various species of Scarabaeidae |
| White peach scale | *Pseudaulacapis pentagona* (Targioni-Tozzetti) |
| Whiteflies | various species of Aleyrodidae |
| Whitefringed beetle | *Graphognathus* spp. |
| Wireworms | various species of Elateridae |
| Wooly apple aphid | *Eriosoma lanigerum* (Hausmann) |
| Yellow jackets | *Vespula* spp. |
| Yellow pecan aphids | primarily *Monelliopsis pecanis* (Bissell) |
| Yellow sugarcane aphid | *Sipha flava* (Forbes) |
| Yellownecked caterpillar | *Datana ministra* (Drury) |
| Yellowmargined leaf beetle | *Microtheca ochroloma* Stal |

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