STATE OF VIRGINIA

ANNUAL REPORT

of

J. O. Rowell
Extension Entomologist, Project Leader
(Full-time)

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(Full-time)

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Associate Extension Entomologist
(Full-time)

Project 22 - Entomology

December 1, 1958 to November 30, 1959

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

Accomplishments in the entomology extension program during the year, as reported herein, were made possible only through the cooperation between extension entomology specialists and other individuals and agencies. Extension entomology specialists wish especially to express appreciation to M. P. Jones, Extension Entomologist, Federal Extension Service, U. S. D. A.; to Dr. J. M. Grayson, Head, Department of Entomology, V. P. I.; to Dr. E. C. Turner, Associate Entomologist; Dr. E. M. Raffensperger, Associate Entomologist, and Dr. Jack L. Bishop, Assistant Entomologist, and L. R. Cagle, V. P. I., for their counsel and/or assistance with preparation of insect control recommendations and survey reports, with insect identification problems, and with the V. P. I. Pest Control Operators' Short Course.

For their assistance in insect identification and in furnishing information on insect habits and life histories, they desire to extend their thanks to Dr. P. W. Oman, Head, Insect Identification & Parasite Introduction Section, Plant Industry Station, Entomology Research Branch, Beltsville, Maryland, and his associates. Thanks is expressed, also, to John C. Jones, U. S. Fish and Wildlife Service, for his assistance with the planning of the program for the V. P. I. Pest Control Operators' Short Course. Extension entomology specialists desire to express appreciation to Dr. R. N. Hofmaster, Virginia Truck Experiment Station; to A. M. Woodside, C. B. Dominick, and Dr. G. M. Boush, Dr. M. L. Bobb and Dr. C. H. Hill, Virginia Agricultural Experiment Station, for helpful advice and counsel on insect

identification and control problems. Thanks is extended to Mr. R. J. Kowal, Cheif, Division of Forest Insect Research, Southeastern Forest Experiment Station, and to Mr. C. L. Morris, Cheif, Forest Insect and Disease Investigations, Virginia Division of Forestry, for their assistance with forest insect control recommendations.

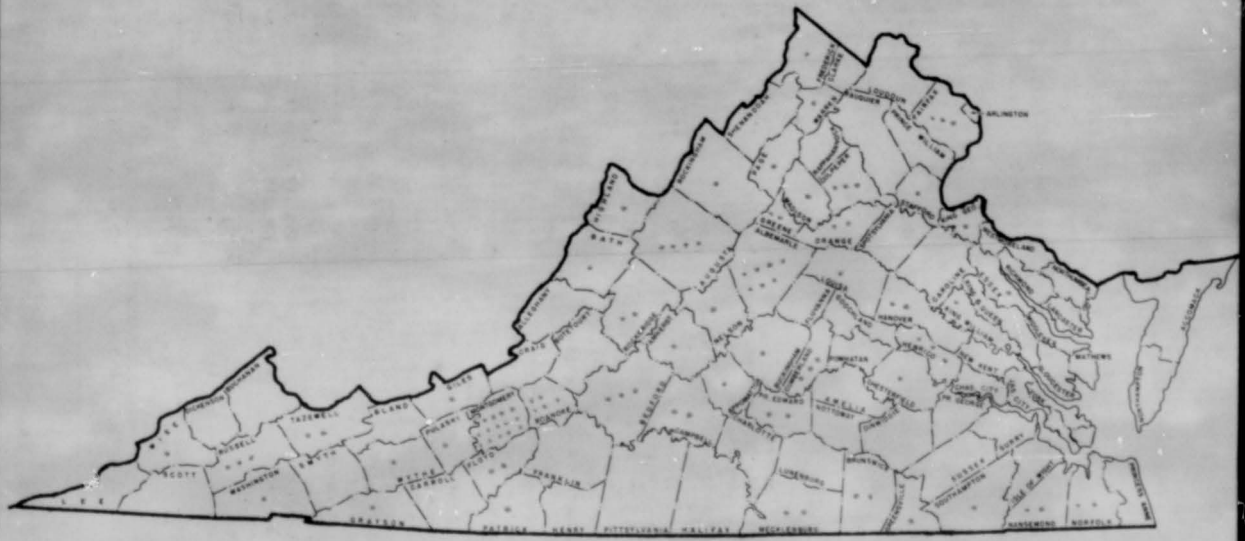
They would like to express special appreciation to Mr. Kelvin Dorward, Head, Economic Insect Survey Section, Plant Pest Control Branch, U. S. D. A., and L. G. Davis and associates, and W. M. Watson for their assistance with Virginia's Economic Insect Pest Survey Program. They desire to thank, also, all cooperators and reporters and especially C. R. Willey, State Entomologist, W. H. Matheny, Assistant State Entomologist, and others from the State Entomologist's office, for advice on and assistance with the survey program and with insect identification problems.

STATISTICAL SUMMARY

	Rowell	Amos	Morris	Total
Days in Headquarters	146 3/4	156½	122½	425 3/4
Days in Field	132 1/4	119½	110	361 3/4
Miles Traveled	23,208	19,605	24,776	67,589
Number of Different County Visits	98	75	207	380
Individual letters written	1,862	709	469	3,040
Circular Letters Written	10	6	3	19
Circular Letters Issued	3,026	897	2,184	6,107
News Articles Prepared	13	10	42	65
Radio Talks Prepared & Presented	6	16	15	37
TV Programs Prepared and Presented	0	0	0	0
Exhibits Prepared and Displayed	25	3	0	28
Estimated Attendance	6,708	4,480	0	11,188
Special Papers, Articles Prepared	2	4	1	7
Leader-Training Meetings Held	14	4	0	18
Leader-Training Meetings - Attendance	561	57	0	618
Lectures, Talks Prepared - Adult	74	42	1	117
Lectures, Talks Prepared - 4-H	77	28	0	105
Total Meetings Attended - Adult or 4-H	20	1	8	29
Total Meetings Held - Adult	74	42	1	117
Total Meetings Held - 4-H	77	28	0	105
Total Meetings - Attendance - Adult	2,687	1,509	25	4,221
Total Meetings - Attendance - 4-H	3,113	872	0	3,985
Meetings Attended - Extension Agents	3	5	5	13
Bulletins, Circulars Prepared	12	4	1	17
Bulletins, Circulars, Mimeographs Issued	19,405	4,173	2,685	26,263
Survey Reports Prepared	1	0	37	38
Survey Reports Issued	713	0	26,856	27,571

Ext. Form 16

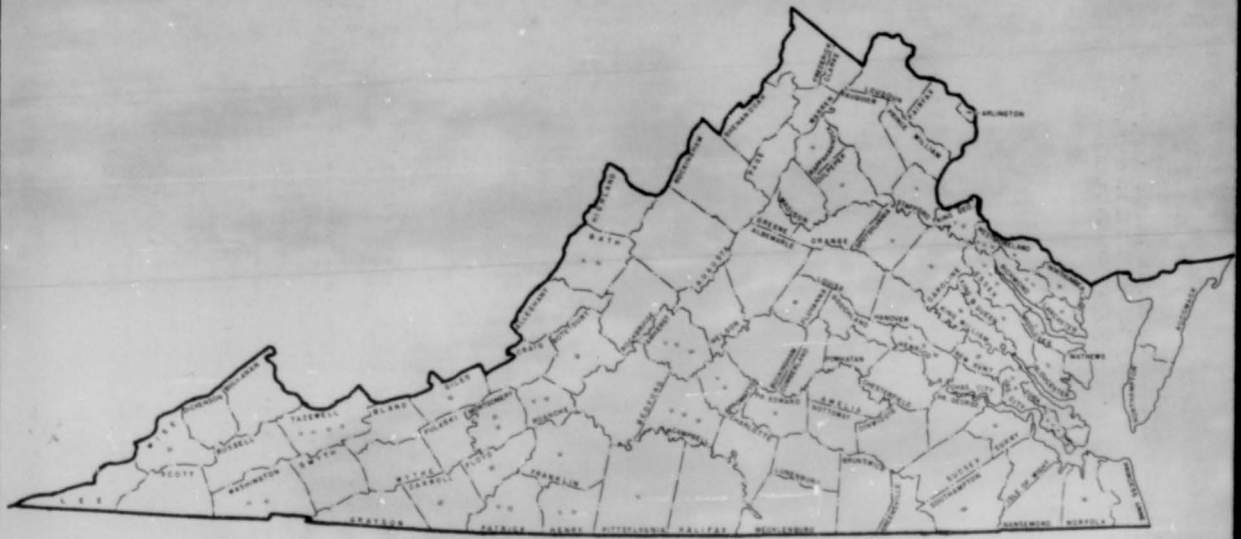
VISITS TO COUNTIES ON ALL PROJECTS*
December 1, 1958 to November 30, 1959
J. O. Rowell, Extension Entomologist



* Each red dot represents a visit by the Extension Entomologist to the respective county.
(Total county visits - 38)

Ext. Form 16

VISITS TO COUNTIES ON ALL PROJECTS*
December 1, 1958 to November 30, 1959
J.M. Amos, Associate Extension Entomologist



* Each red dot represents a visit by the Associate Extension Entomologist to the respective county. (Total county visits - 75)

VISITS TO COUNTIES ON ALL PROJECTS*
December 1, 1958 to November 30, 1959
A.P. Morris, Associate Extension Entomologist

* Each red dot represents a visit by the Associate Extension Entomologist to the respective county. (Total county visits - 207)

INTRODUCTION

Extension entomology in Virginia is under the direct administration and supervision of the Director, Virginia Agricultural Extension Service. Recommendations in the three distinct specialties (entomology and insect pest survey, rodent control, and beekeeping) included in the extension entomology program are coordinated with Dr. J. M. Grayson, Head, Department of Entomology, V. P. I., and with other research entomologists in the Virginia Agricultural Experiment Station. These include, in addition to Dr. Grayson, Dr. E. C. Turner, Associate Entomologist, V. P. I.; Dr. E. M. Raffensperger, Associate Entomologist, V. P. I.; and Dr. J. L. Bishop, Assistant Entomologist, V. P. I.; Dr. M. L. Bobb, Associate Entomologist, Charlottesville; A. M. Woodside, Associate Entomologist, Steeles Tavern; Dr. C. H. Hill, Associate Entomologist, and Dr. W. S. Hough, Entomologist, Winchester; C. B. Dominick, Associate Entomologist, Chatham, and Dr. G. M. Boush, Associate Entomologist, Holland. Recommendations regarding the control of insects affecting vegetable crops are coordinated with Dr. R. N. Hofmaster, Associate Entomologist, Virginia Truck Experiment Station, Norfolk. Not all of the subject matter information, however, is obtained by research conducted in Virginia. Much of the information and teaching materials for the extension entomology program are obtained from several sources, including the Virginia Agricultural Experiment Station, Entomology Research Branch of the U. S. Agricultural Research Service, other state experiment stations,

and various public and private sources. From these sources, the required subject matter material is collected, condensed, and adapted to extension use in this state. In the execution of their primary duties, the extension entomologists, by methods and media described later, disseminate the information to county extension personnel, to other professional agricultural workers in the state, and to the people of Virginia.

John M. Amos, Associate Extension Entomologist, is specifically in charge of the rodent control and beekeeping activities and the fruit insect control project for the extension entomology program. He assists also with other extension entomology projects and activities. A summary of the accomplishments in his major activities appears later in this report.

The extension entomologist devotes full-time to extension entomology activities and to the supervision of the program in extension entomology and insect survey. Major phases of his work are elaborated upon in his part of this report.

A. P. Morris, Associate Extension Entomologist, is in charge of the Cooperative Economic Insect Pest Survey Program. His insect survey activities are under the immediate supervision of the Extension Entomologist and Project Leader. However, his program is operated jointly through the Survey and Detection Operations, Plant Pest Control Division, A. R. S., U. S. D. A.; the State Entomologist, Virginia Department of Agriculture and Immigration; and the Virginia Agricultural Extension Service. A summary review of his activities and accomplishments are included later in this report.

LIVESTOCK PEST CONTROL

External parasite control on cattle, sheep, and swine is an important part of the management programs in this state. The research project on control of external parasites of livestock is under the supervision of Dr. E. C. Turner, Jr., Associate Entomologist. With Dr. Turner's assistance, the extension entomologist has released information on the use of systemic insecticides for the control of cattle grubs and on the control of flies of dairy cattle and beef cattle. See figure 1 and figure 2.

Dr. E. M. Raffensperger, Associate Entomologist, Virginia Agricultural Experiment Station, is conducting research in the control of external parasites of poultry. Extension activities in this field are conducted mainly by the extension entomologist. With Dr. Raffensperger's counsel assistance, the extension entomologist is assembling information on the control of external parasites of poultry.

A new pest, the face fly, attacked considerable attention in Virginia this year. Dr. Turner conducting investigations on the habits and control of this pest in Virginia. See Figure 3.

In any one season extension entomologists are unable to reach many of the counties with livestock and poultry insect control method demonstrations. Because of this fact, the program was conducted again in 1959 largely by way of circular letters, news articles, and radio talks. In August and September of this year, in cooperation with Dr. E. C. Turner, the extension entomologist con-

ducted field demonstrations on the use of Ronnel and Co-Ral in the control of cattle grubs in beef cattle. Demonstrations on the use of Co-Ral to control cattle grubs, lice, and flies were conducted this year in Warren and Albemarle counties.

The extension entomologist, when called upon, cooperates with the Dairy Science Department to present the information on control of external parasites of dairy cattle at the Annual Dairy Management Short Course, and with the Animal Husbandry Department to assist in presenting new information on control of external parasites of beef cattle at the Beef Cattle Production Short Course.

Figure 1. Dr. E. C. Turner, Jr., Spraying Beef Cattle with Co-Ral to control Cattle Grubs and Cattle Lice. (Albemarle County - 1959)

Figure 2. Dr. E. C. Turner, Jr., Giving Trolene Bolus to Beef Cattle to Control Cattle Grubs. (Albemarle County - 1959)

Figure 3. Face Flies Around the Eyes and Face
(Highland County - 1959)

HOUSEHOLD PEST CONTROL

Assisting county agents and home agents conduct household pest leader-training schools is an important activity in the household pest control project. For the past twelve years the extension entomologist has been assisting county agents and home agents in conducting county-wide leader-training schools and/or county-wide special interest meetings in household pest identification and control. Since 1950, J. M. Amos, Associate Extension Entomologist, has assisted in this project activity, handling mainly the rat and mouse control phase and the miscellaneous insect and related pest control discussions. Leader-Training schools and/or county-wide, special-interest meetings are held usually during the winter and early spring. During the period covered by this report, the household pest control leader-training schools were conducted in Amherst (Local Farm Agent), Mecklenburg (Local Home Agent and Local Farm Agent), Greensville (Local Home Agent and Local Farm Agent) counties. The extension entomologist alone assisted the county personnel with these schools. However, the extension entomologist and the associate extension entomologist assisted with the schools in King George and Floyd counties. None of the county-wide special-interest meetings on this subject were held by the extension entomologists during the period covered by this report.

Ordinarily from three to five hours are required to conduct one of the leader-training schools, especially when rodent control is

included as a part of the instruction. Exhibits, motion pictures, slides, flannel graphs, and other visual aids are used in presenting the information for these schools. Leader-training manuals (text folders) are distributed to leaders in attendance. When the household pest control presentations are for county-wide meeting, bulletins and circulars on the subject are made available to those in attendance. See Figure 4 and Figure 5.

Figure 4. Household Pest Leader-Training School in Mecklenburg County, 1959

Figure 5. Household Pest Leader-Training School in Amherst County, 1959

Figure 6. Household Pest Leader-Training School in Floyd County, 1959

STORED PRODUCT INSECT CONTROL

Stored product pests cause enormous losses to stored grains and grain products, feeds, and seeds on the farms and in commercial storages in Virginia. It is conservatively estimated that insects and rodents destroy or spoil one out of every twenty bushels of wheat produced in the United States. The same would probably be true for corn and, possibly, for all small grains in this state.

Stored Grain Insect Control and the Clean Grain Program: The stored grain insect problem touches upon the fields of agronomy, agricultural engineering, marketing, plant breeding, state and federal regulatory operations, and many others. The extension entomologists continue to cooperate with the grain and milling industry and with research entomologists, agricultural engineers and others in an attempt to find a satisfactory approach to a solution to the problem in Virginia.

Our present Extension Clean Grain Committee is composed of George C. Herring, Chairman; W. W. Lewis, G. D. Kite, John M. Amos, J. O. Rowell, and R. D. Michael.

Cured Meat and Cheese Insects: During the period covered by this report, the extension entomologists have received many inquiries for information on prevention and control of insects and mites in cured meats. Likewise, they received many cured meat insect specimens for identification. U.S.D.A. Leaflet No. 385, HOME CURED MEAT, HOW TO PROTECT IT FROM INSECTS, was used as a source of information on this subject.

FIELD CROP INSECT CONTROL

The corn earworm this year regained its place as "insect enemy number one." See Cooperative Economic Insect Pest Survey Program and Special Feature. Late in the summer the corn earworm caused severe damage to soybeans, peanuts, and sorghum. Where it was possible to anticipate an insect outbreak, the extension work on the problem was planned in advance. Some of these problems were of an emergency nature, resulting from unexpected appearance of the insects. The insect survey program, however, served to great advantage in predicting these insect problems, as in the case of the corn earworm outbreak on soybeans. This phase of the extension entomology program embraced many and varied insect control problems. A more detailed account of these insect problems and of the part played by the survey program are mentioned by A. P. Morris in his section, Report of Insects of Importance in Virginia - 1959, under the crops sub-divisions.

Tobacco Insect Control: Tobacco is one of the most important cash crops in Virginia. Working very closely with C. B. Dominick, Associate Entomologist, Tobacco Research Station, Chatham, Virginia, the extension entomologist revised the recommendations for the control of tobacco insects. The revised recommendations were distributed to county agents and other men professional agricultural workers in the tobacco-producing counties of Virginia.

The Tobacco Workers' Conference, Insect Control Recommendations Committee, of which committee the Virginia extension entomologist is

a member, revised the overall insect control recommendations following the Raleigh, N. C., conferences held in July, 1959. The extension entomologist attended the conferences. He was elected Chairman, Tobacco Workers' Conference.

Corn Insect Control: Extension work with corn insects, during the period of the report, was concerned with southern corn rootworm, corn sap beetle, and European corn borer problems. Mr. C. R. Willey, State Entomologist, and his staff have worked very closely with extension entomologists on the Japanese beetle control problems on field corn. The extension entomologists maintain close contact, also, with the entomologist of the Tidewater Field Station, Holland, Virginia, on matters pertaining to new research on control of insects affecting corn.

Hay Crop Insect Control: Several important hay crop pests, including the number one pest of alfalfa in this state, the alfalfa weevil, true armyworm, clover root borer, and root curculio, leafhoppers, spittlebugs, three-cornered alfalfa hoppers, aphids, and others, demand time and attention of the extension entomologist and the survey entomologist. Since these insects often occur in sporadic outbreaks, they are given attention as their presence in the fields is noticed and reported by the survey entomologist, county agents, and farmers.

Dr. J. L. Bishop, Assistant Entomologist, Virginia Agricultural Experiment Station, conducted research on habits and control of several hay crop pests, mainly the alfalfa weevil. He made observations also on the recently discovered pest in this state, the

spotted alfalfa aphid. The extension entomologists are working very closely with Dr. Bishop, in developing and revising control recommendations for hay crop insects.

A detailed account of the major forage and cereal crop insects is given by A. P. Morris in his section on Report of Insects of Importance in Virginia - 1959, Cereal, Hay and Forage Crop Pests.

At the request of the county agents, the extension entomologist assisted in conducting alfalfa weevil control meetings and/or meeting and sprayer calibration and operation demonstrations in the following listed counties:

Montgomery	West-Central District
Giles	York - Warwick
Wythe	Roanoke - Botetourt
Russell	Dairymens' Association
Augusta	

The extension entomologist, in cooperation with Mr. J. F. Shoulders, Associate Extension Agronomist, county agents, and others, is participating in conducting 25 demonstrations on Response of Alfalfa to Fertilizer and Insect Control. Twenty-five additional such demonstrations will be added in the 1959-1960 season.

Peanut Insect Control: The southern corn rootworm is the major insect pest of peanuts in Virginia. The extension entomologist works closely with Dr. G. M. Boush, Associate Entomologist, Tidewater Field Station, Holland, in the preparation of control recommendations for important peanut pests. Dr. Boush's circular, A

CHANGE IN THE RECOMMENDATIONS FOR THE CONTROL OF THE POTATO LEAFHOPPER ON PEANUTS, was distributed to county agents in the peanut counties. A problem has developed in certain areas of the state - possibly resistance on the part of the southern corn rootworm to aldrin and heptachlor - and supplemental recommendations are being prepared on the control of southern corn rootworm in peanuts.

Soybean Insect Control: This year the velvetbean caterpillar, green cloverworm and yellow-striped armyworm caused slight damage to late-maturing soybeans. The most serious insect problem, however, resulted from a heavy outbreak of the corn earworm. A more detailed reference to the problem can be found in A. P. Morris' section dealing with a Report of Insects of Importance in Virginia - 1959, Cereal, Hay, and Forage Crop Pests, and in Special Feature later in this report.

Grain Sorghum Insects: The corn earworm caused slight damage to grain sorghum in several counties of Virginia during August and early September of 1959. Some damage was caused to this crop also by the fall armyworm and the European corn borer.

PASTURE INSECT CONTROL

This year the green June beetle was a pest of only minor importance to ladino clover-orchard grass pastures. This pest was not present to any noticeable degree in permanent pastures. As in previous years the extension entomologist worked closely with the entomologist at the Tidewater Field Station with the view of incorporating research findings into revisions of control recommendations. Extension Circular 733, GREEN JUNE BEETLE CONTROL IN PASTURES, prepared in May, 1957, is being used as a source of recommended control measures for this pest.

Dr. J. L. Bishop, Assistant Entomologist, Virginia Agricultural Experiment Station, V.P.I., is continuing research on the control of temporary and permanent pasture insects, mainly alfalfa weevil and spotted alfalfa aphid. The extension entomologists are cooperating with research entomologists in revising pasture insect control recommendations, and in the preparation of news releases and radio programs on these insect problems.

Under Forage Crop Insects, Mr. A. P. Morris gives additional information on the green June beetle problem in this state.

TRUCK AND GARDEN INSECT CONTROL

The control of home garden insects is a very important phase of the extension entomology program in Virginia. The greater part of the extension entomologist's time in this project is spent in the training of leaders in county-wide garden meetings and leader-training schools. Ordinarily the extension entomologist and the associate extension entomologist (J. M. Amos) work together in conducting the leader-training schools. Weed control in the home garden is usually included as part of the school, which part is handled by the weed control specialist. The leader-training schools were conducted in Page, Roanoke and Floyd counties in the spring of 1959.

On garden insect control problems, the entomology specialists work closely with extension vegetable gardening specialists and with Dr. R. N. Hofmaster, Associate Entomologist, Virginia Truck Experiment Station, Norfolk, Virginia. A special effort has been made at all times to coordinate garden insect control recommendations through conferences with Dr. Hofmaster to discuss the results of research on truck and garden crop insect control, and to prepare additional recommendations and to revise old recommendations for the control of vegetable garden insects. In 1960, Dr. Hofmaster himself will revise the vegetable insect control recommendations, and the Virginia Truck Experiment Station will make distribution of the circulars.

FOREST, ORNAMENTAL AND SHADE TREE INSECTS

The pine sawfly has caused widespread damage in several counties of Virginia during the spring and summer months of 1958 and 1959. The extension entomologist and the survey entomologist assisted with the survey program and the educational program of sawfly detection and control. J. O. Rowell was appointed a member of the Virginia Sawfly Committee. See Figures 7, 8, and 9.

During the preceding three or four years there has been an increasing demand for the services of extension entomologists to assist with programs of communities, nurserymen's associations, home demonstration clubs, and garden clubs, with insect and rodent control problems. Home agents, especially, have organized leader-training schools for training demonstration club leaders in insect, disease, and weed control of ornamental plants and lawns. The extension entomologists, during the period covered by this report, have assisted with leader-training schools for this purpose in Wise, and Henry Counties.

J. O. Rowell assisted with the Northern Virginia Nurserymen's Short Course January 8, 1959. J. M. Amos assisted on the program of the Southern Shade Tree Conference in Williamsburg, February 10-12, 1959.

Figure 7. Pine Sawfly Injury to Pines in Cumberland County, 1959

Figure 8. Close-up of Pine Sawfly Larvae and Injury, 1959

Figure 9. Airplane Application of Biologicals (Virus and Bacterium) to control Pine Sawfly, 1959.

PEST CONTROL OPERATORS' SHORT COURSE

The eleventh Annual V. P. I. Pest Control Operators' Short Course was conducted on November 4, 5, and 6, 1959. Emphasis was placed upon the life history, habits, identification, economic importance, and control of common species of insects and related arthropods which play a role in the spread of organisms which cause diseases in man and domestic animals. Emphasis was given also to minimum standards for pest control jobs and new developments in termite control. An examination on identification of insects and their damage, and on identification of rodents and their damage, was one of the highlights of the three-day program. Another highlight was the awarding of three 10- year certificates of attendance at the short course. Certificates this year went to J. O. Rowell, Extension Entomologist, V. P. I.; B. F. Dodson, Dodson Brothers Exterminating Company, Lynchburg; and to Henry M. Glasglow (Honorary Member), Salem, Virginia. See Figure 11.

Cooperating in the preparation of and in the presentation of this short course were the officers and certain members of the Virginia State Pest Control Association; John C. Jones and J. B. Lindsey of the U. S. Fish and Wildlife Service; Experiment Station and Extension Service entomologists, Department of Entomology, V.P.I.; representatives of the pest control and insecticide industry, and entomologists of the Virginia Department of Health and of the U. S. Public Health Service. One hundred and thirty-three pest control operators and visitors attended the short course.

As has been the custom in the past, the pest control operators and others interested from Virginia, Tennessee, West Virginia, Maryland, North Carolina, South Carolina, and the District of Columbia were invited to attend the short course. Present at the 1959 Pest Control Operators' Short Course for the eleventh anniversary program were pest control operators and equipment dealers from the states mentioned and from Michigan, Ohio, Pennsylvania, New York, Georgia, New Jersey, Delaware, and Mississippi.

L. B. Dietrick, Dean of Agriculture, V. P. I., gave the address of welcome. Additional highlights of the three-day program were an address by Dean L. B. Dietrick and the remarks by Dr. J. M. Grayson at the banquet and entertainment program Thursday evening, November 5. The entertainment program was also enthusiastically applauded.

The membership of the Virginia State Pest Control Association reorganized their 4-H Club awards program, beginning in 1956. The Association offers five sectional awards of $20.00 each for the winners' use in attending the State 4-H Club Short Course at V.P.I., and participating in the entomology classes offered at the short course. Five 4-H club members qualified for the awards in 1959. They are: Larry Bowers, Shenandoah County; John R. Cocke, Bedford County; Ray Davis, Rockingham County; Morgan Morrison, Arlington; and William Patterson, Rockbridge County.

The Association offers also, a $10.00 cash prize (or equivalent) for the outstanding student in entomology at the State 4-H Club Conservation Camp. This award was won in 1959 by Morgan Morrison,

Arlington, Virginia. (Young Morrison went on to the National 4-H Club Congress, Chicago, Illinois, and won a national entomology award of $400.00 cash toward his college education expenses. This significant event will be referred to later under 4-H Club Entomology Activities.)

Figure 10. Group Photograph, 1959 V.P.I. Pest Control Operators' Short Course

Figure 11. Recipients of 10-Year Certificates of Attendance - 1959. (Starting from second from left to right) Henry M. Glasglow; B. F. Dodson; and J. O. Rowell

Figure 12. Officers, 1959-1960 Term, Virginia State Pest Control Association. (Left to Right) C. B. Hill, Secretary-Treasurer; F. H. Tyler, Director; L. E. Chambers, President; V. E. Thomas, Vice-President; and R. E. Rohler, Director

4-H CLUB ENTOMOLOGY ACTIVITIES

J. M. Amos and J. O. Rowell devoted approximately six per cent of their time and effort to 4-H Club entomology activities during the period covered by this report. A steadily-increasing interest in 4-H entomology activities on the part of county agents, state and local 4-H club leaders, and 4-H club members, has necessitated the allocation of more and more time to 4-H Club entomology activities.

The nationally-recognized 4-H Club Entomology Awards Program, now in its seventh year of operation, added materially to the prestige of the entomology activity in 4-H club work in Virginia. R. Morgan Morrison, Arlington, Virginia, won the State 4-H Club award in entomology. This was an expense-paid trip to the National 4-H Club Congress in Chicago. Morgan Morrison went on to win one of the six national $400.00 college scholarships in the 1959 competition, bringing the third national award in entomology to Virginia. John A. Mask, Westmoreland County, was Virginia's first National Entomology Award winner (1952); David Johnson, Prince William County, was Virginia's second national award winner (1957). The national awards program in entomology is sponsored by the Hercules Powder Company, Wilmington, Delaware.

Winners of the five $20.00 cash sectional awards, and the winner of the $10.00 cash award, given by the Virginia State Pest Control Association, are referred to under the section, Pest Control Operators' Short Course, earlier in this annual report.

During the months of June, July, and August, 1959, the Associate Extension Entomologist, J. M. Amos, gave the nature study course in entomology at three 4-H Club encampments (Camp Summers, June 16-20; Holiday Lake, July 20-24; and Abingdon Presbytery Camp, August 3-7). The Extension Entomologist, J. O. Rowell, assisted with six encampment (Camp Clyde Austin, June 9-13; Jamestown, June 15-19; Holiday Lake, June 30-July 2; Holiday Lake, July 6-10; Powell's Fort Valley, August 3-5; and Powell's Fort Valley, August 10-14). He gave the instruction in entomology at the 1959 State 4-H Club Conservation Camp, July 19-24. The total number of 4-H club members and leaders reached in these courses was approximately 650. In 1959, 74 counties participated and there were 1556 4-H Club members enrolled in the (Unit I and Unit II) entomology project, and 889 of these members completed their project.

There were 44 club members enrolled in beekeeping and 24 completed the project. In rodent control there were 13 enrolled and 4 completions.

Both the extension entomologist and the associate extension entomologist assisted 4-H club leaders, county agents and home agents with programs to explain the 4-H club entomology project and to initiate the entomology programs in the clubs and schools. As a result of this increased interest in the 4-H club entomology project, club members were informed concerning the awards program for 1959. Outstanding projects were submitted and judged on the state level, and the state winner was announced at the annual State 4-H Club Short Course at V.P.I.

A. P. Morris assisted with the judging of 4-H Club project records, including entomology records.

The associate extension entomologists and the extension entomologist assisted with the 1959 State 4-H Club Short Course at V. P. I. during the week of June 22 where they presented a series of programs on the importance of insects and rodents to Virginia agriculture. Approximately 32 4-H club members and leaders attended each of the four sessions of the 4-H club entomology program at the short course in 1959.

The extension entomologist continues to serve as a member of the National 4-H Club Entomology Project Development Committee. See Figures 13 - 20.

Figure 13. Insect-Tac-Too, 4-H Conservation Camp, 1959 (J. O. Rowell, M. C.)

Figure 14. Insect-Tac-Too, 4-H Conservation Camp, 1959 (Morgan Morrison, M. C.)

Figure 15. Entomology Class, 4-H Conservation Camp, 1959
(J. O. Rowell, Instructor)

Figure 16. Entomology "Eye-Opener" Program, 4-H
Conservation Camp, 1959
(Morgan Morrison, speaker)

Figure 17. Insect-Tac-Too, State 4-H Club Short Course, 1959
(J. M. Amos, M. C.)

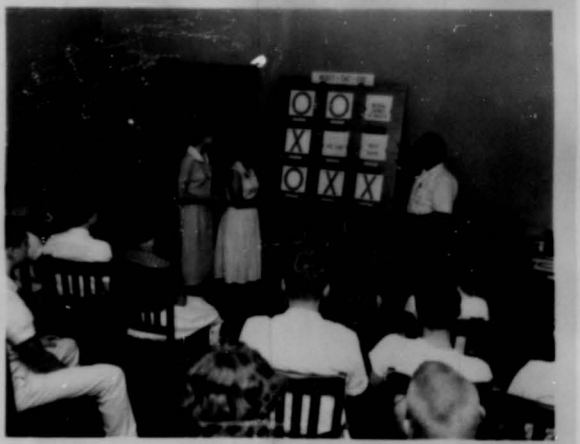


Figure 18. Insect-Tac-Too, State 4-H Club Short Course, 1959
(J. O. Rowell, M. C.)

Figure 19. Insect-Tac-Toe, District 4-H Club Camp, Holiday Lake, 1959
(J. O. Rowell, M.C.)

Figure 20. Collecting Insects, District 4-H Club Camp, Holiday Lake, 1959
(Miss Violet Navy, Greene County Home Agent, Assistant)

HOME GROWN TREE AND SMALL FRUIT INSECT CONTROL

J. M. Amos

The demand for and the interest in general purpose sprays continues to increase. There were 58 letters written concerning the home spray programs, which is about the same number as for 1958. Two radio tapes were made and sent out by the V.P.I. radio station tape service. Three newspaper articles were written and distributed to county and daily papers through the publicity office.

Since the passage of the Miller Bill, which limits the residue and the use of chemicals on food plants to those approved by the USDA and the Food and Drug Administration, the entomologists have received many calls from other professors and extension personel for information concerning the chemical to be used, the amount, time of application and limitations of use of materials. Files of this information are being kept up to date as it is received from the USDA and the Food and Drug Administration. This provides an authoritative source of information of this nature. In addition to this, USDA Agriculture Handbook 129 gives similar information on most crops; but the above files must be relied on for revisions and new uses that are approved after the Handbook is printed.

Home Fruits or Fruit Trees: Interest on the part of home fruit growers in the dwarf varieties continues. Dwarf varieties can be sprayed with small hand equipment and still give enough fruit of good quality to supply the needs of the family table in season. Bucket spray pumps and compressed air sprayers are adequate to cover dwarf or medium-sized fruit trees without difficulty. Large apple trees require sprayers with more pressure and capacity to give satisfactory

results.

The spray program for home gardeners, SPRAYING FRUIT, Circular 638, was revised and brought up to date. Cautions and dates of the last spray before harvest was added. By the time it was printed in June, there was a backlog of requests for several hundred copies of this leaflet. Another indication of its popularity is the fact that over 20,000 copies of this spray program has been printed in the last eight years. Approximately 1000 copies are used each year by the Horticulture Department in their leader training manuals. A copy of the revised circular is enclosed.

The trend in the resistance of mites to organic sprays in apple orchards has not been noticed in sprayed home fruit plantings. Neither has the presence of leaf rollers been serious. Excessive amounts of mildew in apples did not occur where captan fungicide was used this year. In commercial orchards, less mildew was found than in the previous years. Karathane, an organic fungicide, will control mildew; but it is quite expensive.

At the pesticide conference in Richmond with entomologists and pathologists of nearby states in cooperation with the Southern States, it was reported that the general purpose spray kit, containing three 2-pound containers of compatible insecticides and fungicides, was mounting in sales. About 5,000 kits and 900 replacements were sold in 1957 and in 1958 the number of kits sold reached 30,000. The number of kits sold in 1959 increased greatly. The three materials contain a mixture of malathion-methoxychlor insecticide in one can, captan or zineb for general disease control in another, and Karathane or sulfur for mildew control in a third can. It is called an estate kit. It eliminates the

problem of the buyer trying to locate the various needed spray materials, and replacement of the used chemicals could be readily made. Such an arrangement greatly facilitates the spread and use of general purpose sprays. One of the biggest drawbacks to the general use of new materials is the fact that they are not readily available at one location. Several ready-mixed commercial preparations are available and are being more widely distributed.

There were several complaints about Oriental fruit moths this summer and Japanese beetles in ripening fruit. Malathion was suggested for their control with zineb added as a fungicide.

The writer attended the fruit growers schools at Wise, Boones Mill and Mt Airy to speak on bees for pollination. There were about 165 attending these three schools. It was the first time extension entomologists had appeared on these programs in his ten years at V.P.I. Usually the research entomologists participate in these programs.

A spray demonstration on the control of fruit diseases and insects with general purpose materials was conducted on Grimes, Delicious, Paragon, and Staymens. Other fruits sprayed were nectarines, grapes, and raspberries. Applications were made with a compressed air sprayer. Apples were sprayed in the delayed dormant, pre-pink, pink, petal fall, first cover, second cover, third cover, and a spray the first week in July. The apple foliage was free of cedar apple rust this year and very few curculio and codling moth injuries appeared during the spring and summer. There were not many late-season worm entries in the fruit. Malathion-methoxychlor with ferbam, later changing to captan, was used as suggested in V.P.I. Circular 638. About eight bushels of apples were harvested with less than two per cent wormy fruit and about five per

cent with scab.

Scab on nectarines and peaches was severe because of the heavy carry-over from last year's heavy infection. Blotch was also bad.

The writer attended the Cumberland-Shenandoah Fruit Workers' Conference at Hagerstown, Maryland, and participated in discussions of the 1959 research data. Mildew did not prove to be as serious a problem this year as in 1958. It might be that spraying for control helped and the season was not as favorable for its development. Mites are showing resistance to parathion and some growers are considering using sulfur in the early sprays at the sacrifice of some loss in fruit finish. Two new miticides, Mitox or Kelthane, used in the early sprays before fruit form suppresses mites as does the glyodin-mercury schedule. Leaf roller control this year was very disappointing in some locations. Some growers are considering using arsenate of lead in the early sprays to control this insect. Research shows guthion to be of value in controlling this pest. Endrin also shows promise.

Small Fruits: Spray calendars for raspberries, grapes, and strawberries are kept up-to-date, and revisions made where needed.

A. Strawberries: At present virus-free strawberry plants are available from most nurseries on the Del-Mar-Va peninsula. Practically all varieties commonly planted in eastern United States are now available as virus-free as well as nematode free. These plants are superior in production and vigor to plants obtained a few years ago. A regular spray or dusting program is conducted to control or prevent aphids that trans - mit the virus diseases.

We continue to get plants affected by the root rot disease complex. Some research workers feel that there is a relationship between root

rot and nematode infection, but there is no evidence as yet to support this claim.

Workers at the Virginia Truck Station have not been able to test a combination insecticide-fungicide mixture on strawberries to see if it is a desirable and economical practice because of a change in personel. The object was to control strawberry weevil and fruit rots. Captan is recommended for mold control on the fruit, and it is reported to increase the size of the fruit when used throughout the growing season.

It became necessary to revise mimeo-leaflet MR-211. Aramite has been withdrawn from usage on food crops because of its tendency to produce cancer in test animals. This leaflet is now being revised and will be ready for use in the spring. For this revision it is hoped that a better format can be prepared.

B. Grapes: The grape schedule was revised early in 1958 and is now being used to advantage for the larger grower of grapes. Small growers may use the general fruit spray program. Bordeaux mixture is omitted from the regular spray schedule and zineb is given preference over ferbam which is suggested for areas where mildew is a problem. Methoxychlor and malathion are recommended for insect control. A radio tape and two news articles on grapes were prepared for the radio tape service.

C. Raspberries: As yet there are no large plantings of raspberries to present a major disease problem; however, anthracnose is a destructive disease on raspberries. It can be held in check by

spraying with elgetol or lime-sulfur in the delayed dormant period each year. Pruning out badly diseased canes is also helpful. A few requests for information on aphids and cane borers have been received. The red-necked cane borer seemed to be more abundant than usual in red raspberries in the Blacksburg area. Four home visits were made on this insect.

Sprays were discussed on a radio tape and one news article was written on this subject.

BEEKEEPING

J. M. Amos

Last spring was cool and wet with rainfall about normal until June when it turned dry and relatively hot until late in July. Southwest Virginia had a good growing season excepting for the period mentioned above. The Northern Neck area was hit as hard by the drought as any area in the state. It extended over a longer period, having started earlier. The early honey flow was good over the state but was cut short by the drought which forced bees to work hardwoods and pines where they collected considerable honeydew. Both fair and wet weather occurred during the blooming period of apples, peaches and plums and the bees worked them vigorously. It was difficult to get the bees out of the orchards because it was generally cool and wet at that time. Strong colonies did work locust, but white clover blossoms were almost non-existant in areas where they were in abundance the year before. This forced bees to work poplar making the earlier honey dark in color as did the honeydew collected later. During the latter part of the drought it appeared that bees worked alfalfa in larger numbers than has ever been seen on alfalfa in this area in the ten years the writer has been here. Sourwood in most parts of the state yielded very little. In northern Virginia, the crop was reasonably good but a little less than normal.

There was just enough tulip poplar in the honey this year to make the honey a dark red. Honey dew added to the density of this thick honey. The flavor, however, was good.

The fall honeyflow from aster and stickweed was fair over much of the state and helped greatly in filling up empty comb space in the hive for winter food supply. Many colonies will have to be fed in the spring if they are to survive.

Since there was considerable honeydew in the honey this year, many of the beekeepers are leaving this with the bees for winter.

There were a few reports of poisioning bees with insecticides where alfalfa had been treated with heptachlor. One large beekeeper reported a loss of field bees when colonies were removed from an orchard where they were used for pollination. Since most of the alfalfa will be treated with granular fertilizer before plants bloom in the alfalfa, this danger will be reduced in the future.

The extension entomologists are cooperating in every way possible to prevent injury to bees by insecticides. A series of precautions have been drawn up for distribution to county agents and the general public. Caution was voiced at our Annual Extension Conference classes on insects this year. Warnings on the danger of sprays to bees will be made on spray information that is published in the future.

Bees for pollination was presented to the specialists and county extension workers as a part of the subject-matter program of the Annual Extension Conference. One group elected to take entomology, thirty-five were present.

A demonstration on using bees to increase crop yields was conducted in Essex County. Oscar Tolliaferro had difficulty in getting large quantities of melons to set which were sold for watermelon

preserves by the barrel to a canning company. In 1957 he averaged 9 barrels per acre without spraying for insect or disease control and without bees. In 1958 four colonies of bees were located in one end of the field, and his average yield jumped to 16 barrels per acre. His brothers, who did not use bees, averaged 9 barrels again. He is reasonably convinced the bees were helpful in producing the increase. It was pointed out that melons must be insect pollinated to set fruit. He admits that the best melon crop he ever produced was when it was located next to an apiary. In 1959 bees were near the melons but a check has not been made on his yields as yet. It is possible that the dry weather hurt the crop.

In the spring there were several requests for plans for observation hives. Such plans were drawn up but not printed. Next year it is hoped that these can be printed.

During 1958 a meeting was arranged with the State Entomologist, C. R. Willey, the State Apiary Inspector, H. W. Weatherford, and the President of the State Beekeepers' Association to discuss the use of antibiotics in treating bee diseases (especially American foulbrood). An agreement was reached and a letter of permission to move diseased bees for treatment with Terramycin-25 and sulfathiazole. This is a preventive treatment which would permit the bees to clean up the diseased larvae as long as fed the drug. This is being done in hopes that the treatment will be sufficiently effective to permit extension to teach the use of this method of disease control. At present, burning is the treatment recommended by

the State Inspection Service. Several cases were treated, and the observations on these colonies are recorded herein.

Treating American Foulbrood with Terramycin-25 in 1959.

J. M. Amos, Blacksburg

The three colonies previously treated in 1957 and 1958 are still free of disease and no other treatment was given in 1959.

A. H. Smith, Blacksburg

The colony that died had the combs burned. The other colony treated in 1958 was still free of disease.

C. P. Price, RFD, Blacksburg

The colony at this apiary treated last year is still free of disease. None of the other colonies show disease. One treatment of terramycin-25 diluted 1-5 with powdered sugar was given in April. No further treatment was given and the colonies were all clean in the fall.

C. B. Wallace, Tazewell

The bees at this location were visited in May for examination but it was raining when I arrived. Sufficient terramycin-25, 1-5 was left with Mr. Wallace for him to apply, using one tablespoonful per colony. These bees were examined in June. No disease could be found in any of the colonies, even though the bees had robbed out honey from combs which may have had AFB disease spores in the honey. Another examination in October showed no disease in any of the colonies. No further treatment was given.

After one season of treatment of AFB in the four apiaries under test, no foulbrood could be found. These bees will be observed another season to see in the disease reoccurs.

The colony, which had disease last year, died and was robbed out. I secured the combs from Mr. Wallace. The AFB scales were easily found in most combs. These were divided into two frame 4 nuclei and given bees and a queen. Terramycin-25 was given to each colony three times at two week intervals. Each developed healthy brood and produced a shallow super of honey above the completed brood chamber. Both were disease free as far as could be seen in the fall.

The members of the Piedmont Beekeepers Association continue to use a desirable outlet for their dark honey. The membership places their dark honey in 60-pound cans and indicates to the secretary how much honey he has to pool. It is brought to a central point on the day the buyer agrees to pick it up, usually early in November. Buyers are permitted to bid on the honey, and the group agrees on which bid will be accepted.

A summary of the honey pooled over the past five years is given in Table I.

Table I: Honey Pooled by the Piedmont Beekeepers Association (1955-59 inclusive).

Year	Beekeepers in the pool	60 pound cans	Price cents/lb.	Amount of honey
1955	14	350	12.75	21,000 pounds
1956	22	667	12.50	40,000 pounds
1957	18	500	12.75	30,000 pounds
1958	9	256	13.75	15,360 pounds
1959	11	248	12.00	14,880 pounds
5 Totals	74	2021	12 ¢	121,240 pounds

This honey pool brought the beekeepers roughly $28,550 in 5 years for honey which would have otherwise been difficult to market. The poor honey crop this year and a few beekeepers selling outside the pool reduced the volume that would have been handled considerably.

The Souix Bee Honey Cooperative opened a honey packing plant at Waycross, Georgia. Soon after its opening, the price of honey dropped 2¢ in Blacksburg but has now returned to that of other honey or 39 cents for 12 oz.

The writer feels that there is a good opportunity for developing more beekeepers in southwestern Virginia. This will be true as long as tulip poplar continues to come back in the mining area of the state and there is a ready market for this dark honey. In many sections, selection of the proper location will also produce a good crop of light honey from sourwood and basswood, after the early tulip poplar flow.

A summary of beekeeping meetings is given in Table II. At 26 meetings 1031 people were present.

Table II: A summary of Meetings in Beekeeping

Meetings	Place	Subject	Attendance
Piedmont Beekeepers Meeting	Lynchburg	Toastmaster	49
Piedmont Beekeepers Association	Lynchburg	Tubelo honey	18
Piedmont Beekeepers Association	Lynchburg	Spring management	20
Piedmont Beekeepers Association	Lynchburg	Bee Quiz	22
Piedmont Beekeepers Association	Lynchburg	Bee Quiz	28

Meetings	Place	Subject	Attendance
Fruit School	Wise	Pollination	35
Fruit School	Mt. Airy	Pollination	65
Fruit School	Boones Mill	Pollination	65
Beekeeping School	Appomattox	General	6
Beekeeping School	Newport News	General	58
Beekeeping School	Montross	General	7
Henrico County	Richmond	Requeening	12
Richmond Beekeepers Association	Richmond	Bee Quiz	18
Richmond Beekeepers Association	Richmond	Bee Quiz	22
Girl Scout Brownies	Blacksburg	General	12
Boy Scout Camp Pepsico	Surry	General	24
Southern States Beekeeping Fed.	Tampa, Fla.	Exhibits	110
Southern States Beekeeping Fed.	Tampa, Fla.	Hobby group	55
Southern States Beekeeping Fed.	Valdosta, Ga.	Toastmaster	120
Southern States Beekeeping Fed.	Valdosta, Ga.	Hobbyist group	35
Extension Conference	Blacksburg	Bees for Pollination	35
Tidewater Beekeepers Assn.	Newport News	4-H Group	24
Tidewater Beekeepers Assn.	Newport News	Extension Beekeepint	60
Extracting Demonstration	Norfolk	Preparing for Market	4
Virginia State Beekeepers Assn.	Lynchburg		35
Virginia State Beekeepers Assn.	Lynchburg		42
Zoology 402	Blacksburg	General (10)	50
Total Meetings - 26			1031

In addition to the above meetings for teaching groups, a class in beekeeping was taught on the college level (Zoology 402). This class met ten times with five students present.

At some of the association meetings mentioned above the new teaching device, Insect-Tac-Toe (patterned after Jack Barry's Tic-Tac-Dough) was prepared and titled Bee Quiz. The game invites audience participation and is enjoyed by all present. This teaching device was presented to the Southern States Beekeeping Federation meeting also and was well received. Plans for making the panel and game were prepared by J. O. Rowell and the board was used by him at the Conservation Camp, Virginia Beach. See Figure 13. A large number of these working plans for the game were distributed.

During the year the writer served as reported to the U. S. Department of Agriculture, "Gleanings in Bee Culture," and the "American Bee Journal" giving information on the prevailing market conditions, honey plants, and colony development each month as seen in this section of the state.

To further the work of the State Beekeepers' Association, the writer prepared reading material for three beekeeping news letters which were sent to the members of the organization and to the county agents by stamped postage. The material for the letters was prepared at the office and mimeographing done at home. About two-hundred and fifty copies of each news letter were distributed, making a total of 750.

An exhibit on bees as pollinators of plants and biology of the bee were prepared and used three times during the year as shown in Table III (See Figure 22). The importance of bees in producing good quality fruits and increasing the seed yields of our legumes and vegetable seed crops was shown. Many expressions of interest in the exhibit were received.

Table III: A Summary of Use of Beekeeping Exhibits

Occasion	Place	Approx. Attendance
Ag. Student Exposition	Blacksburg	8,000
Southern States Beekeeping Fed.	Tampa, Fla.	110
Tidewater Beekeepers Assn.	Newport News	65
Three Exhibits		8,175

Five radio tapes on feeding bees, bee management, honey and its uses were prepared which goes to 55 radio stations in the state. Four news articles were prepared, one of which was used in the Virginia Department of Agriculture Bulletin, and also in the honey marketing report of the State Marketing Service. This was done in cooperation with H. M. Taylor in charge of the Marketing Service. One special article was written for the American Bee Journal on beekeeping and honey plants in Virginia. It was published in the October issue featuring the southeastern section of the United States.

The writer is cooperating with the Curator of the Morris Arboretum, University of Pennsylvania, in testing the germination of seed of two plants which promise to be good honey plants. They are

called the bee-bee trees, Evoidia daniellii, and E. hupihensis. A fall and spring seeding was made in 1955 and 1956. The plants from the fall seeding were just coming up when a severe freeze occurred killing all that were above ground and probably many that were about to come through the soil. Only a few plants survived or came up from the fall planting. The spring planting had more to come up, but hand weeding, no doubt, killed many of them. About 130 small trees 1 to 3 feet tall grew from the seed that was sown. It is hoped that a reasonable number of these can be planted in one locality to see what kind of honey this plant makes and how much. It is a plant that is heavily worked by bees throughout the blooming period. Some additional seed was received for trial planting in the spring of 1957 and planted in a box. Plants were transplanted to the garden and did not survive as well as those which were not transplanted. Several of the beekeepers in the Lynchburg and Richmond areas obtained and planted the bee-bee trees. Mr. C. L. Burgess, Jr., Lynchburg, has 30 or more trees. Mrs. Sarah Webster got 12 or 14, and a number of people got groups of five. At Longshop about my home I put out about 35. H. L. Maxwell, Berryville, got five for background planting in the area surrounding his honey house. In all, about 320 trees were distributed. Indications are that it is an excellent honey plant. More seed will be planted next spring. E. hupihensis did not germinate well and only a few plants were obtained. They are weak and may not survive the winter. These plants winter killed but more

of the seed germinated in the spring of 1959. There are roughly 200 more seedlings available for distribution. Plans have been made to put 50 or more of these trees in the coastal plain area of the state in cooperation with Prof. Baldwin of William and Mary College, Williamsburg.

In 4-H club work there were 44 enrolled in beekeeping keeping 61 colonies of which 24 completed the project for this year. Twenty-four counties were involved. Several visits were made to 4-H beekeepers. Beekeeping as a 4-H project is one on which the specialist could spend all of his time if he felt it were warranted.

Correspondence in beekeeping this year remained high though there were no short course. Participation on other programs increased the need for writing letters. There were 258 letters written on beekeeping, which is considerably more than last year, and is more than twice as many letters as were written for rodents and fruits. Approximately 15000 pieces of literature were distributed in response to requests for information.

Figure 21. Brownies Girl Scouts, on Outing, Look Into Bee Hive, (J. M. Amos, Demonstrator)

Figure 22. Biology of the Honey Bee Exhibits, V.P.I. Agricultural Exposition, 1939 (Exhibit Prepared by J. M. Amos)

RODENT CONTROL

J. M. Amos

Since rodent control is not truly an entomological subject, very little effort is being made to emphasize this field of work.

The writer is a member of the Clean Grain Sanitation Committee in Virginia. Virginia is primarily a grain consuming state and much of the grain produced here goes into poultry and livestock feeds. This committee usually meets two or three times a year, but in '59 we did about the same as in previous years without committee meetings.

Four talks on clean grain sanitation were given at Buchanan, Chatham, Salem and Denbeigh with a total of 57 present. In addition to this, four radio tapes were made on rat and mouse control. Four newspaper articles were written. At the Annual Extension Conference, rodent control was presented as subject matter to those electing entomology as their field of study. About 35 attended.

A very thorough program covering the role of rodents and their ectoparasites in the transmission of diseases was presented to the Pest Control Operators Short Course November 4, 5, and 6 for pest control operators and health officers. There were 113 registered for the course and 133 attended the banquet. Rodents were identified and included in the test given.

A. Rat and Mouse Control:

A directive from the district office of the USDI was distributed

to the county agents indicating that rodent control supplies containing warfarin would not be available from the Rodent Control Fund office at Raleigh after July 1, 1959. Commercial companies have agreed to prepare the bait at a reasonable price according to the directions provided by the USDI.

No reports of poisoning of pigs with warfarin were reported the past year. An interesting article was read, however, which showed that pigs were quite readily affected by anticogulant materials causing hemorrhages in the fat. Previously a worker criticized the writer for a news article cautioning people to be careful with warfarin near pig stys. This confirmed previous belief that warfarin had caused the difficulties reported in previous years in swine.

Although Rodent Control has been offered for many years as a 4-H project, it has not attracted many participants. There were 13 enrolled in this project in four counties with only four completions.

B. Woodchuck Control:

A circular letter was distributed in February urging agents to secure gas cartridges and plan for woodchuck control demonstrations early in the year. No assistance was given for such demonstrations but the field representative of the USDI, J. C. Jones did conduct a few. The number of gas cartridges used for this purpose has been greatly reduced since the agents are no longer assisting in getting them to the farmers.

C. Orchard Mouse Control:

This subject is being handled by Dr. Frank Horsfall, Horticulture

Department, who does research on the problem. There is a controversy between Dr. Horsfall, who recommends endrin ground cover spray for pine mouse control, and the Department of Interior which feels that endrin is dangerous to humans and wildlife. Endrin has been cleared for use in pine mouse control. Dr. Horsfall now recommends spraying every other 1/2 tree row to reduce the cost of the spray treatment.

Several examples of injury by pine and meadow mice have been called to our attention by people living in suburban areas. Ornamental shrubbery, such as azaleas, boxwood, privet, have been damaged. Strawberries have also been damaged. Because of possible danger to people and pets baiting with zinc phosphide bait on apple has been suggested for use in these places. In some cases the use of numerous snap traps were suggested.

D. Control of Moles and Miscellaneous Pests:

The publication and distribution of V. P. I. Circular 674 continues to answer most questions on mole control. One news article and two radio tapes were made on moles during the past year. The mailing room indicated this was one of the more popular circulars printed. The supply (5000) was exhausted and a rerun was made.

A demonstration on the control of moles by the elimination of the food supply by treating the soil with chemicals was completed. An area 25 feet wide was treated with chlordane, using at the rate of 10 lbs. of actual chemical per acre. Very little penetration of the treated area was noticed.

The mole film was completed this year. It was sent to the Film Council of Greater Columbus, where it was selected for a "Cris Award' at the annual Columbus Film Festival. It is a 6-1/2 minutes color film on the mole, its habits and control. Those who saw it this year said it was good.

We received several requests during the year for the control of snakes, bats, skunks, squirrels, and other small animals. Some of these were referred to the Wildlife Department which could give a better reply to the individual. V. P. I. Circular 667, LIVE TRAPPING OBJECTIONABLE ANIMALS, was very helpful in answering requests. Information from the U. S. Department of the Interior was also included where practical.

A summary of the results of the rabies control program was sent to all agents informing them of the progress made against this disease. The number of cases reported in animals has gradually decreased from more than 300 to less than 100. No cases of rabies in humans were reported last year.

COOPERATIVE ECONOMIC INSECT PEST SURVEY PROGRAM

A. P. Morris

The Cooperative Economic Insect Survey Service is sponsored jointly by the United States Department of Agriculture, Agricultural Research Service, Plant Pest Control Division, Survey and Detection Operations; the Virginia Department of Agriculture and Immigration; and the Virginia Polytechnic Institute Agricultural Extension Service.

The Associate Extension Entomologist in charge of this service, A. P. Morris, devoted his full time to the task of gathering information on the many insects of economic importance in the state during 1959 and issued 37 survey reports to disseminate this information to the public, agricultural workers, and government agencies. The information was gathered by personal surveys of the insects on the various crops in the fields, by visits to extension and professional workers at their stations in the state, and from information and insect specimens sent to the Extension and Experiment Station entomologists of V. P. I.

Five objectives of the service are given in the original agreement. These objectives are: "(1) Assist farmers and others to more adequately protect their crops from insect attack (2) Assure more prompt detection of newly introduced insect pests (3) Lead to the development of a workable insect pest forecasting service (4) Aid manufacturers and suppliers of insecticides and control equipment to determine areas of urgent need and (5) in case of

necessity provide a country-wide skeleton structure to be expanded as needed, to combat any attempt at biological warfare."

The first, second, fourth, and fifth objectives listed above were accomplished by sending copies of survey reports to agricultural workers throughout the state, to industrial representatives at their request, and to governmental agencies. Personnel from these same agencies and the general public were urged to send in specimens of insects that they were not familiar with and information concerning insect activity that they observed. Information from the survey reports was used in a national USDA report that is issued weekly and in that way was available to agricultural workers and industrial representatives directly concerned who requested copies of the national report. Professional entomologists of all agencies and county extension personnel are the backbone of the reporting service to the survey entomologist. They are constantly invited and urged to send reports on insect activity to the clearing house, office of the extension entomologists, for the state and the response has been very good. Vocational agriculture teachers receive copies of the report and participate in the reporting service. Also, 42 news articles were prepared from survey reports and 15 tape recordings for radio broadcasts were made. An Associated Press representative and some industrial news letters sometimes used the information for news releases.

The third objective, "lead to the development of a workable insect pest forecasting service," was accomplished for some insects.

A few of the insects of economic importance that successful forecasts were made about by the survey entomologists are alfalfa weevils, pea aphids, corn earworms, armyworms, and fall armyworms, clover mites, boxelder bugs, clover leaf weevils, elm leaf beetles, and bagworms. Predictions by some of the V.P.I. Experiment Station entomologists and used in the reports were also accurate.

The survey entomologist spent a total of 232½ working days performing his field and office duties. In the performance of his field duties, he drove a total of 24,776 miles, made 207 distinctly different county visits, and spent a total of 110 days in the field. He spent 122½ days in the office making approximately 1500 insect identifications, preparing 141 different vials of insect specimens, with collection data included, for shipment to USDA and National Museum specialists for determinations, and writing 469 individual letters concerning identifications and determinations. These office duties also include the periodical reports and tape recordings for radio broadcasts previously mentioned.

It is impossible to determine with any degree of accuracy the actual amount of time spent on each group of insects in the groupings used in this report. However, the groupings can be listed in the relative order of importance from the standpoint of time estimated to have been devoted to them. This order for time spent in the field is as follows:

1. Cereal and Forage Crop Insects
2. Forest, Ornamental and Shade Tree Insects
3. Insects Affecting Man and Animals

4. Household Insects
5. Cotton Insects
6. Tobacco Insects
7. Truck Crop and Garden Insects
8. Structural Wood Insects
9. Fruit Insects
10. Stored Food Products Insects

This order for time spent in the office is as follows:

1. Cereal and Forage Crop Insects
2. Household Insects
3. Forest, Ornamental and Shade Tree Insects
4. Structural Wood Insects
5. Insects Affecting Man and Animals
6. Stored Food Products Insects
7. Truck Crop and Garden Insects
8. Fruit Insects
9. Tobacco Insects
10. Cotton Insects

A brief analysis, called Highlights of Insect Conditions In Virginia - 1959, and a general Summary of Insect Conditions - 1959, Virginia, follow.

HIGHLIGHTS OF INSECT CONDITIONS IN VIRGINIA - 1959

Corn earworms (Heliothis zea) heavily damaged soybeans, field and sweet corn, sorghum, cotton bolls, tomatoes, and peppers; and caused medium to light damage to peanuts, snap and lima beans, and tobacco. They were heavier than they have been in the past 5 years and were especially a problem in soybeans in from 25 to 35 counties in eastern and southeastern Virginia. Damage was also very heavy to cotton bolls late in the season and, in some fields, as high as 35% of the bolls were penetrated and probably ruined before maturity. The damage to field and sweet corn, peanuts, sorghum, peppers, and tomatoes was somewhat higher than usual for a growing season, and approximately normal to snap and lima beans and tobacco.

Alfalfa weevils (Hypera postica) were heavy and controls had to be applied against them in most counties of the state. Counties not known to be infested to date are Scott, Lee, Wise, Dickenson, and Buchanan; however, there is little doubt that Scott, Lee, and Wise are infested. Light infestations only were found in Bland, Tazewell, and Russell Counties and infestations heavy enough to justify controls were spotted in Smyth and Washington Counties.

Armyworms (Pseudaletia unipuncta) heavily damaged pastures, small grains, field corn, millet, cane, sorghum, and cover crops. Counties in which one or more of these crops were damaged are Highland, Northampton, Princess Anne, Montgomery, King William, Caroline, Charlotte, Accomack, and Brunswick. This species was also present on soybeans along with corn

earworms but were of minor importance as they were far outnumbered by the earworms. There was a spring outbreak and a late summer or fall outbreak.

Fall armyworm (Laphygma frugiperda) outbreaks occurred in corn, sudan and pearl millet, grain sorghum, pastures, and alfalfa. This species was also present but not a problem on cole crops in eastern and southeastern Virginia and on soybeans. Counties which had outbreaks in one or more of these crops were Loudoun, Fairfax, Lunenburg, Brunswick, Spotsylvania, Pittsylvania, Sussex, Northumberland, and Albemarle.

European corn borer (Pyrausta nubilalis) infestations were heavy and generally scattered over the state in various crops. The most heavily damaged crops were field and sweet corn, Irish potatoes, peppers and wheat. Chrysanthemums and mums were damaged to a minor extent at 3 or 4 locations in the state. An abundance survey in 2 districts of the state revealed that infestations in field corn were not as heavy as during 1958.

Southern corn rootworms (Diabrotica undecimpunctata howardi) caused considerable loss in yield of peanuts in one area where controls failed.

Meadow spittlebugs were heavy on clover, alfalfa, and pasture crops in scattered areas of the state. Southwestern Virginia counties were more heavily and generally infested than other parts of the state.

Other insects of importance to cereal and forage crops were pea aphids (Macrosiphum pisi), various species of cutworms, potato leafhoppers (Empoasca fabae), and green June beetles (Cotinis nitida).

Virginia pine sawfly larvae (Neodiprion patti-pratti) heavily defoliated Virginia, short leaf, and in a few instances loblolly and longleaf pine trees over a large area of the state. The heavily infested area extended from Henry County on the west to Southampton County on the east in the southern part of the state, was bordered on the north by the Blue Ridge Mountains from Bedford County to Fauquier and Prince William Counties, and bordered on the east by a line running from Prince William County to Gloucester and to Greensville Counties. Red-headed pine sawfly larvae (N. lecontei) and another species (probably N. taedae) were active on pines in widely separated spots of the state during the summer, primarily in the northern, eastern, and southeastern counties.

Turpentine beetles (Dendroctonus terebrans and/or D. valens) killed pine forest and shade trees in several widely scattered localities of Virginia during 1959 and infestations were recorded in additional trees. Infestations were apparently more frequent in central, south-central, and southwestern Virginia.

Ips bark beetles (primarily Ips calligraphus and/or I. grandicollis) damaged or killed occasional individual and small groups of pine forest and shade trees in scattered areas. Counties in which infestations of varying intensity and size were reported are Culpeper, Halifax, Mecklenburg, Richmond, Rappahannock, Fluvanna, Buckingham, Chesterfield, Nelson, Albemarle, Dinwiddie, Henrico, Accomack, Northampton, Westmoreland, King and Queen, Brunswick, Sussex, Prince George, Fairfax, Nansemond, Louisa, Orange, Greene, Spotsylvania, Stafford, Fauquier, Prince William, Loudoun, Greensville, Southampton, Surry, Gloucester, Mathews, Middlesex, Lancaster,

Northumberland, and King George.

White pine weevil (Pissodes strobi) damage to the terminals of white pine seedlings and young pines was heavier than usual in southwestern and Piedmont areas but heaviest in the southwest. Many overwintered adults were out of hibernation by May 1, and the new generation of adults were emerging by the middle of July.

Pine tip moth (Rhyacionia frustrana) infestations were active and widespread in the eastern and northern parts of the state. Loblolly pine was the main species affected but some instances of damage to shortleaf, slash, mugo, red, and Austrian pines were recorded.

Southern pine beetle (Dendroctonus frontalis) damage was generally light to loblolly and Virginia Pines. Reports of minor damage were received from Pittsylvania, Nansemond, Northampton, Gloucester, and Accomack Counties.

Approximately nine species of aphids attacked host ornamental plants and forest and shade trees. The more prevalent were woolly alder aphids (Prociphilus tessellatus), pine bark aphids (Pineus strobi), white pine aphids (Cinara strobi), rose aphids (Macrosiphum rosae), and an unidentified species which was detrimental to the normal development of crepe myrtle in many areas of the state.

Approximately 40-45 species of scale insects were reported on ornamental plants and forest and shade trees. The more important species were juniper scale (Diaspis carueli), euonymus scale (Unaspis euonymi), San Jose scale (Aspidiotus perniciosus), wax scale (Ceroplastes ceriferus and/or C. floridiensis), camellia scale (Lepidosaphes camelliae), white

peach scale (Pseudaulacaspis pentagona) oyster shell scale (Lepidosaphes ulmi), tuliptree scale (Toumeyella liriodendri), obsure scale (Chrysomphalus obscurus), tea scale (Fiorinia theae), Florida red scale (Chrysomphalus aonidum), peony scale (Pseudaonidia paeoniae), and Newstead's scale (Lepidosaphes newsteadi).

Species of spider mites of primary importance on ornamental plants and of secondary importance on trees were red spider mite (Tetranychus sp.), southern red mite (Paratetranychus ilicis), bulb mites (Rhizoglyphus sp.), and hemlock russet mite (Nalepella tsugifoliae).

Japanese beetles (Popillia japonica) were a problem on various ornamental plants, flowers, and shade and forest trees in infested areas of the state. This species also damaged host crops in many home gardens in the state and were of minor importance on corn, soybeans, and peanuts in a few areas. Additional infestations were found in one area each in Wise and Floyd Counties. Other insects of importance to forest and shade trees and ornamental plants were bagworms (Thyridopteryx ephemeraeformis) on many species of evergreens and mimosa webworms (Homadaula albizziae) on mimosa and honey locust trees. Both of these are state wide in distribution.

Cabbage loopers (Trichoplusia ni) damaged cabbage, tomatoes, broccoli, salad, kale, collards, peppers, and cucumbers in the truck cropping areas of the state but were not as much of a problem as in 1958. They were also present on soybeans, but not a problem on the crop. Again, a polyhedral virus disease reduced populations to a large extent during September and for the balance of the season. Diamondback moth larvae (Plutella maculipennis), imported cabbage worms (Pieris rapae), yellow-

striped armyworms (Prodenia ornithogalli), and garden webworms (Loxostege similalis) were also present on these crops, but their damage was not as extensive as that of the cabbage loopers.

Potato tuberworms caused quite a bit of damage to fall Irish potatoes in Accomack and Northampton Counties.

Mexican bean beetles (Epilachna varivestis) caused varying degrees of damage to bean crops but were not a serious problem as controls were effectively applied against them.

Colorado potato beetles (Leptinotarsa decemlineata) were a minor problem on Irish potatoes and tomatoes, and bean leaf beetles (Cerotoma trifurcata) caused minor concern to growers of snap and lima beans.

Flea beetles, species undetermined, were a major problem, in many instances, on mustard, turnip greens, collards, cabbage, brussell sprouts, corn, beans, Irish potatoes, tomatoes, and cucumbers.

Aphids of importance were green peach aphids (Myzus persicae) on spinach and lettuce; cabbage aphids (Brevicoryne brassicae) on cabbage, kale, and collards; potato aphids (Macrosiphum solanifolii) on potatoes, and tomatoes; turnip aphids (Rhopalosiphum pseudobrassicae) on turnip greens and mustard; and pea aphids (Macrosiphum pisi) on peas.

Variegated cutworms (Peridroma margaritosa), black cutworms (Agrotis ypsilon), cutworms (Feltia sp.), and unidentified species damaged cabbage, peppers, cucumbers, cantaloupes, tomatoes, sweetpotatoes, kale, and collards in many parts of the state.

Spider mites (primarily Tetranychus sp.) were pests of truck crops and home gardens, especially on cabbage, snap and lima beans, and tomatoes.

Serpentine leafminers (probably Liriomyza pusilla), potato leafhoppers (Empoasca fabae), and greenhouse whiteflies (Trialeurodes vaporariorum) were also problems on truck crops and garden crops in some areas.

In apple orchards, red-banded leaf rollers (Argyrotaenia velutina), codling moths (Carpocapsa pomonella), rosy apple aphids (Anuraphis roseus), spider mites, and aphids were not a problem due to good spray schedules and favorable weather. Plum curculios (Conotrachelus nenuphar), lesser peach tree borers (Synanthedon pictipes), and catfacing insects were a problem in a 20 acre peach orchard in southeastern Virginia. Strawberry weevils (Anthonomus signatus), strawberry leafrollers (Ancylis comptana fragariae), spider mites (probably Tetranychus atlanticus), and stalk borers (Papaipema nebris) were quite a problem in strawberries in southeastern Virginia and in the Eastern Shore Counties.

Boll weevils (Anthonomus grandis) and bollworms (Heliothis sp.) became a serious problem in cotton during late July and August and reduced yields to a varying extent.

Hornworms (Protoparce sp.), tobacco flea beetles (Epitrix hirtipennis), green peach aphids (Myzus persicae), and wireworms were the major pests of tobacco crops this year but properly timed and adequate sprays prevented heavy damage by any of them, except in a few isolated instances.

Rice weevils (Sitophilus oryza), black carpet beetles (Attagenus piceus), Angoumois grain moths (Sitotroga cerealella), and saw-toothed grain beetles (Oryzaephilus surinamensis) were the most troublesome insect pests reported in stored grain and cereal products; and larder beetles

(Dermestes lardarius) and red-legged ham beetles (Necrobia rufipes) were the most troublesome insect pests of stored meat.

Termites and powder-post beetles were the most destructive of the structural wood insects. Various species of powder-post beetles caused damage to wooden structures, but the old-house borer (Hylotrupes bajulus) was the most important one species.

Four species of cockroaches, various species of ants, Dermestid beetle larvae, clover mites (Bryobia praetiosa), boxelder bugs (Leptocoris trivittatus), and elm leaf beetles (Galerucella xanthomelaena) were the major household insect pests during 1959, and reports of their presence creating problems in homes were received from all parts of the state.

Common cattle grubs (Hypoderma lineatum) and northern cattle grubs (H. bovis) are both present in the state and their range overlaps to a certain extent. The common cattle grub is present in all parts of the state but is not as prevalent in the northern and southwestern counties (mountainous areas) as it is in the rest of the state. The northern cattle grub is prevalent in the northern and southwestern counties but is present in reduced numbers in other parts of the state.

Sheep scab mites are prevalent and common in sheep wherever they are raised in the state and many flocks have to be treated every year. Infested animals are treated under the supervision of personnel from the office of the State Veterinarian.

Ticks of various species, fleas, house flies, cattle lice, mosquitoes, horn flies, horse flies, and stable flies are all of importance every year and state-wide in distribution.

Face flies (*Musca autumnalis*) known to be present in Loudoun and Bath Counties and are probably in most parts of the state.

SUMMARY OF INSECT CONDITIONS - 1959

Cereal and Forage Crop Insects:

Corn earworms (Heliothis zea) heavily damaged soybeans, field corn and sorghum and caused medium to light damage to peanuts and alfalfa during 1959. Damage to soybeans was extensive in eastern Virginia and most fields were sprayed to control them in approximately 23 counties. They were heavy and controls applied in parts of nine additional counties. Damage to field corn by this species was state wide and most ears were damaged to some extent. Infestations were heavy on peanuts in some fields in approximately four counties and sorghum crops in southeastern Virginia were heavily infested while the seeds were in the late dough stage. Larvae were first observed during the first half of May and the general outbreak in soybeans, sorghum, and peanuts occurred in late August. Outbreaks began tapering off in soybeans about the middle of September but continued on a reduced scale until the crop was unsuitable for larval feeding.

Alfalfa weevils (Hypera postica) were heavy and controls had to be applied against them in most counties of the state. Counties not known to be infested to date are Scott, Lee, Wise, Dickenson and Buchanan, however, there is little doubt but that Scott, Lee, and Wise are infested. Light infestations only were found in Bland, Tazewell, and Russell Counties. Infestations heavy enough to justify controls were spotted in Smyth and

Washington Counties. Larval activity was first noted during the first week of March, spraying was begun in some counties during early April, and damage to untreated fields was heavy and widespread by the middle of April. Second brood larvae were observed in the western end of the Shenandoah Valley on May 23, and some 2nd growth alfalfa was damaged in Buckingham and Botetourt Counties during the first part of June. There were scattered instances of alfalfa weevil damage to ladino clover in the state. Light larval populations were observed in Norfolk, Rappahannock, Loudoun, and Fauquier Counties during July and August.

Armyworms (Pseudaletia unipuncta) heavily damaged pasture, small grains, corn, millet, and sorghum in widely scattered areas of the state. Moths were first observed early in April and small larvae were present in small grain fields approximately a month later. During the middle and last part of May large acerages of pastures were damaged in Highland County and small grains, corn, and alfalfa were damaged in Northampton, Princess Anne, Montgomery, and King William Counties. A second outbreak occurred is some areas in late August and early September. During this second outbreak millet was damaged in Caroline County, rye and cane in Charlotte County, cover crops in Accomack County and Northampton County, and hay and silage in Brunswick County. An extremely heavy flight of moths occurred on the Eastern Shore on September 6 but no outbreaks were reported for the balance of the season. This species was also present along with the corn earworms in soybeans over a large part of eastern and

southeastern Virginia during late August and September but were of minor importance in relation to the earworm.

Fall armyworm (Laphygma frugiperda) outbreaks occurred in corn, sudan and pearl millet, grain sorghum, pastures, and alfalfa in scattered areas of the state. Outbreaks occurred during the last half of July, all of August, and early part of September. Late corn and ensilage corn were damaged in Loudoun, Pittsylvania, Fairfax, Lunenburg, Brunswick, and Spotsylvania Counties. Sudan and pearl millet was damaged in Pittsylvania County, and grain sorghum in Lunenburg, Sussex, and Brunswick Counties. Some grass and pasture crops were attacked in Brunswick and Lunenburg Counties. The species was also present along with corn earworms and green cloverworms in soybeans in eastern and southeastern Virginia. They were secondary in importance to the earworms, however, except in one reported case in Northumberland County where the population became medium after the earworms had been controlled. They were also present along with black cutworms and clover nomophilas in alfalfa in Albemarle County.

European corn borer (Pyrausta Nubilalis) infestations were heavy and general, as usual, during 1959. Eggs began hatching about May 12 and reports of damages to corn were received from late May into November. An abundance survey was made in 10 counties in the southwestern part of the state and in 10 counties in the northern part of the state during the fall. The average number of borers per 100 plants for the 2 areas was 182 compared with 252 in 1958 and 117 during 1957. Seventy-five percent of the stalks examined were infested compared to

eighty percent in 1958 and sixty-three percent in 1957. This species also damaged wheat to varying degrees in Lancaster, King George, Henrico, and Prince Edward Counties.

Meadow spittlebugs (Philaenus leucophthalmus) were heavy in clover, alfalfa, and pastures in scattered areas of the state. Southwestern Virginia counties were more heavily and generally infested than any other part of the state and controls were needed in many instances. Reports of heavy and severe infestations in counties in other parts of the state were on clover in Pittsylvania, Nelson, Alleghany, Highland, Spotsylvania, and Franklin Counties, on alfalfa in Roanoke, Alleghany, and Highland Counties, on pastures and hay crops in Franklin County, and on oats in an Augusta County field. Infestations were as a rule heavier in clover and hay crops than in alfalfa, believed to be due to controls for alfalfa weevils partically or completely controlling them. Meadow spittlebugs were not observed to be a problem in a single alfalfa field where granulated heptachlor or heptachlor in fertilizer was used but were a problem in some fields where a heptachlor spray was used. Eggs were hatching by March 13 and adults were appearing by May 16, 1959.

Pea aphids (Macrosiphum pisi) were heavy on alfalfa in many widely scattered fields during the spring of 1959 and controls were frequently justified. However, generally speaking, they were medium or light. Counties where occasional heavy populations were reported are Franklin, Pittsylvania, Halifax, Henry, Campbell, Goochland, Powhatan, and Amelia. Predators and a fungus disease began to reduce population about the first of May and pea aphids were not a problem after this date.

Cutworms of various species damaged alfalfa, clover, rye, and corn to a varying degree during the year. Black cutworms (Agrotis ypsilon) heavily damaged alfalfa in some fields in Franklin, Hanover, Albemarle, Shenandoah, and Pittsylvania Counties and rye in Accomack and Southampton Counties during September. They were usually associated with corn earworms, clover nomophilas, or yellow-striped armyworms in these infestations and were the primary species damaging the crop. Variegated cutworms (Peridroma margaritosa) were present in an alfalfa field in Henrico County during May and another species (Feltia gladiaria) damaged corn in a Loudoun County field during July.

Southern corn rootworms (Diabrotica undecimpunctata howardi) caused considerable loss in yield of peanuts in one area of southeastern Virginia where controls failed. Some peanut crops were not considered worth digging in the Cypress Chapel area and occasional other fields in the southern part of Nasemond County. The adults were first observed out of hibernation about April 25.

Potato leafhoppers (Empoasca fabae) were the heaviest on peanuts that they have been in 3 years and it took persistent control measures to control them on this crop. Populations built up fast on the crop during the first half of July and persisted until the latter part of August. Expected difficulty with them on alfalfa did not develop into a problem during 1959. Potato leafhopper were observed to be heavy on soybeans in Nansemond County in early August but are not generally considered a problem on this crop.

Japanese beetles (Popillia japonica) were a minor problem on corn, soybeans, and peanuts in a few areas during the year. In Nansemond and Southampton Counties their ragging of the foliage of peanuts in some fields caused farmers to apply controls. Areas where new infestations were reported for the first time were Appalachia in Wise County and in the Gretna and Sandy Level areas of Pittsylvania County. In a field in Fairfax County where the corn plants would pull up too easily to harvest correctly, an investigation revealed an average of 9 larvae per square foot under the plants.

Green June beetles (Cotinis nitida) were not a serious problem in forage or hay crops in 1959. Emergence in southeastern Virginia counties occurred near the end of June. Heavy damage to a pasture in Lee County and another pasture in Patrick County were reported. Another white grub (Phyllophaga hirticula) was responsible for the death of large spots of blue grass in a Clarke County pasture.

Spotted alfalfa aphids (Therioaphis maculata) were generally light and no problem in 1959, however, one severe infestation was reported in Amherst County and an occasional heavy infestation in Scott and Franklin Counties. This species is believed, locally, to overwinter in Virginia. Specimens were collected in Franklin and Pittsylvania Counties on December 12 and 18, 1958, in Halifax County on January 27, 1959, and were present at the rate of 30 per 100 sweeps in Patrick County prior to April 10, 1959. April 10 is too early for infestations to move into the state from the south or west.

Green cloverworms (Plathypena scabra) and bean leaf beetles (Cerotoma trifurcata) varied from light to heavy on soybeans in eastern and southeastern Virginia. However, neither of these species are generally considered of sufficient importance to justify their control on soybeans unless additional and more harmful species are also present. A fungus disease began killing many of the green cloverworms about the first of September. Green cloverworms were also generally distributed on Alfalfa and clover crops in the state but, again, controls are not generally recommended.

Velvet bean caterpillars (Anticarsia gemmatilis) were present but very light on soybeans in eastern and southeastern Virginia by early September. Moth flights were reported August 31, September 1, and October 10, 1959 but only one heavy infestation was reported in very late soybeans in a Middlesex County field. Control measures on a large scale for corn earworms and/or the lateness of moth flights into the state prevented this species from becoming a problem.

Yellow-striped armyworms (Prodenia ornithogalli) and salt-marsh caterpillars (Estigmene acrea), along with corn earworms, velvetbean caterpillars, green cloverworms, armyworms, fall armyworms, cabbage loopers, and bean leaf beetles, were present in soybean crops in eastern and southeastern Virginia. However, these 2 species were very light and controls applied against the corn earworms controlled them.

Southern cornstalk borers (Diatraea crambidoides) were a problem in several corn fields in Sussex County, and in one field in each of

Appomattox and Pittsylvania Counties. This species was probably confused with European corn borers by some county agents and was no doubt frequently present along with European corn borers in many fields.

Clover nomophila larvae (Nomophila noctuella), along with cutworms and fall armyworms, damaged some fields of alfalfa in Albemarle and Shenandoah Counties. This species is more generally present in Virginia than usually suspected and may be responsible for some of the damage that is frequently blamed on other species of webworms.

Clover leaf weevil larvae (Hypera punctata) began hatching in clover and alfalfa fields during the first half of March and were subsequently present in fields in all parts of the state. They were not a problem sufficient to justify controls in instances, however. Controls for alfalfa weevil larvae controlled them in most alfalfa fields in the state.

Corn root webworms (Crambus caliginosellus) caused the loss of thirty-five percent of the stand of corn in an Augusta County field during June and were light in corn in Pittsylvania County.

Flea beetles, species unidentified, were heavy on corn seedlings in King George and Smyth Counties during late May and retarded the growth of the corn plants. Flea beetles (presumably Chaetocnema pulicaria) were heavy in spots on young corn in the Steeles Tavern area of Rockbridge and Augusta Counties and persisted until early July. Two unidentified specimes damaged newely emerged corn plants in Nansemond County during May.

Corn leaf aphids (Rhopalosiphum maidis) became heavy on corn in a Bedford County field in early July and became abundant on corn and sorghum plants in several parts of the state during early August. Aphids, species undetermined, became very heavy and caused orchard grass to turn brown in spots in a Buckingham County field about the middle of April.

Spider mites, species undetermined, were heavy on crimson clover in a Roanoke County field, on clover in an Appomattox County field, and on red clover in an Albemarle County field. Red spiders were heavy most of the summer on some soybean crops on the Eastern Shore of Virginia.

Thrips, species undetermined, were heavy on peanuts in southeastern Virginia until the middle of the summer and were generally heavy on young corn in a field in Madison County. Grass thrips (Anaphothrips obscurus), corn thrips (Frankliniella tenuicornis), grain thrips (Limothrips cerealium), and thrips (Plesiothrips probably perplexus) heavily damaged corn in the Steeles Tavern area of Rockbridge and Augusta Counties. Grass thrips, corn thrips, and tobacco thrips (F. fusca) damaged corn in Caroline County during June.

Hessian fly larvae (Phytophaga destructor) were heavy in threshed wheat and chaff in a Bedford County field on July 1, 1959.

Wheat stem sawfly larvae (Cephus pygmaeus) caused an eight percent loss in wheat in a field in Westmoreland County and heavily damaged a field in Pittsylvania County.

Sweetclover weevils (Sitona cylindricollis), weevils (Gymnaetron pascuorum) and sweetclover aphids (Myzocallidium richmi) were collected

from a field of alfalfa, sweetclover, and red clover in the Newport News area.

Angoumois grain moth larvae (Sitotroga cerealella) were present in approximately fifty percent of the ears of corn in field plots in Nansemond County during early October.

Wheat jointworm (Harmolita tritici) damage to wheat was light to heavy in spots in King and Queen County.

Clover mites (Bryobia praetiosa) damaged red clover in a field in Albemarle County and in a field in Cumberland County.

Clover seed chalcid larvae (Bruchophagus gibbus) damaged developing embryos of red clover in a Prince Edward County field.

Seed-corn maggots (Hylemya cilicrura) destroyed a considerable acerage of corn on a Stafford County farm.

Corn root aphids (Anuraphis maidi-radicis) were light on the roots of corn in a Stafford County field.

Clover root curculio larvae (Sitona hispidula) damaged the roots of alfalfa in a Botetourt County and a Pulaski County field causing some of the plants to die.

Meadow plant bug nymphs (Leptopterna dolabralus) were extremely heavy in a field of fescue and orchard grass mixture in an Albemarle County field during early May.

Lesser clover leaf weevil adults (Hypera nigrirostris) were heavy in an Essex County clover field during April.

Wireworms (probably Melanotus communis) were heavy in a field of sorghum in Isle of Wight County during July.

Yellow-collared scape moth larvae (Cisseps fulvicollis) were present in a Henrico County alfalfa field on November 20, along with corn earworms and velvetbean caterpillars.

Silver-spotted skipper larvae (Proteides clarus) were light but feeding upon soybean leaves in a Chesterfield County field during September.

Leaf rollers (Tortrix pallorana) were present on alfalfa in a Page County field during August.

A looper (Trichoplusia oxygramma) was light on soybeans in an Amelia County field in early September.

Forest, Ornamental, and Shade Tree Insects: (Partially from Virginia Department of Agriculture and Virginia Division Forestry Reports)

Virginia pine sawfly larvae (Neodiprion pratti-pratti) heavily defoliated Virginia, shortleaf, and, in some instances, loblolly and longleaf pine trees over a large area of the state during April and May. The heavily infested area extended from Henry County on the west to Southampton County on the east in the southern part of the state, was bordered on the north by the Blue Ridge Parkway and Skyline Drive from Bedford County to Fauquier and Prince William County, and bordered on the east by a line running from Prince William County to Gloucester County to Greensville County. There were two spots of severe infestation inside of this area. A southern area included most of Halifax and Mecklenburg Counties and approximately one third of Brunswick County. The other area included Cumberland and Louisa Counties and parts of Buckingham, Fluvanna, Spotsylvania, Goochland, Powhatan, and Prince Edward Counties. No instances were reported of trees being killed by the defoliation. Eggs began to hatch around the first of April, pupation occurred about the middle to last of May and adults emerged and began egg laying during October. The infestation is expected to be about as heavy again in 1960 and was almost as heavy in 1958. A species of pine sawfly larvae (probably N. Taedae) were active on pines in 10 separate areas of Accomack County, one small area of Greene County, and two small areas of Richmond County during June and July. Red-headed pine sawfly larvae (N. lecontei) defoliated a few loblolly pine seedlings in Spotsylvania and Isle of Wight Counties during August, were present

on pines in scattered areas of Prince George, Surry, Southampton, Sussex, Greensville, Brunswick, Dinwiddie, and Rappahannock Counties during September, and on scattered loblolly pines in Prince George, Sussex, Charlotte, and Accomack Counties during October.

Turpentine beetles (Dendroctonus terebrans and D. valens) killed pine forest and shade trees in several widely scattered localities of Virginia during 1939 and infestations were recorded in additional trees. Most reports of deaths or infestations were to small numbers of trees or to single trees. The largest spots of active infestations were on a 10 acre area in Cumberland County, and 4 acre areas in Chesterfield, Pittsylvania, and Fluvanna Counties. Infestations were apparently less in northern, eastern and southwestern Virginia and more frequent in central, south-central and southeastern Virginia. Ips beetles were frequently present in some cases as well as turpentine beetles. Adults were emerging in Bath County on April 26 and larvae and adults were present in trees in Mecklenburg County on September 1, 1939. Species of trees killed or damaged were loblolly, shortleaf, white, and Virginia pines.

Ips bark beetles (primarily Ips calligraphus and I. grandicollis) damaged or killed occasional individual and small groups of pine forest and shade trees in scattered areas. The largest active infestations reported were in 3 acres in Culpeper County, 4 acres - mixed with turpentine beetles - in Halifax and Mecklenburg Counties, and a 1/4 acre tract in Richmond County. Counties in which infestations and death of trees due to Ips beetles were reported are Rappahannock, Fluvanna,

Buckingham, Chesterfield, Nelson, Albemarle, Dinwiddie, Henrico, Accomack, Northampton, Westmoreland, Richmond, King and Queen, Brunswick, Sussex, Prince George, Fairfax, Nansemond, Louisa, Orange, Greene, Spotsylvania, Stafford, Fauquier, Prince William, Loudoun, Greensville, Southampton, Surry, Gloucester, Mathews, Middlesex, Lancaster, Northumberland, and King George. Turpentine beetles were frequently present in some cases as well as ips beetles, and southern pine beetles were present in one infestation. Species most frequently infested were loblolly, shortleaf, white, Virginia, and red pines. One incidence of heavy ips beetle damage to a hemlock tree in Augusta County was reported.

White pine weevils (Pissodes strobi) damage to the terminals of white pine seedlings and young pines was heavier than usual in the southwestern part of the state. Damage also appeared much more prevalent than usual this year in ornamental plantings in the Piedmont area, but infestations were not as heavy as in the southwestern counties. Adults were observed coming out of hibernation in Patrick County about April 27 and late pupae and a few newly emerged adults were present in Grayson County by the middle of July. Infestations were reported in Pulaski, Montgomery, Roanoke, Floyd, Grayson, Giles, Carroll, and Patrick Counties in the western part of the state, and in Madison, Albemarle, Cumberland, Alleghany, Botetourt, Rockbridge, and Augusta Counties in other parts of the state. The terminal branches of 4 spruce shrubs were killed in Alleghany County.

Pine tip moth (Rhyacionia frustrana) infestations were active and widespread in the eastern and northern part of the state. Loblolly pine was the main species affected but some instances of damage to shortleaf,

slash, mugo, red, and Austrian pine were recorded. In Accomack and Northampton Counties, from 60% to 90% of the loblolly pine plantations were infested and from 20% to 80% of the trees affected in some of the plantation. Fifty percent of the trees in a Brunswick County plantation was infested, they were active in 30 acres of pines in Hanover County, and a 2 acre plantation in Bedford County was damaged. In Surry County 84% of the trees in a 2 acre area were infested and they damaged 90% of the terminal twigs of a planting in Alleghany County. Light infestations were reported in Albemarle, Prince William and Spotsylvania Counties. Infestations increased in the coastal area of southeastern Virginia. Adults were emerging on April 27 and first generation eggs hatching by May 1 in New Kent County. Pitch twig moth larvae (Petrova comstockiana) was reported active in pitch pine at one point along the upper end of the Blueridge Parkway.

Southern pine beetle (Dendroctonus frontalis) damage was generally light to loblolly and Virginia pines in the state during 1959. Reports received were killing all pines on 1/10 acre in Pittsylvania County, killing 10 trees in a single report in Nansemond County, suspected of being involved in the death of 15 trees in a spot in Northampton County, killing 5 pines in one part of Gloucester County, and killing pines in 2 areas of 3 trees to 1/2 acre in Accomack County. Adults were present in Nansemond County on September 1.

Several species of scale insects were of importance on forest, shade trees, ornamental and/or nursery plants during 1959. Infestations were usually scattered and affected individual or small groups of plants.

Juniper scale (Diaspis carueli) was present on many species of juniper and American arborvitae plants scattered over the state. Euonymus scale (Unaspis euonymi) was prevalent on euonymus plants, wahoo trees, bittersweet, and pachysandra in all parts of the state. San Jose scale (Aspidiotus perniciosus) attacked apple, peach, pear, plum, nectarine, cherry, pyracantha, cotoneaster, skip laurel, photinia, flowering quince, lilac, golden rain tree, mountain ash, and maples and is state wide in distribution. Wax scale (Ceroplastes ceriferus and/or C. floridiensis) infested Chinese, burford, yaupon, and English holly, camellia, boxwood, gardenia, euonymus microphylla, hemlock, japonica, and ivy and seems to be largely confined to southeastern Virginia. Camellia scale (Lepidosaphes camelliae) is largely confined to southeastern Virginia on camellia and burford holly. White peach scale (Pseudaulacaspis pentagona) was state wide on distribution on plum, peach, English laurel, skip laurel, osmorea, lilacs, catalpa, weeping willow, philodendron, elm, golden rain, ash, walnut, white mulberry, and probably potentilla. Oyster-shell scale (Lepidosaphes ulmi) was state wide on some boxwood, lilac, ash, cottonwood, weeping willow, bush honeysuckle, lombardy poplar, pachysandra, maple, and thornless honey locust. Tuliptree scale (Toumeyella liriodendri) infested deciduous magnolia, and tulip poplar. Obscure scale (Chrysomphalus obscurus) infested pin, willow, water, live, red, and white oaks, and weeping cherry. Tea scale (Fiorinia theae) was largely confined to Chinese and burford hollies and camellias in southeast Virginia. Florida red scale (Chrysomphalus aonidum) present on burford holly, Jananese microphylla holly, ivy, and diefferbachia in southeast Virginia. Peony scale (Pseudaonidia paeoniae) was present on

camellias and peonies scattered over the state but much less prevalent than the species that are state wide and listed above. Newsteads scale (Lepidosaphes newsteadi) was present on various species of juniper in the state to some extent. Gloomy scale (Chrysomphalus tenebricosus) infested red and silver maples and honey locust. Peach lecanium scale (Lecanium persicae) infested julianae, candidula, and Japanese barberries. Pine needle scale (Phenacaspis pinifoliae) was present on white, scotch, Austrian, and mugho pines and hemlocks in some areas. Rhododendron scale (Aspidiotus pseudospinosus) was present on Chinese, burford, and Japanese convexa hollies, and pachysandra in a few areas. English walnut scale (Aspidiotus juglans-regiae) attacked varieties of Japanese holly. Soft scale (Coccus hesperidum) infested camellia, burford holly, Japanese holly varieties, and ivy. Azalea bark scale (Eriococcus azaleae) was present on azaleas to a small extent. European elm scale (Gossyparia spuria) infested American and cork elm. Magnolia scale (Neolecanium cornuparvum) infested deciduous magnolia plants and in turn were fed upon to a limited extent by Laetilia coccidivora caterpillars. The scale (Lepidosaphes yanagicola) was found on Euonymus alatus. Scurfy scale (Chionaspis furfura) present to a limited extent on apple, hawthorn, and American elm. Pine tortoise scale (probably Toumeyella pini) present to a limited extent on Virginia, loblolly, and mugho pine. Scale (probably Aspidiotus lataniae) found to a limited extent on American holly while another species (Aspidiotus abietis) was present on pines in one instance, and another (Aspidiotus sp.) was reported on white birch. Kermes scale (Kermes sp.) was recorded on pin oak and willow oak in 3 instances. Fletcher scale

(Lecanium fletcheri) was reported on arborvitae and Japanese yew. European fruit lecanium scale (Lecanium corni) was light on pyracantha and yew. Other scales recorded on host plants were pit-making oak scale (Asterolecanium quercicola), Japanese fiorinia scale (Fiorinia japonica), hypericum scale (Aonidomytilus hyperici), elm scurfy scale (Chionaspis americana), Camellia parlatoria scale (Parlatoria camelliae), a cottony scale (probably Pulvinaria innumerabilis), a black gum scale (probably Phenacaspis nyssae), and Matucoccus sp..

Aphids of various species attack trees and ornamental plants every year but are rarely blamed for the death of host trees. One of these, the woolly alder aphid (Prociphilus tessellatus), was extremely heavy and widespread during 1959. It was reported on host maple trees in Culpeper, Spotsylvania, Craig, Bedford, Northampton, Prince Edward, Sussex, Amelia, Lunenburg, Fairfax, Campbell, Franklin, Augusta, Montgomery, Roanoke, and all the southwestern Counties, to mention on a few of them. Another species common on pine trees, the pine bark aphid (Pineus strobi), is believed responsible for the death of 14 foot tall eastern white pine in Montgomery County and for the decline of 10 white pines in a 2 acre stand in Prince Edward County. However, as a rule, heavy infestations of pine bark aphids were reported on single trees in scattered localities. Counties where infestations were reported are Rockingham, Alleghany, Wyth, Mecklenburg, Brunswick, Greensville, Southampton, Dinwiddie, Roanoke, Nelson, Campbell, Fauquier, Norfolk, and Lee. White pine aphids (Cinara strobi) were reported as heavy on a white pine tree in Augusta County and were present to a varying extent on scattered single host trees in Roanoke, Madison, Franklin,

Norfolk, and Montgomery Counties. Reports of unidentified woolly aphids being present on individual and occasional widespread beech trees were received from some eastern counties, and on an elm tree in Botetourt County. Rose aphids (Macrosiphum rosae) were heavy on roses in one area of Nansemond County, and a few bushes in Montgomery County. Elm leaf aphids (Myzocallis ulmifolii) were heavy on an elm tree in Princess Anne County. Very large aphids (probably Longistigma caryae) were heavy on a maple tree in Pulaski County and aphids (Periphyllus sp.) infested a maple tree in Montgomery County. An unidentified species was heavy enough on occasional crepe myrtle plants to prevent their blooming in Franklin, Roanoke, and Nottoway Counties. Aphids also damaged the leaves and blooms of snow ball plants in 2 Fluvanna County localities, and were heavy on willows and oaks in part of Cumberland County. Adelges Tsugae species was present on hemlock in one planting. Woolly apple aphid (Eriosoma lanigerum) was present on host plants in scattered areas, and the arborvitae aphid (Cinara tujafilinus) was present on an occasional arborvitae plant.

Spider mite damaged many trees and ornamental plants scattered over the state. The two-spotted, or red spider mite (Tetranychus sp.) is believed to be the main species involved but there were other species involved. Plants and trees infested were maple, hemlock, white, red, mugo and loblolly pine, beech, mulberry, mornine locust, elm, boxwoods, gardenia, holly, chamaecyparis, cryptomeria, arborvitae, phlox, dahlia, chrysanthemum, multiflora rose, cedar, spruce, azalea, juniper, photinia serrulata, cotoneaster, skip laral, pyracantha, aucuba, virburnum, camellia,

Apples, plums, pears, Japanese pieris, honey locust, butterfly, bush, flowering quince, and hydrangea. Southern red mite (Paratetranychus ilicis) infestations were also present on some of these host plants. Bulb mites (Rhizoglyphus sp.) damaged gladiolus bulbs in an Augusta County garden. Hemlock russet mite (Halepella tsugifoliae) were present on a few hemlocks and probably some species of spruce. Oribatula sp. was present on boxwood and unidentified russet mites were present on apple and ligustrum.

Japanese beetles (Popillia japonica) were a problem on forest and shade trees and various ornamental plants in the infested areas of the state. An incomplete list of host plants reported damaged by adults includes swamp willow, sycamore, roses, cherry, linden, peach, grape, azalea, oak and various shrubs and flowers. Larvae heavily damaged lawns and pastures by their feeding upon the roots of grasses. The first adults observed in Norfolk County on May 29.

Bagworms (Thyridopteryx ephemeraeformis) damaged a wide range of host species plants in the state during 1959. Host plants most frequently reported as damaged were arborvitae, juniper, red and deodar cedar, spruce, hemlock, white and loblolly pine, apple, plum, cherry, willow, honey locust, blueberry, juilianae barberry, cotoneaster, box-elder, and skip laurel. The larvae started hatching about June 1 and started pupating around the first of August.

Mimosa webworms (Homadaula albizziae)were heavy on single or small numbers of mimosa trees and honey locust trees scattered throughout the state, and in a few cases caused the death of the host trees. Heavy

infestations were reported on mimosa trees in Montgomery, Campbell, Chesterfield, Roanoke, and Washington Counties, to name a few of them. They killed the foliage of 3 large honey locust trees in Fauquier County and were heavy on honey locust trees in Rockingham County.

Elm leaf beetles (Galerucella xanthomelaena) defoliated or heavily damaged the leaves of elm trees in all parts of the state. Some of the counties in which heavy infestations were reported are Rockingham, Montgomery, Nottoway, Pittsylvania, Prince Edward, Tazewell, Goochland, and Chesterfield. The heaviest damage was almost invariably to Chinese elms.

Green June beetles (Cotinis nitida) damaged lawns to a variable extent but not as many infestations were seen or reported this year as in 1958. One severe infestation was recorded in an urban development area in Prince William County. Heavy infestations were reported in a Lunenburg County lawn, and in several lawns in Richmond.

Eastern tent caterpillar (Malacosoma americanum) infestation were present on black cherry, and apple trees primarily and were more prevalent in northern and southwestern Virginia Counties. Reports were not received from other areas of the state but they were no doubt present to some extent on wild and uncared for host trees.

Fall webworms (Hyphantria cunea) caused extensive defoliation of sourwood and persimmon in Nansemond and Isle of Wight Counties, were heavy on a pecan and apple trees in Nansemond County, and were widespread on elm, birch, and other host species in Fauquier, Loudoun, Clarke, Warren, Shenandoah, and Frederick Counties, causing light defoliation. Some hickories, and walnut trees were infested in the Blueridge mountains. It

is expected to become more prevalent in the state during the next 2 years.

Periodic cicada (Magicicada septendecim) damage to shade and forest trees was heavy in the Williamsburg area of James City County, in the southern part of King and Queen County, the northeastern part of Hanover County, and the southern part of Mecklenburg County. Oak, gum, and maple were the host species mentioned in reports.

Pine spittlebugs (Aphrophora parallela) were light on loblolly, pitch and white pines in New Kent, Smyth, and Grayson Counties. They were also observed on pines in Mecklenburg, Brunswick, Greensville, Southampton, Dinwiddie, and Nottoway Counties. Infestation first observed in early April. Spittlebug (Lepyronia sp.) were observed on scrub oak in mountaineous areas of Shenandoah and Montgomery County, and were heavy on 2 pfitzer junipers in Blacksburg, Virginia.

Pales weevils (Hylobius pales) caused high mortality of loblolly and Virginia pine seedlings on a 50 acre area in Spotsylvania County and damaged seedling pines to an extent in Caroline County during March and April.

Orange-striped oakworms (Anisota senatoria) damaged the leaves of individual white oaks in 3 areas in Rappahannock County, unidentified small oaks in one Cumberland county area, and a black oak in Shenandoah County. Larvae were full grown by September 10.

Various species of leaf miners damaged the foliage of host plants during the year. Boxwood leaf miners (Monarthropalpus buxi) were very heavy in leaves of boxwoods in Lynchburg and Fredericksburg during March, in Page County during late June, and in Brunswick County during early May.

They were medium in Augusta County during late April, and in Nelson County about the middle of May. Adults had emerged by May 28 in Albemarle County, pupae were present in Augusta County by April 25, and larvae, pupae, and adults were present in Brunswick about May 5, 1959. Locust leaf miners (Chalepus dorsalis) were heavy throughout northern Virginia as last year, but conspicuously absent in the greater part of the southwestern counties in contrast to previous years. They were heavy on scattered trees in Tazewell County and apparent throughout the Shenandoah Valley during June and heavy in Augusta County in July. Holly leaf miners (Phytomyza sp.) were heavy in leaves of holly trees in Augusta, and Page Counties and the cities of Roanoke, and Richmond. Pupation and adult emergence occurred during April. Oak leaf miners (Cameraria probably cincinnatiella and hamadryadella) were scattered in white oak leaves in Accomack, Northampton, Isle of Wight, Nansemond, Norfolk, and Princess Anne Counties and in the same host trees in the Shenandoah Valley, in Southampton, Pulaski, Clarke, and Wythe Counties. Arborvitae leaf miners (Argyresthia thuiella) were in the pupal late larval or pupal stage by March 13. Leaf miners (Phytomyza minuscula) were heavy in leaves of a columbine plant in Halifax County during late May, and an unidentified species leaf miner is believed to have been responsible for the defoliation of an elm tree in Russell County. Pine needle miners (probably Exoteleia pinifoliella) were heavy in Virginia and shortleaf pines in central and eastern Virginia; in yellow and pitch pines in Augusta, Bath, Warren and Page Counties, and caused extensive browning of needles in areas in Amherst, Smyth, and Grayson Counties. Adult emergence was completed by

June 17, 1959

Numerous species of lepidopterous leaf feeders were of minor importance during 1959. Forest tent caterpillars (Malacosoma disstria) partially defoliated oaks and maple in small areas in Shenandoah County and were in turn highly parasitized. A fairly similar species (probably Tolype velleda) was found on a silver maple in Montgomery County. Buck moth larvae (Hemileuca maia) defoliated some oak trees and were present on many other oak stands in the northern part of the Shenandoah Valley. Green-striped maple worms (Anisota rubicunda) were present on sugar maples in the vicinity of Charlottesville. Fall cankerworms (Alsophila pometaria), linden loopers (Erannis tiliaria), and larvae (Phigalia titea) defoliated about 1,500 acres of mixed hardwoods in Tazewell County. Walnut caterpillar (Datana integerrina) defoliated black walnut seedlings at Charlottesville and were light on pecan trees on a Henrico County farm. Bag moth larvae (Phobetron pithecium) were very light on a red maple in Montgomery County. Walnut sphinx larvae (Cressonia juglander) collected in Spotsylvania. Red-humped oakworm (Symmerista albicosta) collected in Spotsylvania County. Red-humped caterpillars (Schizura concinna) were light on red bud trees in Montgomery and Rockbridge Counties. Saddleback caterpillars (Sibine stimulea) were present on asters in a Henrico County flower bed. Puss caterpillars (Megalopyge opercularis) collected on shrubbery in Hampton, Virginia. Imperial moth larvae (Eacles imperialis) collected in a yard in Patrick County. Hickory-horned devil (Citheronia regalis) collected from a coffee tree in Caroline County and a lawn in Culpeper County. Rose slugs (Endelomyia aethiops) present on rose bush in Cumberland County.

Hackberry leaf slugs (Norape cretata) present on black locust and red bud trees in a Chesterfield County locality. Cherry slugs (Caliroa cerasi) collected from the leaves of an ornamental cherry tree in Nottoway County. Slug caterpillars (Caliroa lineata) were light on leaves of white oak tree in Rockbridge County. Three species of leaf rollers (Psilocorsis obsoletella, P. quercicella, and Tetralopha asperatella) were collected from a single white oak tree in Halifax County. Leaf rollers (probably Archips argyrospila) were light on about 75 pin oaks on the V.P.I. campus, Montgomery County. Needle-tiers (probably Sparganothis sulphurana) were evident in the forest nursery in New Kent County during early August. An unidentified leaf roller was widespread on beech trees in southeastern Virginia and the Eastern Shore Counties during September. Juniper webworms (Dichomeris marginella) damage to juniper trees in Roanoke, Prince Edward, Spotsylvania, and Appomattox Counties was light. Sod webworms (Acrolophus sp.) damaged lawns to a varying extent in Fairfax, Roanoke, Amelia, and Gloucester Counties. Pine webworms (Tetralopha robustella) reported present in many northern counties, in one area in Henry County and common in a 3 acre plantation in Princess Anne County. Pecan leaf casebearers (Acrobasis juglandis) were medium on a pecan tree in Greensville County. Variegated cutworms (Peridroma margaritosa) damaged tulip plants in a Botetourt County flower garden. Bronzed cutworms (Nephelodes emmedonia) damaged grass of a lawn in Henry County.

Various species of borers were of minor importance during the year. Lilac borer (Podosesia syringae) damaged lilacs in Goochland and Roanoke Counties plantings and an oak tree in Craig County. European corn borers

(Pyrausta nubilalis) damaged dahlia plants in Nottoway, and King George Counties. Flatheaded borer larvae (Chrysobothris sp.) present under bark of a dying elm tree in Lynchburg, and under the bark of a small oak tree in New Kent County. Two ambrosia beetles (Monarthrum fasciatum and Platypus quadridentatus) attacked both ends of oak logs and were in freshly sawed oak boards at a mill in Albemarle County and a third species (Monarthrum mali) were probably involved in an attack on recently stacked soft maple board at the same place. Peach tree borers (Sanninoidea exitiosa) damaged flowering peach tree in Southampton County and apricot, plum, and cherry trees in a few localities in other parts of the state. Lesser peach tree borers (Synanthedon pictipes) also damaged a flowering peach tree in Southampton County. Stalk borers (Papaipema nebris) caused the death of a few chrysanthemum plants in Nottoway County. Iris borers (Macronoctua onusta) injured iris plants in a planting in Providence Forge. Locust twig borers (Ecdytolopha insiticiana) were numerous in stems of a black locust tree in Montgomery County. Dogwood twig borers (Oberea tripunctata) damaged a dogwood tree in Spotsylvania County and dogwood borers (Thamnosphecia scitula) damaged dogwood trees on a Pulaski County lawn. Ash borers, species undetermined, were active in a single ash in Madison County. Rhododendron borers (Ramosia rhododendri) damaged rhododendron plants in a Lynchburg planting. Borers (Proteasteras aesculana) damaged twigs of 3 maple trees in Prince William County and twigs of a single tree in Montgomery County. Columbian timber beetle (Corthylus columbianus) damage to yellow poplar in Russell County reported. Carpenterworm (Prionoxystus robiniae) infestation reported in 4 white oak

trees in a Fauquier County area. Pigeon tremex (Tremex columba) collected from an elm tree on the V.P.I. campus, Montgomery County. White oak borers (Goes tigrinus) noted in white oaks in 2 spots in Norfolk County, infesting about 10 trees in each area and 3 white oaks in Madison County. Unidentified borers damaged 6 red oaks in Norfolk and a single red maple in Orange County.

Gall insects are of minor importance each year and those recorded in 1959 were no exception. Maple bladder gall mites (Vasates quadripedes) were present on at least single red and silver maple trees in Fauquier, Westmoreland, Mecklenburg, Greensville, Brunswick, Pittsylvania, Buchanan, Montgomery, Bedford, and Floyd Counties. Phylloxera galls (Phylloxera probably caryaeglobuli) were heavy on a hickory tree in Prince William County, a hickory tree in Halifax County, and a pecan tree in Nansemond County. Mites (Eriophyes acaulis) present on the leaf stalks and veins of a black walnut tree in Montgomery County. Coxcomb elm galls (Colopha ulmicola) were heavy on an elm tree in Westmoreland County. Hackberry button galls (Pachypsylla umbilicus) were heavy on leaves of a hackberry tree in Chesterfield County. Oak galls (Andricus sp.) were present on limbs and twigs of a pin oak tree in Frederick County. Gall fly (Caryomyia similis) were present on the leaves of a hickory tree in Pittsylvania County. Maple leaf spot galls (Cecidomyia ocellaris) were on the leaves of a maple tree in Middlesex County. Spongy oak apple galls (Amphibolips acuminata) on an oak tree in Chesterfield County. Vein pocket galls (Parallelodiplosis florida) stunted and caused abnormal growth of leaves on a pin oak in Roanoke, Virginia. Pine needle gall fly (Itonida pinirigidae) affected 1/5 acre of one and 2 year old Virginia

pine reproduction in Pittsylvania County. Ocellate maple leaf galls (Itonida ocellaris) were quite common on red maple in central Virginia. Large oak apple galls (Amphibolips confluentus) and horned oak galls (Callirhytis cornigera) were present on a large oak tree in Mathews County. Unidentified galls were present on the leaves of a black oak in Madison County and the same species of tree in Norfolk County.

A few coleopterous insects of minor importance during 1959 are as follows. Twig girdlers (Oncideres cingulatus) damaged pecan trees in Essex, Appomattox, King George, and Prince George Counties, and an English walnut tree in Westmoreland County. Twig pruners (Elaphidion villosum) damaged oaks in Roanoke and Gloucester Counties, elm trees in Goochland and Spotsylvania Counties, and mountain laurel in Warren County. May beetles (Phyllophaga sp. probably hirtucla) were heavy on oak trees in Floyd and Montgomery Counties, and in a bluegrass lawn in Clarke County. Soldier beetles (Chauliognathus marginatus) attacked mimosa and rose blooms in Charlotte County locality. Willow leaf beetles (probably Plagiodera versicolora) fed on the leaves of a willow tree in Prince William County. Black blister beetles (Epicauta pennsylvania) present on the foliage of a mimosa tree in Russell County. Black vine weevils (Brachyrhinus sulcatus) were reported on host plants in 2 small areas in the state. Deodar weevil adults (Pissodes nemorensis) found on an evergreen plant in Lancaster County. Japanese weevils (Pseudocneorhinus bifasciatus) fed upon pyracantha, Japanese holly, azalea, and evonymus plants in 4 small areas in the state.

Hemipterous insects of minor importance during the year were sycamore lace bug (Corythucha ciliata) on sycamore trees in Southampton and Fairfax Counties; lace bug (Stephanitis sp.) on azaleas, rhododendron, pyracanthas, cotoneasters, and hawthorns in several scattered areas of the state; and an unidentified species of lace bug on a mulberry tree in Roanoke County. Membracids (Cyrtolobus sp.) were present on an oak tree in Fairfax County. Boxelder bugs (Leptocoris trivittatus) were present in large numbers on boxelder trees in many parts of the state.

White flies (probably mostly Dialeurodes citri) were present on azaleas and gardenias in approximately 50 different scattered but small areas in the state.

Thrips (Leptothrips sp.) damaged stems of sassafras tree in Montgomery County.

Termites hollowed out the stem of a scarlet sage plant that was mulched with sawdust in Montgomery County and termites (Reticulitermes sp.) damaged a pyramidal yew plant in Appomattox County.

Household Insects:

Four species of cockroaches are household pests in Virginia. The brown-banded roach (Supella supellectilium) appeared to be the most important of the four in 1959. Infestations of this species were identified in homes in Richmond and Roanoke and in Southampton, Henry, and Roanoke Counties. Oriental cockroaches were reported heavy in homes in Rappahannock and Halifax Counties and in Bristol, Virginia. German roaches (Balttella germanica) were reported from a home in Augusta County. No American cockroach (Periplaneta americana) infestations were reported this year. Infestations, unidentified to species, were reported in two different areas in Montgomery County. Pest control operators take care of many infestations throughout the state every year that V.P.I. specialists do not get a record of and, also, many infestations are taken care of by the occupants of homes and apartments without the knowledge of specialists.

Ants were reported as household pests more than any other kind of insect, probably because people were afraid they were termites and so wanted accurate determinations. Citronella ants (Lasius sp.) were the most common of these and were recorded in Montgomery, Henry, and Alleghany Counties and in Lynchburg, Galax, and Roanoke. Carpenter ants (Camponatus herculeanus pennsylvanious) were found in a home in Bath County and in a Stafford County home. Little black ant (probably Monomorium minimum) infestations were present in homes in Roanoke and Richmond. Unidentified species were pests in homes in Staunton, Roanoke, and Arlington and in Caroline, Rockingham, Albemarle, and King George Counties

Dermestid beetle larvae were pests in several households in the state. Furniture carpet beetles (Anthrenus flavipes) damaged a rug and sofa in a Charlotte County home, black carpet beetle (Attagenus piceus) infestation found in a Franklin County home, larder beetles (Dermestes lardarius) present in a kitchen in Wise County, and dermestid beetles (Trogoderma inclusum) were a household pest in Montgomery County. Unidentified species were pests in homes in Montgomery, Frederick, and Henrico Counties and damaged antique cars in Rockbridge County.

Boxelder bugs (Leptocoris trivittatus) were nuisances in and around homes in Brunswick, Albemarle, Fairfax, and Montgomery Counties, and in Arlington, Lawrenceville, Christiansburg and Blacksburg.

Clover mites (Bryobia praetiosa) were a problem in homes in Norfolk, Portsmouth, Roanoke, Salem, Chatham, Hampton City, Hopewell, and Scottsburg and in Bland, Orange, Amherst, and Prince Edward Counties. They were also a pest in a school in Radford.

Elm leaf beetles (Galerucella xanthomelaena) were pests in homes in Page and Montgomery Counties, and in a building in Arlington.

Clothes moth infestations were found in a home in Page County, a home in Winchester, and in the upholestry of antique cars in Rockbridge County.

Saw-toothed grain beetles (Oryzaephilus surinamensis) were a problem in homes in Patrick, Montgomery, and Campbell Counties and in Richmond.

Indian-meal moth larvae (Plodia interpunctella) were found as pests in a home in Lynchburg and in a Buckingham County home.

Drug-store beetles (Stegobium paniceum) invaded homes in a neighborhood in Danville, probably coming from a large tobacco warehouse near by, and a home in Alleghany County.

Cigarette beetles (Lasioderma serricorne) were found in the kitchen of a home in South Norfolk, coming from infested spices, corn meal, pancake mix, brown sugar, and egg noodles.

Psocids became a household nuisance in a home in Chesterfield County and in a Blacksburg home.

Millipedes invaded homes and caused consternation to occupants in Mecklenburg, Page, Pulaski, and Rockingham Counties and in Roanoke. Brachyiulus pusillus was one of the species involved.

Sowbugs invaded homes in Montgomery and Shenandoah Counties, and slugs or snails entered the basement of a home in Montgomery County and a home in Craig County.

Mediterranean flour moth larvae (Anagasta kuhniella) were present in large numbers on the ceiling of a home in Cumberland County.

Species of coleoptera that were found in homes in one or two instances were red-headed ash borer adults (Neoclytus acuminatus) in Staunton and in Bland County, round-headed borer adults (Stenosphenus notatus) in Lynchburg, flatheaded borer adult (Agrilus sp.) in Bland County, pales weevil (Hylobius pales) in Franklin County, brown spider beetles (Ptinus clavipe) in Chesterfield County, and rove beetles (family Staphylinidae) in a hardware store in Roanoke.

Species of diptera that attracked attention in homes were flesh fly larvae (Sarcophaga sp.) in a home in Newport News, cluster flies (Pollenia rudis) in Culpeper and Montgomery Counties, sewer or drain flies

(family Psychodidae) in Roanoke, flower flies (family Syrphidae) in Charles City County, and blue bottle flies in Franklin County. Unidentified flies were a nuisance in a Pulaski County church.

Hymenopterous insects that were a nuisance in homes were a leaf-cutting bee (Osmia lignaria) in Page County, velvet ant (Dasymutilla occidentalis) in Northumberland County and an office in Nottoway County, unidentified wasps and bees in one area of Nansemond and Montgomery Counties, and wasps in a Pulaski County church.

A North American mole cricket (Gryllotalpa hexadactyla) was found in a Spotsylvania County church and unidentified leafhoppers swarmed to home lights in Mecklenburg County, causing a lot of annoyance.

Truck Crop and Garden Insects: (Primarily from Va. Truck Exp. Sta. Rep.)

European corn borers (Pyrausta nubilalis) heavily damaged Irish potatoes, sweet corn and peppers during 1959, especially in the truck cropping areas of eastern and southeastern Virginia. Adults were first observed during the last half of April and larvae hatched on Irish potatoes about May 12 in Accomack and Northampton Counties. They caused complete destruction of at least one crop of potatoes in James City County and heavy damage to additional large acreages in the same county. Reports of damage in other parts of the state were severe damage to 1/4 acres of potatoes in Charlotte County, medium damage to vines in spotted areas of King and Queen County, and heavily damaged sweet corn in Middlesex County. All potato crops on the Eastern Shore were infested, some to the extent of 75%, and the peak of first brood adult emergence occurred about the first of July. Counts on peppers on the Eastern Shore revealed 38% infested and 100% of the sweet corn in variety tests were infested by July 17. Third brood moths had emerged and were laying eggs on peppers in eastern Virginia by August 14 and by August 28 approximately 20% of the pepper crop was infested on the Eastern Shore.

Cabbage loopers (Trichoplusia ni) damaged cabbage, tomatoes, broccoli, salad, kale, collards, peppers, and cucumbers to a varying extent in eastern and southeastern Virginia but were not as heavy as in 1958. Again, a polyhedral virus disease reduced infestation to a large extent during September and the balance of the season. Loopers were present on cabbage crops as early as the first half of May, were building up strongly on the Eastern Shore and causing numerous complaints from tomato growers by July 17,

were numerous and damaging young broccoli, salad, kale, and collards by August 14, and continued to build up on cabbage and cole crops on which they were very hard to control despite extensive control measures until the polyhedrial virus disease started reducing populations during early September. The disease subsequently cleaned up infestations of loopers in many areas, but they continued to be a problem in some fields during the remainder of the season. They were heavy in old plantings of peppers and in cucumbers in some instances during late August and early September.

Corn earworms (Heliothis zea) damaged sweet corn to a larger extent than during 1958, were heavy on tomatoes in at least one area, and were severe on old plantings of peppers during 1959, all in eastern Virginia. The first moth of the season was caught in a light trap in Accomack on May 17, and only a few moths were still being taken in the light traps as late as June 19. However, by July 3, 15% of the untreated sweet corn in plots in Accomack County were infested and the damage to sweet corn in the lower part of Northampton County was heavy. They had also damaged untreated tomatoes heavily in Hanover County by July 3. Earworms were in between broods on sweet corn being harvested in eastern Virginia by July 10 and had been heavy on sweet corn in Nansemond County. They were definately heavier than in 1958 on sweet corn by July 17 and all untreated ears were found to contain earworms for the balance of the season. By September 5, damage by them was extensive to old plantings of peppers that had not been planted. A heavy flight of moths occurred about August 28, but no additional outbreaks were reported in truck crops for the balance of the season.

Potato tuberworms (Gnorimoschema operculella) caused quite a bit of

damage in fall Irish potatoes, largely in the Eastern Shore counties, during 1959. This species was infesting nearly every plant in a field in one area and in field plots in Accomack County by September 5, and the infestation was found to be widespread in Northampton County by September 12. Another brood of moths occurred and some new field infestations were observed by September 19, and where original treatments were not repeated, reinfestations of fall plantings had occurred by September 26. Quite a few moths were observed in potato fields in Accomack and Northampton Counties during October, although little foliage damage was observed.

Mexican bean beetles (Epilachna varivestis) caused varying degrees of damage to bean crops in 1959 but were not a serious problem. They were present on snap beans in Accomack and Northampton Counties by June 19, and were damaging bean plants in gardens in Appomattox County, where control seemed difficult, by July 3. Populations became abundant and damage heavy to untreated beans in eastern and southeastern Virginia during July and August. Populations were light on snap and lima beans on the eastern shore by September 5.

Colorado potato beetles (Leptinotarsa decemlineata) were a minor problem on potatoes and tomatoes on a state wide basis in 1959, but were a problem in a few instances. Adults emerged from hibernation about the first of May and did considerable damage to potatoes and tomatoes in some eastern areas. Populations were heavy on newly set tomato plants in Westmoreland County in one instance. All stages were present on potatoes in Accomack and Northampton Counties but infestations kept under control by insecticides during the last half of May.

Bean leaf beetles (Cerotoma trifurcata) caused some concern on snap and lima beans but were not a major problem. Adults were out of hibernation and numerous on seedling beans in gardens during early May, had eaten holes in leaves of bean plants in a number of gardens by May 23, were present in numbers on untreated snap beans plants on the Eastern Shore by June 19, and were generally distributed on snap and lima bean plants in eastern Virginia by September 5.

Flea beetles, species undetermined, damaged mustard, turnip green, kale, collard, cabbage, brussell sprout, corn, bean, Irish potato, tomato and cucumber plants during 1959 and were a major problem in some instances, especially on potatoes and tomatoes. They killed mustard plants and damaged other cruciferous plants in gardens in Augusta County as early as April 17, and had moved into tomato fields to the extent that controls were needed in southeastern Virginia by April 25. Overwintered adults caused considerable damage to Irish potatoes, tomatoes, young greens, corn, snap beans, and kale in eastern and southeastern areas of the state as well as in gardens scattered over the state during May, June and July. They were reported on young cucumbers in eastern Counties by August 14, and were abundant on fall Irish potatoes in Accomack and Northampton Counties by September 5, 1959.

Aphids damaged crops to a varying degree during the year. Green peach aphids (Myzus persicae)were especially troublesome on spinach and lettuce as early as April in eastern and southeastern truck cropping counties and they were so bad on spinach on the Eastern Shore during harvest in early May that processors had to reject some crops entirely. This species was

subsequently heavy on peppers during August and September and aphicides had to be used to control them. Cabbage aphids (Brevicoryne brassicae) were especially troublesome on cabbage during April and May in all of the truck cropping areas, and were also a problem to a lesser extent on kale and collards. They appeared very hard to control and it was not until near the end of May that growers got them under control. Potato aphids (Macrosiphum solanifolii) were so common on tomatoes that treatments were necessary, and were so heavy on potato plants that the plants had a greasy appearance on the Eastern Shore near the end of May. They were also heavy on potatoes and tomatoes in gardens scattered over the state. Turnip aphids (Rhopalosiphum pseudobrassicae) were unusually heavy on turnip greens and mustard in the truck cropping areas during last half of August. Pea aphids (Macrosiphum pisi) were generally distributed on peas in the state and corn leaf aphids (Rhopalosiphum maidis) were light to medium on sweet corn in some areas of the state during August. Unidentified root aphid damaged 75% of the snap bean plants in two rows of a Henrico County garden.

Unidentified cutworms damaged cabbage in an Appomattox County garden during April, fall set plantings of peppers, cucumbers, and other cucurbits on the Eastern Shore during August, and climbing cutworms heavily damaged cantaloupes and tomatoes in Hanover during June. Variegated cutworms moths (Peridroma margaritosa) were present in large numbers during late April and again in early July. Larvae damaged newly planted peppers and sweetpotatoes in Accomack and Northampton Counties during the rest of the month of July. Black cutworm moths (Agrotis upsilon) were taken in large numbers in a light trap on the Eastern Shore during late April, were again

heavy in the light traps during early July and larvae damaged newly planted peppers and sweet potatoes for the remainder of the month. The light trap revealed the heaviest catch of the year of this species during late August and larvae caused considerable damage to some cole crops on the Eastern Shore during October. Cutworms (Feltia sp.) were light to medium in early planted tomato plants in Nansemond County during April.

Spider mites (primarily Tetranychus telarius) were a pest on vegetable crops in eastern Virginia during most of the growing season. Hot dry weather during part of May, June and July favored their development so some cabbage crops in one area of Norfolk County were damaged during May, some lima and snap beans on the Eastern Shore and in gardens in other parts of the state were heavily damaged during June, July, and August. Spider mites were also a problem on tomatoes in some instances.

Serpentine leafminers (probably Liriomyza pusilla) nearly defoliated some fields of tomatoes in Northampton County about the middle of July and were abundant on young cucumbers and snap and lima beans in eastern Virginia during August and September. Growers were advised to treat to control them. Spinach leafminers (Pegomyia hyoscyani) were determined as the species that have been heavily damaging beets in Bland County for the past two years.

Potato leafhoppers (Empoasca fabae) were very heavy in a few untreated potato fields during June; were well distributed on snap beans on the Eastern Shore during June, July, and August; were heavy on young cucumbers in eastern Virginia during August; and abundant on fall potatoes on the Eastern Shore in early September.

Greenhouse whiteflies (Trialeurodes vaporariorum) were observed on snap and lima beans during August and September and were heavy on collards and tomatoes during August. Infestations on snap and lima beans during late August and September. They were also reported as severe on snap beans in a Charlottesville, Virginia garden.

A number of lepidopterous larvae which are usually of importance in truck and garden crops in Virginia were not of much importance this year. Some of these were as follows. Diamondback moth larvae (Plutella maculipennis) damaged cabbage and other cole crops in eastern and southeastern Virginia and in Prince Edward County to a limited extent during June, July, and August. Imported cabbageworms (Pieris rapae) were practically the same as diamondbacked moth larvae in intensity and distribution. Armyworm moths (Pseudaletia unipuncta) were taken in a light trap in Accomack County on the nights of April 8 and 9 in larger numbers than during the preceding three years and continued to be numerous until May. Larvae were noted in sweet corn during the latter part of May but no reports of heavy damage to truck crops were received. Another heavy flight occurred in late September but again no outbreaks of armyworms in truck crops were reported. Stalk borers (Papaema nebris) were light in tomato plants in Pittsylvania County and sweet corn in Floyd County during June. Lesser cornstalk borer (Elasmopalpus lignosellus) damage was rather severe to snap and lima beans in localized areas of eastern Virginia during August. Yellow-striped armyworms (Prodenia ornithogalli) were present to a limited extent on cole crops in eastern and southeastern Virginia during August but control measures for other

insects kept them from being a major problem. Fall armyworms (Laphygma frugiperda) and garden webworms (Loxostege similalis) were present but not a problem on cole crops in eastern and southeastern Virginia during the last half of August. Velvetbean caterpiller moths (Anticarsia gemmatilis) were taken in small numbers in the light trap in Accomack County during late August and September but no larval infestations were reported injurying truck crop. Hornworms, species unidentified, were rather heavy in localized old plantings of peppers on the Eastern Shore during early September. Large numbers of celery looper moths (Anagrapha falcifera) were taken in a light trap in Accomack County but no field infestations of the larvae were reported.

A number of species of Coleoptera were of minor importance to truck crops and gardens during the growing season. Cabbage curculios (Ceutorhynchus rapae) caused considerable damage to cabbage crops in Northampton and Accomack Counties in some instances where controls were not used, and were rather general in other fields but damage decidely less if controls were used. Japanese beetles (Popillia japonica) damaged gardens in all infested areas of the state where controls were not correctly and persistently used and a single specimen was found in a Floyd County garden. Wireworms, species undetermined, damaged bean plants in a Rockbridge County garden and sweet potato tubers in a single garden in each of Franklin and Floyd Counties. Spotted cucumber beetles (Diabrotica undecimpunctata howardi) and striped cucumber beetles (Acalymma vittata) were medium on 1/2 acre of cucumbers in Mecklenburg County, and on cantaloupes in one area in Essex County during early June and were

increasing on cucumbers in eastern Virginia during early September. By July 17, 33% of the cucumber vines in the Mecklenburg County planting was dead and the rest of the plants probably did not produce. No subsequent damage to the cucumbers in eastern Virginia was reported. Asparagus beetles (Crioceris asparagi) were very severe on all asparagus plantings in Westmoreland County during late May. Cowpea curculio larvae (Chalcodermus aeneus) were reported very heavy on black-eyed peas in a Charlotte County garden during August. Black blister beetles (Epicauta pennsylvanica) damaged tomato plants in a Patrick County garden during early September. Corn sap beetles, species undetermined, were present on sweet corn in some Nansemond County gardens during July.

Green stink bugs (Acrosternum hilare) and nymphs of stinkbug (Chlorochroa persimilis) were present on and punctured lima bean pods in a garden in each of Henrico and Goochland Counties during late August, and an unidentified species was heavy on lima beans in a New Kent County during September.

Springtails (Collembola) were pests and caused extensive damage in plant beds in greenhouses in eastern Virginia during April and later attacked small vegetable plants in the fields during May to the extent that controls had to be recommended in some instances.

Cabbage maggots (Hylemya brassicae) caused the stunting and poor growth of cabbage plants in a Carroll County garden during June.

Cone-nosed grasshopper nymphs (Neoconocephalus sp.) fed on onions in an Albemarle County Garden during early May.

Insects Affecting Man and Animals:

House flies (Musca domestica) were normal for 1959, starting out light and building up as the season progressed until they were very heavy around pig palors, dairies, cattle barns, garbage dumps, poultry houses, silos, compost piles, eating establishments, and homes. Infestations reached their highest peak during July and August. Fly populations, as far as I can tell, are generally highest in the southeastern part of the state because of the higher temperatures there and the types of farming, hog raising and dairying, that are located in that part of the state. Actually, very few reports of house fly populations are received in this office. They are such common problems that very few people ever think of reporting them and the survey entomologist spends his time on other problems.

Common cattle grubs (Hypoderma lineatum) and northern cattle grubs (H. bovis) both occurred in Virginia during 1959. Surveys showed that common cattle grubs are present in all parts of the state but that northern cattle grubs are few east of the Blue Ridge Mountains and may be entirely absent in some counties in the southeastern part of the state. Grubs began to show up in the backs of cattle during January and were largely through by the end of March. During February, 66% of the grubs extracted were common cattle grubs and 33% were northern cattle grubs. However, by late March 94% of the grubs extracted were northern cattle grubs and 6% were common cattle grubs. Adults emerged and started running cattle during May.

Sheep scab mites (Psoroptes equi ovis) are found every where that sheep are raised in the state. According to reports from the Virginia Livestock Health Bulletin 825 sheep were found scabby out of 2,024 sheep inspected during 1959 and all of these were treated. In Virginia, sheep scabbies is considered a disease so inspections and treatments come under the supervision of the State Veterinarian. Generally, only flocks that are suspected of being scabby are inspected and if the disease is found in a flock the entire flock is treated to control them.

Ticks are pests of livestock, man, and other animals in most parts of the state but are much heavier in many areas than in others. The heaviest infestations seem to be in the southeastern part of the state along roadways and highways. The primary species involved in these infestations is believed to be Dermacenter variabilis. Reports of infestations, other than the infestations along southeastern Virginia highways and roadways, are as follows. Brown dog ticks (Rhipicephalus sanguineus) heavy in a home in Fairfax County and in a Loudoun County home, and immature ticks heavy on a lawn in Culpeper County. Unidentified species were heavy around a home in Nelson County, in three homes in King and Queen County, and heavy on a Giles County lawn, frequently present on dogs in Richmond, and heavy in a Richmond home. One case of tick paralysis of a three year old child was diagnosed by the medical doctor in attendance in Nansemond County.

Fleas were reported heavy in a home in Montgomery County, a home in Brunswick County, a barn in Botetourt County, and a home in Richmond.

Face flies (Musca autumnalis) were reported present in 2 areas in Loudoun County early in the year and late in the summer were heavy on

the face and eyes of cattle in Bath, Highland, and Montgomery Counties and this species suspected of being present on cattle in Smyth, Bland, Giles, and Rappahannock Counties.

Black blow fly larvae (Phormia regina) infested the soiled wool of a few lambs in southwestern Virginia late in July.

Mosquitoes, species unidentified, began emerging and annoying people in parts of Nansemond County during the early part of May, were so heavy in the Springfield area of Fairfax County that children could not play out-of-doors for several days during July, and were extremely heavy even in open fields in parts of Nansemond and Southampton Counties during early August.

Little blue lice (Solenopotes capillatus) were light on beef cattle in a King George County herd and a Charlotte County herd, and unidentified species were heavy on dairy cattle in Bland County early in February.

Deer flies (Chrysops sp.) were heavy in some wooded areas of Princess Anne County in early May, bit a woman in Roanoke County and caused her to have to be hospitalized during late May, and along with stable flies (Stomoxys calcitrans) and horn flies (Siphona irritans) were abundant on beef cattle in areas of Princess Anne and Norfolk Counties during early July.

Horse flies (Tabanus sp.) averaged 5 or 6 per beef animal in some areas of Norfolk County and were heavy in some areas of Fairfax County during the first half of July.

Sheep bot fly larvae (Oestrus ovis) caused the death of a ram on a farm in Montgomery County in late July and 30 bots were removed from the sinus of the animal.

Nose bot fly larvae (Gasterophilus haemorrhoidalis) were present in the nasal cavaties of sheep in an Amelia County flock during September.

Lesser house fly (Fannia caicularis) infestations were moderate in dairy barns at V.P.I. during early June.

A horse sucking louse (Haematopinus asini) was collected from a horse by a veterinarian at Warrenton.

Tropical rat mites (probably Liponissus bacoti) attacked members of a Richmond family in their home.

Chiggers (Eutrombicula alfeddugesi) were light to moderate in wooded areas in Nansemond County.

A wheel bug nymph (Arilus cristatus) bit a man in Bristol, Virginia.

Ants (Formica subintegra) bit a woman in Warren County, causing severe pain.

A grouse fly (Lynchia americana) was collected from a grouse killed in the Jefferson National Forest during late November 1958.

Velvet ant (Dasymutilla occidentalis) collected in an office in Nottoway County and around a freight depot in Charlotte County.

Saddleback caterpillar (Sibene stimulea) caused irritation to the skin of people who brushed against them in an Albemarle County corn field and in a Henrico County flower bed.

Puss caterpillar (Megalopyge opercularis) collected from host plants in Greensville County.

Litter mites (Rhizoglyphus sp.) were heavy in a poultry house in Frederick County and caused abnormal behavior of the chickens.

Hag moth larvae (Phobetron pithecium) collected in Alleghany County.

Predoceous thrips bit workers in a manufacturing plant in Montgomery County.

Midges were a nuisance around a home in Page County during April.

Stored Food Products Insects:

Instances of stored meat insects causing damage were larder beetles (Dermestes lardarius) in pork in a Roanoke County home and on two Rockingham County farms, red-legged ham beetles (Necrobia rufipes) in hams on a Spotsylvania County farm, bone beetles (Nitidula bipuntata) in hams stored in a garage in Bluefield, and foreign grain beetles (Ahasverus advena) present in a meat house on a Washington County farm.

Instances of stored grain insects causing damage were rice weevils (Sitophilus oryza) severe in stored wheat on a New Kent County farm and wheat and barley on a farm in Henry County, angoumois grain moths (Sitotroga cerealella) swarming over newly harvested corn in a granary in Stafford County, yellow mealworms (Tenebrio molitor) in a mill in Prince Edward County, black carpet beetles (Attagenus piceus) in stored feed on a Madison County dairy, lesser mealworm (Alphitobius diaperinus) in poultry feed on a farm in James City County, litter mites (Rhizoglyphus sp.) in poultry feed on a farm in Frederick County, and carpet beetles (Anthrenus scrophulariae) in packaged dog biscuits in a Montgomery County store.

Potato tuberworms (Gnorimoschema operculella) practically destroyed Irish potatoes in storage at an Albemarle County locality.

Structural Wood Insects:

Termite infestations are found and treated by pest control operators in many homes and buildings every year that are never reported to V.P.I. specialists. Records received and reported in this summary are generally those from home or property owners who are suspicious of termites being present because they observe flights of reproductive forms and go to their county agent or V.P.I. specialists for advice. Reproductive form generally swarm during March, April, and May. Reports received this year were of damage to a warehouse in Campbell County; homes in Prince William, Albemarle, Rockingham, Patrick, Buchanan, Nansemond, and Montgomery Counties; an apartment house in Clifton Forge, homes in Harrisonburg, Pulaski, Roanoke, and Blacksburg; cabins of a motor court in Buckingham County; a church in Pulaski County; and a public building in Blacksburg. In the public building at Blacksburg the workers had built tunnels along the walls of third floor rooms and were determined as Reticulitermes sp.

Powder-post beetle infestations are very common in homes and buildings in Virginia and many new infestations are found every year. Of the powder post beetles, the old house borer (Hylotrupes bajulus) is the most common and most destructive species. Reports of infestation of old house borers received in 1959 were in the rafters of a home in Roanoke, pine lumber stored in an attic in Montgomery County, in pine board of a closet in a one year old home in Nottoway County, lumber in a home in Lynchburg, sills of a home in Floyd County, rafters of a home in Bedford County and woodwork of a home in Page County. Lyctus powder post beetles (Trogoxylon parallelopipedon) were collected from oak wood of a garage in

Spotsylvania County. Unidentified species of powder post beetles damaged floor joists of a home in Lunenburg County, front porch of a home in Russell County, oak joists of a home in Floyd County, rafters of a house in Bedford County, the woodwork in a Page County home, floor of an office in Keysville, and the sills of a home in Portsmouth.

Carpenter ants (Camponotus herculeanus pennsylvanicus) were found infesting a home in Bath County and winged sexual forms were found in several homes in Floyd County.

Carpenter bee was found boring into the rafters of a home in Page County.

Tobacco Insects:

Hornworms (Protoparce quinquemaculata and P. sexta) were not a major problem on tobacco primarily because of the close watch kept on them and prompt control measures being applied. Moths were first caught in a light trap at Chatham on May 16, eggs were present on plants by May 29, and larvae were showing up by June 5. Larvae and damage were recorded as light for the balance of the season until the middle of August when the crop was nearing maturity. Large moth flights, primarily P. quinquemaculata, were recorded on May 31 and August 1, 1959.

Tobacco flea beetles (Epitrix hirtipennis) were generally light to medium on tobacco in 1959 but heavy infestations developed in a few fields. Controls were generally applied and damage held to a minimum. Infestations were light in tobacco plant beds during April and light to medium on newly set plants in fields by the middle of May. Moderately heavy populations were present in untreated fields by the end of May but these decreased early in June. During the middle and last of June populations began to increase again but were held in check by controls. They became moderately heavy in some fields by early August but declined as growers again applied insecticides and the crop reached maturity.

Green peach aphid (Myzus persicae) populations began building up on tobacco crops about the middle of June and were medium in many fields by the end of the month. Predators and hot dry weather reduced and kept infestations down during most of July, but they were doing commercial damage in some fields during early August. Infestations again decreased except in a few cases where growers were careless and did not apply controls promptly.

Wireworms, species undetermined, severely damaged tobacco plants in a few isolated cases reported during the year. They tunneled out the stalks of 60% of the tobacco transplants in a 3 acre field in Prince Edward County, and severely damaged 90% to 95% of the plants in a 2-1/2 acre field in Franklin County during late May. The field in Franklin County was plowed up and reset as were three other fields in the same county.

Tobacco budworms (Heliothis sp.) were generally light on tobacco in Virginia during 1959, according to reports received. However, corn earworms (called false tobacco budworms) damaged leaves of tobacco in part of a 10 acre field in Greensville County during early September.

Green June beetle larvae (Cotinis nitida) were light to medium in some plant beds during April but were not a problem in fields of tobacco later in the season.

Vegetable weevil larvae (Listroderes costirostis obliquus) were light in several tobacco plant beds at one location in Pittsylvania during early May but no other reports concerning them were received.

Cutworms, species undetermined, damaged newly transplanted tobacco plants in some fields but were not a general problem during 1959. The heaviest report received was of damage to 15% to 20% of the plants in one field in Prince Edward County.

Thrips populations became fairly heavy in some fields in Pittsylvania County during early June but had decreased considerably by June 19. They were not a problem for the rest of the growing season.

Crickets did light damage to tobacco plants on one farm in Franklin County during early June.

Tobacco moth larvae (Ephestria elutella) damaged flue cured tobacco in the shed on one Charlotte County farm.

Fruit Insects:

Apples

Red-banded leaf rollers (Argyrotaenia velutinana) were not a serious problem in apples this year, althoug populations were heavy in some orchards at one time. Egg laying was observed about March 28 and the eggs were hatching around April 25. The second generation of eggs hatched around May 18, pupal skins were observed on June 1 and moths were present in large numbers on June 10. By the latter part of June, the larvae were heavy in some orchards but these were controlled by good spray programs plus favorable weather for the growers so that populations and damage were below par by August 14.

Codling moth (Carpocapsa pomonella) populations were below average in the fall of 1958 and the emergence from hibernation of adults in the spring of 1959 occurred largely in early May. The first brood was still active in northern Virginia orchards near the end of June at which time infestations were normal to slightly heavy. Good spray programs plus weather detrimental to this insect species lowered populations to the extent that they were below average by the middle of August.

Rosy apple aphids (Anuraphis roseus) and apple aphids (Aphis pomi) were of little importance in apple orchards this year. Rosy apple aphids hatched in the Piedmont area of the state around April 10 and infestations were soon medium on apple buds in Prince Edward, Albemarle, and Nelson Counties and in Hampton City. Infestations were reported about normal or below normal in northern Virginia orchards late in April, but subsequently became heavier than usual before the spring was over. However, they were

readily brought under control by spray schedules. They were not a problem during the remainder of the growing season. Apple aphids were heavy in orchards about the first of June but infestations had fallen off by the end of June. However, they were still considered a problem on an area basis but controls kept them from becoming serious during the rest of the season.

European red mites (Metatetranychus ulmi) hatched around the end of April and were normal. By the end of June, they were heavy in localized areas in the northern part of the state but generally lighter than usual. They did not develop into a problem during the remainder of the season in commercial orchards but were extremely heavy on a few individual trees in back yards and home orchards where a spray schedule was not followed. Schoene mites emerged from hibernation and were active in northern Virginia orchards during late April but controls prevented their being a problem for the remainder of the year.

Budmoth larvae (Spilonota ocellana) damage was light to the buds of apple trees in a Shenandoah County orchard during late April but no more reports were received about them for the balance of the year.

Leaf skeletonizer (Bucculatrix pomifoliella) pupal cases were heavy on the sides of apple trees in some orchards in Rappahannock County prior to the end of June but no controls were applied against them and they were not a problem this year.

There were no known spots in northern Virginia apple orchards where tentiform leafminers (Lithocolletris crataegella) or unspotted leafminers (Callistro guminatella) were of economic importance and no controls were applied against them.

Peaches

Plum curculios (Conotrachelus nenuphar) were not reported as a problem in peach orchards in the Shenandoah Valley, the Piedmont area, or eastern Virginia but had stung 100% of the fruit in a Nansemond County orchard by May 12, and were heavy in peaches in a home orchard in Norfolk near the end of August.

Lesser peach tree borers (Synanthedon pictipes) were serious in a 20 acre peach orchard in Nansemond County and about 1/2 the larvae had pupated by May 12. No other reports concerning this species in orchards were received this year.

Terrapin scale (Lecanium nigrofasciatum) were present in a Roanoke County orchard in late August and damaged the fruit with honey dew deposits.

Catfacing insects were heavy on peaches in orchards in all parts of Virginia during the pink and early bloom stages and controls were applied.

Oriental fruit moth larvae (Grapholitha molesta) damaged the twigs of a peach tree in Alleghany County and damaged peaches in a Warren County orchard.

Lecanium scale (Lecanium probably corni) is building up in peach orchards in all parts of the state.

Plums, Pears, and Cherries

Plum curculios (Conotrachelus nenuphar) damaged plums in a small home planting in Alexandria.

Pear slugs (Caliroa cerasi) fed on the leaves of pear trees in Mathews County during June.

Spider mites, species unidentified, were present on a few pear trees in an Augusta County planting during June.

Cherry aphids (probably Myzus cerasi) were reported on a cherry tree in Prince George County and as heavy on a cherry tree in Hanover County during June.

Oriental fruit moth larvae (Grapholitha molesta) damaged a cherry tree in Campbell County and a tree in Richmond, Virginia.

Strawberries

Strawberry weevils (Anthonomus signatus) did an unusual amount of damage to strawberries on the Eastern Shore and damaged the strawberry plants in a garden in Franklin County. The weevils seemed to be about two weeks behind schedule on the Eastern Shore and some growers treated too soon

Strawberry leafrollers (Ancylis comptana fragariae) were present in this crop by late May but did not hurt the yeild in eastern Virginia. Infestations increased and some damage had resulted to plants by the end of June.

Spider mites (probably Tetranychus atlanticus) were favored by the weather during May so continued to build up on strawberry plants in southeastern Virginia until practically all growers needed to apply controls near the end of the month.

Stalk borers (Papaipema nebris) attacked some fields of strawberry plants in southeastern Virginia during May.

Japanese beetles (Popillia japonica) were heavy in soil around strawberry plants in an Orange County planting in September.

Grapes

Japanese beetle (Popillia japonica) damaged grapes from light to heavy

in the infested parts of the state. They were severe in parts of King and Queen and Smyth Counties, medium in parts of Charlotte, reported as damaging grapes in spotted areas of Wythe and Prince William Counties, and light on grapes in Albemarle County.

Grape leafhoppers (probably Erythroneura comes) heavily damaged the leaves of grape vines in a Giles County vineyard and in an Alleghany County planting.

Grape tomato galls (Lasioptera vitis or Dasyneura vitis) were present on a grapevine in Clarke County.

Brambles

Red-necked cane borers (Agrilus ruficollis) damaged raspberries at three locations in the Blacksburg area of Montgomery County.

Red-humped caterpillar (Schizura concinna) collected feeding on raspberry plants in a Rockingham garden.

Unidentified aphids heavily damaged blackberry plants at one location in each of Bedford and Henrico Counties.

Spider mites, species unidentified, heavily damaged blackberry leaves in a Bedford County planting.

Nut Crops

Twig girdlers (Oncideres cingulata) damaged the new growth of several English walnut trees in a Henrico County planting, twigs of an English walnut tree in Westmoreland County, and twigs of pecan trees in King George, Essex, Appomattox, and Prince George Counties.

Spittlebugs, species unidentified, infested most pecan trees on the Eastern Shore and were light on a pecan tree in Fairfax County.

Globular hickory leaf galls (Phylloxera caryaeglobuli) were present on the leaves of a pecan tree in Sussex County and a pecan tree in Nansemond County.

Pecan leaf casebearers (Acrobasis juglandis) were medium on a pecan tree in Greensville County.

Cotton Insects:

Boll weevils (Anthonomus grandis) were very light during the early part of the growing season but continued to build up until they were very heavy during the latter part of July and during August, causing quite a loss of the top crop of cotton in most fields. A survey of the species in Nansemond, Southampton, Brunswick, and Mecklenburg Counties conducted during March revealed that the rate of survival for the winter of 1958-1959 was 5%. The mean for the four county area was 27 adults per acre. No adults were found out of hibernation as late as June 5 but a few had no doubt entered fields of young cotton by that date. Punctured square counts were still low on July 10 but were rapidly increasing by August 7 and had reached 100% in some fields by August 28.

Boll worms (Heliothis sp.) did considerable damage to cotton squares and bolls during August. Damage to square was very light during July but boll worm eggs were quite heavy on cotton plants during the week of August 7 and by the end of August the larvae had damaged 30% to 35% of the large bolls in some fields.

Aphids were light on cotton surveyed during June and July, and also during August with the exception of an occasional plant which would be covered with them. Aphids were not a problem at any time during 1959.

Thrips were not a problem on cotton at any time during 1959. They were recorded as light in fields surveyed during early June and no later records were received concerning them after this date.

Flea beetles were not a problem on cotton in Virginia during 1959. They were light during early June and no records received during the rest of the growing season.

Spider mites were not a problem on cotton in 1939, according to reports made. They were found to be medium in an occasional field and heavy on an occasional plant only, but generally light, in fields surveyed during early August. No reports were received concerning them after August 7.

Beneficial Insects:

Buttercup oil-beetle (Meloe angusticollis) were medium in some gardens in a Spotsylvania County area.

Moth larvae (Laetilia coccidivora) were feeding upon magnolia scale on a tree in Montgomery County.

Banded garden spiders (Argiope trifasciata) webbed up a bed of dahlias in Highland County, and jumping spiders (Salticidae) hatched in a home in Hampton, Virginia.

Wheel bugs (Arilus cristatus) collected in Orange County and in Bristol, Virginia.

Cicada killers (Sphecius speciosus) present in large numbers in a lawn in Augusta County and built a nest in a Washington County flower bed.

Wasps (Scolia dubia) were present in large numbers on lawns in Culpeper, Smyth, and Nansemond Counties.

Forest tent caterpillar maggot (Sarcophaga aldrichi) killed many pupae and larvae of the forest tent caterpillar in an area of the George Washington National Forest in Shenandoah County during August.

Clothes moth parasites (Apanteles carpatus) present in a home in Page County.

Ichneumonidae adult (probably Megarhyssa sp.) collected on an elm tree on the V.P.I. campus and collected in a home in Bland County.

Praying mantis egg mass collected from the gounds of a home in Roanoke County.

Syrphidae fly larvae found on a pin oak tree in Franklin County. Also quite prevalent in many alfalfa fields in all parts of the state during the spring.

Chrysomelidae beetle larvae (Gastrophysa sp.) were heavy on "dock" weeds in parts of Floyd County on May 21, 1959.

Lady bird beetles and larvae were present in alfalfa fields, orchards, and on all crops where aphids were present in large numbers during 1959.

Lace wings (order Neuroptera) were present on crops where aphids became present in large numbers.

Miscellaneous Insects:

Silky ants (Formica fusca) collected in Lunenburg and Pittsylvania Counties.

Allegheny mound ants (Formica exsectoides) collected in a shale bank in Bath County and in Rappahannock County.

Ants (Formica integra and Camponotus ferrugineus) were collected in Middlesex County.

Many dead seed-corn maggot adults (Hylemya cilicrura) were found stuck to leaves and stems of ornamental plants, clothes lines, vegetable crops, and fruit and shade trees in practically all parts of the state during May and June. They had been killed by a fungus disease and the hyphae of the fungus was holding them in place.

Pterophoridae moth adult (Oidaematophorous sp.)collected in a building in West Point.

Rat-tailed maggots (family Syrphidae) were heavy in a trench silo in Lee County and around a barn and under the bark of an oak tree in Lunenburg County.

Blossom beetles (Anomola binotata) were collected in a wheat field in Brunswick County.

A hawk moth (Ampelophagus myron) collected in Norfolk County.

Clear-winged hawk moths (probably Hemaris sp.) collected in Spotsylvania and Greene Countries.

Mole cricket (Gryllotalpa hexadactyla) collected around a dwelling in Bath County.

Crickets (Anuogryllus muticus) collected in Franklin County.

A cave cricket (family Tettigoniidae) collected in Fauquier County.

Chrysomelidae beetles (Disonycha discoidea) collected on a wild apricot vine in Pittsylvania County.

Collembola (Proistoma minuta) present in large numbers forming clumps in land being plowed in Greensville County on May 15.

Jug-builder wasp (Rumenes fratermus) nest found on a boxwood plant in Fairfax County.

Sciara armyworm (Sciara sp.) observed crossing a sidewalk in a wooded area in Fairfax County.

Psocids (order Corrodentia) present on limbs of a magnolia tree in Henry County and on a potato agar culture media at the Tobacco Research Station in Pittsylvania County.

Soldier fly larvae (family Stratiomyiidae) present in large numbers in a compost heap in Campbell County and in a silo in Roanoke County.

March flies (family Bibionidae) collected in Bland County.

Lists of Insects of Importance in Virginia - 1959:

CROP AND FOREST INSECTS	MAN AND ANIMAL AND HOUSEHOLD INSECTS
1. Corn earworm	1. House fly
2. European corn borer	2. Termites
3. Virginia pine sawfly	3. Cattle grubs
4. Alfalfa weevil	4. Horn fly
5. Spotted cucumber beetle	5. Mosquitoes
6. Cabbage looper	6. Cockroaches
7. Armyworm	7. Cattle lice
8. Aphids	8. Clothes moths
9. Angoumois grain moth	9. Fleas
10. Tobacco hornworm	10. Horse flies

MISCELLANEOUS PROJECTS AND ACTIVITIES

Extension entomologists assisted with the many diverse miscellaneous projects included in the entomology program. While his attention was directed mainly toward the beekeeping, rodent control, and fruit insect control projects, J. M. Amos gave considerable time to miscellaneous project activities, especially to 4-H club entomology, and to insect identification and entomology correspondence. A. P. Morris assisted also with insect identification and correspondence.

Perhaps as much as 15 to 18 per cent of the extension entomologists total time was taken up with miscellaneous projects and activities. The activities are considered here in the approximate order of importance from the standpoint of time devoted to each.

Insect Identification and Correspondence: Insect identification and the correspondence relating thereto was a major part of the routine office work. Through the receipt of specimens in connection with the insect identification service, it was possible to keep county extension agents posted on the occurrence of new insect pests and the spread of well-established species in Virginia. The greatest value of the insect identification service generally is that, along with the identification of the insect, the sender of that specimen is furnished control recommendations in cases where control measures are applicable and available. Of the 3,040 letters

written by the extension entomologists during the period covered by this report, it is estimated that 2171 pertained to insect identification and control recommendations.

Revision of Old Publications and Preparation of New Leaflets, Circulars and Bulletins: During the fall and winter, approximately six weeks were spent by extension entomologists in revision of six old leaflets and circulars.

Emergency Insect Control Problems: A certain amount of the extension entomologists' time cannot be planned. Insect outbreaks, as with the southern corn rootworm, alfalfa weevil, spotted alfalfa aphid, armyworms, and corn earworms, emergency pest control problems frequently arise in widely separate parts of the state. Emergency project activities took perhaps as much as 5 per cent of the extension entomologists' time in 1959. When these emergencies arose, assistance was given, where possible, by telephone or letter. Some required a personal visit to the county or area involved.

Professional Improvement Study: Several hours each week were devoted to reading new publications and articles on entomological subjects and to studying the results of research on insect control problems. Much of this study was done during non-office hours. In addition, in order to keep abreast of new developments, the extension entomologist attended local and national professional meetings. From November 30 to December 4, 1959, J. M. Amos, and J. O. Rowell attended the national meetings of the Entomological Society of America in Detroit, Michigan. J. O. Rowell, and J. M. Amos took the

third phase Communications Training Course at V. P. I. during the week of October 19, 1959. A. P. Morris took the same training during the week of November 2.

Classroom Teaching, Special Projects, Seminars and Short Courses: Participation in these extra-curricular activities, while not a specific part of their field of work, was found to be beneficial to the extension specialists in entomology. Such participation added materially to professional experience and training. During the period covered by this report, the extension entomologists were called upon to present special lectures on applied entomology, rodent control, and beekeeping subjects to regular college classes in entomology, horticulture, and agronomy. During the week of August 17, extension entomologists presented a course in Insect Identification and Control for county agents and specialists. One hundred and thirty-two agents and specialists attended the course. J. M. Amos taught the course in Beekeeping at V.P.I., March 30 to June 1. He had five students in his class.

Field Days, Fairs, and Achievement Day Program: A. P. Morris, Associate Extension Entomologist, assisted with a 4-H club achievement day program in Appomattox County in May, 1959.

Insect, Weed and Disease Identification Clinics: While insect identification clinics have been held occasionally by the extension entomologists in previous years, 1954 marks the beginning of this project on an extensive scale. During the period covered by this report, insect, weed and disease identification clinics were held in Henrico County.

District Meetings of County Extension Agents: Participation on the program of district meetings of county extension agents has proved a valuable additional way of giving direct assistance to county agents and home agents with their entomological problems. Each of the six districts in Virginia hold spring and fall meetings of county extension agents within their respective districts. In previous years extension entomologists have appeared on the program of several of these district meetings, taking their regular turn in presenting subject matter material to county agents and assistants. This year, however, none of the extension entomologists were called on for assistance at district meetings.

V. P. I. AGRICULTURAL EXPOSITION: For the past three years the extension entomologists have assisted with the V. P. I. Agricultural Exposition. J. O. Rowell is a faculty member of the Exhibits Committee. See Figures 23, 24, and 25.

Figure 23. Insects and Diseases at Ornamentals Exhibit, V.P.I. Agricultural Exposition, 1959.

Figure 24. Virginia State Pest Control Association Exhibit, V.P.I. Agricultural Exposition, 1959

Figure 25. Orkin Exterminating Company Exhibits, V.P.I. Agricultural Exposition, 1959.

SPECIAL FEATURE

The Corn Earworm Outbreak on Soybeans in Eastern Virginia in 1959

J. M. Amos

To bring the corn earworms under control required over 26,500 gallons of concentrated insecticide, the use of as many as fifteen airplanes and numerous ground sprayers.

At least twenty of the thirty-three counties in eastern Virginia were badly infested with corn earworm in soybeans late in August and early September. In many counties of the area affected, the late bean crop was threatened with destruction. This was particularly true where the beans followed small grains. Normal early-planted full-season beans escaped most of the injury. Drought delayed soybean planting later than usual and hastened the maturity of field corn. As the corn ears hardened, late soybeans were succulent, some were blooming and many had small beans and unfilled pods. Under these conditions the beans were very favorable for oviposition by the moths. So numerous were the larvae that they were feeding on the foliage much like armyworms, a condition not observed heretofore to any extent. Two rows of beans beat together and beat caused from 6 to 39 larvae to drop to the ground. In addition there were many green cloverworms, a few armyworms and occasional cutworms. It looked like most of the soybeans following small grains would be a total loss.

The Extension Entomologists reported the infestation to the county agents at once. In these surveys they contacted many of them directly and advised the county agents and growers of the situation. Three airplane spraying companies were contacted and two of them responded quickly. Pilots for crop spraying were scarce but one county had five planes and from 12 to 15 planes were used at the peak of the spraying. Some beans were small enough for ground sprayers to treat and many of these were put to work.

The county agents, their assistants, and the Extension Entomologists were kept busy teaching the growers whether or not there were enough larvae present to warrant spraying. At one time there was a shortage of insecticide and the regional distributing office of the chemical companies involved were called and urged to make a quick shipment into the area. An exchange of pilots was set up by the agents so that the planes could all be kept busy for the three or four week period that they were needed. The situation worked out much more orderly than in 1956 when there was some confusion, lack of material and equipment to combat the problem.

In 15 of the most heavily infested counties about 42,950 acres were treated with both types of equipment. DDT and toxaphene were used in combination to control the complex of species of caterpillars involved using 3 to 4 pounds of actual ingredients per acre. Farmers were warned not to use the hay for forage. Many farmers did not spray this year in counties that sprayed in 1956, feeling that airplane spraying was not so effective that year.

To determine if the treatments were helpful, the Extension Entomologists circulated a questionaire thru the county agents at harvest time. The following results were obtained:

36.3 percent treated all of their late beans

63.7 percent of those that treated did not treat all of their beans

75.0 percent reported the untreated bean yields were less than those treated

64.0 percent reported bean yields below average this year

29.0 percent reported about average yields

7.0 percent reported above average yields

88.1 percent reported an increase in yield due to treatment

Since 75 percent of the farmers felt that they got an increase in yield by treating and 88 percent felt that the money spent on control was returned in increased yield, it is evident that the spraying saved the farmers many thousands of dollars. Only 7 of the 85 farmers reporting stated definitely that they felt that the treatment did not pay. Again this year a few reported poor results with the airplane but nearly all of the growers were well satisfied with airplane results. Many feel that ground spraying is the only way to treat for earworm control.

SUMMARY OF ANNUAL REPORT IN EXTENSION ENTOMOLOGY - 1959

J. O. Rowell, J. M. Amos, and A. P. Morris

The highlights of the year in Project 22 are summarized in the paragraphs to follow. J. O. Rowell, Extension Entomologist, spent full-time on insect and related pest identification and control matters; J. M. Amos, Associate Extension Entomologist, devoted full-time to entomology, dividing this time between fruit insect control, beekeeping, general entomology, and rodent control project activities; A. P. Morris, Associate Extension Entomologist, concentrated his full effort on the cooperative economic insect survey and reporting service.

Entomology: It was not possible to treat each separate project activity with any appreciable degree of thoroughness; however, in the insect control phase, emphasis was placed upon certain activities which seemed to lend themselves to the greatest productivity in the shortest time.

Leader-training schools on control of pests of ornamentals were important extension entomology activities for the early spring. These schools were conducted in Wise and Henry Counties not reached previously with this service. The schools were conducted also at the Northern Virginia Nurserymen's Association meeting, and at The Southern Shade Tree Conference. Approximately 262 county agents, home agents, local leaders, and nurserymen attended these schools in 1959.

Morgan Morrison, Arlington, won the 1959 State 4-H Club Entomology Award given by the Hercules Powder Company. This was an all-expense paid trip to the National 4-H Club Congress in Chicago. Morgan went on to win one of the six national 4-H Club Entomology Awards, $400.00 cash toward his higher education. This is the third time - since 1952 - that a Virginia 4-H club member has won a national 4-H club entomology award. John R. Cocke, Bedford County; Larry Bowers, Shenandoah County; Ray Davis, Rockingham County; William Patterson, Rockbridge County; and Morgan Morrison, Arlington, Virginia, won one each of the five $20.00 cash Sectional 4-H Club Entomology Awards given by the Virginia State Pest Control Association. Morgan Morrison, Arlington, won the $10.00 cash award for outstanding work in entomology at the 1959 4-H Club Conservation Camp, which award was given by the Virginia State Pest Control Association. Nature study courses in entomology were given at nine county encampments and at the State 4-H Club Conservation Camp. In Virginia 74 counties participated in the 1959 4-H Club Entomology Awards Program, 1556 members were enrolled in the project, and 889 completed their projects.

In September and October of 1959, in cooperation with Dr. E. C. Turner, the extension entomologist assisted county agents in Albemarle and Warren Counties with demonstrations on the use of systemics (Ronnel and Co-Ral) to control cattle grubs in beef cattle.

The further development in Extension Entomology of a new and different teaching aid and visual, Insect-Tac-Too, was an important accomplishment.

Home Grown Tree and Small Fruits: Combination sprays and dusts are being recommended for insect and disease control on fruits about the home and seem to be well accepted. The general fruit spray program was rewritten and revised this year. More than 1000 copies of the general fruit spray program, raspberry spray program, and strawberry pest control leaflets were supplied to the Horticulture Department for use in Leader Training Manuals. Assistance was given to the Horticulture Department at three fruit schools on insect pollination. Two radio tapes were made for the tape service and three newspaper articles written. On fruit problems correspondence totaled 58 letters.

Beekeeping: The extension entomologist appeared on the program of the Virginia State Beekeepers Association with an attendance of 38. He also assisted the group by preparing three news letters.

The associate extension entomologist attended twenty-six bee meetings with an attendance of 1031.

A honey pool was formed for marketing dark honey over the past five years. Over 121,000 pounds were sold at 12½ cents per pound in 60-pound cans during this period.

Two exhibits were made on honeybees. One was an observation hive and an exhibit on biology of the bee was prepared for Agricultural Exposition. It was used at the Southern States Beekeeping Federation and at the Tidewater Beekeepers Association meeting. An estimated 8,175 people saw these exhibits.

Rodent Control: Four talks were given on the Clean Grain Sanitation Program with 57 in attendance. In addition to this, four radio tapes

were made and four newspaper articles written. Rodent control was presented to 35 county agents as subject matter at the Annual Extension Conference.

The mole control film was finally finished this year and a 6½ minute TV tape on moles is now available. We also have a good set of colored slides on moles.

Cooperative Economic Insect Survey: The Cooperative Economic Insect Survey Service is sponsored jointly by the Survey and Detection Operations Section of the USDA, the Virginia Department of Agriculture, and the V.P.I. Agricultural Extension Service and was started June 1, 1954.

The Associate Extension Entomologist in charge of this service, A. P. Morris, devoted full time to gathering information on insects of economic importance in Virginia and making reports to disseminate the information to the public, agricultural workers, and governmental agencies. The information was gathered by personal surveys of insects on the various crops, by visits to extension and professional workers in the state, and from correspondence with Extension and Experiment Station Entomologists of V. P. I.

Five objectives of the service are (1) assist farmers to adequately protect crops from insect attack (2) assure more prompt detection of newly introduced insect pests (3) lead to the development of a workable insect pest forecasting service (4) aid manufacturers and suppliers of insecticide and control equipment to determine areas of urgent need and (5) provide a country-wide skeleton structure to combat biological warfare, if needed.

The first, second, fourth and fifth objectives listed above were accomplished by sending copies of survey reports to agricultural workers in the state, to industrial representatives, and to governmental agencies. A total of 37 survey reports were prepared during the year. Personnel from these agencies and the general public were urged to send in specimens and information on insect activity observed to the survey entomologists. Information from the survey reports was used in a national report by USDA which is issued weekly and in that way was available to agricultural workers and industrial representatives who request copies of the national report. Professional entomologists and county extension personnel are the backbone of the reporting service. They are constantly urged to send reports on insect activity observed to the office of the extension entomologists. The response has been very good. Vocational agriculture teachers receive survey reports and participate in the reporting service. Also, 42 news articles and 15 tape recordings for radio broadcasts were made to inform the public of insect developments. An associated Press representative and some industrial news letters also used the information for news releases.

The third objective, "lead to the development of a workable insect pest forecasting service," was accomplished for alfalfa weevils, pea aphids, corn earworms, armyworms, fall armyworms, clover mites, boxelder bugs, clover leaf weevils, elm leaf beetles, and bagworms during 1959.

The survey entomologist spent a total of 232½ working days performing his field and office duties. In the performance of field duties he spend 110 days, drove 24,776 miles, and made 207 different county visits. He spent 122½ days in the office making approximately 1500 insect identifications, preparing 141 vials of insects for shipment to USDA and National Museum specialists for determinations, and writing 469 individual letters concerning identifications and determinations. These office duties also include 37 periodical survey reports, and 15 tape recordings for radio broadcasts.

It is impossible to determine with accuracy the actual amount of time spent on each group of insects in the groupings used in the report. However, the groups that received the greatest amount of time were the cereal and forage crop insects; forest, ornamental and shade tree insects; insects affecting man and animals; household insects; structural wood insects; and truck crop and garden insects.

The major insects of importance during 1959, under each of these groups are cereal and forage crop insects - corn earworms, alfalfa weevils, armyworms, fall armyworms, European corn borers, and meadow spittlebugs, forest, ornamental and shade tree insects - Virginia pine sawflies, turpentine beetles, Ips beetles, white pine weevils, pine tip moths, and southern pine beetles; household insects - cockroaches, ants, Dermestid beetle larvae, boxelder bugs, clover mites, and clothes moths; insects affecting man and animals - house flies, cattle grubs, sheep scab mites, and ticks; truck crop insects -

European corn borers, cabbage loopers, corn earworms, potato tuberworms, Mexican bean beetles, and Colorado potato beetles; stored product insects - various species of hide beetles, red-legged ham beetles, foreign grain beetles, and rice weevils; tobacco insects - hornworms, tobacco flea beetles, green peach aphids, wireworms, tobacco budworms, and cutworms of various species; fruit insects - red-banded leaf rollers, codling moths, rosy apple aphids, spider mites, and plum curculios; structural wood insects - termites, old house borers, and Lyctus beetles; cotton insects - boll weevils, bollworms, and aphids.