1965

Directory - Where to Find It

Air Applicator Institute

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DIRECTORY

WHERE TO FIND IT

Air Applicator
INFORMATION SERIES
Vol. 6
Where to obtain authentic and needed information is a problem in every new industry. The purpose of this volume is to provide classified lists of sources of material and information.

There is a wealth of information available in the field of agricultural aviation. This material, however, is obtainable in piecemeal form and from many sources. State colleges of agriculture, the United States Department of Agriculture, city and county libraries, chemical and agricultural magazines, chemical companies and state departments of aeronautics are a few of the sources. This volume presents these and other channels of pertinent information for the air-applicator who wishes to be a student of air-application.

This volume further serves as a quick reference guide for information on air agricultural organizations, chemical and equipment companies, state colleges and state and federal agencies. The volume contains the references for the five preceding volumes in the series, a glossary of agricultural and chemical terms and a set of handy liquid and dry measures conversion tables.

The Air-Applicator Institute has much additional information in its files and access to hard to find material. You are cordially invited to write to Air-Applicator Institute, 412 Scott Building, Portland 4, Oregon. We will try to assist you in locating the information you need.

A WEALTH OF INFORMATION LIES AT YOUR DOORSTEP IN THE FORM OF PUBLISHED BULLETINS AND CIRCULARS BY YOUR STATE AGRICULTURAL COLLEGE.

Visit the publications department of your state college. Write for lists of publications. Ask the county agent for lists of publications.

Fig. 1. Mist Master Courtesy Mississippi Valley Flying Service
PART ONE

Agricultural and Related Organizations

AMERICAN CHEMICAL SOCIETY

AMERICAN FRUIT GROWERS MAGAZINE
The National Fruit Magazine. Publ.: American Fruit Growers Publ. Co., 1370 Ontario St., Cleveland, Ohio. Contains: Buyers’ Guide; Classified Index; Articles on Insect and Disease Control.

AMERICAN HORTICULTURAL SOCIETY

AMERICAN INSTITUTE OF CHEMISTS

AMERICAN MOSQUITO CONTROL ASSOCIATION

ASSOCIATION OF OFFICIAL AGRICULTURE CHEMISTS, INC.
P. O. Box 540, Benjamin Franklin Station, Washington 4, D. C., Henry A. Lepper, Secretary-Treasurer.

COMMERCIAL FERTILIZER

COUNTY AGENTS DIRECTORY-1949
lisher, C. L. Mast, Jr., 139 N. Clark Street, Chicago 2, III. Contains list of County Agents and home demonstration agents; state Presidents and Secretaries of Farm Bureaus, Officers of the U.S.D.A., U.S. Dept. of Interior, Office of Indian Affairs, all faculty of Agricultural colleges, National Register Associations (cattle, horse, swine, sheep, goat) National Organizations, Regional Offices of Production & Marketing Administration, Regional Offices of Soil Conservation Service, Officers and Directors of American Farm Bureau Federation, State Club Leaders, Where to Buy Department, Index to Advertisers.

NATIONAL AGRICULTURAL CHEMICAL ASSOCIATION
Barr Building, 910 Seventeenth St., N. W., Washington 6, D. C.

NATIONAL FARM CHEMURGIE COUNCIL INC.,
350 Fifth Avenue, New York 1, N. Y. John W. Ticknor, Treasurer, Publ.: Chemurgie Digest, Industrial and Agricultural Reports.

NATIONAL FERTILIZER ASSOCIATION, INC.
616 Investment Bldg., Washington D. C., Secretary and Treasurer, Daniel S. Murph. Publ.: Yearbook, Fertilizer Review.

NATIONAL PEST CONTROL ASSOCIATION, INC.
William O. Buettner, Executive Secretary, 3019 Ft. Hamilton Parkway, Brooklyn 18, N. Y. For lists of members see section on Pest control operators.

NEW JERSEY MOSQUITO EXTERMINATION ASSOCIATION

NORTHEASTERN FOREST DISEASE AND INSECT PEST CONTROL COMMITTEE
Dr. Walter H. Snell, Brown University, Providence, R. I., Chairman.

PACIFIC INSECTICIDE INSTITUTE
420 Market St., San Francisco 11, California. W. D. Gray Secretary.

PEST CONTROL OPERATORS OF CALIFORNIA, INC.
Hugh C. Smith, President, Columbia Pest Control Company, 101 North Virgil Avenue, Los Angeles 4, California.

UNITED STATES DEPARTMENT OF AGRICULTURE BUREAU OF ENTOMOLOGY AN PLANT QUARANTINE
Directory of Bureau of Enomology and Plant Quarantine, 1948
PART I

Mimeographed. Contains: Brief statements of the function of the Bureau and divisions, with names and addresses of the administrative leaders. Laboratories, offices, and field headquarters, with name of man in charge, is arranged alphabetically, by States. Personnel and division indices are also contained. Publ.: U. S. D. A. Bureau of Entomology and Plant Quarantine.

NORTHWEST VEGETABLE INSECT CONFERENCE
This conference met at the Imperial Hotel Portland, Oregon on January 22-24, 1951.
The conference membership consisted of State, Federal and Dominion Entomologists engaged in research and extension work on insects of the Northwest including Canada.
H. S. Telford, Enomologist, State College of Washington was elected chairman for 1952.

ASSOCIATION OF WEED CONTROL CONFERENCES
The Association of Weed Control Conferences is made up of representatives of the Northeastern, Northcentral, Southern and Western Weed Conferences.
Walter S. Ball, Sacramento, California, Chief of the Bureau of Rodent and Weed Control is President of the Association.

State Department of Agriculture

Every state has as one of its offices a department of agriculture. In most states the department of agriculture is largely an administrative or enforcing agency and leaves the research and experimental work to the state colleges extension and experiment stations. Air-applicators should always consult the state department of agriculture relative to regulations which might apply to air-application. Although there are some 23 states which have no specific laws for controlling air-applicators, many of these same states have excellent information and publish materials designed to assist air-applicators.

STATE OFFICIALS

Air-Applicators have occasion to visit or correspond with numerous state officials either directly or indirectly concerned with air-applying activities. These officials are often the state director of aeronautics, the state director of agriculture, the U. S. Department of Agriculture, Extension director, the director of Agricultural Experiment Station, the state entomologist or the plant pathologist. The following reference list gives the names and addresses for the above people by states:
ORGANIZATIONS

The state departments of agriculture can put you in touch with the work of the state entomologists, weed officers, and experimental station personnel who are always most helpful in their suggestions and information.

ALABAMA

Aeronautics—Asa Rountree, Jr., 102 Church Street, Montgomery.
Agriculture—J. N. Poole, Commissioner of Agriculture and Industries, Montgomery.
U. S. D. A. Extension Service—Mr. P. O. Davis, Auburn.
U. S. D. A. Experiment Station—Mr. M. J. Funchess, Auburn.
State Entomologist—Mr. F. S. Arant and J. M. Robinson, Auburn.
Plant Pathologist—Mr. J. L. Seal, Auburn.

ARIZONA

Aeronautics—No record.
Agriculture—Mr. K. B. McMicken, Arizona Commission of Agriculture and Horticulture, Phoenix.
U.S.D.A. Extension Service—Mr. C. U. Pickrell, Tucson.
U.S.D.A. Experiment Station—Mr. P. S. Burgess, Tucson.
State Entomologist—Mr. C. T. Vorhies, Tucson.
Plant Pathologist—Mr. J. G. Brown, Tucson.

ARKANSAS

Aeronautics—Rutherford J. Ross, Secretary Aeronautics Commission, Fort Smith.
Agriculture—Mr. Thatcher, Executive Director Arkansas Agriculture and Industrial Commission, Little Rock (and 659 Munsey Bldg., Washington D. C.)
U. S. D. A. Experiment Station—Mr. L. S. Ellis, 524 P. O. Bldg., Little Rock
State Entomologist—Mr. W. J. Baerg, Fayetteville.
Plant Pathologist—Mr. V. H. Young, Fayetteville.

COLORADO

Aeronautics—No director.
Agriculture—Mr. W. C. Sweinhart, Director of Agriculture, Denver.
U. S. D. A. Extension Service—Mr. F. A. Anderson, Fort Collins.
U. S. D. A. Experiment Station—Mr. H. J. Henney, Fort Collins.
State Entomologist—Mr. George M. List, Fort Collins.
Plant Pathologist—Mr. L. W. Durrell, Fort Collins.

CALIFORNIA

Aeronautics—Mr. Warren E. Carey, 817 Tenth Street, Sacramento.
Agriculture—Mr. A. A. Brock, Director of Agriculture, Sacramento.
PART I

U. S. D. A. Experiment Station—Mr. P. F. Sharp, Berkeley 4.
State Entomologist—E. O. Essig, Berkeley 4, Mr. A. M. Boyce, Mr. H. S. Smith, Riverside.
Plant Pathologist—Mr. M. W. Gardner, Berkeley, 4.

CONNECTICUT
Aeronautics—Mr. Keneth H. Ringrose, Connecticut Aero. Commission, P. O. Box 1649, Hartford.
Agriculture—Mr. O. F. King, Commissioner of Agriculture, Hartford.
U. S. D. A. Experiment Station—Mr. W. B. Young, Storrs, Mr. J. G. Horsfall, New Haven 4, (State Station).
State Entomologist—Mr. R. B. Friend, New Haven.

DELAWARE
Aeronautics—Hugh R. Sharp, Chairman, Greenville.
Agriculture—Mr. Walker L. Mifflin, President State Board of Agriculture, Dover.
U. S. D. A. Extension Service—Mr. G. M. Worrilow, Newark.
U. S. D. A. Experiment Station—Mr. G. M. Worrilow, Newark.
State Entomologist—Mr. L. A. Sterns, Newark.
Plant Pathologist—Mr. J. W. Heuberger, Newark.

DISTRICT OF COLUMBIA
No Records

FLORIDA
Aeronautics—Mr. Walter E. Keyes, Director Florida State Improvement Commission Box 930, Tallahassee.
Agriculture—Mr. Nathan Mayo, Commissioner of Agriculture, Tallahassee.
U. S. D. A. Experiment Station—Mr. Harold Mowry, Gainesville.
State Entomologist—Mr. A. N. Tissot, Gainesville.
Plant Pathologist—Mr. W. B. Tisdale, Gainesville.

GEORGIA
Aeronautics—No Record.
Agriculture—Mr. Tom Linder, Commissioner of Agriculture, Atlanta.
U. S. D. A. Extension Service—Mr. Walter S. Brown, Athens (Experiment-State Station) Tifton, (Coastal Plain Station).
U. S. D. A. Experiment Station—See Above.
State Entomologist—None Listed.
ORGANIZATIONS

Plant Pathologist—Mr. B. B. Higgins, Georgia Agriculture Experiment Station, Athens.

IDAHO

Aeronautics—Mr. Chet Moulton, Department of Aeronautics, Capitol Building, Boise.
Agriculture—Mr. Dave Stubblefield, Commissioner of Agriculture, Boise.
U. S. D. A. Experiment Station—Same As Above.
State Entomologist—Mr. H. C. Manis, Moscow.
Plant Pathologist—Mr. C. W. Hungerford, Moscow.

ILLINOIS

Aeronautics—Mr. Joseph K. McLaughlin, Director-Chairman of the Board Department of Aeronautics, Capitol Airport, Springfield.
Agriculture—Mr. Arnold Benson, Secretary of Agriculture, State House, Springfield.
U. S. D. A. Extension Service—Mr. H. P. Rusk, Urbana.
U. S. D. A. Experiment Station—Same As Above.
State Entomologist—Mr. G. C. Decker, Urbana.
Plant Pathologists—Mr. H. W. Anderson, Urbana.

INDIANA

Aeronautics—Mr. C. F. Cornish, Aeronautics Commission of Indiana, 311 West Washington Street, Indianapolis.
Agriculture—Mr. Chas. M. Dawson, Commissioner of Agriculture, Indianapolis.
U. S. D. A. Experiment Station—Same As Above.
State Entomologist—Mr. J. J. Davis, LaFayette.
Plant Pathologist—Mr. R. M. Caldwell, LaFayette.

IOWA

Aeronautics—Mr. Norbert Locke, Iowa Aeronautics Commission State Capitol, Des Moines.
Agriculture—Mr. Harry D. Linn, Secretary of Agriculture, Des Moines.
U. S. D. A. Experiment Station—Same As Above.
State Entomologist—Mr. H. M. Harris, State College, Ames.
Plant Pathologist—Mr. George McNew, State College, Ames.

KANSAS

Aeronautics—Mr. Riley R. Whearty, Kansas State Development Commission, 903 Harrison Street, Topeka.
Agriculture—Mr. J. C. Mohler, Secretary of State Board of Agriculture, Topeka.
PART I

U. S. D. A. Extension Service—Mr. L. C. Williams, Manhattan.
U. S. D. A. Experiment Station—Mr. R. I. Throckmorton, Manhattan.
State Entomologist—Mr. R. C. Smith, Manhattan.
Plant Pathologist—Mr. L. E. Melchers, Manhattan.

KENTUCKY
Aeronautics—Mr. Carles H. Gartrell, Department of Aeronautics, Frankfort.
Agriculture—Mr. Elliot Robertson, Commissioner of Agriculture, Frankfort.
U. S. D. A. Extension Service—Mr. T. P. Cooper, Lexington 29.
U. S. D. A. Experiment Station—Same As Above.
State Entomologist—Mr. W. A. Price, Lexington 29.

LOUISIANA
Aeronautics—Mr. T. B. Herndon, Aeronautics Division, Department of Public Works, Baton Rouge.
Agriculture—Mr. W. E. Anderson, Department of Agriculture and Immigration, Baton Rouge.
U. S. D. A. Extension Service—Mr. H. C. Sanders, Baton Rouge 3.
U. S. D. A. Experiment Station—Mr. W. G. Taggart, Baton Rouge 3.
State Entomologist—Mr. C. E. Smith, Baton Rouge 3.
Plant Pathologist—Mr. C. W. Edgerton, Baton Rouge 3.

MAINE
Aeronautics—Mr. Scott K. Higgins, Aeronautic Commission, State Airport.
Agriculture—Mr. A. K. Gardner, Commissioner of Agriculture Augusta.
U. S. D. A. Extension Service—Mr. A. L. Deering, Orona,
U. S. D. A. Experiment Station—Mr. Fred Griffie, Orona.
State Entomologist—Mr. F. H. Lathrop, University of Maine, Orona.
Plant Pathologist—Mr. Donald Folsom, Orona.

MARYLAND
Aeronautics—Mr. Richard A. Jamison, Maryland Aviation Commission, 922 Munsey Building, Baltimore.
Agriculture—Mr. H. C. Byrd, Ex. Officer, State Bd. of Agriculture University of Maryland, College Park.
U. S. D. A. Extension Service—Mr. T. B. Symons, College Park.
U. S. D. A. Experiment Station—Mr. W. B. Kemp, College Park.
State Entomologist—Mr. E. N. Cory, College Park.
Plant Pathologist—Mr. R. A. Jehle, College Park.

MASSACHUSETTS
Aeronautics—Mr. Crocker Snow, Massachusetts Aeronautic Commission, Logan Airport, East Boston.
ORGANIZATIONS

Agriculture—Mr. John Chandler, Commissioner of Agriculture
State House, Boston.
U. S. D. A. Extension Service—Mr. W. A. Munson, Amherst.
U. S. D. A. Experiment Station—Mr. F. J. Sievers, Amherst.
State Entomologist—Mr. A. I. Bourne, Amherst.
Plant Pathologist—Mr. A. V. Osmun, Amherst.

MICHIGAN
Aeronautics—Mr. Lester J. Maitland, Michigan Aeronautics Com-
mission, Capitol City Airport, Lansing.
Agriculture—Mr. Charles Figy, Commissioner, State Department
of Agriculture, Lansing.
U. S. D. A. Extension Service—Mr. C. V. Ballard, East Lansing.
U. S. D. A. Experiment Station—Mr. V. R. Gardner, East Lansing.
State Entomologist—Mr. Ray Huston, East Lansing.
Plant Pathologist—Mr. W. B. Drew, East Lansing.

MINNESOTA
Aeronautics—Mr. L. L. Schroeder, Department of Aeronautics, Hol-
man Field, St. Paul.
Agriculture—Mr. R. A. Trovatten, Commissioner of Agriculture,
Dairy and Food, St. Paul.
U. S. D. A. Extension Service—Mr. Paul E. Miller, St. Paul.
U. S. D. A. Experiment Station—Mr. C. H. Bailey, St Paul
State Entomologist—Mr. C. E. Mickel, University Farm St. Paul 8.
Plant Pathologist—Mr. E. C. Stakman, University Farm, St. Paul.

MISSISSIPPI
Aeronautics—Mr. C. A. Moore, Mississippi Aeronautics Commission
P. O. Box 5, Jackson.
U. S. D. A. Extension Service—Mr. L. I. Jones, State College.
U. S. D. A. Experiment Station—Mr. F. J. Welch, State College
State Entomologist—Mr. Clay Lyle, State College.
Plant Pathologist—Mr. John T. Presley, State College.

MISSOURI
Aeronautics—Mr. George D. Clayton, Jr., 227 Broadway, Hannibal.
Agriculture—Mr. Robert Thornburg, Commissioner of Agriculture,
Jefferson City.
U. S. D. A. Experiment Station—Mr. J. H. Longwell, Columbia
State Entomologist—Mr. Leonard Haseman, Columbia.
Plant Pathologist—Mr. C. M. Tucker, Columbia.

MONTANA
Aeronautics—Mr. Frank W. Wiley, Montana Aeronautics Commissi-
ion, Box 1698, Helena.
Agriculture—Mr. Albert H. Kruse, Commissioner of Agriculture,
Labor and Industry, Helena.
U. S. D. A. Extension Service—Mr. R. B. Tootell, Bozeman.
U. S. D. A. Experiment Station—Mr. Clyde McKee, Bozeman.
State Entomologist—Mr. J. H. Pepper, Bozeman.
Plant Pathologist—Mr. H. E. Morris, Bozeman.

NEBRASKA
Aeronautics—Mr. James D. Ramsey, Department of Aeronautics
State House, Lincoln.
Agriculture—Mr. Rufus M. Howard, Director of Agriculture and
Inspection, Lincoln.
U. S. D. A. Extension Service—Mr. W. V. Lambert, Lincoln 1.
U. S. D. A. Experiment Station, Mr. W. W. Burr, Lincoln 1.
State Entomologist—Mr. Ephriam Hixson, Lincoln.
Plant Pathologist—Mr. W. B. Allington, Lincoln 1.

NEW HAMPSHIRE
Aeronautics—Mr. Russell Hilliard, N. H. Aeronautics Commission
P. O. Box 237, Municipal Airport, Concord.
Agriculture—Mr. P. I. Fitts, Commissioner of Agriculture, Concord.
U. S. D. A. Extension Service—Mr. L. A. Bevan, Durham.
U. S. D. A. Experiment Station—Mr. R. F. Chandler, Jr., Durham
State Entomologist—Mr. J. G. Conklin, Durham.
Plant Pathologist—Mr. M. C Richards, Durham.

NEVADA
Aeronautics—No Record.
Agriculture—Mr. George G. Schweis, Dir. Plant Industry, State
Department of Agriculture, Reno.
U. S. D. A. Extension Service—Mr. C. W. Creel, Reno.
U. S. D. A. Experiment Station—Mr. Charles Fleming, Reno.
State Entomologist—University of Nevada, Reno (only listing
given).
Plant Pathologist—Same As Above.

NEW MEXICO
Aeronautics—Charles J. Boyd, Albuquerque, Highway Road, Santa
Fe.
Agriculture—Mr. L. W. Branson, Dean, A & M College, State Col-
lege P. O.
U.S.D.A. Extension Service—Mr. H. R. Varney, State College.
U.S.D.A. Experiment Station — Same as above.
State Entomologist—Mr. J. R. Eyer, State College.
Plant Pathologist—Mr. R. F. Crawford, State College.

NORTH CAROLINA
Aeronautics—No record.
Agriculture—Mr. L. Y. Ballentine, Commissioner of Agriculture,
Raleigh.
ORGANIZATIONS

U.S.D.A. Extension Service—Mr. I. O. Schaub, Raleigh.
U.S.D.A. Experiment Station—Mr. J. L. Hilton, Raleigh.
State Entomologist—Mr. Z. P. Metcalf, Raleigh.
Plant Pathologist—Mr. C. J. Nusbaum, Raleigh.

NEW JERSEY
Aeronautics—Mr. Robert L. Copsey, Department of Conservation and Economic Development, Division of Planning and Development, Aeronautics Section, State House, Trenton.
Agriculture—Mr. W. H. Allen, Secretary of Agriculture, State Board of Agriculture, Trenton.
U.S.D.A. Experiment Station—Same as above.
State Entomologist—Mr. B. B. Pepper, New Brunswick.
Plant Pathologist—Mr. W. H. Martin, New Brunswick.

NEW YORK
Aeronautics—Mr. C. B. Friday, Department of Commerce, Bureau of Aviation, Albany.
Agriculture—Mr. C. Chester Dumond, Commissioner of Agriculture and Markets, Albany.
U.S.D.A. Extension Service—Mr. L. R. Simons, Cornell University, Ithaca.
U.S.D.A. Experiment Station—Mr. C. E. F. Guterman, Cornell University, Ithaca. Mr. A. J. Heinicke, State Station, Geneva.
State Entomologist—Mr. P. J. Chapman, State Station, Geneva.
Plant Pathologist—Mr. O. A. Reinking, State Station, Geneva.

NORTH DAKOTA
Aeronautics—Mr. Harold G. Vavra, Box 112, Minot.
Agriculture—Mr. Math Dahl, Commissioner of Agriculture and Labor, Bismarck.
U.S.D.A. Extension Service—Mr. E. J. Haslerud, Fargo.
U.S.D.A. Experiment Station, Mr. H. L. Walster, Fargo.
State Entomologist—Mr. J. A. Munro, Fargo.
Plant Pathologist—Mr. W. E. Brentzel, Fargo.

OHIO
Aeronautics—Mr. C. E. A. Brown, Ohio Aviation Board, 501 Wyan- dotte Building, Columbus.
Agriculture—Mr. A. M. Marion, Director of Agriculture, Columbus.
U.S.D.A. Extension Service—Mr. C. M. Ferguson, Ohio State University, Columbus.
U.S.D.A. Experiment Station—Mr. L. L. Rummel, Agriculture Experiment Station, Wooster.
State Entomologist—Mr. C. R. Neiswander, Exp. Sta., Wooster.
Plant Pathologist—Mr. H. C. Young, Exp. Sta., Wooster.
OKLAHOMA

Aeronautics—Mr. Eldon Stout, Oklahoma Aviation Commission, State Capitol, Oklahoma City.

Agriculture—Mr. Harold Hutton, Pres., State Board of Agriculture, Oklahoma City.


U.S.D.A. Experiment Station—Mr. W. L. Blizzard, Okla. Agr. and Me. Stillwater.

State Entomologist—Mr. F. A. Fenton, Stillwater.

Plant Pathologist—Mr. W. W. Hansen, Stillwater.

OREGON

Aeronautics—Mr. W. M. Bartlett, Oregon Board of Aeronautics, 895 Chemeketa Street, Salem.

Agriculture—Mr. Ervin L. Peterson, Director of Agriculture, Agriculture Building, Salem.

U.S.D.A. Extension Service—Mr. W. A. Schoenfeld, Corvallis.

U.S.D.A. Experiment Station—Same as above.

State Entomologist—Mr. D. C. Mote, Corvallis.

Plant Pathologist—Mr. S. M. Deitz, Corvallis.

PENNSYLVANIA

Aeronautics—Mr. Wm. L. Anderson, Penn. Aeronautics Commission, Harrisburg State Airport, New Cumberland.

Agriculture—Mr. Miles Horst, Secretary of Agriculture, Harrisburg.


U.S.D.A. Experiment Station—Mr. F. F. Lininger, State College.

State Entomologist—Mr. E. H. Dusham, State College.

Plant Pathologist—Mr. F. D. Kern, State College.

RHODE ISLAND

Aeronautics—Mr. Albert R. Tavani, Administrator, Division of Aeronautics, Theodore Francis Green Airport, Hillsgrove.

Agriculture—Mr. F. S. Lever, Dir. of Agri. and Conservation, Providence.

U.S.D.A. Extension Service—Mr. H. O. Stuart, Kingston.

U.S.D.A. Experiment Station—Mr. M. H. Cambell, Kingston.

State Entomologist—No record.

Plant Pathologist—Mr. F. L. Howard, Kingston.

SOUTH CAROLINA

Aeronautics—Mr. L. O. Andrews, South Carolina Aeronautics Com. P.O. Box 1176, Columbia.

Agriculture—Mr. J. Roy Jones, Commissioner of Agri. Columbia.


U.S.D.A. Experiment Station—Mr. H. P. Cooper, Clemson.

State Entomologist—Mr. J. A. Berly, Clemson.

Plant Pathologist—Mr. G. M. Armstrong, Clemson.
SOUTH DAKOTA

Aeronautics—Mr. L. V. Hanson, South Dakota Aeronautics Commission, Capitol Building, Pierre.
Agriculture—Mr. E. H. Everson, Secretary of Agriculture, Pierre.
U.S.D.A. Extension Service—Mr. George Gilbertson, Brookings.
U.S.D.A. Experiment Station, Mr. I. B. Johnson, Brookings.
State Entomologist—Mr. C. H. Severin, Brookings.
Plant Pathologist—Mr. C. L. Nagel, Brookings.

TENNESSEE

Aeronautics—Mr. Tom O. Kesterson, Tenn. Bureau of Aeronautics, Berry Field, Nashville.
Agriculture—Mr. O. O. Van Cleave, Commissioner of Agriculture, Nashville.
U.S.D.A. Extension Service—Mr. John McL...d, Knoxville, 7.
U.S.D.A. Experiment Station—Same as above.
State Entomologist—Mr. S. Marcovitch, Knoxville, 7.
Plant Pathologist—Mr. C. D. Sherbakoff, Knoxville, 7.

TEXAS

Aeronautics—Mr. A. W. Meadows, Texas Aeronautics Commission, Municipal Airport, Austin.
Agriculture—Mr. J. E. McDonald, Commissioner of Agriculture, Austin.
U.S.D.A. Extension Service—Mr. J. D. Prewet, College Station.
U.S.D.A. Experiment Station—Mr. R. D. Lewis, College Station.
State Entomologist—Mr. H. G. Johnston, College Station.
Plant Pathologist—Mr. A. A. Dunlap, College Station.

UTAH

Aeronautics—Mr. D. A. Fuhriman, Utah Aeronautics Commission, 423 State Capitol Building, Salt Lake City.
Agriculture—Mr. R. H. DasTrup, Chairman Agriculture Commission, Salt Lake City.
U.S.D.A. Extension Service—Mr. Carl Frischknecht, State College, Logan.
U.S.D.A. Experiment Station—Mr. R. H. Walker, State College, Logan.
State Entomologist—Mr. D. M. Hammond, Logan.
Plant Pathologist—Mr. B. L. Richards, Logan.

VERMONT

Aeronautics—Mr. Edward F. Knapp, Vermont Aeronautics Commission, State House, Montpelier.
Agriculture—Mr. Stanley Judd, Commissioner of Agriculture, Montpelier.
U.S.D.A. Extension Service—Mr. J. E. Carrigan, Burlington.
U.S.D.A. Experiment Station—Same as above.
State Entomologist—Mr. C. T. Parsons, Burlington.
Plant Pathologist—Mr. Thomas Sproston, Burlington.

VIRGINIA
Aeronautics—Mr. Allan C. Perkinson, State Corporation Commission, Division of Aviation, Richmond.
Agriculture—Mr. L. M. Walker, Jr., Commissioner of Agriculture, Richmond.
U.S.D.A. Extension Service—Mr. L. B. Dietrick, Blackburg.
U.S.D.A. Experiment Station—Mr. N. H. Young, Blacksburg, and Mr. V. A. Tiedjens, Truck Exp. Station, Norfolk.
State Entomologist—Mr. W. J. Schoene, Blacksburg.
Plant Pathologist—Mr. S. A. Wingard, Blacksburg.

WASHINGTON
Agriculture—Mr. S. N. Omdahl, Director of Agriculture, Old Capitol Building, Olympia.
U.S.D.A. Extension Service—Mr. V. E. Ellington, Pullman.
U.S.D.A. Experiment Station—Mr. M. T. Buchanan, Pullman
State Entomologist—R. L. Webster, Pullman.
Plant Pathologist—Mr. Geo. W. Fischer, Pullman.

WEST VIRGINIA
Aeronautics—Mr. Hubert H. Stark, State Aeronautics Commission, Charleston.
Agriculture—Mr. J. B. McLaughlin, Commissioner of Agriculture, Charleston.
U.S.D.A. Experiment Station—Mr. C. R. Orton, Morgantown.
State Entomologist—Mr. L. M. Peairs, Morgantown.
Plant Pathologist—Mr. J. G. Leach, Morgantown.

WISCONSIN
Aeronautics—Mr. T. K. Jordan, State Aeronautics Commission, Senate Parlors, State Capitol, Madison 2.
Agriculture—Mr. Milton H. Button, Director of Agriculture, Madison.
U.S.D.A. Experiment Station—Mr. R. K. Froker, Madison 6.
State Entomologist—Mr. T. C. Allen, Madison 6.
Plant Pathologist—Mr. G. W. Keitt, Madison 6.

WYOMING
Aeronautics—Mr. C. K. Faught, Jr., Wyoming Aeronautics Commission, Room 31, Capitol Building, Cheyenne.
Agriculture—Mr. E. J. Ward, Commissioner of Agriculture, 310 Capitol Building, Cheyenne.
ORGANIZATIONS

U.S.D.A. Extension Service—Mr. A. E. Bowman, Laramie.
U.S.D.A. Experiment Station, Mr. J. A. Hill, Laramie.
State Entomologist—Mr. D. G. Denning, University of Wyoming, Laramie, and Mr. R. E. Pfadt, same address.
Plant Pathologist—Mr. G. H. Starr, (Agr. and Ec.), University of Wyoming.

HAWAII

Aeronautics—Mr. Glenn T. Belcher, Hawaii Aeronautics Commission, Honolulu Airport, Honolulu 17, T. H.
Agriculture—No record.
U.S.D.A. Experiment Station, Mr. J. H. Beaumont, Honolulu.
State Entomologist—Mr. F. G. Holdaway, Honolulu 10.
Plant Pathologist—Mr. W. J. Hendrix, Honolulu 10.

CONSULT STATE DIRECTOR OF AERONAUTICS: It is almost a certainty that at least some form of permit or registry is necessary with the State Department of Aeronautics.

Air-application involves low flying. All of the states either have special local regulations relative to safe flying or they have laws permitting the enforcement of F.A.A. regulations. In any case an air-applicator must have a F.A.A. waiver and in many states the state registration of air-applicators amounts only to a formality which satisfies the state director that a F.A.A. waiver has been obtained. It also gives them a check on who and how many are engaged in the air-application industry in the state. This information is useful for statistical purposes. Some state directors require reports upon the completion of each job giving the number of acres, crop and chemical.

ANNUAL WEED CONFERENCES

Weed conferences are held annually on a regional basis. They are the Western, North Central, Southern and North Eastern. These conferences are attended by all parties interested in the control of weeds.

In recent years the importance of organized weed control has gained wide recognition. There has been considerable pooling of information and wide cooperation in research. At each annual meeting the most critical problems are discussed and ways and means suggested for meeting them.

One of the several practical outcomes of these meetings is the making of recommendations for the chemical control of weeds. These dosage recommendations represent the most authentic knowledge in the efficient use of chemicals or weed control.
An excellent source of information is the "published proceedings" of numerous conferences, particularly the various annual weed conferences. See Fig. 2a. Send to the various weed conferences for copies of the proceedings.

"SHORT COURSES"

Many states now hold agricultural aviation "Short Courses" for pilots and operators. These courses range from two days to a week in length and are usually sponsored by the state colleges and state departments of aeronautics.

The syllabus or course outline is an excellent source of authentic information. Fig. 2b shows a typical short course syllabus.

**FAA DISTRICT OFFICES**

The FAA must approve all aircraft used in air-application and certificate pilots. The FAA issues waivers for low flying or other
deviation from the civil air regulations. See Volumes Three and Five for full discussion of the F.A.A. and its relation to agricultural aviation.

Conveniently located district offices are in most states. Consult with a F.A.A. Safety Agent relative to aircraft modification problems and flight waivers. The following list gives the location of F.A.A. district offices by states.

The F.A.A. has two offices in Washington, D. C. which concern themselves with agricultural aviation. For information write to: Office of Aviation Development, Wiley Wright, Director; and Office of Aviation Safety, Industrial Uses of Aircraft, Hugh Mitchell, Chief; Federal Aviation Agency Commerce Building, Washington D. C.

ALABAMA — Municipal Airport, Box 73, Route 1, Birmingham, Springhill, Mobile.

ARIZONA — Sky Harbor Airport, P.O. Box 992, Phoenix.

ARKANSAS — P.O. Box 426, Little Rock.

CALIFORNIA — Hangar No. 4, Lockheed Air Terminal, Burbank. Fresno Air Terminal, P.O. Box 591, Fresno. Administration Building, Municipal Airport, Long Beach. 5651 West Manchester Ave., Los Angeles 45. Municipal Airport, Oakland 14. Municipal Airport, P.O. Box 71, Ontario. Municipal Airport, P.O. Box 1240, Palo Alto. Municipal Airport, Sacramento. Administration Building, Lindbergh Field, San Diego. Hancock Field, Santa Maria. International Terminal Building, San Francisco Municipal Airport, South San Francisco.

COLORADO — F.A.A. District Office Building, Stapleton Airfield, Denver 7. P. O. Box 1046, Grand Junction.


FLORIDA — 430 Lynch Building, Jacksonville. P.O. Box 1133, Miami Springs. P.O. Box 2511, Municipal Airport, Orlando. P.O. Box 839, Municipal Airport, Tallahassee. P.O. Box 2112, Tampa.

GEORGIA — P.O. Box 738, Municipal Airport, Atlanta.

IDAHO — 1412 Idaho Street, Boise.

ILLINOIS — 6013 South Central Ave., Chicago Midway Airport, Chicago 38. Chicago International Airport, O'Hare Field, Park Ridge. Capital Airport, Springfield.

INDIANA — Weir-Cook Airport, Indianapolis.

IOWA — P.O. Box 1907, Cedar Rapids. 211 Old Federal Building, Des Moines.

KANSAS — Administration Building, Fairfax Airport, Dodge City. Administration Building, Fairfax Airport, Kansas City 15. Municipal Airport, 320 Administration Building, Wichita.

KENTUCKY — Bowman Field, Louisville.
PART I

LOUISIANA — Box 8147 Centilly Station, New Orleans. P.O. Box 86, Shreveport.

MAINE — Municipal Airport, Portland.

MARYLAND — Terminal Building, Municipal Airport, Baltimore 22.

MASSACHUSETTS — 287 Marginal Street, East Boston 28. Municipal Airport, Norwood. P.O. Box 215, Barnes Westfield Airport, Westfield.

MICHIGAN — Kent County Airport, Grand Rapids. Wayne County Airport, Romulus.

MINNESOTA — Wold-Chamberlain Field, Minneapolis. Rochester Airport, Rochester.

MISSISSIPPI — P.O. Box 1727, Jackson 5.

MISSOURI — P.O. Box 486, Springfield. Administration Building, Lambert-St. Louis Airport, Box 127, St. Louis 21.

MONTANA — 219 1/2 North Broadway, Billings. P.O. Box 1167 Municipal Airport, Helena.

NEBRASKA — P.O. Box 1748, Lincoln. P.O. Box 581, North Platte. 403 15th Street, Omaha.

NEVADA — Administration Building, McCarran Field, P.O. Box 1752, Las Vegas. 328 Gazette Building, P.O. Box 499, Reno.

NEW HAMPSHIRE — Municipal Airport, Concord.

NEW JERSEY — Central Airport, Camden 11, Room 202 Administration Bldg., Municipal Airport, Newark. Teterboro Air Terminal, Teterboro.

NEW MEXICO — 2910 E. Central Avenue, Albuquerque.


NORTH CAROLINA — 1315 Independence Building, Charlotte. P.O. Box 1858, Raleigh. P. O. Box 2996, Winston Salem.

NORTH DAKOTA — Municipal Airport, Bismarck. 621 First Avenue, Walker Building, Fargo.

OHIO — Lunken Airport, Cincinnati. 6200 Rock River Drive, Cleveland. Port Columbus Airport, Columbus. Toledo Municipal Airport, Box 37, Toledo.

OKLAHOMA — P.O. Box 5158, Farley Station, Oklahoma City 2.


ORGANIZATIONS

SOUTH CAROLINA — P.O. Box 1085, Capital Airport, Columbia.
SOUTH DAKOTA — P.O. Box 96, Huron. P.O. Box 27, Rushmore Airport, Rapid City.
TENNESSEE—R.F.D. 1, Box 668, Municipal Airport, Memphis. Berry Field, Nashville 4.
TEXAS — P.O. Box 2306, Amarillo. P.O. Box 1592, Big Springs. Airport Branch Post Office, Brownsville. 241 Terminal Building, Love Field, Dallas. Municipal Airport, El Paso. P.O. Box 1689, Fort Worth. 8242 Travelair, Municipal Airport, Houston. Route 10, Box 289, San Antonio Airport, San Antonio.
UTAH — Municipal Airport No. 1, Salt Lake City 3.
VIRGINIA — 2013 Richmond Highway, Beacon Field, Alexandria. Woodrum Field, Roanoke. P.O. Box 266, Sandston.
WASHINGTON — Felts Field, P.O. Box 26, Parkwater. P.O. Box 17, Boeing Field, Seattle. 2300 West Washington Ave., Yakima.
WEST VIRGINIA — P.O. Box 1448, Benedum Airport, Clarksburg.
WISCONSIN — General Mitchell Field, Milwaukee. Old City Hall Building, Wausau.
WYOMING — Municipal Airport, 3801 Evans Avenue, Cheyenne.
ALASKA — Merrill Field, P.O. Box 440, Anchorage. Wien Hangar, Weeks Field, P.O. Box 790, Fairbanks. McKinley Building, P.O. Box 2449, Juneau.
HAWAII — Regional Office, Box 4009, Honolulu.
PUERTO RICO — P.O. Box 4764, San Juan.

U. S. DEPARTMENT OF AGRICULTURE

The Department of Agriculture is directed by law to acquire and diffuse useful information on agricultural subjects in the most general and comprehensive sense. The Department performs functions relating to research, education, conservation, marketing, regulatory work, and agricultural adjustment. It conducts research in agricultural and industrial chemistry, the industrial uses of farm products, entomology, soils, agricultural engineering, agricultural economics, marketing, crop and livestock production, production and manufacture of dairy products, human nutrition, home economics, and conservation. It makes research results available for practical farm application through extension and experiment station work in cooperation with the States.

The Department provides crop reports, commodity standards, Federal meat inspection service, and other marketing services. It seeks to eradicate and control plant and animal diseases and pests. It administers
more than 50 regulatory laws designed to protect the farmer and consuming public. It promotes the efficient use of soils and forests. It provides rural rehabilitation, and guarantees farmers a fair price and a stable market through commodity loans and marketing quotas. It also provides agricultural credit, assists tenants to become farm owners, and facilitates the introduction of electric service to persons in rural areas.

**Bureau of Entomology**

The Bureau of Entomology and Plant Quarantine carries on investigations on insects, gives advice on how to control or use them, cooperates with State and local agencies to control and prevent the spread of injurious insects and plant diseases, advises the Secretary of Agriculture on matters relating to plant quarantines, and is responsible for the enforcement of Federal plant quarantines and regulatory orders to prevent the introduction into or spread within the United States of injurious insect pests and plant diseases.

The research conducted by the Bureau of insects includes studies on their classification, anatomy, physiology, habits, and responses under normal and artificial conditions. The investigations are conducted to develop information on how insects which are injurious to agriculture, forestry, or animals, or which annoy or injure man or destroy his possessions may be eliminated or controlled. This involves research on chemicals or other substances that may be used to prevent, destroy, attract, repel, or mitigate insects which infest vegetation, attack or annoy animals, or may be present in households or any environment whatsoever including the study of problems relating to the composition, action, and application of such materials, and the development of methods for their manufacture and use. Investigations are made on diseases and natural enemies of insects to determine ways of utilizing those which may aid in the control of injurious insect pests. Studies are made on the culture and use of honey bees and of beekeeping practices.

**Bureau of Plant Industry**

The activities of the Bureau of Plant Industry, Soils, and Agricultural Engineering include investigations of plant production, improvements of soils in which plants are grown, and the engineering problems concerned with crop production, primary processing of crops, handling of soils and with the design and construction of farm buildings. Headquarters for the Bureau are at the Plant Industry Station, Beltsville, Maryland. Most of its work is conducted in cooperation with the State agricultural experiment stations.

Research with plants is concerned chiefly with reducing the hazards of production and improving the yield and quality of all crops. One of the principal ways of doing this is by breeding new strains or varie-
ties that are resistant to diseases, insects, heat, drought, or cold and that have a tendency to yield well. Representatives of the Bureau have visited most foreign countries and brought back thousands of plants that have been useful here, either in their original form or as breeding material. Other important work with plants includes studies of weed control and of methods of planting, harvesting, transportation, and storage of crop plants. Efforts to control diseases involve studies of bacteria, fungi, and nematodes, their life histories, and a knowledge of how they are spread to new territory. With this information it is often possible to work out some practical control measure, such as seed treatment, spraying, dusting, or soil fumigation.

The Bureau is giving much emphasis to the study of growth regulating chemicals, which have a variety of uses, including stimulation of rooting of cuttings prevention of preharvest drops of some fruits, hastening of ripening, and increase of flavor and nutritional value. The basic discovery of the length of day on the blossoming and fruiting of plants has resulted in a long series of studies on the effects of this factor on various plants and their propagation, adaptation and production.

Extension Divisions

The U. S. Department of Agriculture works with state colleges and universities in a cooperative extension service in agriculture and home economics. This cooperative service usually goes under the title of the state university or college department of agriculture, extension division.

Experiment Station

The U. S. Department of Agriculture also cooperates with the local state colleges in setting up experimental stations for special research in the immediate crop areas of the subject studied.

For complete information on the organization of the U. S. Department of Agriculture see Reference No. 255, Directory of Organization and Field Activities of the Department of Agriculture, 1947, Fig. 3, described in Part 2 of this volume.
BUREAU OF ENTOMOLOGY

avery S. Hoyt
Acting Chief
Washington, D. C.

Cotton Insect Investigations — R. W. Harned.

Forest Insect Investigations — F. C. Cranghead, Research Center, Beltsville, Md.


Fruit Insect Investigations — B. A. Porter.

Grasshopper Control — Claude Wakeland, 131 Speer Boulevard, Denver, Colorado.


Insecticide Investigations — R. C. Roark, Research Center, Beltsville, Md.

Insect Pest Survey and Information — G. J. Haeussler.

Insects Affecting Man and Animals — E. F. Knipling.

Insect Investigation — C. F. W. Muesebeck.

Mexican Fruit Fly Control — P. A. Hoidale, Room 503, Rio Grande Building, Harlingen, Texas.

Pink Bollworm and Thubereria Weevil Control — L. F. Curl, Room 571, Federal Building, San Antonio 6, Texas.

Truck Crop and Garden Insect Investigations — W. H. White.
There is much agricultural aviation literature available. The problem is what and where. This section presents some of the materials. The Air-Applicator Institute stocks many of the available publications. Write us and if we do not have the title you wish we will get it for you.

Each of the books, pamphlets and articles listed in this bibliography have been carefully read and selected for its authenticity and value as a source of practical information. You are urged to obtain and study as many of these materials as you can. Your time will be well utilized.

**State College Publications**

Figure 4a shows a few of the hundreds of publications which are available through your local state agricultural college. Most of the state colleges have investigated the problems of agriculture common to the state and adjoining area. These investigations include studies of local crops, insects and weeds.

Fig. 4a. Lists of state college publications. 4b. Typical state college publications.
Many bulletins have been released giving specific recommendations for the use of pesticides, herbicides and fungicides, including actual spray programs. The state agricultural colleges in cooperation with the U. S. Department of Agriculture, the extension services and the experimental stations form the most authentic source of information.

Space does not permit the listing of all the excellent materials which you may obtain free from your state agricultural college. Write to your state college (See list of addresses in this part) for a list of their publications. See Figure 4b. Address request to publications divisions.

U. S. Department of Agriculture

The U. S. Department of Agriculture makes available many useful bulletins and circulars useful to air-applicators. Figure 5 shows the list of U. S. Department of Agriculture publications available through the Government Printing Office. Build a library of information through the various materials of U.S.D.A. and other agencies.

Trade Literature

Valuable up-to-the-minute information on chemicals, methods, crops and pests is available in the free literature published and distributed by the large chemical suppliers. Pictured here and listed are a few samples of this type of information.

The free news sheet type of publications distributed by the chemical companies as shown in Fig. 6a are excellent sources of specific information on many products. These publications also provide much general information and are always up to date. Send your name to the company requesting that your name be placed on their mailing list.

Many state departments of agriculture or state colleges of agriculture publish a monthly. See Figure 6b "California Agriculture" and
"Ohio Farm and Home Research" are examples. Consult your local state college for name of your state publication.

There are many good commercial agricultural magazines which are useful for general information. All of these frequently carry articles on spraying and dusting. Consult your local library for a list. "Agricultural Chemicals" is the name of a trade magazine to which every air-applicator should subscribe. See Fig. 7. This magazine has many articles dealing with specific crops, pests and chemicals.

Fig. 7. Agricultural Chemicals — A "must" for air-applicators.
HANDBOOK OF AGRICULTURAL PEST CONTROL
by Stanley F. Bailey and Leslie M. Smith

This recently published handbook covers agricultural chemicals, their rates of application and useful formulas. There are chapters on fumigation, spray machines, toxicology, dusts and dusting, aircraft and mosquito control. The book deals with hormones, nutrients and defoliants, as well as insecticides, herbicides and fungicides.

INSECTS OF WESTERN NORTH AMERICA
by E. O. Essig

This book containing over 1000 pages is an excellent basic text on insects. It is well illustrated and treats fully the cycles, habitats, breeding customs and economic importance of all common insects. Order your copy from the Air-Applicator Institute.

THE INSECT GUIDE
by Ralph B. Swan, Ph.D

Two hundred and fifty pages of insect descriptions. Tells how to identify. Well illustrated with color plates — an asset to your professional library.

INTRODUCTION TO APPLIED ENTOMOLOGY
by William J. Baerg

Basic and elementary information on the most common harmful insects. Good identification sketches, life histories, with suggestions for control. 190 pages. Another must for the student of air-application.

WEED CONTROL
by Robbins, Crofts and Raynor

A critical review of the various methods of weed control, chapter on chemicals in weed control, non-selective sprays, selective herbicides, translocation, soil sterilization, special weed problems, and special weeds. 550 pages. This book also belongs in your professional library.

ENTOMA
Edited by G. S. Langford

Entoma is a directory for Entomologists. It lists the manufacturers and formulators of insecticides, herbicides and fungicides. Equipment companies, associations, organizations, consultants and operators are also listed. 375 pages. See Figure 9.
METHODS OF INSECT CONTROL
by Dwight Isely

Over 300 pages of vital crop, insect and chemical information. The author uses a down-to-earth practical approach. The text is very readable and describes the basic facts of insect pests and methods for their control. These are two volumes of 180 pages each. Volume one describes the crops and pests and Volume two, insecticides and methods of control.

VISUALIZED CHEMISTRY
by William Lemkin, Ph.D.

The purpose of "Visualized Chemistry" is to present the basic elements of chemistry in a graphic and simple to understand manner. If you wish a better understanding of chemicals this book will give it to you fast.

CHEMISTRY OF INSECTICIDES, FUNGICIDES AND HERBICIDES
by Donald E. H. Frear, Ph. D.

This book is a standard text on agricultural chemicals written by an authority. Although there is much technical terminology used, there is much information useful to air-applicators. You need this book also.

DIAGNOSTIC TECHNIQUES FOR SOILS AND CROPS
Edited by Herminie Broedel Kitchen

Since the beginning of agricultural chemistry one of the main problems has been the determining of fertilizer needs of soils. You can gain a lot of information about soil analysis from this text. 300 pages, illustrated.

SPRAY CHEMICALS AND APPLICATION EQUIPMENT
by J. A. McClintock and Wayne B. Fisher

This book is now in its third printing. It contains 300 pages of text and illustration. Describes most of the new insecticides, herbicides and fungicides. A book well worth adding to your library.

AN OUTLINE OF BUSINESS LAW
by Babb and Martin

This book covers such items as contracts, sales, agencies, partnership, corporations, security and bankruptcy. A handy volume to have. 350 pages.
AN OUTLINE OF ELEMENTARY ACCOUNTING
by Bauer and Darby

Here is a simple text on accounting methods. Every air-applicator should have a sound system of bookkeeping. 200 pages.

AN OUTLINE OF GENERAL BIOLOGY
by Gordon Alexander, Ph D.

If you have forgotten your early knowledge of plant structure and how plants grow this book will serve as an excellent review. 200 pages.

ENTOMA A DIRECTORY OF INSECT AND PLANT PEST CONTROL
EIGHTH EDITION 1949-1950

The AIR-APPLICATOR INSTITUTE is headquarters for all AGRICULTURAL AVIATION BOOKS

write for price list.

Fig. 9. Entoma — A comprehensive directory for entomologists.

MOTION PICTURES

The following list of motion pictures is useful for both classroom study and sales promotion. Many operators have provided films for farmers' meetings, thus providing an opportunity to describe their spraying and dusting services.

Many of the pictures listed are available at little or no cost. They are always in demand and must be booked well in advance.
PART II

- **APHIDS**: 1 reel, 16 mm. sound. Their unusual life and relation to man. Bell and Howell Co. 1801 Larchmont Ave., Chicago 13, Ill.

- **GRASSHOPPERS**: 1 reel 16 mm. sound, close-ups of male and female, hatchings, methods of feeding. Edited Pictures System, Inc., 330 W. 42nd St., New York, N.Y.

- **YOUR ENEMY—GRASSHOPPERS.** (3 reels, 16 mm., color; released 1951. 23 minutes.) Grasshoppers—their ways and why they are one of the major crop destroyers in this country. Control by individual farmers and in cooperative campaigns is explained. This is one of the most interesting and important films ever made on any insect problem.

  These film strips are available through your local state agricultural college.

- **MOSQUITOES — PUBLIC ENEMY**: 2 reels, 16mm, sound. Life History of Mosquitoes, U. S. Department of Agriculture.

- **MOSQUITO—THE PUBLIC ENEMY.** (2 reels, 16mm. and 35 mm., sound, b/w; released 1935; revised 1944. 14 minutes.) Shows species of mosquitoes that cause malaria and yellow fever; the development of larvae and pupae into full grown mosquitoes; breeding places, and the methods of control. Introductory remarks by Dr. L. O. Howard, Chief, Bureau of Entomology, 1894-1931.

- **MOSQUITOES.** (3 reels, 16mm. and 35mm., silent, b/w; released 1933. 33 minutes.) Life history of the mosquito. Species that cause malaria and yellow fever. Interesting under-water microscopic shots show the development of larvae and pupae into full-grown mosquitoes. The chief method of attack is the elimination of breeding places. Flushing stagnant pools, draining and filling swamps, spraying oil. Control measures in New Jersey, Florida, and Panama.

- **INSECT AND RODENT ENEMIES OF MAN**: Wil-Kil Pest Control Inc., 522 West North Ave., Milwaukee 12, Wis.

- **FIVE BANDITS OF THE COTTON CROP.** (1 reel, 16mm., sound, color; released 1948. 10 minutes). Cotton growers annually are robbed of 125 million dollars by destructive insects. The insects are the boll weevil, bollworm, fleahopper, cotton leafworm, and cotton aphid. In rogue’s gallery fashion, these insects are brought up under the spotlight, for scrutiny and study. So that we shall be able to recognize them, we are told how each insect comes into being, how he begets others, how he lives and where he may be found. The film ends with a plea to cotton growers to seek from official sources information about insecticides for the bandits’ destruction.

- **STORY OF DDT**: 3 reels, 16 mm. sound, development of DDT from discovery in 1870. International Film Bureau Incorporated, 84 E. Randolph St., Chicago 1, Ill.

- **MICROSCOPIC MYSTERIES**: 1 reel, 16 mm. sound, natural life habits and activities of certain insects, Teaching Film Custodians Inc., 2, W. 43rd St. New York, N. Y.
DEATH TO WEEDS: 1 reel, 16 mm. color sound, Dow Chemical Company, Midland, Michigan.

GOODBYE WEEDS: 16 mm. color sound, Sherwin Williams Company, Cleveland, Ohio.

KILLING WEEDS WITH 2,4-D. (2 reels, 16 mm., sound, color; released 1940, 16 minutes). Shows how to use the chemical weed killer, 2,4-D safely and with telling effect. Cautions against use of 2,4-D in the garden, and tells how wheat, rice, and corn, among other crops, may be weeded with this chemical. It explains good 2, 4-D mixtures and spraying techniques. Many common weeds are shown before and after spraying.


PROTECTION OF FRUIT: 2 reels, 16 mm. sound, cooperation between entomologists, chemists and growers in controlling fruit insects and diseases. British Information Services, 30 Rockefeller Plaza, New York, N. Y.

DOOMSDAY FOR PESTS: 16 mm. color sound, Sherwin Williams Company, Cleveland, Ohio.

THE PLANT SPEAKS SERIES: 16 mm. sound, made available by the American Polash Institute. The Plant Speaks Through Deficiency Symptoms, 25 minutes; Soil Tests Tell Why, 10 minutes; The Plant Speaks Through Tissue Tests, 14 minutes; The Plant Speaks Through Leaf Analysis, 18 minutes; Save That Soil, 28 minutes. Available from Educational Film Library, Syracuse University, Syracuse, N. Y.; Visual Aid Service, University of Illinois, Champaign, Illinois; Dept of Visual Education, University of California, Berkeley 4, California.

AIR-AGE: 1 reel, 16 mm. sound, has lots of spraying, dusting, fruit drop and defoliating shots. Entertaining and instructional. Idaho State Department of Aeronautics, Boise, Idaho.

SOIL CONSERVATION SERVICE: Write to Washington, D. C. for complete list of available films.

Filmstrips


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5. Selective Weed Killer, Circular 157, Aden S. Crafts and W. A. Harvey, College of Agriculture, University of California.


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17. Ridding the Garden of Common Pests, Circular 146, University of California, College of Agriculture.

18. New Foliage Sprays of Nitrogen Influence Fruit Set, E. G. Fisher Cornell University, American Fruit Grower 69:18 0'49.

19. Pre-Harvest Apple Sprays, Farm and Home Research, July '49, Ohio Agricultural Experiment Station.
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21 Weed Control in Cannery Peas Using Dinitro Sprays, G. F. Warren and K. P. Buckholtz, Agricultural Experiment Station, University of Wisconsin.

22 Preliminary Studies on the Effects of 2,4-D Sprays on preharvest Drop, Yield, and Quality of Grapefruit, Paper No. 570, University of California Citrus Experimental Station.

23 Investigations on Thinning of Peaches by Means of Caustic and Hormone Sprays, Journal Series, A. E. Murneek and A. D. Hibbard, Missouri Agricultural Experiment Station, University of Missouri.

24 "Control of Weeds in Strawberry Plantings by the Use of 2,4-D, Journal Article No. 853, Michigan Agricultural Experiment Station, Michigan State College.

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26 "The Use of Oil Sprays as Selective Herbicides for Carrots and "Parsnips", Contribution No. 613 Massachusetts Agricultural Experiment Station, Massachusetts State College.

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PART II


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263 "Toxaphene Residues", Bulletin 461, Montant State College.


265 "Chemical Control of Weeds in South Dakota", Circular 69, South Dakota State College.

266 "Kill Those Hoppers", Circular A-144, North Dakota Agricultural College.

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44
Fig. 10. Courtesy American Cyanamid Company.
Samples showing benefits of defoliation of rank cotton in the Coastal Plains Area. The sample on the left, from the defoliated plot, graded middling. The sample on the right, from the undefoliated plot, graded low middling.
AGITATORS and MIXERS

PATTERSON FOUNDRY & MACHINE CO., East Liverpool, Ohio

ALSOP ENGINEERING CORP., Mildale, Conn.

MIXING EQUIPMENT CO. INC., 1080 Garson Ave., Rochester 9, N.Y.

GENERAL MACHINE CO. 398 Market St., Newark, New Jersey

CONSOLIDATED PRODUCTS CO., 15 Park Row, New York, N.Y.

YOUNG MACHINERY CO. Muncy, Pennsylvania

NOZZLES

ACCESSORIES MANUFACTURING CO. 705 McGee, Kansas City Mo.

JOHN BEAN DIVISION, FOOD MACHINERY & CHEMICAL CORPORATION, Lansing 4, Michigan

FROST INSECTICIDE CO., Box 36, Arlington 74, Mass.

PEST CONTROL EQUIPMENT CO., 47 W. 23 St., New York 18, N.Y.

MONARCH MANUFACTURING WORKS, INC., 3406 Miller St., Philadelphia, Pennsylvania

W.A. WESTGATE, Box 245, Davis California

ANDREW WILSON, INC., Springfield, New Jersey

SPRAYING SYSTEMS COMPANY, 3230 Randolph St., Bellwood, Ill.

PUMPS

OBERDORFER FOUNDRIES, INC., Agricultural Pump Division, Syracuse, New York

COLUMBIA EXPORTERS, Portland, Oregon

ALLIS-CHALMERS MANUFACTURING CO., Milwaukee 1, Wis.

ECONOMY PUMPS, INC., Hamilton, Ohio
SUPPLIERS

CROWELL MANUFACTURING CO., 319 Franklin Ave., Brooklyn 5, New York

FULLER COMPANY, Catasaqua, Pennsylvania

PENNSYLVANIA PUMP & COMPRESSOR CO., Easton, Penn.

JAY MANUFACTURING CO., Sullivan Division, 307 N. Michigan Avenue, Chicago, Illinois

BEACH-RUSS CO. 60 Church St., New York, N. Y.

RESPIRATORS

ACME PROTECTION EQUIPMENT CO., 3035 West Lake St., Chicago, Illinois

MINE SAFETY APPLIANCES COMPANY, Braddock, Thomas & Meade Pittsburgh 8, Pa.

NASAL FILTER COMPANY, Columbus, Ohio


PULMOSAN SAFETY EQUIPMENT COMPANY, 644 Pacific Street, Brooklyn 17, N. Y.

WILSON PRODUCTS INCORPORATED, 116 Thorn Street, Reading, Pennsylvania.

AIRPLANE SPRAYER AND DUSTER UNITS

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS, College Station, Texas.

ART WHITAKER, 5001 N. E. Union Avenue, Portland 11, Oregon.

ARROW SPRAYER MANUFACTURING COMPANY, Clinton, Illinois

BARRIE AERONAUTICAL CORPORATION, Lockport, New York.

BELL AIRCRAFT CORPORATION, Post Office Box One, Buffalo 5, New York.

CANNERS DUSTING SERVICE, Pecatonica Airport, Incorporated, Pecatonica, Illinois.
CENTRAL AIRCRAFT COMPANY, Yakima, Washington.

CESSNA AIRCRAFT CORPORATION, Wichita, Kansas.

DAKOTA AVIATION COMPANY, Box 18, Hiron, South Dakota.

I-C-D EQUIPMENT COMPANY, Campbell, California.

JOHNSON FLYING SERVICE, Missoula, Montana.

MARTIN SPRAYER MANUFACTURING COMPANY, Monmouth, Illinois.

MISSISSIPPI VALLEY AIRCRAFT SERVICE, Fletcher Field, Clarksdale, Mississippi.

NORTHWEST AGRICULTURAL AVIATION CORPORATION, Box 555, Choteau, Montana.

ONG AIRCRAFT CORPORATION, P. O. Box 214, Kansas City, Missouri.

PATTERSON AIRCRAFT, 4043 Redondo Beach Boulevard, Lawndale, California.

PIPER AIRCRAFT CORPORATION, Lock Haven, Pennsylvania.

RAWDON BROTHERS AIRCRAFT, INCORPORATED, Wichita, Kansas.

SIKORSKY AIRCRAFT, Bridgeport, Connecticut.

UNITED HELICOPTERS, INCORPORATED, 1350 Willow Road, Palo Alto, California.

W. A. WESTGATE, Davis, California.

YINGLING AIRCRAFT, INCORPORATED, Municipal Airport, Wichita, Kansas.

CHEMICAL COMPANIES

Over 300 chemical manufacturers distribute products under more than 4000 trade names.

In this section are listed some of the major chemical companies and a few of their trade name products. This is very incomplete and in no way constitutes a recommendation or endorsement by the Air-Appli
cator Institute. Excellent descriptive literature is available from the chemical companies. See Figure 6a. Write to them for information on the crop, pest or chemical desired.

ALLIED CHEMICAL & DYE CORPORATION, General Chemical Division, 40 Rector Street, New York 6, N. Y. (Orchard Brand) (Stafast, Genitox, Genithion, Film Fast).


AMERICAN CYANAMID COMPANY, Agricultural Chemicals Division, 30 Rockefeller Plaza, New York 20, N. Y. (Thiophos).

AMERICAN AGRICULTURAL CHEMICAL COMPANY, 50 Church Street, New York, N. Y.


ANTARA PRODUCTS, 435 Hudson Street, New York 14, N. Y. (Surfactant).

ARMOUR & COMPANY, Adhesive Division, 1355 West 31st Street, Chicago 8, Illinois.

ASHCRAFT-WILKINSON COMPANY, Atlanta, Georgia.


ATLAS POWDER COMPANY, Wilmington 99, Delaware. (Atlas).

CALIFORNIA SPRAY-CHEMICAL CORPORATION, Richmond, California. (Ortho, Estercide, Isotox).

CALIFORNIA INDUSTRIAL MINERALS COMPANY, Friant, California. (Frinite).

CAROLINA PYROPHYLLITE COMPANY, 10 East 40th Street, New York 16, N. Y.

CARBIDE AND CARBON CHEMICALS COMPANY, 30 East 42nd Street, New York 17, N. Y.

CENTENIAL FLOURING MILLS, Seattle Washington. (Stopweed, Aero-Mix).

CHEMAGRO CORPORATION, New York, N. Y. (Metacide).

CHEMICAL CORPORATION OF COLORADO, 1592 W. 12th Avenue, Denver, Colorado (.44).

CHEMURIC CORPORATION, (Chemi-kill).
CHIPMAN CHEMICAL COMPANY, INCORPORATED,  
Chicago, Illinois, (Shed-a-leaf, Benochlor, Chloroben).

COMMERCIAL SOLVENTS CORPORATION, 17 East 42nd Street,  
New York 17, N. Y.

DESTRUXOL CORPORATION LIMITED, 495 South Arroyo Park- 
way, Pasadena 2, California (Destruxol).

DOGGETT-PFEIL COMPANY, Springfield, New Jersey.

DOW CHEMICAL COMPANY, Midland, Michigan, (Dow-S, Esteron,  
Dowfume).

E. J. DUPONT de MEMOURS COMPANY INC., Wilimington 98, Dela­ 
wre, (Cresan, Gemesan, Arasan, Migreen, Marlate, Deenate).

FLORIDIN COMPANY, Department M, 220 Liberty Street, Warren,  
Pa. (Diluex).

GEIGY COMPANY, INCORPORATED, 89 Barclay Street, New York  
8, N. Y. (Gy-phene, Geigy).

HALCO CHEMICAL COMPANY, Kenilworth, New Jersey. (Halco).

INNIS, SPEIDEN & COMPANY, 117 Liberty Street, New York 6,  
N. Y. (Isco).

J. M. HUBER CORPORATION, 199 Park Avenue, New York 17,  
N. Y. (Barden Clay).

JOHN POWELL & CO. INC., One Park Avenue, New York 16, N. Y.  
(Powco).

JOHNS-MANVILLE, Box 290, New York, N. Y. (Celite).

JULIUS HYMAN & COMPANY, Denver, Colorado.

KOLKER CHEMICAL WORKS INCORPORATED, 80 Lister Avenue,  
Newark 5, New Jersey.

LION OIL COMPANY, Chemical Division, El Dorado, Ark. (Lion).

McCORMICK & COMPANY, INCORPORATED, Baltimore 2, Mary­ 
land. (Bee brand, Red Arrow, Black Arrow).

MICHIGAN CHEMICAL CORPORATION, Saint Louis, Michigan.

MILLER PRODUCTS COMPANY, Portland, Oregon. (Airmix, Hor­ 
motox, Hormoester).

EMUSOL CORPORATION, 59 E. Madison St., Chicago, Ill., (Emcol).

MONSANTO CHEMICAL COMPANY, Engineering Sales Department,  
1700 South Second St., St. Louis 4, Missouri. (Nifos, Santo, Sterox)

NIAGARA CHEMICAL DIVISION FOOD MACHINERY AND  
CHEMICAL CORPORATION, Middleport, N. Y. (Niatox, Phoskil,  
Ro-Kill, Hexamite, Gamkill, Diatox).
SUPPLIERS

MOPCO CHEMICAL COMPANY, Harrison, New Jersey. (Mopco).

O. E. LINCK COMPANY INCORPORATED, Valley Road and Route 6, Clifton, New Jersey. (Weedette, Tot Weed C-lect).

PACIFIC COAST BORAX COMPANY, First National Bank Building, Auburn, Ala. (Polybor - Chlorate).

PENNSYLVANIA SALT MANUFACTURING COMPANY, Agricultural Chemicals Department, Philadelphia 7, Pennsylvania. (Pennsalt Hi-Gam E-20, Penco, Knox-out).

PENNSYLVANIA INDUSTRIAL CHEMICAL CORPORATION, Clairton Pennsylvania. (Picco Hi-solv).

PHILLIPS CHEMICAL COMPANY, 4521 Produce Plaza West, Los Angeles, Calif. (Phillips 66).

PITTSBURGH PLATE GLASS COMPANY, Corona Chemical Division, Milwaukee, Wis. (Corona).

PITTSBURGH COKE & CHEMICAL COMPANY, Grant Building, Pittsburgh 19, Pa.

R. T. VANDERBILT CO. INC., 250 Park Avenue, New York, N. Y.


SHARPLES CHEMICALS INC., 123 South Broad Street, Philadelphia, Pennsylvania.

SHERWIN-WILLIAMS COMPANY, 101 Prospect Ave., N. W. Cleveland, Ohio. (Sherwilkil, Weed-no-more, Selectol).

SHELL CHEMICAL CORPORATION, 500 Fifth Avenue, New York 18, N. Y. (Endrop).


SOCONY-VACUUM OIL COMPANY, INC., 26 Broadway, New York 4, N. Y. (S/V Sovacides).

STANDARD AGRICULTURAL CHEMICALS, 7301 Jefferson Street, Hoboken, New Jersey. (Stantox, Stanicide, Stanamite).

STAUFFER CHEMICAL COMPANY, 420 Lexington Avenue, New York 17, N. Y. (Ens-Zem, Paradust, Toxadust, Gamaxo, Nico-dust).
PART III

S. B. PENICK & COMPANY, 734 West Division Street, Chicago 10, Illinois.


THOMPSON HORTICULTURAL CHEMICALS CORP., (Thompson's Bramblecide, Weedicide).

TOBACCO BY-PRODUCTS & CHEMICALS CORPORATION, Richmond, Virginia. (Black Leaf).

U. S. INDUSTRIAL CHEMICALS, INC., 60 East 42nd Street, New York 17, N. Y. (Pyrenone).

UNITED STATES RUBBER COMPANY, Naugatuck Chemical Division, Naugatuck, Conn. (Spergon, Aramite, Phygon, Synklor-48-E, Synchlor-40-W, Tufor-40).

VEITH CHEMICAL COMPANY, 1261 Blackstone Ave., Fresno, California. (Kill-Tox).

VIRGINIA-CAROLINA CHEMICAL CORPORATION, 401 East Main Street, Richmond, Virginia. (V.C).

VELSICOL CORPORATION, 330 East Grand Avenue, Chicago 11, Ill.

W. R. E. ANDREWS SALES, INCORPORATED, 1505 Race Street, Philadelphia 2, Pennsylvania. (Zee-n-o, Mangano).

WM. COOPER & NEPHEWS, INCORPORATED, 1909 Clifton Ave., Chicago 14, Ill.

Fig. 11. Courtesy National Cotton Council.

Airplanes are used extensively for applying both dust and liquid defoliants. This photo shows one type of equipment developed recently for applying liquid defoliants.
PART FOUR

If you are just getting started in the air-applicating industry, you will find that the study of these terms will be one of the best ways of learning. Mastering the terminology is a basic step which will assist materially in reading the texts. Also in itself the knowledge of the words represents a sizeable background of technical understanding.

DEFINITIONS

ABSCISSION: The formation of a layer of cells which causes the fruit, leaf, or stem to fall off the plant.

ACARACIDE Miticide — chemical for controlling mites.

ACIDS: An acid is a hydrogen compound whose hydrogen may be replaced by a metal, and whose water solution changes the color of litmus from blue to red. Many compounds, such as sugar and alcohol, contain hydrogen, but are not acids, because they do not conform to the two conditions stated in the definition above.

ACID EQUIVALENT: Acid equivalent has the same meaning as parent acid.

ACTIVE INGREDIENT: Active ingredient is the toxicant material in a compound or mixture.

ACROLOGY: A science that treats of mites, lice, ticks, etc., that cause mange in animals and galls in plants.

AGRICULTURAL CHEMICALS: The term agricultural chemicals encompasses all chemicals which are used in farming operations and includes materials used as fertilizers, herbicides, fungicides, defoliants, and insecticides as well as many others.

AGRONOMY: Branch of the science of agriculture that deals with field crop production.

AMORPHOUS: Without definite shape or form — not crystalized.

ANNUAL: Those completing their life cycle in one year. They must be reproduced annually from seed. These can be controlled by cultivating or mowing prior to seed formation or in some cases by spraying with selective weed killers.

ANTIDOTE: A drug to counteract the effect of a poison.

ANTHRACNOSE: A plant disease caused by a fungus.
ANTU - ALPHANAPHTHYLTHIOUREA: A new and powerful rat killer. Also poisonous to hogs, dogs and other meat eating animals. Apparently not poisonous to domestic fowls, plant eating animals and probably not to man.

APERIENT: A medicine which causes the bowels to move gently.

AQUATIC: A plant or animal inhabiting water. Of, or pertaining to water.

AROMATICS: Compounds derived from the hydrocarbon benzene

ASEXUAL: Reproducing without sexual action such as by cell division and propagation by root stocks.

BARBERRY: A shrub varying in size from small seedlings to 20-foot shrub and is the host of a very destructive fungus disease (stem rust) which spreads to other plants.

BASE: A base is a compound of a metallic element or radical with one or more hydroxyl (OH) groups. The term is usually applied to a water solution of a metallic hydroxide. 74

BENTOMITE: Natural occurring light-colored clay. Divided into two general classes, the swelling and non-swelling. Former is used to dilute insecticidal and fungicidal dust, as an emulsifier for home mixed oil emulsions and in the preparation of tank mixed and proprietary nicotine bentomite sprays.

BIANNUAL: Biannual plants live a two year cycle—seeding the second season.

BIENNIAL: Biennial plants require two years to complete their life cycle. The first year it produces leaves and stores food. The second year is produces fruits and seeds. Control of this type of weed is usually most successful in the first year of growth. This prevents seed formation and allows for control before the weeds become well established. 121

BLACK STEM RUST: Fungus disease that affects wheat, oats, barley, rye and many grasses.

BLIGHT: A fungus disease of plants similar to wilt.

BOOT: The boot is a pod which contains the germ material and precedes the heading stage.

BORDEAUX MIXTURE: Name applied to sprays made by combining dilute solutions of copper sulphate with lime and water. A fungicide and repellent and often combined with various insecticides to make a combination insecticide and fungicide spray.

BROWN ROT: Fungus disease that attacks several fruit and tuber crops, causing them to rot. The rotten spots are usually brown, hence the name.
DEFINITIONS

CARBOHYDRATES: A group of compounds containing carbon combined with hydrogen and oxygen such as starches and sugars and are used by animals to produce fat, heat and energy.

CALYX: The circle of leaf-like parts called sepals below the petals of a flower often united into a cup.

CALIBRATING: Determining the caliber on the neck of a test bottle or tube in order to ascertain the accuracy of the scale upon it.

CARRIER: The liquid or solid material added to a chemical compound to facilitate its storage, shipment or use in the field by means of increasing the bulk. (See also “diluent”).

CHEMICAL PROFILE: A division of soil profile divided on a basis of chemical composition.

CHLOROSIS: A yellowing of plant foliage which results from the halting of the development of the green coloring matter.

COLLOIDAL: Resembling glue or jelly.

COMPATIBLE: Two compounds are said to be compatible when they can be mixed without affecting each other’s properties.

COMPATIBILITY: The term compatibility is loosely used to mean several different things. It is used here to refer to the suitability of pest control materials for simultaneous or successive applications to the same plant. Although some substances may react with each other and still be compatible, the question of compatibility is largely one of chemistry, and involves a consideration of the probability of reaction between materials and the possible effect of reaction-products.

CONCENTRATION: The proportion of active ingredient in the carrying medium and is to be designated as a percentage or ppm of this medium.

CONCENTRATED SOLUTION: A concentrated solution is one which contains a large amount of solute in proportion to the solvent.

CONTACT HERBICIDE: A chemical or combination of chemicals that kills by contact with plant tissue but is not appreciably translocated.

COTYLEDONS: These are the two characteristic broad leaves that first appear as the seedlings of most plants emerge. They are not true leaves of the plant and usually die off as the plant develops.

COVERAGE: Coverage means both the amount and the uniformity of chemical deposit upon the surfaces of the crop plants.

CROWN: The point where stem and root join in a seed plant.
PART IV

DEFLOCCULATOR: See flocculation.

DEFOLIANT: A compound which causes the leaves, or foliage, to drop from the plant.

DINITRO COMPOUNDS: Organic compounds manufactured in this country which have come into general use in certain fruit growing districts, for the control of scale insects, the fruit tree leaf roller, the pear psylla, the bud moth, mites and aphids. Used in powder form or as liquid.

DEPOSIT: The total material placed upon the plant.

DERIVATIVE: A derivative is the material obtained from treating a parent substance with some other material such as 2,4-D acid and lye which results in a sodium salt derivative.

DETERGENT: Having cleansing qualities.

DILUENT: The material, liquid or dry, used to dilute and give volume to the spray or dust being applied. Diluents also act to weaken the active material which would be too strong to apply in pure state.

DILUTE SOLUTION: A dilute solution is one which contains a small amount of solute in proportion to the solvent.

EFFECTIVE SWATH: Effective swath width must be determined for each individual airplane flown at various heights. Obviously as the plane is flown higher above the crop there will be a greater spread of spray. Wing tip vortices cause a feathering of the spray at the end of the swath. Experiment by test runs over sensitive paper or glass plates is the only practical method for determining the amount of overlap necessary to avoid stripping. Once the effective width has been determined for a given airplane you should stick religiously to the known pattern.

EMULSION: Emulsions are mixtures of materials which no not naturally mix, such as oils and water. Most emulsions have a water base in which droplets of oil are suspended. Milk is an emulsion. Most spray emulsions are oil and water. Any two liquids that differ in density will tend to settle into layers if left standing. Agents called stabilizers are added which tend to keep the materials from settling out.

EMULSIFIABLE OIL: An emulsifiable oil looks like a miscible oil, however, when it is added to the spray tank (agitator running), it does not change color in the tank. It emulsifies and assumes the whitish color only under pressure as it leaves the spray gun nozzle.

EMULSIFYING AGENT: An agent is added to a suspension which adheres to the surfaces of the particles or liquid droplets thus keeping them from coming together. This stabilizes the suspension eliminating the need for agitation.
DEFINITIONS

EMERGENCE: The time when the first leaves of the crop plant come through the ground.

ENTOMOLOGISTS: One skilled in insect knowledge.

ENTOMOLOGY: Branch of science that deals with the study of insects in all of its phases.

FLOCCULATION: The chemicals in a spray not possessing a sufficient amount of spreader will tend to be drawn together and large quantities collect in one area leaving adjacent areas not covered. This is called splotching or flocculation.

FORTIFIED OILS: Fortified oils are oils which have had their toxicity increased. This is done by adding chemicals (fortifying agents) such as phenol compounds or sulfur. It usually costs less for these fortifying agents, per unit of toxicity, than for an amount of unfortified oil of equal toxicity. Fortified oils are used as general-contact sprays. The oil itself acts mainly as a carrier for the toxic fortifying agent.

FUNGICIDE: A chemical used for killing fungi.

GENERAL-CONTACT OIL SPRAYS: General-contact oil sprays kill all kinds of plants, both weeds and crops. They should contain enough toxicants to kill all plants sprayed.

GPH: Gph is the abbreviation for gallons per hour.

GPM: Gpm is the abbreviation for gallons per minute.

GROWING POINT: The point from which new growth arises, usually the tip of a long stem. The region just below the growing point bends sharply downwards when treated with 2,4-D solution.

HERBACEOUS: A more or less soft or succulent plant that does not develop wood tissue.

HERBICIDE: Any compound which will kill plants.

HORTICULTURE: Horticulture is the science of growing vegetables, flowers and ornamental plants.

HORMONE WEED KILLERS: Chemicals which exert an effect upon the growth processes in such a way as to cause death of plants. Growth regulators is probably a better descriptive term than hormones.

INSECTICIDES: An insecticide is a substance which kills insects by chemical action. Insecticides are available commercially in both powder and liquid form. Some can be obtained in either form for convenience in applying. Trapping and electrocuting are not properly considered to be insecticides.
INVERT EMULSIONS: Invert emulsions have an oil base in which droplets of water are suspended. Weed killing emulsions may have additional chemicals dissolved in either the oil or water or both.

INTERNODE: That part of a stem between the joints or nodes.


JOINTING STAGE: The stage when grass stems begin elongating.

KNOCKDOWN: Term used to express the measure of the speed of effect of a toxicant, especially on insects.

LARVA: The name given to that stage of insect life hatching from the egg of insects which have complete metamorphosis. Caterpillars, maggots and grubs are larvae.

LEAF SHEATH: The often tubular lower part of the leaf of Grasses and Sedges to which the blade is joined and which encircles the stem.

LEGUME: Peas, beans, clover and alfalfa are examples of legume crops. Legumes reproduce through a pod which contains its seeds.

LOW VOLATILE ESTERS: The esters of 2,4-D, 2,4,5-T and other similar herbicidal compounds that have low volatility should be designated as low volatile esters and not as non-volatile esters.

MECHANICAL MIXERS: These are quick breaking emulsions which may be used if equipment is designed to deliver uniform mixture by adequate agitators.

MISCIBLE LIQUIDS: Miscible liquids are liquids which remain mixed in all proportions, thus forming a true solution. Examples: alcohol and water; glycerine and water.

MISCIBLE OIL: Miscible oils contain an emulsifier dissolved in the oil. The concentrate is prepared by mixing the miscible oil with a small amount of water (4 to 6 per cent). This material has the appearance of clear lubricating oil. When added to the spray tank with the agitator running a creamy-white mixture is obtained.

MMD: Medium mass diameter.

MPH: MPH is the abbreviation for miles per hour.

NECROSIS: The dying of leaves after treatment with weed killer. Dead areas of treated leaves are called necrotic areas. "Burning" is used as a synonym for necrosis.

NODE: The joint in a stem.
DEFINITIONS

NON-MISCIBLE LIQUIDS: Non-miscible liquids are liquids which do not mix, and tend to separate on standing. Such liquids, when thoroughly shaken, form an emulsion.

NON-SELECTIVE HERBICIDE: Those materials which kill above ground parts of most plants. Non-selective herbicides give maximum kill but in so doing may do extreme injury to crop plants.

OIL EMULSIONS: Oil emulsions are prepared by breaking the oil up into fine globules and adding water up to 50%. Emulsions vary in consistency and color. Their appearance can vary from a thin cream to a thick brown paste.

ORGANIC CHEMICALS: It was formerly believed that organic compounds could be made only with the aid of some mysterious force that is present in the living plant or animal organism; hence the name "organic". This concept was shattered when, in 1828, the German chemist, Wohler, succeeded in synthesizing urea from inorganic substances. Nevertheless, we still cling to the term "organic chemistry", which has now come to mean simply the chemistry of the carbon compounds.

ORIFICE: The opening or outlet end of a nozzle. Most spray nozzles have detachable discs with openings (orifices) so the volume of spray can be varied.

PARENT ACID: Pure acid from which formulation is made.

PATTERN: The pattern is the arrangement or spread of different particle sizes and deposit over the entire swath width.

PERENNIAL: Perennials live for more than two years. Many not only produce seeds but also spread by means of underground rootstocks. Small pieces of these rootstocks can give rise to new plants even when covered to considerable depth in the cultivation process. Perennials usually have alternate seasons of active growth and dormancy. Examples: Johnson Grass and Morning Glory.

PHYTOTOXIC: A substance poisonous to plants.

POMOLOGY: Pomology is the science and practice of fruit growing.

POST-EMERGENCE TREATMENT: Treatments made after weed and crop plants have emerged.

PPM: Ppm is the abbreviation for parts per million.

PRECIPITATE: To cause to settle out from a solution.

PRE-EMERGENCE TREATMENT: Treatments applied after seeding, but before crop plants appear above the ground. Such treatments may be contact or residual in action: Pre-emergence, con-
tact — Treatments applied to weed seedlings when they emerge before crop plants. The chemicals are quickly broken down into non-toxic substances. Pre-emergence, residual — treatment applied soon after seeding but before either weed or crop plants emerge. The chemicals remain in the soil long enough to kill germinating weed seeds but are broken down into non-toxic materials before crop plants germinate.

PRE-PLANTING TREATMENT: Any treatment applied after the soil has been prepared for planting, but before crop seeds are placed in the soil.

PSI: Psi is the abbreviation for pounds per square inch.

RATE AND DOSAGE: These terms are synonymous, with “rate” the preferred term. Rate refers to the amount of active material (such as 2,4-D acid equivalent) applied to a unit area (such as one acre) regardless of percentage of chemical in the carrier.

ROOTSTOCK: Rootstocks do not propagate their seeds. They grow in all directions beneath the surface of the ground and form new plants along their length. Wild morning glory, Canada thistle, whitetop, leafy spurge and Russian knapweed by both seed and rootstock. Same as Rhizome.

ROSETTE: A dense clump of leaves borne on a very short stem close to the surface of the ground.

RPM: Rpm is the abbreviation for revolutions per minute.

SAFENER: A safener is a material added to a chemical formulation to prevent its changing chemically under certain conditions to a harmful material. For example, arsenicals under certain temperature and humidity conditions may form a large quantity of arsenic acid which may cause serious foliage injury.

SALTS: A salt compound consisting of a metal or metallic radical combined with a non-metal or an acid radical. The term salt, as commonly used, refers to sodium chloride, but in chemistry salt is the general name of a class of compounds which resemble sodium chloride.

Properties of salts: salts very widely in characteristics. As a general rule, salts are white, crystalline solids with a “salty” taste. They are usually soluble in water, and neutral to litmus. Among the many exceptions to the above, are copper sulfate, which is blue; calcium carbonate (marble), which is in solution, reacts to litmus, owing to hydrolysis.

SATURATED SOLUTION: A saturated solution is one which contains all the solute it can normally dissolve at a given temperature and pressure. For example, if several teaspoonfuls of sugar are stirred in a glass of water, some of the sugar will dissolve, while
the rest will drop to the bottom of the glass. The clear solution is now said to be saturated at the given temperature and pressure.

**SELECTIVE HERBICIDE:** A weed killing material which will give a satisfactory weed kill with a minimum amount of injury to the crop. Many of the selective chemicals can also be used non-selectively.

**SELECTIVE MORPHOLOGY:** Where a crop may have the property of regenerating from a crown whereas the weeds will not. Example: Treatment of strawberries and alfalfa in the dormant stage with fortified oils.

**SELECTIVE OIL SPRAYS:** Selective oil sprays are ones which do not damage certain oil-tolerant crop plants but kill many common weeds.

**SELECTIVE PHYSIOLOGY:** Where a crop is resistant to the herbicide because of its basic physiology or make up while weeds are not. Example: Treatment of wheat with 2,4-D.

**SENSCENCE:** Senility sets in when a plant has reached its growth stage and is fully mature. For example: the falling of the leaves from a plant marks the stage of senescence.

**SOIL STERILANT:** A material which renders the soil incapable of supporting plant growth. Sterilization may be temporary or relatively permanent.

**SOLUTE:** The solute is the substance which goes into solution. It may be either a solid, a liquid or a gas.

**SOLUTION:** A solution is a uniform mixture consisting of a solute and a solvent. The proportions of these ingredients may vary widely. Hence, a solution is a mixture and not a compound, because it does not conform to the law of Definite Proportions. Brine is a solution of water and salt.

**SOAP SPRAY:** Soap dissolved in water used to control soft bodies insects on tender plants. May also be used as a wetting or spreading agent with nicotine, pyrethrum and some other sprays.

**SOLUBILIZERS:** An agent which when incorporated with an otherwise unsoluble material make it soluble.

**SOLVENT:** The solvent is the substance which dissolves the solute. It is usually a liquid like water, although it may be either a solid, a liquid, or a gas. Water is a solvent for sugar.

**SPREADERS:** Spreaders are needed and used in conjunction with stickers, first to keep the stickers from causing the particles in the spray tank to be drawn together and second to reduce the surface tension between the droplets and the plant surfaces. Also machines for spreading manures and fertilizers.
STABILITY: This refers to suspension or emulsion. If the materials tend to separate it is called unstable. The terms tight and loose are used to designate varying degrees of stability of either emulsions or suspensions.

STABILIZERS: These materials are put in emulsions to assist in uniform dispersal. They sometimes act also as wetting agents.

STICKERS: A sticker is a material which acts as an agent in causing the chemical to adhere and not form a droplet which will run off the surface of the plant. (Stickers are needed especially with the very waxey type plants.)

STOOLLING: Stooling is the branching out of sprouts from the main shoot.

SUPERSATURATED SOLUTION: A supersaturated solution is one which contains more of the solute than it can hold under the given conditions of temperature and pressure.

SUSPENSION: A combination of a non-soluble material and a liquid or two immiscible liquids which are so violently agitated as to cause one of the materials to be uniformly distributed within the other and remain so with agitation. Sand and water is an example of a suspension.

STRIPPING: Stripping is the result when the spray runs are too far apart. There must be sufficient overlap in the spray swaths to compensate for the feathering out of deposit at the ends of the swath.

SWATH: Swath is the lateral distance covered by each spray run across a field. Due to wing tip vortices the spray material is feathered out at each end. This requires some over lapping to get the proper amount of spray deposit upon the crop. The effective swath therefore is always somewhat less than the actual swath coverage.

SYNERGIST: A synergist is a booster which when used with another chemical makes the material more effective.

SYSTEMIC HERBICIDE: A compound which translocated readily within the plant and has an effect throughout the entire plant system.

TAP-ROOT: The main root, often thickened and fleshy, directly continuous with the stem.

TILLERS: To form a number of stems or shoots from a single seed — as in wheat.

TILTH: Tilth is the physical condition and permeability of soil.

TOXICOLOGY: The science of poisons.
DEFINITIONS

TRANSLOCATED HERBICIDES: Those materials which are absorbed by one part of the plant, and exert a toxic action on other parts.

TURGID: A turgid plant is one that is lush and succulent and fully distended, the stems and leaves are fully inflated and swelled out such as in "rank" growth.

UNSATURATED SOLUTION: An unsaturated solution is one which can dissolve more of the solute under the same conditions of temperature and pressure. For example, if a pinch of sugar is dissolved in a glass of water, the solution is unsaturated because it can readily dissolve more sugar.

UNSULPHONATED RESIDUE: Percentage of unsulphonated residue is a measure of the amount of refinement. The greater the per cent of unsulphonated residue the greater refinement or purity. For example, dormant spray oil is acceptable at 56-70 per cent. Summer or foliage oils must range from 80-100 percent to safeguard foliage injury.

VAPOR PRESSURE: That property which causes a chemical compound to evaporate.

VISCOSITY: The quality of being sticky; stickiness.

VOLATILE: A compound is said to be volatile when it evaporates, or vaporizes (changes from a liquid to a gas at ordinary temperatures on exposure to the air).

WATER SOLUBLE: That part of a plant food that will dissolve in water.

WETTING AGENT: A compound which when added to a spray solution causes it to spread over and wet plant surfaces more thoroughly.

WETTING EFFECT: Some plants have a velvety porous surface which readily absorb liquid materials. Others have a smooth hard waxy surface. The latter type of plant surface requires the use of soaps, spreaders and other types of wetting agents.

WETTABLE POWDER: Materials that are insoluble in water are usually available as wettable powders. They can be used with a small amount of wetting agent, in this form as water suspension for spray.

WINTER KILLING OF WHEAT: Winter killing is not the killing of young wheat because of cool weather. Winter killing is caused by two fungus organisms acting alone or in combination. These fungi are most active and prefer a thick covering of snow over unfrozen ground.
PART FIVE

LIQUID MEASURE

One level tablespoonful equals 3 level teaspoonfuls
One fluid ounce (U.S.) equals 2 tablespoonfuls or 29.57 milliliters
One cupful equals 8 fluid ounces
One pint equals 2 cupfuls or 16 fluid ounces of 473.2 milliliters
One quart (U.S.) equals 2 pints or 32 fluid ounces or 0.9463 liter or 0.8327 quart (Brit.)
One gallon (U.S.) equals 4 quarts or 128 fluid ounces or 0.8333 gallon (Imperial or Brit.) or 231 cubic inches or 0.1337 cubic foot or 3.785 liters
One fluid ounce (Brit.) equals 28.41 milliliters
One quart (Brit.) equals 40 fluid ounces (Brit.) or 1.1365 liters
One gallon (Imperial or Brit.) equals 4 quarts (Brit.) or 1.2009 gallons (U.S.) or 277.5 cubic inches or 4.546 liters
One milliliter equals almost exactly 1 cubic centimeter
One liter equals 1000 milliliters or 1.057 liquid quart (U.S.)

DRY MEASURE

One quart (U.S.) equals 2 pints or 67.20 cubic inches or 1.1012 liters or 0.9690 quart (Brit.)
One bushel (U.S.) equals 32 quarts or 4 pecks or 1.244 cubic feet or 35.238 liters
One quart (Brit.) equals 1.0320 quart (U.S.)
One bushel (Brit.) equals 8 gallons or 1.2843 cubic feet or 36.368 liters

SQUARE MEASURE

One liter equals 0.9081 dry quart (U.S.)
One square foot equals 144 square inches or 0.0929 square meter
One square yard equals 9 square feet or 0.8361 square meter
One square rod equals 272.25 square feet or 30.25 square yards or 25.293 square meters
One acre equals 43,560 square feet or 4840 square yards or 160 square rods or 0.4047 hectare
One square mile equals 640 acres or 259.000 hectares
An area 4 rods by 4 rods equals 16 square rods or 0.1 acre
One square meter equals 1550 square inches
One hectare equals 2.471 acres or 10,000 square meters
WEIGHT EQUIVALENTS

One grain equals 64.7989 milligrams
One ounce (Avoirdupois) equals 437.5 grains or 28.3495 grams
One pound (Avoirdupois) equals 16 ounces or 7000 grains or 453.59 grams
One ton (U.S. short) equals 2000 pounds or 0.893 long ton or 907.185 kilograms
One ton (U.S. long; Brit.) equals 2240 pounds or 1.120 short tons or 1016.047 kilograms
One microgram equals 1 gamma or 0.001 milligram
One gram equals 1000 milligrams or 15.432 grains or 0.0353 ounce
One kilogram equals 1000 grams or 35.27 ounces or 2.205 pounds
One ton (metric) equals 1000 kilograms or 2204 pounds or 0.984 long ton or 1.1023 short tons
One grain per pound equals 0.0143 percent
One milligram per kilogram equals 1 part per million or 0.007 grain per pound

SPECIFIC GRAVITY TABLE

Defined as the ratio of weight of a material to weight of an equal volume of water at a specified temperature. Specific gravity or density of water at 4 °C is 1.00000
One pound of water at 4 °C. equals 27.692 cubic inches; at 25 °C. equals 27.773 cubic inches.
One cubic foot of water at 25 °C. equals 62.219 pounds or 7.48 gallons
1 pint of water equals about 1 pound
One gallon (U.S.) of water equals 8.3454 pounds (multiplied by density of water at existing temperature)
One gallon (Brit.) of water equals 10.022 pounds (multiplied by density of water at existing temperature)

EQUIVALENT RATES OF APPLICATION

One ounce per square foot equals about 2722.5 pounds per acre
One ounce per square yard equals about 302.5 pounds per acre
One pound per 100 square feet equals 435.6 pounds per acre
One pint per square rod equals 20 gallons per acre
One gram per square foot equals about 96 pounds per acre
Based on rows 3 feet apart and 100 gallons spray per acre, 1 gallon will cover 145 row feet or about 1 quart per 36 row feet. With rows 3 feet apart and 25 pounds of dust per acre, 1 pound of dust will treat 281 row feet or 2.8 ounces per 100 row feet.
TABLE OF CONTENTS

"WHERE TO FIND IT"

PART ONE—ORGANIZATIONS

Agricultural and Related Organizations
State Officials
Annual Weed Conferences
Short Courses
United States Department of Agriculture

PART TWO—BIBLIOGRAPHY

Agricultural College Publications
U. S. Department of Agriculture Publications
Commercial Literature
Agricultural Magazines
Books
Motion Pictures
References

PART THREE—SUPPLIERS

Agitators and Mixers
Nozzles
Pumps
Respirators
Chemical Companies
Sprayer and Duster Units

PART FOUR—DEFINITIONS

PART FIVE—MEASUREMENT CONVERSIONS

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Fig. 12. Courtesy American Cyanamid Company.

A field of cotton in three different stages of defoliation. Upper photo—before defoliants were applied. Center—Five days after defoliant was applied. Some leaves are beginning to drop. Bottom—Complete Defoliation.
NOTE:—
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