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RESEARCH GUIDE

Biological Control Agents in Integrated Pest Management: Are They Regulated?

A Research Guide

Jamie C. Abrams*

Integrated Pest Management (IPM) is a method of coordinating different pest control techniques which balance environmental, economic, and social issues with the traditional use of chemical pesticides. The author predicts expanding implementation of biological control methods of IPM in light of the environmental harm and expense that results from the use of chemical pesticides. This guide to legal and nonlegal resources focuses on research in the area of biological control methods of IPM, and the means of obtaining current information on this topic.

I. Introduction

A. Scope

The purpose of this guide is to assist the reader in locating the legal and nonlegal resources relating to biological control methods of integrated pest management (IPM) in agriculture. The research tools which are referenced in this guide will assist a researcher in answering the following types of questions: Are farmers required to notify the state or federal environmental conservation departments when releasing

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thousands of lady beetles or wasps over their fields? What procedures must farmers follow, if any, when using a "beneficial" fungus to control stem diseases and infestations? Does the EPA monitor the use of bacteria on food crops to control caterpillar pests?

B. *Integrated Pest Management*

Integrated pest management combines different pest management techniques which balance environmental, economic, and social issues.¹ IPM practice begins by monitoring the area to detect, identify, and sample pest populations.² Then, IPM practice incorporates into the management study weather and seasonal forecasts to anticipate future pest levels. Appropriate management strategies are chosen if predicted pest populations are anticipated to cause damage. These strategies include biological, chemical, cultural, genetic, and physical controls.

Implementation of IPM programs in various states has resulted in an emphasis on the use of a biological method to control pests.³ The biological control management technique, also known as "biocontrol," uses naturally occurring enemy organisms to act against certain pests.⁴ Biocontrol agents interfere with pest survival and reproduction, and are grouped into three categories—predators, parasites, and pathogens.⁵ Examples of predators include the Australian lady beetle which feeds on mealy bugs, and the green lacewing which eats aphids.⁶ Parasitic larvae develop in or on the host pest, killing the host.⁷ Wasps are one of the most frequently used para-

1. See generally Koplinka-Loehr, *Biological Control Is Important IPM Strategy*, Agriculture News Service, (Cornell U.) 18 (1988).

2. The term "pest" covers any organism that adversely affects crop production, including insects, diseases, weeds, mites, bacteria, fungi, viruses, and nematodes. See Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. §§ 136(t), 136(w) (1988).

3. IPM LABORATORIES, INC., IPM LABORATORIES QUARTERLY 1 (Jan. 1989).

4. Koplinka-Loehr, *supra* note 1.

5. IPM LABORATORIES, *supra* note 3.

6. Koplinka-Loehr, *supra* note 1.

7. *Id.*

sites.⁸ Pathogens are disease-causing organisms such as viruses, bacteria, fungi, and protozoans which can be mass produced and sprayed on crops for control.⁹

It is important to note the difference between biocontrols and biotechnology. Biotechnology employs genetic variation through the recombination or splicing of the genetic material from one organism into another.¹⁰ Biocontrols, in the classical sense and for the purposes of this guide, rely on naturally-occurring organisms introduced into the pest population.¹¹

Nonindigenous microbial pesticides are regulated as if they were newly created creatures of biotechnology. Pathogens are considered biological or microbial insecticides.¹² They cause disease in the pest population without reproducing in the field like the natural predator or parasite enemies.¹³ Microbial pesticides are frequently, but not always, nonindigenous to the area in which they are introduced.¹⁴ Federal regulatory agencies believe the introduction of nonindigenous microbial pesticides presents the same risks and uncertainties as genetically altered organisms,¹⁵ and therefore are regulated as if they were newly created creatures of biotechnology.

C. *Historical Development*

Biological control methods have been practiced in the United States for over a hundred years.¹⁶ The historical background of agricultural pest control illustrates why the present focus on integrated pest management, in both the scientific and legal communities, is so timely. Biological control methods, which were largely replaced by chemical methods at one point, have reemerged to play an important role in IPM.

8. *Id.*

9. *Id.*

10. U.S. DEP'T AGRIC., OFFICE OF AGRIC. BIOTECHNOLOGY, MINUTES: AGRICULTURAL BIOTECHNOLOGY RESEARCH ADVISORY COMMITTEE, No. 88-03, at 16 (Sept. 22-23, 1988).

11. Koplinka-Loehr, *supra* note 1.

12. *Id.*

13. *Id.*

14. *Id.*

15. IPM LABORATORIES, *supra* note 3, at 1.

16. *Id.*

In 1889, pesticide applications on California citrus groves were having little effect on the cottony cushion scale, an insect that was destroying the citrus crops.¹⁷ The cottony cushion scale population was practically eliminated within one year after the introduction of a parasitic fly and the Australian lady beetle into the citrus groves.¹⁸ To this day, the scale is under control because of these two biological control agents.¹⁹

The 1940's through the 1960's saw the rampant use of chemical pesticides, which made the use of biological controls almost impossible.²⁰ The 1980's saw increasing pest resistance to chemicals, greater public environmental awareness, and stricter legislation of traditional chemical pesticides.²¹

In the past, it was possible to develop chemical insecticides whenever pest resistance became overwhelming. Today, new chemical pesticides are not easily discovered. It is estimated to cost more than \$40 million to develop each new successful pesticide.²² Even when new substances are developed, they frequently fail the more stringent environmental standards present today.

In addition to the high cost of new pesticide creation, the cost of maintaining old pesticides is mounting. The 1988 Amendments to the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) require the Environmental Protection Agency (EPA) to re-register all pre-existing pesticides.²³ This re-registration process is expected to cost \$250 million.²⁴

In 1962, Rachel Carson's *Silent Spring* exposed the human health and environmental consequences of chemical pesticides. Perhaps now, the prohibitive economic cost of chemical use combined with the health and environmental considerations will alter agricultural practices to produce a stronger reliance on integrated pest management.

17. *Id.*

18. *Id.*

19. *Id.*

20. *Id.*

21. *Id.*

22. *Id.*

23. IPM LABORATORIES, INC., IPM LABORATORIES QUARTERLY (Apr. 1989).

24. *Id.*

D. *Conclusion*

The desire and need for chemical-free solutions to pest problems has sharpened. With the increased interest in and concern for a safe food supply, agricultural biocontrols will be the focus of scientific and legal communities in the coming years. It is recommended that this entire guide be read before conducting research.

II. Federal Law

A. *Statutory Law*

1. *Research Guidance*

Federal statutes are published in three codes, all of which use the identical citation pattern.

a. *United States Code (U.S.C.)*

This official edition is printed by the United States Government Printing Office.

b. *United States Code Annotated (U.S.C.A.)*

This unofficial edition is published by West Publishing Company.

c. *United States Code Services, Lawyers Edition (U.S.C.S.)*

This unofficial edition is published by The Lawyers Cooperative Publishing Company.

The two unofficial codes are preferable research tools to the U.S.C. because each section provides annotations of applicable federal and state court decisions, law review articles, legislative history and citations to the *Code of Federal Regulations* (discussed below). The unofficial editions are updated on a more timely basis than the U.S.C. with annual cumulative pocket supplements. In addition, the U.S.C.A. tracks code sections with a West Publishing feature called "Topic and Key Numbers," which provides references to other West publications, including the computer database, *WESTLAW*.

Title 7 of the U.S.C. (regulating agriculture) has the most relevant statutory law on biocontrols.

2. *Current Federal Statutes Pertaining to Biocontrol Agents*

a. *Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)*.²⁵

In 1970, Congress transferred the authority to regulate pesticides from the United States Department of Agriculture (USDA) to the United States Environmental Protection Agency (EPA).²⁶ Under FIFRA, a pesticide may not be distributed in interstate commerce unless it has been registered with the EPA.²⁷ Registration for a substance can be canceled if it is later found to be unsafe.²⁸ Additionally, each registrant is automatically reviewed every five years.²⁹

(1) Section 136(t), in conjunction with section 136w(c)(1), defines "pest" as any form of plant or animal life "which is injurious to health or the environment."³⁰

(2) Section 136(u) defines "pesticide" as "any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest. . . ." The term "substance" is not defined in the statute.³¹

(3) Section 136a discusses the registration of pesticides.³²

(4) IPM is statutorily recognized and encouraged. Section 136w-3 of FIFRA provides for coordination and cooperation between the EPA Administrator and the Secretary of Agriculture to develop and implement alternative methods to

25. 7 U.S.C. §§ 136-136y (1988).

26. *Id.*

27. *Id.* § 136a.

28. *Id.* § 136d(b).

29. *Id.* § 136d(a)(1).

30. *Id.* §§ 136(t), 136w(c)1.

31. *Id.* § 136(u).

32. *Id.* § 136a.

combat and control pests.³³

(5) State involvement is provided for in FIFRA.

(a) Section 136b allows states to train and certify pesticide applicators.³⁴

(b) Section 136v permits states to regulate the sale and use of any federally registered pesticide.³⁵

(c) Section 136w-1 allows states to take primary enforcement authority for violations of FIFRA.³⁶

b. *Federal Food, Drug, and Cosmetic Act of 1938 (FDCA)*.³⁷

FDCA is administered by the Food and Drug Administration (FDA).

(1) Section 346a is titled "Tolerances for Pesticide Chemicals in or on Raw Agricultural Commodities."³⁸ It provides that unless a chemical pesticide is generally recognized as safe by experts, and is within the tolerance limits prescribed for that pesticide, it will be deemed unsafe. The EPA sets the tolerance limits through FIFRA registration requirements.³⁹

(2) Section 346a(d)(1) is interconnected with FIFRA registration requirements.⁴⁰

(3) Section 342 contains criteria for "adulterated"

33. *Id.* § 136w-3.

34. *Id.* § 136b.

35. *Id.* § 136v.

36. *Id.* § 136w-1.

37. 21 U.S.C.A. §§ 301-394 (1972 & Supp. 1991).

38. *Id.* § 346a

39. *Id.*

40. *Id.* § 346a(d)(1).

food.⁴¹

B. *Federal Administrative Regulations*

1. *Research Guidance*

a. Federal administrative rules are published in the daily *Federal Register* and codified in the annually revised *Code of Federal Regulations* (C.F.R.). The C.F.R. is organized by subject headings which are referred to as Titles and arranged in a similar manner to the U.S.C. For a complete understanding of how to use these two complementary publications to research the most up-to-date agency regulations, use *The Federal Register: What It Is and How To Use It* (rev. June 1985), published by the Office of the Federal Register National Archives and Records Administration.

b. The *Federal Register Index* is organized alphabetically by agency. Categories within each agency heading are organized into rules, proposed rules, and notices. Under each of these categories, the subject matter is arranged alphabetically. When looking for regulations concerning biocontrol agents, look under "Environmental Protection Agency—Pesticides." The USDA is under "A" for Agriculture Department rather than "U."

c. The *CFR Index and Finding Aids* contains clear and concise "explanations" for each annual volume, as well as "finding aids" which explain each preceding section of the volume, and explain how the *CFR Index* is organized and how to use each section. This index serves as a locator for finding regulations in the C.F.R. Changes in the C.F.R. are published in the *Federal Register*. To determine if any new regulations have been issued, amended, or revoked, the researcher must consult:

(1) *LSA: List of C.F.R. Sections Affected*, a monthly pamphlet which shows any changes which have been

41. *Id.* § 342.

made since the most recently published C.F.R. volume;

(2) The "Cumulative List of Parts Affected" section of the latest issue of the *Federal Register*; and

(3) *Shepard's Code of Federal Regulation Citations*.

2. Regulations and Notices Applicable to Pathogen Biocontrol Agents

a. 40 C.F.R. § 158.65 (1990).

Subparagraph (3) of this section regulates microbial pesticides, and exempts "[p]est control organisms such as insect predators, nematodes, and macroscopic parasites . . . from the requirements of FIFRA as authorized by section 25(b) of FIFRA and specified in § 152.20(a) of this chapter."

b. Statement of Policy, 51 Fed. Reg. 23,313 (1986).

The EPA's policy statement on microbial products subject to FIFRA and TSCA describes how the EPA will address certain nonindigenous and other microbial pesticides.

c. 51 Fed. Reg. 23,302 (1986).

This notice, sponsored by the Office of Science and Technology Policy, explains the coordinated framework set up among the federal agencies involved with the review of biotechnology research and products.

d. 50 Fed. Reg. 47,174 (1985).

This section provides a concise index of United States laws, regulations, and guidelines that are applicable to biotechnology research and products.

e. 49 Fed. Reg. 40,659 (1984).

The EPA, in its statement "Microbial Pesticides; Interim Policy on Small Scale Field Testing," requires notification prior to tests involving naturally occurring nonindigenous microbial pesticides in order to determine whether experimental

use permits are required.

C. *Case Law*

Case law can be culled from many sources, such as the annotations found after federal and state statutes, law review articles, and electronic data base services. At the time of this writing, there were no federal cases published that pertained to agricultural biocontrol methods. In the late 1980s, there was some litigation in the Northwest which discussed IPM. These cases involved land management on public lands. The cases dealt with IPM as an alternative to chemical use, appropriate for analysis in the National Environmental Policy Act's environmental impact statement. While it is interesting to note that courts have acknowledged IPM in their opinions, the litigation thus far does not address issues of agricultural IPM biocontrol methods.

III. Organizations

A. *Federal Agencies*

1. *Research Guidance*

A good source on federal governmental organizations is R. D'Aleo, *FEDFIND, Your Key to Finding Federal Government Information* (1986). Listings are divided into products and services, and information sources. It summarizes the federal government organizational structure as well as how bills become laws. There is a section on the Department of Agriculture and the EPA, and a section on experts and how to find them.

2. *The Major Federal Agencies that Regulate Biocontrols*

a. *The Environmental Protection Agency (EPA)*

The EPA has an Office of Pesticide and Toxic Substances which contains the Office of Pesticide Programs. There are several branches within the Office of Pesticide Programs that deal with biocontrols. The Insecticide/Rodenticide and Fungi-

cide/Herbicide branches have jurisdiction over microbial pesticides. The Benefits and Economic Analysis Branch deals with IPM, but mainly in the non-agricultural arena. This branch coordinates the handling of IPM in agriculture with the USDA.

Generally, the EPA regulates microbial pesticides while the USDA regulates predators and parasites. Call or write the Office of Pesticide Programs for information on the EPA's registration procedures or position on specific biological controls. The EPA will also, upon request, provide "contact sheets" which identify the responsibilities of specific departments and employees.

Office of Pesticide Programs
Environmental Protection Agency
401 M Street, SW
Washington, D.C. 20460
(202) 557-7102

b. *The United States Department of Agriculture (USDA)*

The USDA has a complex hierarchy. Within the USDA is the Animal and Plant Health Inspection Service (APHIS). There are three contacts within APHIS. The office of Biotechnology, Biologics and Environmental Protection (BBEP) is helpful in evaluating whether more comprehensive regulations are needed for biocontrols in APHIS. The offices of Plant Protection and Quarantine (PPQ) and Biological Assessment and Technical Support (BATS) can answer technical questions and clarify the nature of APHIS' authority for dealing with biocontrols. Include the department and room number in correspondence.

Director
APHIS-BBEP PPQ-BATS
USDA
Room 850/Room 626
Federal Building
6505 Belcrest Road
Hyattsville, MD 20782

(301) 436-8378/(301) 436-8896

Another section of the USDA is the Office of Agricultural Biotechnology (OAB), which is within the Office of the Secretary of the USDA. (See B.2.c. below). The USDA news releases and reports are available electronically through its "EDI SERVICE"; the phone number is (202) 447-5505.

c. *The Food and Drug Administration (FDA)*

The FDA is a division of the United States Department of Health and Human Services.

FDA
5600 Fishers Lane
Rockville, Maryland 20857
(301) 443-1544

B. *Other Organizations for Researching Biocontrols*

1. *The National Institute of Health (NIH)*

The NIH does not have a specific pesticide section, although it participates in studies on microbial pesticides. The NIH is planning to sponsor a science conference on Environmental Health and Agriculture.

Environmental Health Sciences Research
The National Institute of Health
P.O. Box 12233
Triangle Park, North Carolina 27709
(919) 541-3345

2. *The National Science Foundation (NSF)*

The NSF funds research in microbial ecology. NSF scientists have been involved with biocontrols as experts in microbial physiology. The NSF is a good source of scientific experts.

Director of the Ecology Program
National Science Foundation

1800 G Street, NW
Washington, D.C. 20550
(202) 357-9734

3. *Agricultural Biotechnology Research Advisory Committee (ABRAC)*

This committee, a cosponsor of the National Pesticide Forum, is comprised of scientists and lawyers and is approved by the Secretary of Agriculture. It is affiliated with the OAB which prepared *Agricultural Biotechnology: Introduction to Field Testing* (March 1990). This document contains chapters discussing existing federal authorities on biosafety reviews, laws, and regulations.

Office of Agricultural Biotechnology
USDA
Room 321-A Administration Building
14th and Independence Avenue, SW
Washington, D.C. 20250-2200
(202) 447-9165

C. *Public Interest Groups*

1. *The Bio-Integral Resource Center (BIRC)*

BIRC, the publisher of *The IPM Practitioner* and the *Common Sense Pest-Control Quarterly*, is a non-profit organization that provides information on the least-toxic methods for managing pests. There are three types of membership categories, ranging from twenty-five to forty-five dollars, which include a subscription to one or both of BIRC's journal publications. A free copy of the Publications Catalogue, available upon request, provides in-depth explanation of the booklets, manuals, and articles from back journal issues available for order. One sixteen page booklet available, *IPM Policy and Implementation*, is a collection of articles outlining IPM policies and strategies for implementation. BIRC also provides a variety of services including advice on solving specific pest problems.

BIRC
P.O. Box 7414
Berkeley, California 94707
(415) 524-2567

2. *National Coalition Against the Misuse of Pesticides (NCAMP)*

NCAMP, the publisher of *Pesticides and You*, seeks to focus public attention on the pesticide problem. It provides information ranging from specific details on chemicals and pest controls to new developments under FIFRA. NCAMP is part of a grassroots network that can direct you to organizations in your area.

NCAMP
530 Seventh Street SE
Washington, D.C. 20003
(202) 543-5450

3. *Northwest Coalition for Alternatives to Pesticides (NCAP)*

NCAP is the publisher of the *Journal of Pesticide Reform*, formerly *NCAP News*.

NCAP
P.O. Box 1393
Eugene, Oregon 97440-1393
(503) 344-5044.

4. *Natural Resources Defense Council (NRDC)*

The NRDC, publisher of *The Amicus Journal*, is a non-profit organization committed to protecting natural resources and improving the quality of the human environment. It has instituted a pesticide project with scientific experts.

NRDC
122 East 42nd Street
New York, New York 10168

(212) 727-4474

D. *Research Centers*

1. *Research Guidance*

P.D. DRESSER & K. HILL, *Research Centers Directory*, (14th Ed., 1990). The Directory consists of two volumes. Volume One alphabetically lists and describes research institutes, centers, laboratories, and other nonprofit research facilities and activities. The bulk of the material is organized according to scientific categories. Volume Two has two indices: The Master Index, arranged by the names of the research organizations, and the Subject Index, which has a heading for "Integrated Pest Management." There is also a heading under "Pest Control, Biological." The editors expect new information to be included in the supplement, *New Research Centers*.

Editor

Research Centers Directory

Gale Research, Inc.

835 Penobscot Building

Detroit, MI 48226-4094

(800) 347-GALE or (313) 961-2242

2. *The IPM House*

This Experiment Station is affiliated with Cornell University and the New York State Department of Agriculture. It conducts extensive studies on IPM.

New York State Agricultural Experiment Station

Geneva, New York

(315) 787-2353

E. *Farm/Agricultural Interests*

1. *American Agricultural Law Association*

The Association publishes the monthly *Agricultural Law Update* and the *American Agricultural Law Association*

Membership Directory. The Association's purpose is to advance understanding and awareness of the field of agricultural law. It conducts seminars on agricultural law topics.

American Agricultural Law Association
c/o Terence J. Centner
Department of Agricultural Economics
315 Conner Hall
University of Georgia
Athens, Georgia 30602
(404) 542-0756

2. *Institute for Alternative Agriculture, Inc.*

The Institute, publisher of *American Journal of Alternative Agriculture*, is a nonprofit research and educational organization to encourage and facilitate low-cost, resource-conserving, and environmentally sound farming methods. It holds annual scientific symposia, publishes a monthly newsletter, provides a clearinghouse for national information, advocates for sustainable agriculture in Washington, and develops and implements research and outreach programs.

Institute for Alternative Agriculture, Inc.
9200 Edmonston Road, Suite 117
Greenbelt, Maryland 20770

IV. Publications

A. *Law Review Articles*

1. *Research Guidance*

The information compiled in this section was found through the *Index to Legal Periodicals*, published by Dennis & Co., New York. It has both an author and subject index, arranged alphabetically. As of the winter of 1990 there was no subject heading for "IPM." Possibly relevant subject headings are: "environmental law and environmental protection," "pesticides," and "agriculture." No relevant articles were found under the first two headings. The following articles were found under "agriculture."

2. Selected Law Review Articles

- a. Torres, *Theoretical Problems with the Environmental Regulation of Agriculture*, 8 VA. ENVTL. L. J. 191 (1989).

This is the first article in a collection presented at the October 1988 American Agricultural Law Association meeting. The author provides an analysis of the differences in the "regulatory cultures" of the USDA and the EPA. It is interesting to read for the insight it provides into the historical background of these bureaucracies that regulate the area of biocontrols.

- b. Madden and Thompson, *Ethical Perspectives on Changing Agricultural Technology in the United States*, 3 NOTRE DAME J. L. ETHICS AND PUB. POL'Y 85 (1987).

This article, written by a professor of philosophy and a professor of agricultural economics, advocates a replacement of the present reliance on chemical pesticides with natural biological controls. The authors articulate the public policy arguments which balance the harmful and beneficial consequences of technology. Additionally, they focus on the uniqueness of agricultural technology, which unlike any other productive industry, has resources that are renewable if properly used.

Although the agricultural community is very active in IPM development, the legal community is slow to follow. This article provides an interesting analysis of the creative lawyering necessary to forge through a fairly unchartered arena.

- c. Kimbrell and Rifkin, *Biotechnology—A Proposal for Regulatory Reform*, 3 NOTRE DAME J. L. ETHICS AND PUB. POL'Y 117 (1987).

This article focuses on the biotechnology, scientific manipulation, and restructuring of an organism. It describes the regulatory system that deals with a developing technology, its limits and problems, and its application to biocontrols.

Nonindigenous microbial pesticides are treated similarly to a genetically engineered microorganism.

- d. Withers and Kenworthy, *Biotechnology—Ethics, Safety and Regulation*, 3 NOTRE DAME J. L. ETHICS AND PUB. POL'Y 131 (1987).

This article is more specific than the above cited article as to the regulatory framework set up by the principal federal agencies.

- e. McGarity, *Federal Regulation of Agricultural Biotechnologies*, 20 U. MICH. J. L. REF. 1089 (1987).

Professor McGarity provides an excellent history of the regulation of genetically modified organisms. The article raises issues that can be applied to any new field that involves assessment of risk, especially that of agriculture.

B. *Specialty Publications*

1. *Research Guidance*

Ulrich's International Periodicals Directory is simple to use. The listing most productive for IPM information was "Environmental Studies." There were no headings for "Pesticides," "IPM," or "Chemistry and Ecology." For information on specific IPM technologies, use specific search terms. For example, under "Biology-entomology" there was a journal on mosquito control; under "Forests and Forestology" the reader is directed to a Canadian newsletter on forest pest management.

2. *A Sampling of Publications Pertaining to IPM*

- a. *The IPM Practitioner*, is published by BIRC (see section on Public Interest Groups), ten times a year. It monitors IPM as it applies to agricultural, medical, landscape, structural, range, veterinary, and forest settings. It includes research notes, conference highlights, journal abstracts, prod-

ucts, and services.

b. *Common Sense Pest Control Quarterly* is published by BIRC four times a year and is written for non-technical readers. It describes least-toxic methods for managing common pests for the household, such as ants, slugs, termites, and aphids.

c. *The Amicus Journal* is published quarterly by the NRDC and is automatically mailed to NRDC members, with nonmember subscriptions available. The Journal's purpose is to provide the public with thought and opinion on environmental affairs, in keeping with the NRDC's public-interest advocacy program. The Journal does not focus solely on IPM issues but it frequently publishes articles that are closely related.

d. *Journal of Pesticide Reform* is published by NCAP.

V. Research Tools

A. *Legal Research, Generally*

J.M. JACOBSTEIN & R.M. MERSKY, *Fundamentals of Legal Research* (1987) is a basic text that enables a researcher to locate and use legal resources. Twice a year a supplement is published to update changes in the publications cited. A thorough hornbook series is M. Cohen, R.C. Berring & K.C. Olson, *How to Find the Law* (9th ed. 1989).

B. *Legal and Environmental Research*

1. J. WASSERMAN & J.W. O'BRIEN, *Law and Legal Information Directory* (1980).

This directory provides sources of information about the legal field from law schools and bar associations to legislative manuals and registers. It is divided into twenty-three sections according to the type of information source. It is helpful if you have the name of an organization and want to know how to locate and contact them.

2. T.F.P. SULLIVAN, *Directory of Environmental Information Sources* (1988).

The EIS is organized into five sections with a subject index organized by categories. One of the subject headings is "Pesticides." The editor has supplied very readable "How to Use This Book" and "Four Basic Rules of Information Acquisition" essays that will aid in using this directory and doing research. This source will provide direction to federal and state governments, professionals, scientific and trade organizations, newsletters, and databases.

3. K.A. HAMMOND, G. MACINKO & W.B. FAIRCHILD, *Sourcebook on the Environment, A Guide to the Literature* (1978).

This book is a good place to begin to familiarize oneself with the researching tools in the environmental arena. Appendix A provides a clear and concise summary of available resources, such as abstracts, government documents, and periodical information. Appendix B, entitled "Review of Federal Environmental Legislation," outlines legislative enactments and amendments.

4. G.R. WOLFF, *Environment Information Sources Handbook* (1974).

This handbook has a subject index. It categorizes information according to the type of source, such as Commercial Newsletters and Information Services, Offices of Federal Government, and University and Study Centers. "IPM" was found under the heading "Pest and Pest Control."

C. *Encyclopedias*

1. J. RYAN, *First Stop: The Master Index to Subject Encyclopedias* (1989) Z 5848.R93.

The headings "pesticide" and "insecticide" had subheadings which provided a wealth of encyclopedias for review. The following is a sampling of the available information:

- a. "Pesticides and Biological Control" listed *The Encyclopedia of American Forest and Conservation History*, vol. 2, 523-26 (Richard C. Davis ed. 1983).
 - b. "Pesticide Controversy" listed *Editorial Research Reports*, vol. 1, 313-28 (Hoyt Gimlin, Ed., Washington, DC, Congressional Quarterly Coverage: 1980-1987).
 - c. "Insecticide and Pesticide Technology" listed:
 - (1) *Foods and Food Products Encyclopedia*, 1002-09, 1462-67 (1982).
 - (2) *McGraw-Hill Encyclopedia of Environmental Science*, 530-33 (1980).
 - (3) *McGraw-Hill Encyclopedia of Food, Agriculture and Nutrition*, 437-38 (1977).
2. P. WASSERMAN, G. McCANN, & P. TOBIN, *Encyclopedia of Legal Information Sources* (1988).

This an easy-to-use encyclopedia to find books, periodicals, databases, and organizations. It is organized alphabetically by subject. The topics headings are broad and there are no headings for "Agriculture," "Environmental Law," "IPM," or "Pest."

D. Abstracts

1. *Union List of Serials (Wilson 1950) Z 6945 U5.*

IPM information was found under the subject headings "Environment" and "Pesticides." Under the heading "Environment" were listed: Environment Information access, Environment Information Center of Ecology Forum, Inc. and Environmental Ethics, John Muir Institute for Environmental Studies. The heading "Pesticide" directs the researcher to: Pesticides Abstracts, Washington, DC, EPA and the Pesticides Monitoring Journal (Washington, DC Technical Services Division, Office of Pesticide Programs, EPA).

2. *Environment Abstracts Annual*, Bowker A & I Publishing.

This abstract provides insight into the availability of articles, books, and conference reports on environmental issues, and has a well organized subject index. Although there is no subject heading for "Integrated Pest Management," the subject headings "Pest Control" and "Pest Control Programs" will lead to reports on specific topics, such as black fly control, rice farming, and gypsy moths. "Env. Constraints-Food" had some articles on agricultural practices for food production. "Insecticide" and "Pesticide" headings provide direction to sources that examine the traditional chemical methods of control. After looking in the subject index, go to the abstract in the front of the book. There you will find summaries of the articles, books, or chapters listed in the index.

E. *Electronic Legal Data Bases*

LEXIS and WESTLAW are two computer legal data base services. These services search their respective data bases for the term(s) requested by the user. A broad search such as "pesticide" will retrieve hundreds of citations.

LEXIS has an Environmental Law Library, "ENVIRN." The "ENVIRN" library contains case law, administrative rules, federal statutory and regulatory sources, and new publications.

VI. Miscellaneous

A. *State Law*

Since states have been given authority to register pesticides, it is important to review the state law. In order to identify the appropriate state environmental agency use K. Hubler & T.R. Henderson, *Directory of State Environmental Agencies*, published by the Environmental Law Institute. It is divided into general sections by state. Within each state section are specific subsections that identify the agency responsible for the specific area, such as air or water pollution.

B. *Pesticide Conference*

The *National Pesticide Forum* is an annual event that deals with pesticide problems and non-chemical pesticide management strategies across the country and around the world. For information on future conferences, contact NCAMP (202)543-5450 or the Agricultural Biotechnology Research Advisory Committee of the USDA (202)447-9165.

C. *IPM Legal Practice*

Jellinek, Schwartz, Connolley & Freshman, Inc. is a firm that has an extensive pesticide practice covering microbiological control agents and genetically altered microorganisms. They can be reached at:

Suite 500
1050 15th Street, NW
Washington, D.C. 20005
(202)789-8181.

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APPENDIX B

ABRAC Agricultural Biotechnology Research Advisory Committee

APHIS	Animal and Plant Health Inspection Service (USDA)
ARS	Agricultural Research Service (USDA)
BASS	Biological Assessment Support Staff (APHIS)
BATS	Biological Assessment and Technological Support
BBEP	Biotechnology, Biologics and Environmental Protection
BECS	Biotechnology and Environmental Coordination Staff (APHIS)
BIRC	Bio-Integral Resource Center
BROC	Biotechnology Research Oversight Committee (ARS)
BSAC	Biotechnology Science Advisory Committee (EPA)
BSAP	Biotechnology Science Advisory Panel (EPA)
BSCC	Biotechnology Science Coordinating Committee (FCCSET)
CBA	Committee on Biotechnology in Agriculture (USDA)
CFR	Code of Federal Regulations
CFSAN	Center for Food Safety and Applied Nutrition (FDA)
COB	Committee on Biotechnology (NASULGC)
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FCCSET	Federal Coordinating Council for Science, Engineering & Technology
FDCA	Federal Food, Drug and Cosmetic Act
FDA	Federal Food and Drug Administration
FEPCA	The Federal Environmental Pesticide Control Act of 1972
FIFRA	The Federal Insecticide, Fungicide, and Rodenticide Act
IPM	Integrated Pest Management
NASULGC	National Association of State Universities & Land Grant Colleges
NBIAP	National Biological Impact Assessment Program (NASULGC)

NCAMP	National Coalition Against the Misuse of Pesticides
NCAP	Northwest Coalition for Alternatives to Pesticides
NEPA	National Environmental Policy Act
NIH	National Institute of Health
NRDC	Natural Resources Defense Council
NSF	National Science Foundation
OAB	Office of Agricultural Biotechnology (USDA)
OPTS	Office of Pesticides and Toxic Substances (EPA)
OSTP	Office of Science and Technology Policy
PPQ	Plant Protection and Quarantine (APHIS)
TSCA	Toxic Substances Control Act
USC	United States Code
USCA	United States Code Annotated
USCA	United States Code Service
USDA	United States Department of Agriculture