

**LEGAL AND POLICY OPTIONS TO MINIMIZE ADVERSE EFFECTS OF  
MOSQUITO CONTROL PRACTICES ON FLORIDA'S SALTWATER FISHERIES**

by

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## EXECUTIVE SUMMARY

Its reputation as a fishing mecca is one of the most important images that Florida projects. Commercial and recreational fisheries represent a significant component of the state's revenues. Over the period of 1953-1982, total commercial marine landings in Florida ranged from 163 million to 215 million pounds annually. A 1982 study calculated that saltwater sport fishing alone contributes approximately \$2 billion per year to the economy. However, despite continuing increases in the numbers of commercial fishing trips, and the establishment of many fish hatcheries, total harvests of fish and shellfish have been generally declining since the mid-1960s. As a result, the state's well deserved image may be in jeopardy. One factor in this decline has been the loss or degradation of estuarine fishery habitat.

Estuaries play a critical role in the maintenance of fishery populations. Approximately 95% of Florida's commercial fisheries species and most of the recreational species depend on estuaries during one or more life stages. Among other functions, estuaries provide important habitat for the juveniles of many fishery species, as well as for the prey base supporting those species. Studies suggest that shallow seagrass beds, tidal creeks, emergent marsh vegetation, and mangrove prop roots serve as primary juvenile habitat for many species.

Several fishery species, including clams and oysters, spend their entire life cycles within estuarine systems. Others, such as shrimp, migrate as larvae from offshore areas to estuarine nursery habitat, developing into sub-adults before returning to deeper waters to complete their life cycles. Some of Florida's best known estuarine-dependent species include spotted seatrout, striped mullet, striped bass, red drum, snook, mangrove snapper, and tarpon. Spawning occurs offshore for many of these, with larvae or early juveniles moving into estuaries to feed and mature. Tampa Bay alone provides important nursery habitat for approximately twenty major offshore commercial species.

Though there are several factors responsible for the observed declines in Florida's fisheries, some of the most significant involve human impacts on estuaries. Estuarine habitat is being degraded in many ways, including the effects of pollution, bulkheading, construction activity and dredging and filling. One suspected source of adverse impacts involves the use of pesticides for mosquito control. Pesticides are the primary means for mosquito control used today, and are suspected of adversely affecting non-target organisms. The effects of mosquito control pesticides on marine organisms are of particular concern, since spraying operations often occur in or near estuarine environments. Although

there is disagreement in the scientific community as to the severity of the problem, there is some evidence indicating that these pesticides may harm a variety of estuarine organisms which are important to the survival of popular game fish, including red drum, snook, and spotted sea trout.

This report examines the regulation of mosquito control activities in Florida and makes legal and institutional recommendations to improve protection of non-target estuarine and marine organisms. The primary federal laws affecting the use of pesticides are the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and the Endangered Species Act (ESA). FIFRA governs the registration, manufacture, distribution, and use of pesticides in the United States and is implemented by the Environmental Protection Agency (EPA). As part of the registration process EPA conducts cost benefit analyses on pesticide uses, including assessment of environmental risk. FIFRA also provides for reclassification, suspension, or cancellation of existing pesticide registrations through the Special Review process.

FIFRA depends largely on pesticide labels to guide users in environmentally safe use of pesticides. Unfortunately, many mosquito control pesticide labels contain ambiguous language, thereby providing inadequate guidance to pesticide applicators. Although EPA requires elaborate data to be presented during the registration process, there is evidence that the environmental risks of many pesticides have not been adequately assessed. EPA is currently re-registering all pesticides registered before 1984 because the agency has determined its risk assessment was inadequate for these pesticides. Furthermore, scientists indicate that current EPA risk assessment models may severely underestimate risk to non-target species.

The Endangered Species Act prohibits actions which harm endangered or threatened species, and is also implemented by the EPA. The spraying of mosquito control pesticides which causes harm to endangered or threatened species would probably be a violation of the ESA. The ESA contains a citizen's suit provision which could be used to enjoin the use of mosquito control pesticides which harm endangered or threatened species. The Act also establishes a regulatory program, the Endangered Species Protection Program, to ensure that endangered and threatened species are considered in the registration and use of pesticides.

At the state level, Chapter 388, Florida Statutes, and Rule 10D-54, Florida Administrative Code, establish a variety of regulations which address the consideration and protection of non-target species. State oversight of mosquito control is provided by the Department of Health and Rehabilitative Services. Mosquito control programs are required to conduct pre- and post-spray

surveillance of mosquito population levels and are required to assess post-spray non-target effects. While there is an elaborate regulatory system in place, effective protection of non-target marine organisms is hindered by a pervasive lack of enforcement at the local, state, and federal level.

Some of the more important recommendations for modification of mosquito control in Florida include: clarification of ambiguous mosquito control pesticide labels; strengthening of surveillance and reporting requirements; strengthening of enforcement efforts and authority; increased use of Integrated Pest Management techniques; development of alternatives to pesticides; increased research to assess the effects of pesticides on non-target organisms; increased funding, particularly for public education, research, and enforcement; utilization of administrative and judicial remedies if warranted; and public education.

This report is one of two researched and written under Project Number R/FDNR-3A with the Florida Department of Natural Resources and Florida Sea Grant College. The second report, "Maintenance and Restoration of Freshwater Flows to Estuaries for Fisheries Habitat Purposes," by Jeff Wade, has also been published as a Sea Grant Technical Paper.

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# LEGAL AND POLICY OPTIONS TO MINIMIZE ADVERSE EFFECTS OF MOSQUITO CONTROL PRACTICES ON FLORIDA'S SALTWATER FISHERIES

## INTRODUCTION

The importance of estuaries as nursery grounds for saltwater recreational and commercial fisheries is well recognized. Estuaries are one of the most productive ecosystems in the world and provide essential habitat for many game fish and their prey. Many scientists and citizens are concerned that mosquito control practices may be degrading the ecological quality and fisheries value of estuarine waters in Florida.

Florida has over 1200 miles of coastline, including vast areas of salt marshes and mangrove swamps which are excellent breeding grounds for mosquitoes. Early efforts at mosquito control were accomplished by eliminating breeding habitats by draining and filling low lying areas. Although these early permanent control techniques were often considered successful, they were soon replaced by cheaper and seemingly more effective pesticides. DDT was first used in Florida in 1945 and is credited

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Comp and Seaman, Jr., *Estuarine Habitat and Fishery Resources of Florida*, in FLORIDA AQUATIC HABITAT AND FISHERY RESOURCES 337-340 (W. Seaman, Jr., ed. 1988); E. ODUM, FUNDAMENTALS OF ECOLOGY (3d ed. 1971); J. CLARK, COASTAL ECOSYSTEM MANAGEMENT 11 (1983); Niering, W., and R. Warren, *Salt Marshes*, in COASTAL ECOSYSTEM MANAGEMENT (J. Clark 1983); Maloney, F., and B. Canter, *Stormwater Runoff and the Coastal Zone: Legal Alternatives for Effective Management*, Final Report to Florida Sea Grant, University of Florida 238 (March, 1979).

*See generally*, Clark, *Adverse Impacts to Freshwater Aquatic and Marine Organisms*, MOSQUITO CONTROL PESTICIDES: ECOLOGICAL IMPACTS AND MANAGEMENT ALTERNATIVES 33-39 (1991). (Proceedings of a Conference held on January 18, 1991, at the University of Florida, Gainesville, Florida, published by Scientific Publishers, Inc., Gainesville, Florida.); Ward, *The Coral Reefs of Florida Are Imperiled*, 178 No. 1 NATIONAL GEOGRAPHIC 128-130 (July, 1990); Taylor, *The Ubiquitous Mosquito*, FLORIDA NATURALIST 11 (Winter 1988); *Pesticide Use Observations, Monroe County, Florida* (Report prepared by the National Enforcement Investigations Center for the U.S. Environmental Protection Agency) (January, 1980).

*Integrated Pest Management For Mosquitoes in Florida, A Work Document 2* (Prepared by the Sub-group for Development of IPM for the Governor's Working Group for Mosquito Control, composed of representatives from the Florida Department of Health and Rehabilitative Services, the University of Florida's Institute of Food and Agricultural Sciences, the U.S. Department of Agriculture, the U.S. Navy, and several mosquito control districts in Florida, May, 1982) [hereinafter cited as *IPM*].

*Id.* at 3.

*Id.* at 7.

with the elimination of malaria from the state in 1948. However, as early as 1947 it was becoming apparent that certain species of mosquitoes were becoming resistant to DDT. In addition, adverse environmental effects were being noticed as early as 1951.

More recently, mosquitoes have been deemed to be directly related to the economic well being of our state. Specifically, the eradication and control of mosquitoes has been determined to be of such importance to the health and economy of Florida that the state has declared as public policy that levels of arthropods be reduced so as to "foster the quality of life of the people, promote the economic development of the state, and facilitate the enjoyment of its natural attractions...." To carry out this policy, the state authorized the creation of mosquito control districts and established a state regulatory program for mosquito control activities.

Today, almost all efforts to control mosquitoes involve the use of pesticides. In 1988, a total of over 1 million pounds of active ingredient of the three most widely used pesticides (malathion, naled, and fenthion) were applied by mosquito control districts participating in Florida's mosquito control regulatory program. This figure does not reflect significant amounts of other pesticides which were applied by mosquito control districts participating in Florida's mosquito control regulatory program, or any of the pesticides applied by several hundred programs which do not participate in the state mosquito control regulatory program. Appendix B contains a complete listing of pesticides applied from 1987 to 1989 by mosquito control programs participating in Florida's mosquito control regulatory program. Figures 1,2,3, and 4, contained in Appendix A, graphically illustrate relative amounts of

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*Id.* at 3.

*Id.* at 7.

*Id.*

FLA. STAT. § 388.0101 (1989).

*Id.* §§ 388.021, 388.361.

Johnson, Newman, Aufmuth, and Whitten, *Handbook of Pesticide Use and Effects on Florida Wildlife* (Document prepared for the Florida Game and Fresh Water Fish Commission, Nongame Wildlife Program) 44 (February, 1991) (in press). This value was derived from the Florida Department of Health and Rehabilitative Services, Entomology Section, 1988 Annual Report.

*See* the report section entitled Florida Regulatory Framework for an explanation of Florida's mosquito control regulatory program.

adulticides and selected larvicides which were sprayed during this time. Source reduction techniques, such as ditching, diking, and draining, have all but been abandoned due to wetlands protection laws and changes in management philosophies by state lands managers.

The effects of mosquito control pesticides on marine organisms are of particular concern, since spraying operations often occur in or near estuarine environments. Although there is disagreement in the scientific community as to the direct and indirect effects of various mosquito control pesticides on fish, some researchers indicate that these pesticides may harm a variety of marine organisms, particularly crustaceans such as copepods (minute freshwater and marine crustaceans) and decapods (shrimps, lobsters, and crabs). These organisms play important roles in the intricate food web that supports a number of popular game fish including red drum, spotted sea trout, and snook. Juvenile forms of fish and other aquatic biota appear to be particularly vulnerable to the effects of pesticides. Some scientists and citizens are concerned because many of the effects of these pesticides on non-target species are unknown, particularly cumulative and long term effects.

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Figures 3 and 4 do not include larvicides applied in the form of briquets, tossits, or granules because of the uncertainty and incompatibility of the measuring units reported by HRS.

Some researchers indicate that certain mosquito control pesticides may have adverse effects on marine fish and crustaceans. See Thompson & Tucker, *Toxicity of the Organophosphate Insecticide Fenthion, Alone and with Thermal Fog Carriers, to an Estuarine Copepod and Young Fish*, 43 BULLETIN OF ENVIRONMENTAL CONTAMINATION AND TOXICOLOGY 789 (1989); Tucker, *Dangers of Using Organophosphorus Pesticides and Diesel Oil in Fish Ponds*, AQUACULTURE MAGAZINE (October, 1987); Hester, Olson, & Floore, *Effects of Diflubenzuron on three estuarine decapods, Callinectes sp., Palaemonetes pugio and Uca pugnator*, 57, No.1 FLORIDA ANTI-MOSQUITO ASSOCIATION 8 (1986); Tsen, Wang, & Tucker, *Assimilation of Fenthion in Coastal Water*, in PROCEEDINGS OF THE 8TH INTERNATIONAL OCEAN DISPOSAL SYMPOSIUM, Yugoslavia (October, 1989) (in publication); Clark, *Adverse Impacts to Freshwater Aquatic and Marine Organisms*, MOSQUITO CONTROL PESTICIDES: ECOLOGICAL IMPACTS AND MANAGEMENT ALTERNATIVES 33-39 (1991). (Proceedings of a Conference held on January 18, 1991, at the University of Florida, Gainesville, Florida, published by Scientific Publishers, Inc., Gainesville, Florida.).

However, other researchers indicate that certain mosquito control pesticides do not have adverse impacts on non-target species. See Hester, Rathburn, & Boike, *Effects of Methoprene on Non-Target Organisms When Applied as a Mosquito Larvicide*, in Proceedings of the Florida Anti-Mosquito Association 51st Meeting (April 27-30, 1980); Hester, Rathburn, & Rogers, *Small Plot Field Tests of an Oil Formulation Against Mosquito Larvae and Non-Target Organisms*, 39 No. 3 MOSQUITO NEWS (September 1979); Hester, Clements, Dukes, & Swenson, reprinted from Proceedings of the Florida anti-Mosquito Association 49th Meeting (April 2-5, 1978).

Clark, *Adverse Impacts to Freshwater Aquatic and Marine Organisms*, MOSQUITO CONTROL PESTICIDES: ECOLOGICAL IMPACTS AND MANAGEMENT ALTERNATIVES 33-39 (1991). (Proceedings of a Conference held on January 18, 1991, at the University of Florida, Gainesville, Florida, published by Scientific

The activities and regulation of mosquito control districts as they relate to non-target marine species is the subject of this report. The first section of the report examines the existing federal regulatory framework; the second section examines the existing state regulatory framework; and the third section presents findings and recommendations to correct problems occurring in Florida's mosquito control regulatory programs.

## **FEDERAL REGULATORY FRAMEWORK**

### **I. The Federal Insecticide, Fungicide, and Rodenticide Act**

The registration, manufacture, distribution, and use of pesticides in the United States is regulated by the Environmental Protection Agency (EPA) under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA). Pesticides which are used in Florida for mosquito control are subject to the requirements of FIFRA. An examination of the requirements of FIFRA illustrates the factors EPA considers when deciding whether to approve registration of pesticides. For example, FIFRA requires applicants for pesticide registration to present data regarding the effects of pesticides on non-target species.

EPA must balance adverse effects and benefits of each pesticide when deciding whether to register a pesticide. Registered pesticides must be accompanied by labels that protect users and the environment. FIFRA also contains mechanisms by which EPA can reconsider existing pesticide regulations, such as when new evidence of adverse effects is discovered. In addition, EPA may restrict, suspend, or cancel pesticide registrations which EPA finds are not meeting statutory requirements.

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7 U.S.C.A. §§ 136 - 136y.

### A. General Statutory Scheme

Pesticide regulation under FIFRA is driven by the requirement that all pesticides must be registered with the EPA. The registration process requires that EPA consider the adverse effects and benefits of each pesticide, and determine whether the pesticides meet statutory criteria. FIFRA prohibits anyone from distributing, selling, or receiving any pesticide which is not registered with the administrator of the Federal Environmental Protection Agency (EPA). The term "pesticide" is defined broadly as any substance or mixture of substances used for repelling or destroying a pest. FIFRA requires that a person seeking registration must file information about the pesticide with EPA, and then the administrator of EPA must decide if the pesticide meets the statutory requirements with respect to labeling and will not produce "unreasonable adverse effects on the environment." "Unreasonable adverse effects on the environment" are defined as any unreasonable risk to man or the environment, taking into account economic, social, and environmental costs and benefits of the use of a particular pesticide. The term "unreasonable" is not defined by FIFRA.

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*Id.* § 136a(a).

*Id.* § 136(u).

*Id.* § 136a(c)(1),(2); 40 C.F.R. Part 158 (July 1, 1991). EPA rules require that applicants submit data pertaining to product chemistry, residue chemistry, environmental fate, toxicology, reentry protection, aerial drift evaluation, wildlife and aquatic organisms, plant protection, nontarget insects, product performance, and biochemical and microbial pesticides. 40 C.F.R. part 158 (July 1, 1991). Additional standards for conducting acceptable tests, guidance on evaluation and reporting of data, further guidance on when data are required, definitions of most terms, and examples of protocols are available in an advisory document referred to as Pesticide Assessment Guidelines through the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

Labels are written, printed, or graphic matter accompanying pesticides. *Id.* §136(p). Labels must include, among other things, directions for use which are adequate to protect health and the environment. *Id.* § 136(q)(1)(F).

*Id.* § 136a(c)(5).

*Id.* § 136(bb). EPA may conditionally register or amend a pesticide registration, or suspend the registration of a pesticide, if EPA determines the statutory requirements for such actions are met. *Id.* §§ 136a(c)(7), 136d. As of 1982 EPA had suspended or canceled the registration of over 3,000 pesticides for use in the United States. J.C. JUERGENSMEYER & J.B. WADLEY, AGRICULTURAL LAW 53 (1982).

FIFRA imposes a reporting duty on all registrants to promptly notify EPA of any new information regarding unreasonable adverse effects on the environment of the pesticide. Failure to report required information relating to the risks and benefits of a registered pesticide constitutes a violation of FIFRA. EPA rules detail what information must be submitted, including specific requirements relating to completed toxicological studies, incomplete toxicological studies, epidemiological studies, efficacy studies, studies of dietary or environmental pesticide residues, toxic or adverse effect incident reports, failure of performance incident reports, dietary or environmental pesticide residue incident reports, and other information which might raise questions about the continued registrability of a registrant's pesticide product.

Under FIFRA, pesticides are classified either for general or restricted use. General use pesticides are those that EPA determines will not generally cause any unreasonable adverse effects on the environment, when used in accordance with the labeling. Restricted use pesticides are those that EPA determines "may generally cause, without additional regulatory restrictions, unreasonable adverse effects on the environment," when used in accordance with the labeling.

General use pesticides may be bought and used by any person. Restricted use pesticides may only be applied by a certified applicator or by someone under the direct supervision of a certified applicator. FIFRA directs EPA to issue standards for the certification of applicators of pesticides which insure that an individual is competent with respect to the use and handling of pesticides.

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7 U.S.C.A. § 136d(a)(2). The applicant must submit the information to EPA within 15 days of the applicant becoming aware of the information. 40 C.F.R. § 153.64 (July 1, 1991).

40 C.F.R. § 153.66 (July 1, 1991).

*Id.* §§ 153.69-153.78.

7 U.S.C.A. § 136a(d)(1)(A).

*Id.* § 136a(d)(1)(B).

*Id.* § 136a(d)(1)(C).

*Id.*

*Id.* § 136b(a)(1).

Applicators of restricted use pesticides must be certified by EPA in accordance with FIFRA, or by an EPA approved state certification plan.

Mosquito control pesticides currently being used in Florida are all considered general use pesticides. However, Florida exceeds federal statutory requirements by requiring that mosquito control pesticide applicators successfully complete a state certification process.

In addition to regulating the registration of pesticides and the qualifications of pesticide applicators, FIFRA also regulates the use of pesticides. Specifically, it is unlawful for any person to alter any labeling, to use any registered pesticide in a manner inconsistent with its labeling, to violate any cancellation of registration of a pesticide, or to add or take any substance from a pesticide which may defeat the purposes of FIFRA. Of particular significance is the requirement that pesticides may only be used in a manner which is consistent with their labeling. Pesticide application rates specified on labels are designed to be the minimum necessary to effect the desired eradication of the pest.

EPA may issue civil penalties for violations of FIFRA or its rules of not more than \$5000 for each offense by a commercial applicator. A commercial applicator is any applicator who uses or supervises the use of any restricted use pesticide for any purpose, or on any property, other than for the purposes of producing any agricultural commodity on property owned or rented by the applicator or the applicator's employer. In addition to civil penalties, EPA may issue criminal penalties against commercial applicators who knowingly violate use provisions of FIFRA or its rules, up to \$25,000, or imprisonment for one year, or both.

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*Id.* § 136b. A state may submit a state plan to certify applicators of restricted use pesticides, which EPA may approve if it determines that the state has adequate regulatory structure, legal authority, funds, reporting systems, and standards to implement and conduct a satisfactory certification program. *Id.* § 136b(a)(2). A state certification program must contain provisions to submit required reports to EPA and must have certification standards which conform with the standards promulgated by EPA under FIFRA. *Id.* § 136b(a)(2)(D),(E). In addition, EPA rules and state certification standards must include a provision to provide information concerning integrated pest management techniques to individuals who request such information. *Id.* § 136b(c).

*Id.* § 136j.

*Id.* § 136l(a)(1).

*Id.* § 136(e)(2),(3).

*Id.* § 136l(b)(1).

Under FIFRA, EPA is authorized to establish procedures and regulations to deal with the disposal or storage of packages and containers of pesticides, and the disposal or storage of pesticides. EPA is also authorized to establish requirements and procedures for safe disposal of any pesticide for which the registration has been suspended or canceled. EPA is charged with conducting research concerning pesticides and integrated pest management, and must develop a national monitoring plan. EPA, in cooperation with other federal, state, and local agencies, must monitor air, soil, water, man, plants, and animals for human and environmental pesticide pollution.

States may also regulate the sale or use of any federally registered pesticide in the state, as long as the regulation does not permit any sale or use prohibited by FIFRA. A state plan for regulation of the sale and use of pesticides is subject to approval by EPA and will be suspended if EPA determines that a state is not capable of exercising, or has failed to exercise, adequate control to insure state registration which is in accord with the provisions of FIFRA. EPA has approved a Florida plan for regulation of the sale and use of pesticides.

States may also enter into cooperative agreements with EPA which delegate the authority to enforce provisions of FIFRA to the state. Any state that has entered into a cooperative agreement with EPA for the enforcement of pesticide use restrictions, or is deemed by EPA to have adopted adequate 1) pesticide use laws and regulations, 2) enforcement procedures, and 3) record keeping and recording

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*Id.* § 136q(a).

*Id.* § 136q(a)(b).

*Id.* § 136r(a),(b).

*Id.* § 136r(c).

*Id.* § 136v(a).

*Id.* § 136v(c).

The Florida Department of Agriculture and Consumer Services (DACCS) is the state agency responsible for regulating pesticide sales, labeling, and use in Florida. FLA. STAT. ch. 487 (1989). However, mosquito control programs, while subject to labeling and use requirements imposed by DACCS, are primarily regulated by the Florida Department of Health and Rehabilitative Services. *Id.* ch. 388.

7 U.S.C.A. § 136u(a).

procedures, shall have primary enforcement responsibility for pesticide use violations within that state. EPA retains authority to enforce the provisions of FIFRA, even when it determines that a state has primary enforcement authority. Florida has entered into yearly cooperative enforcement agreements with EPA since the late 1980s. The Florida/EPA cooperative enforcement agreement is discussed in Section III of the Florida Regulatory Framework portion of this report.

In the event that EPA receives a complaint indicating a significant violation by a state of the pesticide use provisions of FIFRA, EPA must first refer the matter to the appropriate state officials. If the state does not take appropriate enforcement action within thirty days, EPA may act upon the complaint. Similarly, if EPA determines that a state with primary enforcement authority is not carrying out its responsibility, it must notify the state. The state then has ninety days within which to correct the deficiencies. If inadequacies still exist after 90 days, EPA may rescind, in whole or in part, the state's primary enforcement authority for pesticide use.

In summary, FIFRA establishes a regulatory framework for registration of pesticides, certification of pesticide applicators, and use of pesticides. Although states have the authority to administer the provisions of FIFRA, their discretion is limited to creating regulations which are at least as strict as those in FIFRA.

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*Id.* § 136w-1(a),(b). EPA assumes the enforcement responsibility in states that do not have primary enforcement responsibility, and the provision in FIFRA which allows EPA to inspect records of producers, sellers, or distributors of pesticides is extended to apply to any commercial applicator. *Id.* § 136w-1(c). Section 136f of FIFRA requires producers, sellers, or distributors of pesticides to permit EPA to inspect all records required under FIFRA. *Id.* § 136f.

*Id.* § 136w-2(c).

*Id.* § 136w-2(a).

*Id.*

*Id.* § 136w-2(b).

*Id.*

## **B. Cost Benefit Analysis Under FIFRA**

### **1. Probable Issues Concerning the Use of Pesticides in Florida for Mosquito Control**

FIFRA directs the administrator of EPA to analyze the costs and benefits of a given pesticide use when determining whether to register, re-register, suspend, or cancel that pesticide use. FIFRA data and reporting requirements for registrants illustrate the kinds of information which EPA considers when evaluating pesticide registrations. An important component of cost benefit analyses is the risk assessment of pesticide uses. Unfortunately, there is evidence that the environmental risks of many registered pesticides have not been adequately assessed. In order to evaluate pesticides used to control mosquitos in Florida, the administrator would probably assess potential issues such as: 1) adverse fish, insect, and wildlife impacts from pesticide applications into and around estuarine systems, 2) adverse water quality impacts from pesticide applications, 3) adverse health effects in humans from continued pesticide applications, 4) adverse health effects from a reduction or termination of pesticide applications, 5) nuisance effects from a reduction or termination of pesticide applications, 6) adverse economic effects from a reduction or termination of pesticide applications, 7) the availability of viable alternatives, and 8) the efficacy of the pesticide. A review of FIFRA statutory provisions, EPA regulations, and administrative decisions regarding cost benefit analysis provides some insight into how the administrator might evaluate the use of a particular pesticide for mosquito control in Florida. Review of cost benefit factors is also useful to identify potential administrative and judicial remedies for pesticides causing adverse impacts to saltwater fisheries.

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FIFRA data requirements are discussed in note 19. FIFRA reporting requirements are discussed in the text accompanying notes 23 - 25.

*See* 7 U.S.C.A. § 136a-1, addressing re-registration of registered pesticides. In addition, one scientist has indicated that current EPA models may seriously underestimate risk of pesticides to non-target species. *See* Tiebout, *Evaluation of Federal Ecological Risk Assessment*, MOSQUITO CONTROL PESTICIDES: ECOLOGICAL IMPACTS AND MANAGEMENT ALTERNATIVES 77-83 (1991). (Proceedings of a Conference held on January 18, 1991, at the University of Florida, Gainesville, Florida, published by Scientific Publishers, Inc., Gainesville, Florida.).

## 2. Statutory Guidelines for Cost Benefit Analyses

The administrator of EPA is directed to approve registration of a pesticide if: 1) the pesticide meets the efficacy and labeling requirements of FIFRA, 2) the pesticide "will perform its intended function without adverse effects on the environment," and 3) "when used in accordance with widespread and commonly recognized practice, it [the pesticide] will not generally cause unreasonable adverse effects on the environment." Congress defined "unreasonable adverse effects on the environment" to include "any unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide." Clearly, this definition directs the administrator to consider economic and social, as well as environmental costs and benefits of pesticide uses. After a pesticide is registered, FIFRA places an ongoing duty on registrants to inform EPA of any "additional factual information regarding unreasonable adverse effects on the environment of the pesticide."

Similar language concerning cost and benefit analyses exists in provisions of FIFRA addressing cancellation and suspension of pesticide uses. Specifically, when determining whether to issue notice of intent to cancel registration, the administrator must take into account "the impact of the action proposed in such notice on production and prices of agricultural commodities, retail food prices, and otherwise on the agricultural economy." Prior to issuing a final order concerning cancellation or suspension, the administrator must first consider restricting a pesticide's use as an alternative to cancellation, and must fully explain reasons for the restrictions, as well as the impacts on agricultural commodities, retail food prices, and the agricultural economy.

Additional language is contained in the provisions of FIFRA dealing with misbranding. The administrator must review each registration to determine whether the label satisfies the requirements of FIFRA. Among other requirements, a pesticide label is misbranded if the label does not contain

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7 U.S.C. § 136a(c)(5).

*Id.* § 136(bb).

*Id.* § 136d(a)(2).

*Id.* § 136d(b).

*Id.*

*Id.*

directions concerning the use of a pesticide which are "adequate to protect health and the environment." Similarly, a pesticide is misbranded if the label does not contain a warning or caution statement which is "adequate to protect health and the environment." The sale or distribution of pesticides which are misbranded is unlawful under FIFRA. Clearly, the administrator must evaluate the risks involved with a particular pesticide use in order to ascertain whether the label complies with the requirements of FIFRA.

FIFRA provides some general guidance for the administrator to use in determining whether to grant registration or re-registration, to evaluate labeling, or to issue a notice to cancel or suspend an existing registration. However, the statute provides little guidance as to the relative weights which the administrator should give to the costs and benefits of a pesticide use. Procedures for pesticide evaluation are further elucidated in EPA rules promulgated under FIFRA.

### **3. Regulatory Guidelines for Cost Benefit Analyses**

EPA rules specify the types and minimum amounts of data that a registrant must submit to allow EPA to evaluate the risks and benefits of a pesticide use. In addition, the rules provide guidance for determining use classifications by listing specific criteria for determinations of unreasonable adverse effects. The rules list minimum criteria which must be met in order for a pesticide to be classified for general use for both domestic and non-domestic application. Pesticide uses which do not meet these tolerances are classified for restricted use unless the label meets certain additional criteria, or the benefits of unrestricted use outweigh the risks of unrestricted use.

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*Id.* § 136(q)(1)(f).

*Id.* § 136(q)(1)(g).

*Id.* § 136j(a)(1)(E).

40 C.F.R. § 158.20(b) (July 1, 1991).

*Id.* § 162.11(c).

*Id.* The criteria include tolerances for acute dermal LD<sub>50</sub>, inhalation LC<sub>50</sub>, eye irritation or corneal opacity, skin irritation, and acute oral LD<sub>50</sub>.

*Id.* § 162.11(c). Section 162.11(c)(3) lists labeling criteria, which if met, can prevent a pesticide from being classified for restricted use. If these criteria are met the labeling will be considered sufficient to prevent unreasonable adverse effects on the environment.

*Id.* § 162.11(c).

EPA rules addressing Special Review procedures provide additional insight into how EPA evaluates the costs and benefits of pesticide uses. The purpose of a Special Review proceeding is to help the administrator determine when to initiate procedures to cancel, deny, or reclassify a pesticide registration because uses of that pesticide may cause unreasonable adverse effects on the environment. The process contains many procedural requirements and is intended to insure that EPA openly evaluates both the risks and benefits of pesticide uses.

Prior to 1985, EPA risk assessment criteria for the evaluation of potential adverse effects focused primarily on toxicity data for the particular pesticide. EPA was required to initiate Special Review for any pesticide whose acute toxicity exceeded specific numerical values, or which caused certain chronic effects at any level. In 1985, EPA issued revised risk criteria rules, claiming that the lack of flexibility in the current rules limited EPA's discretion to consider other relevant factors and prevented EPA from addressing the most dangerous pesticides first.

Under current EPA rules, the administrator may initiate Special Review on his own initiative or at the request of any interested person, if the administrator determines that certain risk criteria are met by the pesticide use. Several of the risk criteria are of particular significance to mosquito control

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*Id.* § 154.1.

*Id.*

50 Fed. Reg. 49005 (Nov. 27, 1985).

In the earlier rules Special Review was called Rebuttable Presumption Against Registration (RPAR). The title was changed amid concern that RPAR carried negative connotations that could cause adverse economic consequences for the pesticide industry.

50 Fed. Reg. 49005 (Nov. 27, 1985).

*Id.*

EPA rejected industry suggestions that restrictions be placed on communications from persons outside EPA, and expressly stated that EPA may initiate a Special Review in response to any communication from a person outside EPA, regardless of the manner or form of the communication. 40 C.F.R. §§ 154.7, 154.10 (July 1, 1991).

40 C.F.R. § 154.7 (July 1, 1991). Criteria for initiation of Special Review include a number of factors relating to humans, animals, and the environment. The criteria are as follows:

- (a) The administrator may conduct a Special Review of a pesticide use if he determines, based on a validated test or other significant evidence, that the use of the pesticide ...
  - (1) May pose a risk of serious acute injury to humans or domestic animals.

activities in Florida. Specifically, the administrator may conduct a Special Review of a pesticide use "if he determines, based on a validated test or other significant evidence," that a pesticide use adversely effects nontarget organisms, endangered or threatened species, or the habitat of endangered or threatened species. In addition, risks to the environment of "sufficient magnitude" may also justify

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(2) May pose a risk of inducing in humans an oncogenic, heritable genetic, teratogenic, fetotoxic, reproductive effect, or a chronic or delayed toxic effect, which risk is of concern in terms of either the degree of risk to individual humans or the number of humans at some risk, based upon:

- (i) Effects demonstrated in humans or experimental animals.
- (ii) Known or predicted level of exposure of various groups of humans.
- (iii) The use of appropriate methods of evaluating data and relating such data to human risk.

(3) *May result in residues in the environment of nontarget organisms at levels which equal or exceed concentrations acutely or chronically toxic to such organisms, as determined from tests conducted on representative species or from other appropriate data.*

(4) *May pose a risk to the continued existence of any endangered or threatened species....*

(5) *May result in the destruction or other adverse modification of any habitat designated ... as a critical habitat for any endangered or threatened species.*

(6) *May otherwise pose a risk to humans or to the environment which is of sufficient magnitude to merit a determination whether the use of the pesticide product offers offsetting social, economic, and environmental benefits that justify initial or continued registration.*

(b) In making any determination that a pesticide use satisfies one of the criteria for issuance of a Special Review ... the administrator shall consider available evidence concerning both the adverse effect in question and the magnitude and scope of exposure of humans and nontarget organisms associated with use of the pesticide.

40 C.F.R. § 154.7 (July 1, 1991). (Emphasis added).

*Id.* § 154.7. A "validated test" is defined as "a test determined by the agency to have been conducted and evaluated in a manner consistent with accepted scientific procedures." *Id.* § 154.1(i). "Other additional evidence" means "factually significant information that relates to the uses of the pesticide and their adverse risk to man or to the environment but does not include evidence based only on misuse of the pesticide unless such misuse is widespread and commonly recognized practice." *Id.* § 154.1(e). EPA intended that these rather broad definitions would assure that risk assessment would have a reasonable scientific basis, yet would not bind EPA from considering pertinent information merely because the information would not satisfy rigid criteria. 50 Fed. Reg. 49006 (Nov. 27, 1985).

40 C.F.R. §§ 154.7(a)(3),(4),(5) (July 1, 1991). EPA received industry comments criticizing the criteria regulating the impact of pesticide uses on endangered species. Specifically, industry representatives suggested that the word "significant" should be put before "risk," and that the language about critical habitats be deleted from the rule. EPA declined to follow these industry suggestions, expressly stating that the Endangered Species Act prohibited the consideration of population size and the taking of even one endangered species. Similarly, pesticide use which impacts the food source or critical habitat of an

initiation of Special Review. Furthermore, there is a catch-all criterion which directs EPA to initiate a Special Review when potential risks arise which are not addressed by any of the specific criteria. The risk criteria are intended to insure that EPA considers both the "toxic effects associated with the pesticide and the actual or projected exposure of humans and other nontarget organisms to the pesticide." The Special Review proceeding serves as a mechanism for reconsideration of pesticide registrations which appear to cause unreasonable adverse effects on the environment. Special Review may be initiated by EPA or at the request of any interested person. Requests which meet certain risk criteria will trigger a formal Special Review proceeding. Through the procedure, EPA attempts to gain public input and to insure adequate consideration of risks and benefits of pesticide uses. As part of the evaluation under the risk criteria, the administrator must consider adverse effects and the magnitude and scope of exposure of humans and nontarget organisms to the pesticide. The Special Review process can result in cancellation, suspension, or reclassification of a pesticide registration.

#### **4. Administrative Interpretations**

FIFRA directs EPA to evaluate the costs and benefits of pesticide uses whenever EPA pursues a cancellation or suspension proceeding. Accordingly, administrative proceedings are the appropriate forum for in-depth analyses of the various cost and benefit issues surrounding particular pesticide uses. The administrator must consider statutory and regulatory criteria, and, therefore, administrative decisions help illustrate the factors considered in cost benefit analyses and how the various statutory and regulatory criteria have been applied. Ultimately, however, the final decision making power lies with the administrator. Several recent administrative decisions addressing pesticide cancellation procedures are discussed below.

##### **a. Special Review of Diazinon**

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endangered species is prohibited under the Endangered Species Act. 50 Fed. Reg. 49007 (Nov. 27, 1985).

40 C.F.R. § 154.7(a)(6) (July 1, 1991).

50 Fed. Reg. 49003-4 (Nov. 27, 1985).

*Id.* at 49003.

Special Review procedural requirements are discussed on pages 27 - 29 of this report.

In 1986, EPA initiated a Special Review of the pesticide diazinon for use on golf courses and sod farms. After initial consideration, EPA issued a Notice of Intent to Cancel because of alleged risks to birds. EPA examined factors such as diazinon's acute toxicity, estimated doses consumed by birds, diazinon application practices, reported bird kills, problems with reporting bird kills, and effects on endangered species. In addition, EPA also examined the effectiveness of alternatives to the use of diazinon and the impact cancellation would have on operating costs. Ultimately, EPA concluded that the use of diazinon on golf courses and sod farms should be canceled because the risks to birds outweighed the economic benefits of continued use.

As part of its analysis of the use of diazinon, EPA attempted to determine what degree of risk warrants cancellation. Petitioners argued that cancellation is justified only if "continued use of diazinon would adversely affect long-term bird populations or result in widespread mortality." However, FIFRA directs that cancellation is required if continued use would cause "any" unreasonable risk to the environment. In holding that there was significant risk to justify cancellation, the administrator cited the legislative history of FIFRA, which stated that "any adverse effect ought not be tolerated unless there are overriding benefits from the use of a pesticide." In addition, the administrator stated that there is no statutory or regulatory requirement that a particular threshold level of risk must be reached in order to justify cancellation.

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In re Ciba-Geigy Corp., 53 Fed. Reg. 11119 (April 5, 1988).

*Id.* at 11120.

*Id.*

*Id.*

*Id.*

*Id.* at 11122.

7 U.S.C. § 136(bb) (1987).

In re Ciba-Geigy Corp., 53 Fed. Reg. 11119, 11122 (April 5, 1988), quoting S.Rep. No. 970, 92d Cong., 2d Sess. 11 (1972).

*Id.* On appeal, the circuit court expressly affirmed the administrator's rejection of Ciba Geigy's argument that bird kills alone were not sufficient to show unreasonable risk and that the administrator must first determine that the pesticide use will endanger the overall bird population. *Ciba-Geigy Corp. v. U.S. EPA*, 874 F.2d 277, 279 (5th Cir. 1989).

The administrator examined prior cancellation decisions and found that any risk is sufficient to justify cancellation if the risk is unreasonable in relation to the benefits of continued use. As further evidence that FIFRA does not envision a threshold risk level above which cancellations are warranted, the administrator pointed out that in 1985 EPA specifically deleted a regulatory provision providing that population effects were a separate basis for initiating Special Review.

In evaluating the risks of continued use of diazinon, the administrator examined factors such as diazinon's comparative toxicity, routes of exposure, magnitude of exposure, risk assessment based on toxicity and residue data, reported bird kills, and field studies. The administrator determined that diazinon was "very highly toxic" compared to other pesticides and that diazinon could easily be ingested directly by birds feeding in treated areas, or indirectly by ingestion of seeds or invertebrates. The magnitude of exposure was evaluated by examining the concentrations of residues which remained from various application techniques. The residues were then factored into a risk assessment model, along with bird feeding habits, in an attempt to predict the time it would take for various bird species feeding in treated areas to reach their median lethal dosage. The model, which received favorable peer review, indicated that the median lethal dosage would be reached in 15 to 80 minutes, depending on the size of the bird and the concentration of the application. The administrator determined that these

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In re Ciba-Geigy Corp., 53 Fed. Reg. 11119, 11122 (April 5, 1988).

*Id.*

*Id.* Comparative toxicity is evaluated by reference to a pesticide's median lethal dosage (LD<sub>50</sub>) which is the single dose that causes mortality in 50 percent of adult birds. *Id.* at 11122.

*Id.* at 11122-25.

*Id.* at 11122.

*Id.* at 11123.

*Id.*

*Id.*

predictions were particularly significant because the waterfowl in question typically feed for a single five to eight hour period.

Petitioners argued that cancellation should never be based only on lab data, exposure information, and bird kills, and that the best evidence is provided from validly conducted field studies. The administrator, citing previous administrative and judicial decisions, rejected this contention, stating instead that lab data alone may provide a sufficient basis to warrant cancellation or suspension. With respect to field studies, the administrator acknowledged that such studies may often be the best evidence of risk, but that petitioner's studies were inadequate and inconclusive. The administrator concluded that although the risk to overall bird populations might be less under the proposed modified label, the risk to individual birds would still be too great.

In evaluating the benefits of continued use of diazinon, the administrator examined the potential economic impacts of cancellation, such as effects on price competition, turf quality, minor pests, and pest resistance. Although the administrator concluded that diazinon was the most economic pesticide for most turf pests, he identified several alternative pesticides. In addition, the administrator pointed out the availability of non-chemical control methods, such as biological controls and cultural controls. Similarly, integrated pest management programs could be used to control turf pests. In summary, the

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*Id.* at 11124.

*Id.*

*Id.* at 11124. *See* EDF v. EPA, 548 F.2d 998, 1005 (D.C. Cir. 1976), quoting EDF v. EPA, 489 F.2d 1247, 1254 (D.C. Cir 1973).

*Id.*

*Id.*

*Id.* at 11126.

*Id.* at 11128. An example of biological control is the use of bacteria to eradicate a particular pest.

*Id.* An example of a cultural control is to reduce stress on the turf, thereby increasing the vigor and growth of the turf and making it more resistant to pests.

*Id.* Integrated pest management is the pest control practice of using biological control and other non-chemical methods in conjunction with minimal amounts of pesticides.

administrator determined that the economic effect of cancellation of diazinon for turf grazes was insignificant because a number of viable alternatives existed.

One of the issues in the decision was whether proposed label amendments were sufficient to meet the requirements for continued use under FIFRA. FIFRA requires EPA to consider label or use changes as an alternative to outright cancellation of a pesticide use. However, the administrator determined that there was no evidence that additional amendments would significantly reduce the risks to acceptable levels. The administrator noted that additional amendments would also reduce the benefits of the pesticide use, which were already outweighed by the risks. Accordingly, the administrator declined to allow continued use subject to additional label restrictions.

FIFRA directs that EPA may issue a notice of intent to cancel if a pesticide "generally causes unreasonable adverse effects on the environment." Petitioners asserted that "generally" means that EPA may only issue a notice of intent to cancel if the pesticide use causes such effects in more than 51 percent of the cases in which it is used. EPA rejected this interpretation, stating that FIFRA makes it clear that unreasonable adverse effects on the environment are prohibited regardless of whether such effects are caused most of the time.

Ciba-Geigy subsequently challenged EPA's interpretation of the term "generally" in Ciba-Geigy Corp. v. U.S. EPA. The court of appeals approved of the administrator's interpretation that FIFRA allows the administrator to cancel registrations of pesticides whenever he determines a pesticide commonly causes unreasonable risks, regardless of whether the pesticide use actually causes adverse

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7 U.S.C. § 136d(b) (1987).

In re Ciba-Geigy Corp., 53 Fed. Reg. 11119, 11130 (April 5, 1988).

*Id.*

*Id.*

7 U.S.C. § 136d(b) (1987).

53 Fed. Reg. 11119, 11122 (April 5, 1988).

874 F.2d 277 (5th Cir. 1989).

effects more than 50 percent of the time. The court stated that the administrator need only determine that there is a significant probability that adverse effects may occur.

The court of appeals declined to consider whether EPA's analysis and ultimate determination of the relative costs and benefits of diazinon use were supported by substantial evidence. However, the court remanded the case back to the administrator, indicating that the administrator had failed to consider all of the substantive requirements of the term "generally." Specifically, the court stated that "generally" requires that administrator determine whether a particular pesticide application "creates unreasonable risks, though not necessarily actual adverse consequences, with considerable frequency, and thus requires the administrator to consider whether he has defined the application he intends to prohibit sufficiently narrowly." In other words, the court felt that the administrator should reevaluate the scope of its ban on the use of diazinon, paying particular attention to the court's elucidation of the statutory requirements of the term "generally."

Despite its holding remanding the decision back to EPA, the Ciba-Geigy court reaffirmed much of the administrator's reasoning. EPA's interpretation of "generally" indicated that cancellation of certain pesticide uses may be appropriate even though the adverse affects may be limited to a particular geographic area or to the use of a particular application technique. Although the Ciba-Geigy court cautions against imposing too wide a ban on a pesticide use in response to localized adverse effects, the court affirmatively endorses the concept of narrow bans designed to alleviate specific instances of adverse effects.

In addition, EPA and the Ciba-Geigy court make it clear that "generally" does not necessarily mean most of the time. Rather, "generally" may be interpreted as meaning that, in a particular instance, there were unreasonable adverse effects "'with regard to the overall picture.'" This interpretation of "generally" could be of particular significance to mosquito control activities in Florida, where application of a pesticide may cause adverse effects in one geographic area but not in another.

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*Id.* at 278.

*Id.* at 279.

*Id.* at 280.

*Id.*

874 F.2d 277, 279 (5th Cir. 1989), citing 53 Fed. Reg. 11119, 11122 (1988).

Similarly, a particular application technique, such as aerial spraying may cause more adverse effects than ground applications.

On remand, EPA upheld its earlier decision to cancel diazinon use on golf courses and sod farms. EPA found that diazinon "causes an unreasonable risk to birds commonly and with considerable frequency," and that regulatory alternatives short of cancellation would not reduce risk to acceptable levels. On remand EPA also reviewed the evidence and re-considered the merits of Ciba-Geigy's proposed label amendments and found that: 1) there was widespread and continuous risk to a number of bird species; 2) label amendments would not sufficiently lower the risks, and 3) the benefits of continued use would be minimal. Of particular interest is EPA's statement concerning what constitutes an unreasonable risk:

...the Agency's concern for wildlife is not limited to long-term adverse effects on populations. Absent some countervailing benefit of continued use, as a matter of policy an unnecessary risk of regularly repeated bird kills will not be tolerated.

Throughout the case, Ciba-Geigy argued that cancellation of diazinon was warranted only if diazinon posed an unreasonable risk to bird populations. EPA and the court disagreed, stating that diazinon use did not have to "generally cause actual bird kills." Instead, cancellation is justifiable if diazinon "generally causes an unreasonable risk of bird kills." The court of appeals stated that

FIFRA gives the Administrator sufficient discretion to determine that recurring bird kills, even if they do not significantly reduce bird population, are themselves an unreasonable environmental effect.

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In re Ciba-Geigy Corporation, et al., 55 Fed. Reg. 31138 (July 31, 1990).

*Id.* at 31138.

*Id.* at 31140. EPA determined the benefits were minimal because there were other effective and less harmful pesticides available.

55 Fed. Reg. 31138, 31144 (July 31, 1990).

*Id.* at 31138.

*Id.*

874 F.2d 277, 280 (5th Cir. 1989).

Accordingly, EPA rejected Ciba-Geigy's argument that bird populations had to be adversely affected, stating that such a position is "inconsistent with this Agency's commitment to eliminate unreasonable risks generally posed to individual birds, regardless of the effect on bird populations."

The diazinon case is significant in several respects. Prior to this decision, successful requests for cancellation of other pesticides had been based, at least partially, on a risk to human health. However, the decision to cancel diazinon use on golf courses was based solely on the fact that diazinon causes adverse impacts to birds. Another distinction between the diazinon case and previous cancellation proceedings is that the arguments for continued use were not based on benefits to public health programs or food programs. Rather, the arguments were based on economics and the benefits of well groomed golf courses.

These distinctions are significant with regard to Florida's mosquito control programs. The diazinon case is strong precedent for cancellation of pesticide uses which adversely effect non-target wildlife and for which there are no public health or food production benefits. Much of Florida's mosquito control spraying is similar in nature. While it is true that some mosquito control spraying is conducted for public health concerns, the majority of spraying is conducted to eliminate nuisance biting mosquitoes. In addition, the court of appeals makes it clear that EPA need not tolerate pesticide uses which pose an unreasonable risk to non-target species when the adverse effects outweigh the countervailing benefits. FIFRA gives the administrator of EPA considerable discretion to determine what constitutes an unreasonable risk. The diazinon case indicates that pesticide uses in Florida which adversely impact non-target species and which are conducted solely to control nuisance mosquitoes might be susceptible to a cancellation action, if the adverse effects are determined to outweigh the economic benefits of control of nuisance mosquitos.

**b. Special Review of Dicofof**

In its decision concerning the use of diazinon on golf courses and sod farms, EPA determined that outright cancellation of those uses was the only acceptable solution. However, as an alternative to outright cancellation of a pesticide use, EPA may consider altering the terms of the registration, including, but not limited to, the pesticide's chemical composition, the label requirements, and application techniques. In 1986, after conducting a Special Review of the pesticide dicofof, EPA

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55 Fed. Reg. 31138, 31145 (July 31, 1990).

determined that certain changes in the existing registration would bring the use of dicofol within an acceptable level of risk.

EPA initiated a Special Review of the miticide dicofol in 1984, amid concern that dicofol and its contaminants (DDTr) were causing significant adverse effects to non-target wildlife. In assessing the risks of dicofol use, EPA found that DDTr had adverse effects on various fish and birds, and that dicofol may cause adverse effects in birds. EPA consulted with the Office of Endangered Species (OES) and determined that continued use of dicofol would probably jeopardize the existence of a number of endangered species of birds. EPA and OES conclusions were derived from both field and laboratory studies. As part of their analysis, EPA and OES evaluated the distribution of sensitive species to determine whether these species were actually present in areas of high dicofol use. EPA and OES found that there were one or more highly sensitive species and several endangered species present in each of the areas of high dicofol use.

EPA found a number of significant benefits to dicofol use. EPA found that dicofol, unlike other miticides, was particularly selective, and consequently was favored for use in Integrated Pest Management programs because it did not kill potentially beneficial non-target insects. Similarly, because of its high selectivity and common use in Integrated Pest Management programs, dicofol was determined to be a factor in prohibiting mite resistance to pesticides. In addition, EPA evaluated both

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51 Fed. Reg. 19508 (1986).

At the time that the Special Review was initiated, Dicofol products were regularly contaminated with DDT, DDE, and other closely related compounds. These compounds, referred to collectively as DDTr, were thought to be the primary cause of the adverse effects observed in relation to Dicofol use. 51 Fed. Reg. 19508 (1986).

51 Fed. Reg. 19508, 19509 (1986). The Office of Endangered Species found that Dicofol use would probably jeopardize the existence of the peregrine falcon, brown pelican, bald eagle, Everglade kite, wood stork, and Arctic peregrine falcon. 51 Fed. Reg. 19508, 19509 (1986).

*Id.* at 19512.

*Id.*

*Id.* at 19515. Less selective alternative miticides would probably kill non-target beneficial insects which are essential components of many Integrated Pest Management (IPM) programs. Accordingly, the effectiveness of the IPM programs would be reduced and more alternative miticides would have to be applied. *Id.*

*Id.* at 19516. Repeated use of a particular class of pesticide can lead to accelerated insect resistance to pesticides within that class. Dicofol was the last chlorinated hydrocarbon available for use as a miticide.

the effectiveness of dicofol as compared to other miticides, and the overall economic impact of removal of dicofol from the market. EPA found that cancellation of dicofol would probably disrupt Integrated Pest Management programs, accelerate mite resistance to other miticides, and cost producers of agricultural crops between 21 and 39 million dollars per year.

After balancing the risks and benefits of dicofol use, EPA determined that the risks of dicofol use as currently formulated and regulated were unacceptable. However, as an alternative to the outright ban of dicofol products, EPA suggested certain modifications to the registration. Generally, EPA determined that continued use of dicofol would be acceptable if registrants reduced the DDT<sub>r</sub> contamination in dicofol products to a specified level, and the label was revised to address disposal and handling concerns.

Several aspects of EPA's balancing of risks and benefits of dicofol use are particularly significant with regard to mosquito control activities in Florida. First, EPA's final assessment of risks was based solely on risks to birds and fish. Although EPA had initially determined that dicofol use might be a potential human carcinogen, this view was rejected as non-verifiable by both EPA and a Scientific Advisory Panel. Second, despite significant benefits of dicofol use, EPA determined that the risks to wildlife were too great to allow continued use without restrictions. Undoubtedly, the existence of adversely effected endangered species contributed to EPA's decision. Third, rather than imposing an outright ban on any future use of dicofol, EPA attempted to design a creative remedy addressing environmental, agricultural, and economic concerns.

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Cancellation of dicofol would probably result in increased use of other miticides, thereby increasing the rate by which mites become resistant to the alternative miticides. *Id.*

*Id.*

*Id.* at 19517. In 1984, when EPA initiated Special Review, DDT<sub>r</sub> constituted roughly 10 percent of the composition of dicofol. In 1986, at the time EPA issued its final determination, several manufacturers had amended their registrations to indicate DDT<sub>r</sub> constituted no more than 2.5 percent of dicofol. Under EPA's final determination levels of DDT<sub>r</sub> would initially have to be equal to or less than 2.5 percent of dicofol's composition, and then equal to or less than 0.1 percent within two years. *Id.* at 19517.

*Id.* at 19517.

*Id.* at 19522-23.

## **C. Potential Legal Remedies Under FIFRA**

### **1. Administrative Remedies**

#### **a. General**

FIFRA directs that EPA provide an administrative mechanism for reevaluation of existing pesticide registrations. Section 136d(b) provides that the administrator of EPA may change a pesticide classification or cancel use of a pesticide if a pesticide or its labeling does not comply with FIFRA, or if a pesticide "when used in accordance with widespread and commonly recognized practice, generally causes unreasonable adverse effects on the environment." If the administrator determines that the pesticide poses an "imminent hazard during the time required for cancellation or change of classification proceedings," he may suspend use of the pesticide. In the case of an emergency, the administrator may suspend use of a pesticide prior to the notification and hearing requirement. EPA orders concerning cancellation, suspension, or some other change in classification are judicially reviewable in federal court.

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7 U.S.C.A. § 136d(b).

*Id.* § 136d(c)(1). If EPA determines that suspension of a pesticide use is warranted, then EPA must notify the registrant and include findings pertaining to the question of "imminent hazard." *Id.* The registrant may request a hearing within five days of receipt of notification of a suspension order. *Id.* § 136d(c)(2). If a hearing is requested, EPA must commence the hearing within five days of receipt of the request unless EPA and the registrant agree that it can commence at a later time. *Id.* The hearing officer has 10 days from the completion of the presentation of evidence to issue a recommended order. *Id.* EPA then has 7 days to render a final order on the issue of suspension. *Id.*

7 U.S.C.A. § 136d(c)(3).

*Id.* §§ 136d(c)(4), 136d(h), 136n. A discussion of jurisdiction, standards of review, causes of action, and standing begins on page 30 of this report.

**b. Petition for Special Review**

EPA Special Review procedures provide a mechanism for evaluating pesticide uses which allegedly cause unreasonable adverse effects on the environment. Suspension and cancellation actions are usually initiated through the special review process. The administrator must first make an initial determination of whether to initiate a Special Review. If the administrator decides he may initiate a Special Review, he must notify affected registrants and applicants and solicit their comments for a 30 day period. The administrator must then make a final public announcement of whether to initiate Special Review. If the administrator proposes not to initiate Special Review, he must issue a proposed decision in the Federal Register and provide for public comment for 30 days. A decision not to initiate Special Review must be accompanied with a statement of reasons and published in the Federal Register. A decision to initiate Special Review must also be published in the Federal Register.

If the agency decides to initiate a Special Review, it also will initiate a Current Benefits Review. Although the Current Benefits Review is not considered in the decision of whether to initiate Special Review, the review is used to assist the EPA in deciding whether to allow continued use of the pesticide pending a detailed risk benefit analysis. In addition, the Current Benefits Review is used by EPA in identifying potential regulatory options and in preparing for a more detailed benefits analysis.

After the administrator issues notice of the decision to initiate a Special Review proceeding, any person may comment on whether the pesticide use meets the risk criteria necessary for initiation of a

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40 C.F.R. Part 154 (July 1, 1991).

*Id.*

*Id.* § 154.21.

*Id.* § 154.25.

*Id.* § 154.23.

*Id.* § 154.25(b).

*Id.* § 154.25(c).

50 Fed. Reg. 49004 (Nov. 27, 1985).

*Id.*

Special Review. In addition, any interested person may request a meeting with EPA to discuss matters relating to the Special Review proceeding. The administrator may also conduct an informal public hearing to gather relevant information. As part of its risk benefit evaluation, EPA evaluates potential risks by examining factors such as the nature of any adverse effect, the magnitude of exposure of humans and other nontarget organisms, and the size of the population at risk. Data relating to these factors may be supplied by the registrant, EPA, or any interested person.

EPA evaluates benefits of continued use by assessing the availability, efficacy, and cost of alternative control methods. After the initial comment period the administrator must prepare a notice of preliminary determination, which must set forth the facts the administrator used in reaching a decision and include explanations of the decision. The administrator must also request comments from the Secretary of Agriculture and the Scientific Advisory Panel. Finally, the administrator must prepare a notice of final determination which must include: a discussion of the administrator's reasoning with respect to determinations about pesticide uses; comments received from the Secretary of Agriculture and the Scientific Advisory Panel; the administrator's responses to any significant public comments; and instructions to registrants, applicants, and other interested persons concerning future regulatory action.

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40 C.F.R. § 154.26 (July 1, 1991).

*Id.* § 154.27.

*Id.* § 154.29.

50 Fed. Reg. 49004 (Nov. 27, 1985).

40 C.F.R. §§ 154.21(b), 154.26, 154.27, 154.29 (July 1, 1991).

*Id.*

40 C.F.R. § 154.31 (July 1, 1991).

*Id.* § 154.31(b). Referral to the Secretary of Agriculture enables the administrator to more adequately analyze the impact of the proposed action on agricultural commodities, retail food prices, and the agricultural economy. *Id.* § 154.31(b)(2).

*Id.* § 154.31(b)(3). The Scientific Advisory Panel consists of seven representatives appointed by the administrator from a list of nominees nominated by the National Institutes of Health and the National Science Foundation. The members are representatives from the disciplines of toxicology, pathology, environmental biology, and related sciences. 7 U.S.C.A. § 136w(d).

40 C.F.R. § 154.33(b) (July 1, 1991).

The elaborate procedure required in Special Review proceedings reflects congressional desire that EPA carefully consider environmental, human, social, and economic benefits and costs in evaluating pesticide uses. Review by the Secretary of Agriculture envisions adequate evaluation of benefits and costs to the agricultural economy, while Scientific Advisory Panel review envisions an unbiased scientific assessment of benefits and costs by the nation's leading scientists. In addition, comments are solicited from all affected and interested persons. Ultimately, however, the decision of whether to initiate a Special Review proceeding and the final outcome of a Special Review proceeding lie within the discretion of the EPA administrator.

## **2. Judicial Remedies**

Several opportunities exist for persons to challenge EPA decisions under FIFRA and to enforce various provisions of FIFRA in the Federal courts. Unfortunately, FIFRA provisions addressing judicial review are somewhat confusing and unclear. The array of potential plaintiffs and their stated causes of action and desired remedies further confuse standing issues. Generally, potential plaintiffs attempting to bring suits under FIFRA can be either registrants, non-registrants who participated in earlier proceedings, or non-registrants who did not participate in earlier proceedings. Plaintiffs may be seeking to challenge an EPA decision concerning a pesticide, or plaintiffs may be seeking an injunction against a third party's use of a pesticide. An examination of pesticide cases provides some clarification as to how various factors affect judicial review under FIFRA. This section discusses federal court jurisdiction, standards of review, causes of action, and standing.

**a. Jurisdiction and Standards of Review**

FIFRA provides for district court review of agency orders which refuse to cancel or suspend registrations or change classifications not following a hearing, and other final agency orders not committed to agency discretion. District courts may also enforce and prevent violations of FIFRA. FIFRA does not indicate the appropriate standard of review for these types of actions. In the absence of an explicit statement of the appropriate standard of review by the enabling statute, the standard of review under the Administrative Procedure Act (APA) is determined by the nature of the agency action being reviewed by the court. Courts typically apply the arbitrary and capricious standard when reviewing informal non-adjudicatory type agency actions and the substantial evidence standard when reviewing formal adjudicatory type agency actions. FIFRA also provides for immediate federal district court review of any suspension order entered prior to a hearing, to determine whether the agency action was arbitrary, capricious, an abuse of discretion, or whether the order was issued in accordance with procedures established by law.

Agency orders entered after a public hearing may be challenged in federal circuit court. In order to bring an action in circuit court, the following statutory conditions must be met: 1) an agency order must have been issued after a public hearing, 2) an actual controversy must exist as to the validity of the order, 3) there must be an adversely affected person, and 4) the adversely affected person must have been a party to the proceedings. Circuit courts which review agency orders under FIFRA must sustain the order of the administrator if "it is supported by substantial evidence when considered on the

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7 U.S.C.A. § 136n(a).

*Id.* § 136n(c).

B. SCHWARTZ, ADMINISTRATIVE LAW §§ 10.7, 10.13 (2d ed. 1984).

7 U.S.C.A. § 136d(c)(4). Any registrant or interested person with registrant's permission may request review by the district court. Under this provision, a district court is limited to ordering a temporary stay of the suspension order until the Administrator makes a final decision concerning cancellation. A temporary court order to stay an agency suspension order does not prohibit action under any other administrative review proceedings authorized by FIFRA. *Id.*

*Id.* § 136n(b).

*Id.*

record as a whole." Challenges to agency orders must be filed in the circuit court within sixty days of the entry of the order being challenged.

Although FIFRA provisions provide guidance as to the jurisdiction of federal district and circuit courts, there remains some confusion as to the appropriate forum for particular causes of action. For example, Section 136n(a) provides that "final actions of the administrator not committed to the discretion of the administrator by law are judicially reviewable by the district courts of the United States." However, Section 136n(b) provides that courts of appeal may review orders issued by the administrator following a public hearing which adversely affect any person. These two provisions appear to grant concurrent jurisdiction for challenges of certain agency actions or orders.

In Amvac Chemical Corporation v. U.S. Environmental Protection Agency, plaintiff Amvac filed suit simultaneously in district and circuit court, challenging EPA's refusal to hold a public hearing prior to publication of an amended notice of intent to cancel the registration of dibromochloropropane, a nematode control pesticide. Defendant EPA moved to dismiss the suit from district court, arguing that Congress intended for decisions regarding pesticide registrations to be decided by the circuit courts. The court of appeals disagreed with EPA, stating that "a decision not to hold a public hearing is not an order issued following a public hearing" and accordingly the agency decision canceling the registration "is not yet ripe for review" by the circuit court. The court subsequently dismissed the petition from circuit court, holding that district court was the appropriate forum. One commentator has suggested that there may be overlapping jurisdiction in the district and circuit courts for certain FIFRA matters and that the safest course is to file simultaneous suits in each of the two forums.

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*Id.*

*Id.*

653 F.2d 1260, 1265 (9th Cir. 1981).

*Id.* at 1262.

*See* W. RODGERS, ENVIRONMENTAL LAW, PESTICIDES AND TOXIC SUBSTANCES 58 (1988).

**b. Causes of Action and Standing to Restrain Violations of FIFRA**

FIFRA, unlike most other federal environmental protection statutes, has no express citizen's suit provision. FIFRA does provide detailed procedures for challenges to agency decisions concerning pesticides, but does not provide for private actions against states or private polluters. The legislative history surrounding FIFRA indicates that although Congress rejected an express citizen's suit provision, it did want to encourage review of agency actions in the federal courts. Courts have consistently allowed challenges of final EPA orders regarding suspension, cancellation, or reclassification of pesticide registrations.

Standing for adversely affected citizens to challenge EPA final decisions was firmly established in the early 1970s in the case of Environmental Defense Fund, Inc. v. Hardin. In Hardin, plaintiffs, five environmental organizations, sought cancellation and suspension of registration for all pesticides containing DDT. The court applied the "zone of interests" test, and held that plaintiff's alleged injury of biological harm to man and other living things was sufficient to meet the constitutional case and controversy requirement.

In addition, the court held that plaintiffs met standing requirements under the Administrative Procedure Act (APA) because plaintiffs were "aggrieved by agency action within the meaning of the relevant statute." The court cited affirmatively earlier cases which established that environmental groups may bring suits to protect the public interest.

Hardin establishes that persons who are adversely affected by EPA decisions concerning pesticides have standing to challenge those decisions in a Federal Court of Appeals. The court in Hardin takes a broad view of FIFRA standing requirements, despite the absence of an express citizen's suit provision. Clearly, Hardin encourages non-registrant parties to scrutinize and challenge EPA's

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S. Rep. No. 92-970, 92d Cong., 2d Sess. 4-5 (1972).

*See* W. RODGERS, ENVIRONMENTAL LAW, PESTICIDES AND TOXIC SUBSTANCES § 5.7 (1988).

428 F.2d 1093 (D.C. Cir. 1970).

*Id.* at 1096, citing *Association of Data Processing Service Organizations v. Camp*, 397 U.S. 150, 90 S.Ct. 827, 25 L.Ed.2d 184 (1970); *Flast v. Cohen*, 392 U.S. 83, 88 S.Ct. 1942, 20 L.Ed.2d 947 (1968).

428 F.2d 1093, 1097 (D.C. Cir. 1970). The court stated that the "zone of interests" test is equivalent to the APA test. *Id.* at 1097, n. 16.

*Id.* at 1097.

regulation of pesticides. The decision in Hardin was reaffirmed in a related case, Environmental Defense Fund, Inc. v. Ruckelshaus.

The courts have generally allowed actions challenging EPA decisions regarding pesticides. In addition, the courts have generally allowed suits by adversely affected persons against federal agencies allegedly using pesticides in violation of FIFRA. Jurisdiction in these suits is often based on the APA and FIFRA. Under Section 10 of the APA, persons adversely affected by federal agency action are entitled to judicial review of that action. Persons alleging they have been adversely affected by a federal agency that is violating FIFRA are therefore entitled to judicial review.

However, the courts have been reluctant to allow adversely affected parties to sue to enjoin other users of pesticides, such as states and private parties, who are violating FIFRA. Section 136n(c) of FIFRA states that "the district courts of the United States are vested with jurisdiction specifically to enforce, and to prevent and restrain violations ... [of FIFRA]." This provision, in combination with Section 10 of the APA, appears to allow suits to enjoin user violations of FIFRA. However, use of this section has been limited to specific plaintiffs and defendants. Section 136n(c) has been interpreted by reviewing courts to allow suits by EPA and the United States Attorney General against any defendant, but citizens have only been allowed to use this provision to obtain review of federal "agency actions" which allegedly violate FIFRA.

Potential plaintiffs have sought to invoke other statutes to establish jurisdiction under FIFRA for actions to enjoin private parties or states which are allegedly violating FIFRA. Several successful suits have been brought alleging that federal agency actions violate the National Environmental Policy

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439 F.2d 584, 590 (D.C. Cir. 1971).

5 U.S.C.A. § 702.

7 U.S.C.A. § 136n(c).

*See People for Environmental Progress v. Leisz*, 373 F.Supp. 589 (D. Cal. 1974), stating that enforcement of FIFRA is reserved for the U.S. Environmental Protection Agency and the U.S. Attorney General and does not extend to civil actions by private citizens.

*See Kelly v. Butz*, 404 F.Supp. 925 (W.D. 1975), holding that a state attorney general may bring suit on behalf of the citizens of the state to enjoin FIFRA violations by a federal agency. *See also Sierra Club v. Peterson*, 705 F.2d 1475 (9th Cir. 1983) and *Oregon Environmental Council v. Kunzman*, 714 F.2d 901 (9th Cir. 1983), both holding that plaintiff environmental groups could use Section 10 of the Administrative Procedure Act to challenge federal agency spraying programs for allegedly violating FIFRA.

Act, because the agency actions result in violations of FIFRA which should have been the subject of an Environmental Impact Statement.

Several suits have been brought alleging jurisdiction through the Declaratory Judgement Act and FIFRA. The Declaratory Judgment Act states that "in a case of actual controversy within its jurisdiction ... any court ... may declare the rights and other legal relations of any interested party seeking such declaration, whether or not further relief is or could be sought." This provision has been uniformly interpreted to allow actions only when there is a separate basis for jurisdiction. Several cases have held that FIFRA does not provide a basis for jurisdiction when a private party is suing to enjoin an unlawful pesticide user that is not a federal agency.

Private plaintiffs have also attempted to use Section 1983 to challenge state spraying programs. In Almond Hill School v. U.S. Department of Agriculture, plaintiffs argued that a private cause of action exists through 42 U.S.C. § 1983 to enforce provisions of FIFRA. On review, the circuit court held that plaintiffs were barred from pursuing private enforcement of FIFRA through section 1983. The court reviewed the legislative history of FIFRA and found that remedial devices were "sufficiently comprehensive" to suggest that private causes of action were not part of the legislative scheme.

Private plaintiffs may also bring actions against federal agencies for procedural violations of the APA. In Defenders of Wildlife v. Administrator, Environmental Protection Agency, plaintiffs sought an injunction to prohibit the continued above-ground use of the pesticide strychnine. Plaintiffs asserted

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*See Save Our Ecosystems v. Clark*, 747 F.2d 1240 (9th Cir. 1984); *Southern Oregon Citizens Against Toxic Sprays, Inc. v. Clark*, 720 F.2d 1475 (9th Cir. 1983), *cert. denied* 469 U.S. 1028, 105 S.Ct. 446, 83 L.Ed.2d 372 (1984).

28 U.S.C.A. § 2201(a).

*Fielder v. Clark*, 714 F.2d 77, 77 (9th Cir. 1983); *Skelly Oil Co. v. Phillips Petroleum Co.*, 339 U.S. 667, 671-74 (1950).

*Fielder v. Clark*, 714 F.2d 77, 79 (9th Cir. 1983); *In re "Agent Orange" Product Liability Litigation*, 635 F.2d 987, 991-92 n. 9 (2d Cir. 1980).

768 F.2d 1030 (9th Cir. 1985).

*Id.* at 1033.

*Id.* at 1039.

that the EPA's actions were arbitrary and capricious within the meaning of the APA because EPA had violated APA procedural requirements.

The Defenders of Wildlife court ultimately held that EPA actions were arbitrary and capricious and not in accordance with law because EPA failed to follow proper APA procedure. The court stated explicitly that the strychnine registration process is governed by the APA, despite the existence of FIFRA judicial review provisions. The court characterized the EPA administrative action as informal rulemaking which was subject to judicial review under the APA absent "legislative intention to preclude review." Under the APA, the standard of review for informal rulemaking is whether the action is arbitrary and capricious and in accordance with law.

**Table 1. Potential Causes of Action under FIFRA for an Injunction to Prohibit Unlawful Pesticide Use**

Plaintiff	Defendant	Does Viable C/A Exist?
EPA	Any User	Yes <sup>1</sup>
U.S. Attorney General	Any User	Yes <sup>1</sup>
State Attorney General	Any User	Yes <sup>1</sup>
Citizens	Federal Agency	Yes <sup>2</sup>
Citizens	Users other than Federal Agency	No <sup>3</sup>

Basis for C/A:

<sup>1</sup> Action under 7 U.S.C.A. § 136n(c) and 7 U.S.C.A. 1361, and APA

<sup>2</sup> Action under Section 10 of APA and FIFRA, APA and NEPA

<sup>3</sup> Action under APA, FIFRA, Declaratory Judgment Act, and Section 1983

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*Id.* at 1347.

## **II. The Federal Clean Water Act**

The second federal enactment with potential application is the Clean Water Act (CWA). The CWA regulates toxic substances by establishing effluent limitations for some of these substances and requiring that the best available technology economically achievable be applied to control sources. However, permitting requirements under the CWA for toxic substances and other pollutants apply only to discharges of pollutants. A "discharge of a pollutant" is defined as any addition of a pollutant to waters from any point source.

Point sources are defined as any "discernible, confined, discrete conveyance, including but not limited to any pipe, ditch ... from which pollutants are... discharged." It is unclear whether aerial applications of pesticides which are deposited in water meet the statutory definition of a point source. EPA currently does not require mosquito control operations to obtain point source pollution permits.

The CWA does require states to establish Water Quality Standards for state waters. States have addressed toxic pollutants in their water quality standards but violations and lack of regulatory mechanisms to enforce these standards are widespread.

## **III. The Federal Toxic Substances Control Act**

The Federal Toxic Substances Control Act (TSCA) regulates the manufacture of a variety of new and existing chemical substances. EPA has the power to forbid the manufacture of both new and existing chemicals that studies have shown present an unreasonable risk to health or the environment. However, pesticides are expressly exempted from regulation under TSCA.

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33 U.S.C.A. § 1317.

*Id.* § 1342(a)(1).

*Id.* § 1362(12).

*Id.* § 1362(14).

*Id.* § 1313.

W. RODGERS, 2 ENVIRONMENTAL LAW, AIR AND WATER 245-52 (1986).

15 U.S.C.A. §§ 2601 - 2654 (1988).

*Id.* § 2601.

*Id.* § 2605.

*Id.* § 2602(2)(B)(ii).

#### **IV. The Endangered Species Act**

The Endangered Species Act of 1973 (ESA) prohibits takings of threatened or endangered species. The use of mosquito control pesticides which harm threatened or endangered species may be a violation of the ESA. The following section discusses the requirements and prohibitions of the ESA and its regulatory programs, and identifies potential causes of action under the ESA regarding mosquito control pesticides which adversely affect threatened or endangered species.

##### **A. General Statutory Scheme**

The ESA mandates the protection of fish, wildlife, and plants that are "endangered or threatened" species as defined in the Act. Endangered species are those that are in danger of extinction throughout all, or a significant portion of their range. Threatened species are those that are likely to become endangered throughout all, or a significant portion of their range in the foreseeable future. The Act provides for the creation of a list of endangered species and a list of threatened species. The Secretary must consider the following factors in determining whether a species is endangered or threatened: 1) present or threatened modification of its habitat or range; 2) overutilization for commercial, sporting, scientific, or educational purposes; 3) disease or predation; 4) inadequacy of existing regulatory mechanisms; and 5) other natural or human-made factors affecting its continued existence. The Secretary of the Interior may add or subtract species from the list depending upon the status of the species.

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16 U.S.C.A. §§ 1531 - 1544.

*Id.* § 1531.

*Id.* § 1532(6).

*Id.* § 1532(20).

*Id.* § 1533(c)(1).

*Id.* § 1533(a)(1)(A)-(E).

*Id.* § 1533(c). The Secretary must consider the factors and follow the procedures in Sections 1533(a) and 1533(b) of the ESA when deciding whether to add, remove, or reclassify a species. *Id.* In addition, the Secretary must review all species on the lists at least once every five years to determine whether the status of the species should be changed. *Id.* § 1533(c)(2).

Section 9 of the ESA protects these species by making it illegal to take endangered or threatened species. The term "take" means to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct." The U.S. Fish and Wildlife Service has by regulation defined "harm" to "include habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering." Clearly, the poisoning of an endangered species with a mosquito pesticide would meet the definition of "take."

Another form of protection for listed species is the development and implementation of recovery plans by the Secretary of the Interior. The Secretary must create a recovery plan unless he finds that a plan will not promote the conservation of the species. The Secretary, when developing and implementing recovery plans, must give priority to endangered or threatened species which are most likely to benefit from a recovery plan, and which are threatened by construction, other development projects, or other forms of economic activity. Recovery plans must include: 1) site-specific management actions which are necessary to ensure the conservation and survival of the species; 2) objective, measurable criteria to measure the success of the plan; and 3) estimates of the time and cost to achieve the plan's goal. Also, in a further effort to protect threatened and endangered species, the

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*Id.* § 1538(a)(1)(B). In addition to the prohibition on taking endangered species, the ESA makes it illegal, except with regard to fish or wildlife held for noncommercial purposes prior to the effective date of the ESA, to import or export endangered species within the United States or Territorial Seas of the United States, to take endangered species upon the High Seas, to sell or offer for sale any endangered species in interstate or foreign commerce, to possess, sell, deliver, carry, transport, or ship any species taken in violation of the ESA, or to engage in any trade in specimens or to possess any specimens in violation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora. *See* Annotation, Validity, Construction, and Application of the Endangered Species Act of 1973 (16 U.S.C.S. §§ 1531-1543), 32 A.L.R. 332, 340-342 (1989).

16 U.S.C.A. § 1532(19).

50 C.F.R. § 17.3 (July 1, 1991).

16 U.S.C.A. § 1533(f)(1).

*Id.*

*Id.* § 1533(f)(1)(A).

*Id.* § 1533(f)(B).

ESA provides the Secretary of the Interior with the power to acquire land in order to establish and implement a program to conserve endangered plants, fish and wildlife.

Section 7 of the ESA requires that federal agencies must abide by the prohibitions contained in the ESA and carry out programs for the conservation of threatened and endangered species. Federal agencies must also consult with the Secretary of the Interior and insure that actions authorized, funded, or carried out by the agencies do not jeopardize the continued existence of threatened or endangered species, nor result in destruction or modification of the habitats of such species. After initiating the consultation required under this section, an agency or permit applicant may not make any "irreversible or irretrievable commitment of resources...which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures." The restrictions of this section extend to actions with direct or indirect effects on endangered or threatened species, or their habitat.

The Environmental Protection Agency (EPA) is the federal agency that is responsible for the registration of pesticides for use in the United States. The duty under Section 7 to ensure that agency actions do not jeopardize listed species extends to licensing activities, such as the registration of pesticides by EPA. Accordingly, EPA must ensure that its actions regarding pesticide registrations do not harm listed species. Approval of registration of a pesticide that is likely to harm endangered or threatened species would probably be a violation of the ESA. However, it might be difficult to prove harm prior to registration and subsequent use of the pesticide. A more likely scenario would be to use evidence that the current use of a particular pesticide is adversely affecting listed, threatened or endangered species, to prevent the EPA from re-registering the pesticide, or to prompt the EPA to suspend or cancel a pesticide already in use. The ESA directs the Secretary of the Interior to

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*Id.* § 1534(a).

*Id.* § 1536(a)(1).

*Id.* § 1536(a)(2).

16 U.S.C.A. § 1536(d).

Part III, Environmental Protection Agency, Endangered Species Protection Program; Notice of Proposed Program, 54 Fed. Reg. 27,984 (1989).

*Id.*

*See* notes 267 - 269 and accompanying text.

cooperate with the states to the maximum extent practicable. This involves allowing the states to: 1) manage programs for the protection of threatened and endangered species pursuant to a cooperative agreement with the federal government, 2) manage areas established for the conservation of endangered species, 3) adopt import and export laws concerning endangered species so long as there is no conflict with federal law, and 4) make other laws protecting endangered species that are stricter than those found in the ESA.

The ESA provides sanctions for violations of the Act, including civil penalties, forfeiture, fines, and imprisonment. In addition, the ESA provides for citizen's suits against any person, including any local, state, or federal government or agency, to enjoin actions that would violate the ESA. The Secretary and the alleged violator must be given written notice sixty days prior to the commencement of any action under the citizen's suit provision. The ESA also mandates that the Secretary of the Interior or the Secretary of Commerce enforce the Act to prevent the taking of threatened or endangered species. There are, however, exceptions from the prohibitions of the ESA that are allowed at the discretion of the Secretary.

## **B. Endangered Species Protection Program**

The EPA is charged with implementing and enforcing the ESA. The EPA has created a program which attempts to minimize the adverse effects of pesticides on threatened and endangered species.

### **1. Purpose**

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16 U.S.C.A. § 1535(a).

*Id.* § 1535(a)-(d).

*Id.* § 1540(a)-(d).

*Id.* § 1540(g).

*Id.* § 1540(g)(2)(A)(i).

*Id.* § 1540(e)(1).

*Id.* § 1539(a)-(j). Exceptions at the Secretary's discretion include: undue economic hardship (one year only), Alaska natives if for subsistence purposes, pre-Act endangered species parts, antique articles greater than 100 years of age composed in whole or in part from endangered species, and experimental populations.

Section 7 of the ESA requires all federal agencies to insure that actions authorized, funded or carried out by such agency will not be "likely to jeopardize the continued existence" of a listed species or to result in the destruction or adverse modification of the critical habitat of a listed species. This mandate applies to the registration of pesticides by the EPA. Therefore, EPA must ensure, as part of the registration process, that pesticides do not adversely affect threatened or endangered species. In an effort to comply with the Endangered Species Act, the EPA has implemented a program called the Endangered Species Protection Program (ESPP). The ESPP is a pesticide labeling program enacted to protect threatened and endangered species from pesticides, while allowing for the continuation of agricultural food and fiber commodity production.

## **2. History**

The ESPP started in 1982 as a case-by-case approach with the EPA conducting consultations in response to requests for registration of individual pesticides. This approach was slow, often did not consider older and more toxic pesticides, and fostered market inequity among registrants of different pesticides for the same uses. The case-by-case approach resulted in the inadequate protection of listed species.

In order to rectify the situation, the EPA in cooperation with the U.S. Fish and Wildlife Service (USFWS), developed the "cluster" approach to conducting consultations. All pesticides registered for the same use pattern were to be addressed at the same time. Each pesticide in a cluster was evaluated independently for its toxicity and expected exposure to threatened and endangered species. The individual evaluations were grouped together and referred to the USFWS for consultation as a cluster. This approach accelerated the review of a larger number of pesticides that could affect threatened and

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16 U.S.C.A. § 1536(a)(2).

Part III, Environmental Protection Agency, Endangered Species Protection Program; Notice of Proposed Program, 54 Fed. Reg. 27,984 (1989).

*Id.* at 27,984.

*Id.* at 27,985.

*Id.*

endangered species, treated new and old pesticides alike, and eliminated market inequities by reviewing pesticides with similar uses as a single group.

The cluster approach, however, had several problems associated with it. First, the EPA encountered difficulties in obtaining accurate maps and map information for its county-specific Pesticide Use Bulletins. These bulletins were to contain habitat maps and descriptions of pesticide use limitations within the habitat of threatened and endangered species, and were to supplement pesticide product labeling. Second, the EPA received numerous suggestions from other federal agencies, states, and users regarding the overall cluster approach that might be incorporated into the plan, or perhaps into a new plan. Third, lack of public participation in the formation of the program caused great criticism. These factors prompted the EPA to conclude that more time was necessary to develop the ESPP.

### **3. The Current ESPP**

The EPA began implementing the current version of the ESPP in January of 1991. The new ESPP was created to fulfill two objectives: 1) to provide the best protection for endangered species by developing a species-based approach to biological consultation, focusing on the endangered species themselves rather than on clusters of pesticide use sites, and 2) to be responsive to the needs of agricultural production in this country by developing a program that can be readily implemented without an unnecessary burden on pesticide users.

EPA is beginning the new the new species-based program by determining which listed species are in the most need of protection. Endangered species are being ranked according to their status, vulnerability to pesticides, and other pertinent factors. The EPA, with the assistance of the USFWS, will identify: the counties in which each of the ranked species are located; the agricultural crops and other pesticide use sites that are in the county; and the pesticides registered for use on those sites. For

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*Id.*

*Id.*

*Id.* at 27,991.

*Id.* at 27,988. The program attempts to ease implementation burdens by creating refined maps, by developing threshold application rates, and by considering different exposures resulting from various application methods when determining whether a pesticide "may affect" endangered species.

*Id.* at 27,988.

each pesticide that is identified, the EPA will evaluate all possible uses to determine those that "may affect" listed species. The EPA will determine the threshold (lowest) application rate on the pesticide label that "may affect" endangered species. This rate will then be used to evaluate all uses of a particular pesticide. EPA will then request a consultation from the USFWS for those pesticide uses that result in "may affect" determinations. Consultation with the USFWS is limited to specific application rates that "may affect" endangered species. Application rates which fall below the threshold application rate will not be part of the consultation request. This procedure allows the USFWS to include all species that may be affected by pesticides that are referred to them.

Subsequent consultations will focus on the next group in the species ranking and their associated pesticides until all species and pesticides have been reviewed. When all species and pesticides have been reviewed, additional consultation will occur on a case-by-case basis depending on the receipt of new information, registration applications, or listing of new species.

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In evaluating "may affect" determinations, the EPA will take into account, to the extent the information is available: validated toxicity data; newer, more precise mathematical systems models; and information on exposure and other aspects of exposure such as application methods, timing, and species biology. Often, pesticide threats to endangered species are from acute toxicity from direct exposure. However, "may affect" determinations may be made on the basis of secondary toxicity; cumulative, reproductive, or chronic effects; or effects on habitat or food supply. *Id.* at 27,989.

*Id.* at 27,988.

*Id.*

*Id.*

#### **4. Public Comment**

The EPA will provide notice to the public thirty (30) days prior to initiating consultation with the USFWS. The notice will identify the pesticides, use sites, species evaluated, and will summarize the "may affect" determinations. Submission of information or scientific data early in the process by concerned citizens, users, states, and other federal agencies, will help the EPA in making its "may affect" determinations. The EPA will also review its preliminary "may affect" determination if a pesticide registrant applies for an amendment to the registration that is based on reducing or nullifying the effects of a pesticide on endangered species. This provision encourages identification of additional reasonable and prudent actions that will protect endangered species while minimizing the limitations on pesticide use.

#### **5. Consultation**

After the thirty day period, consultation with the USFWS begins. At this time the EPA, the USFWS, and the U.S. Department of Agriculture (USDA) exchange information on exposure, work to identify relationships between species and pesticide use sites, and attempt to identify modifications of use which could be used as reasonable and prudent actions to protect listed species. The final result will be a Biological Opinion (BO) developed by the USFWS. The BO will contain currently occupied habitat maps and habitat descriptions. This information will be available to the public for comment prior to adoption of regulations. The EPA will then address new problems, implement viable actions, or reinstate consultation with the USFWS if necessary. It is important to note that not all pesticides that EPA refers to the USFWS via a "may affect" determination will necessarily be found by the USFWS to cause jeopardy to a species or result in reasonable and prudent measures to reduce incidental take. The jeopardy opinion can be based on an assessment of whether a species will actually be exposed to the pesticide in question.

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For example, a registrant might show elimination of high exposure use patterns or modification of application rates that reduce exposure to endangered species.

Part III, Environmental Protection Agency, Endangered Species Protection Program; Notice of Proposed Program, 54 Fed. Reg. 27,989 (1989).

*Id.*

*Id.*

*Id.*

## 6. Implementation

EPA will institute the new species-based program in several phrases: 1) the "catch-up" phase during which the EPA will reinitiate consultation to update existing BO's, including those generated from the cluster approach consultations, to incorporate newly listed species, all uses, and additional information now available on the pesticides involved; 2) the "additional consultations" phase during which EPA will use the new species-based approach to evaluate all remaining registered pesticides; and 3) the "maintenance" phase during which the EPA will maintain ongoing compliance with the ESA by evaluating registration actions for new pesticide uses and referring those that exceed the "may affect" criteria to the USFWS.

The EPA will implement the new species-based ESPP through pesticide labeling that will refer users to, and require compliance with, county-specific bulletins rather than listing all affected counties on the label. Because the label statement is generic and counties will not be listed, registrants will not need to change their product labels whenever use limitations are extended to new counties or rescinded in currently listed counties. Label changes will be necessary only if the reasonable and prudent actions specified in a BO are rescinded for all uses of a product. The EPA will also refine habitat maps and identify reasonable and prudent actions to mitigate jeopardy and anticipated incidental take. When modifications in pesticide use are necessary to protect a threatened or endangered species, the product registrant will be instructed that in order to remain in compliance with FIFRA, the product label must be modified to inform the user that the product can only be used in compliance with a county bulletin.

The county bulletins will contain a county map showing the geographic area associated with each threatened or endangered species and general information pertaining to the protection of listed species. In addition, the county map will identify the pesticides that may harm these species and describe the use limitations necessary to protect them. If a county has no use limitations the bulletin will state that use of the pesticide according to label directions is appropriate. All bulletins will contain an address to which a pesticide user or other interested party may direct comments. Bulletins will be

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*Id.* at 27,989-90.

*Id.* at 27,991.

*Id.* at 27,990.

Persons may make suggestions for improving the information contained in the bulletins, pertinent technical information, and suggestions for less stringent but equally protective reasonable and prudent alternatives to

updated no more than once a year. Technically valid information received by the EPA may be used to reinitiate consultation with the USFWS.

## **7. State Plans**

States affected by the ESPP may develop a state-initiated plan for protecting threatened and endangered species from pesticides. State plans are submitted to the EPA for review and approval, subject to consultation with the USFWS to determine if the provisions of the plan constitute reasonable and prudent actions to protect endangered species. If approved, EPA will adopt the state plan and issue bulletins that require users to comply with the restrictions of the plan. All federal programs are in effect until a state plan is approved.

The only complete exemption to the requirements of the ESPP is the indoor use of pesticide products. Public health emergencies may also constitute an exemption, but only during the period of the emergency.

## **8. Enforcement**

Enforcement of the pesticide use limitations imposed by the ESPP will be carried out under the misbranding and misuse provisions of FIFRA. Products found to be misbranded may be subject to

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the use limitations.

Part III, Environmental Protection Agency, Endangered Species Protection Program; Notice of Proposed Program, 54 Fed. Reg. 27,991 (1989).

*Id.* at 27,990.

*Id.* at 27,991.

States may submit plans to EPA at any time. *Id.*

*Id.* at 27,991.

*Id.*

Under section 18 of FIFRA (40 C.F.R. Part 166), a state or federal public health agency may request that the EPA grant an emergency exemption for a public health emergency or utilize the crisis provision (40 C.F.R. 166.50), if a state or federal agency can demonstrate that: 1) an emergency, non-routine condition exists that requires the use of a pesticide; 2) effective registered pesticides or alternative practices are not available or economically or environmentally feasible; and 3) the situation will present significant risks to human health.

7 U.S.C. § 136j(a)(1)(E). Products which do not carry the required label language to protect threatened and endangered species are misbranded.

cancellation. Also, the USFWS may take enforcement action under the ESA if a person harms an endangered species through pesticide use or any other means, unless the USFWS has provided for an incidental take. States with primary enforcement responsibility under FIFRA will enforce the ESPP through existing cooperative enforcement agreements with EPA. Otherwise, enforcement will remain with EPA.

## **9. Critique of the Endangered Species Protection Program**

The ESPP under the "cluster" approach has been criticized for a number of reasons, several of which may also hinder the effectiveness of the new species-based approach. First, it is difficult to get adequate data regarding certain pesticides because of product marketing and trade secret considerations. Second, it is difficult to obtain adequate data demonstrating that the application of a particular pesticide to an endangered species or its habitat actually causes harm. Third, there is a serious lack of sophisticated data on pesticide application, specifically, "how much goes where." At this time, it would appear that any attempt to apply such information to an assessment is purely speculative. These factors make it difficult, if not impossible, to quantify the effects of a pesticide on threatened and endangered species when the data used to assess the situation is either non-existent, difficult to obtain, or is purely speculative. One solution would be to fund more research in these areas, thus supplying information to make future assessments more accurate.

It is only fair to point out that the EPA, in switching from a case-by-case method of analysis to the cluster approach, has significantly increased the efficiency of its review process. The cluster approach allowed a greater number of pesticides to be reviewed at a much faster rate than before. The

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7 U.S.C. § 136j(a)(2)(G).

Part III, Environmental Protection Agency, Endangered Species Protection Program; Notice of Proposed Program, 54 Fed. Reg. 27,992 (1989).

*Id.* See also, 16 U.S.C.A. § 1540(e)(1), authorizing the use of other federal agencies for enforcement of the ESA.

Under Section 10 of the ESA the secretary may issue permits allowing incidental takings of endangered and threatened species, provided that the applicant submits an acceptable conservation plan. 16 U.S.C.A. § 1539 (1989).

See Part III, Environmental Protection Agency, Endangered Species Protection Program; Notice of Proposed Program, 54 Fed. Reg. 27,984, 27,985 (1989).

new species-based approach falls prey to the same criticisms as noted above, but it is far better that pesticides are being assessed in this manner than to curtail all analysis because of poor data.

### **C. Opportunities for Judicial Review**

There have been a number of decisions favoring the application of the ESA to block the actions of persons, businesses, and federal agencies that were detrimental to listed, threatened or endangered species. To date, no cases have dealt specifically with mosquito pesticides. However, in Defenders of Wildlife v. Administrator, Environmental Protection Agency, the ESA was used to enjoin the EPA's registration of a pesticide that was adversely affecting a listed, threatened or endangered species.

In Defenders, environmental organizations brought suit against the EPA, challenging the continued registration of strychnine pesticides and rodenticides for above-ground use. The court held that the environmental organizations could maintain a suit under the citizen suit provision of the ESA, even if an incidental result of a successful suit would be a cancellation of a pesticide registration, because the ESA citizen suit provision expressly provides a private right of action. The court also held that continued registration of the strychnine pesticides resulted in a prohibited "taking" because endangered species (black-footed ferret) had directly or indirectly ingested strychnine bait and had died as a result. The Defenders of Wildlife had submitted to the EPA information that they had compiled on poisonings of threatened and endangered species, the so called "Kill Book." This type of proof, it appears, helped persuade the court that the continued registration of strychnine pesticides was effecting a "taking" of listed, threatened or endangered species. If the EPA had obtained an incidental taking statement from the USFWS prior to the taking of endangered species, then the strychnine registration

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*See, Wildlife Federation v. Coleman*, 400 F.Supp. 705 (D.Miss. 1975) holding that where the Federal Highway Administration had been found to have breached its duties under § 7 of the ESA by authorizing and funding construction of a highway through the critical habitat of an endangered species of bird, the state agency doing the construction was subject to an injunction brought against the federal agency until it brought the highway project into compliance with § 7; *People v. K. Sakai Co.*, 56 Cal. App. 3d 531 (1976) where the court stated that the ESA is a constitutional exercise of the police power since protection of endangered species of wildlife is a matter of general concern and in the interest of the public.

882 F.2d. 1294 (8th Cir. 1989), aff'g, 700 F. Supp. 1028 (D. Minn. 1988), 688 F. Supp. 1134 (D. Minn. 1988).

882 F.2d 1294, 1298 (8th Cir. 1989); *See* 16 U.S.C.A. § 1540 (g)(1) (1990).

882 F.2d 1294, 1301 (8th Cir. 1989).

*Id.* at 1298.

would not have constituted a taking. Finally, the court held that the environmental organizations could not maintain their claims under the Bald and Golden Eagle Protection Act (BGEPA) and the Migratory Bird Treaty Act (MBTA), because neither the BGEPA nor the MBTA provides a private right of action. Although Section 704 of the APA provides for review of "final agency action for which there is no other adequate remedy in a court ...," the court held that use of this provision was precluded because FIFRA provides for judicial review.

#### **D. Conclusions**

The ESA prohibits activities which result in "takings" of endangered or threatened species. The term "takings" includes most activities which result in harm to endangered or threatened species. It is important to note that a taking may occur in the absence of direct physical injury. A taking occurs when a challenged action has "some prohibited impact on an endangered species." For example, a prohibited impact can take the form of allowing an endangered species' critical habitat to be adversely affected when no direct physical damage is being done to the species. Acts which result in significant habitat modification or degradation which "actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding or sheltering" are defined as takings. These examples illustrate that taking includes actions that directly or indirectly result in injury or death.

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*Id.* See 16 U.S.C. § 1536(b)(4),(o)(2); 50 C.F.R. § 402.14(g)(7),.14(i) (1987). EPA may issue incidental take permits to federal agencies if, after consultation, the EPA determines that the agency action "is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of [critical] habitat of such species." 16 U.S.C. § 1536(a)(2),(b)(4). Applicants for incidental take permits must propose a conservation plan which minimizes and mitigates the impacts of takings. *Id.* § 1536(b)(4).

882 F.2d 1294, 1298 (8th Cir. 1989).

5 U.S.C. § 704 (1982).

882 F.2d 1294, 1302, 1303 (8th Cir. 1989).

*Palila v. Hawaii Dep't. of Land and Natural Resources*, 639 F.2d 495, 497 (9th Cir. 1981). In this case, the state's maintenance of sheep and goats in critical habitat of an endangered species, causing destructive impact on the species, was found to be a taking under the ESA.

*Sierra Club v. Lyng*, 694 F.Supp. 1260, 1268-72 (E.D.Tex. 1988). In this case, the United States Forest Service's tree-cutting practices harmed the habitat of an endangered species thus constituting a taking under the ESA.

50 C.F.R. § 17.3 (July 1, 1991).

Spraying of mosquito control pesticides which results in direct or indirect harm to endangered or threatened species would probably be a violation of the taking prohibition contained in the ESA. Mosquito control applications which caused direct mortality of endangered or threatened species would definitely be a violation of the Act. Likewise, pesticides which caused long term adverse effects, such as sub-lethal poisoning or depletion of the affected species' food supply, would also probably be a violation of the Act.

One difficulty in establishing that a taking has occurred or will occur comes in proving that a particular pesticide is causing or will cause harm to the endangered species. The likelihood of success of a suit alleging a taking can be greatly enhanced through the presentation of scientific documentation of actual or potential direct or indirect harm to the endangered or threatened species. However, collection of scientific evidence can be both costly and time consuming. In addition, the taking must be presently occurring or be likely to occur in the foreseeable future. Allegations of past violations are unlikely to be persuasive.

Parties engaged in the spraying of mosquito control pesticides can insulate themselves from potential liability under the ESA by obtaining an incidental take permit. EPA may issue incidental take permits if the applicant proposes a conservation plan which minimizes and mitigates the impacts of the takings. Conservation plans have the dual benefit of protecting applicants from liability while providing enhanced protection for endangered species.

The ESPP establishes an elaborate system designed to minimize or eliminate the effects of pesticides on endangered and threatened species. The ESPP has just begun to be implemented and it is too early to draw any conclusions as to its effectiveness. However, the program, if implemented properly, should provide significant additional protection for endangered and threatened species. At a minimum, the program requires agencies to consider and evaluate the effects of various pesticides on endangered and threatened species. A potential pitfall of the program is that, like FIFRA, the ESPP relies heavily on applicator compliance with the new restrictions.

## FLORIDA REGULATORY FRAMEWORK

### I. Overview

Regulation of mosquito control activities in Florida involves several agencies. The Florida Department of Health and Rehabilitative Services (HRS) is the lead agency charged with regulating mosquito control activities. The Department of Agriculture and Consumer Services (DACS) is responsible for registering pesticides for mosquito control use in Florida. The U.S. Environmental Protection Agency is responsible for ensuring that federal pesticide law is enforced. The Florida Department of Natural Resources and the Florida Department of Environmental Regulation have some authority with respect to mosquito control activities on certain lands and waters of the state.

The DACS regulates the registration, distribution, and application of pesticides within Florida pursuant to Chapter 487, Florida Statutes. Like FIFRA, Chapter 487 focuses primarily on the registration and distribution of pesticides, and relies on label restrictions to regulate the use of pesticides. Chapter 487 requires registrants to submit information about a pesticide, including an ingredient statement, a complete copy of the labeling for the pesticide, a statement of claims including directions for use, and a guaranteed analysis of the active ingredients contained in the pesticide. The DACS must also adopt rules governing the review of data submitted by a registrant, and may require the registrant to submit the complete formula, evidence of the efficacy and the safety of the pesticide, and any other relevant data.

DACS rules governing pesticide registration requirements are contained in Rule 5E-2.031, Florida Administrative Code. Generally, DACS requires that all information submitted to EPA in support of federal registration must be submitted to DACS in the form of data summaries. If DACS determines that the data summaries are inadequate to allow adequate public health and environmental assessments, then DACS may require the applicant to submit or generate additional data. In its review of applications for registration, DACS must consider product chemistry data, toxicological data,

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FLA. STAT. § 487.041(1)(c) (1991).

*Id.* § 487.041(3).

FLA. ADMIN. CODE Rule 5E-2.031(2)(a) (August 2, 1989).

*Id.* Rule 5E-2.031(2)(b).

environmental fate data, residue chemistry data, and worker/applicator data. DACS must also consider data from other authoritative sources. Chapter 487 provides DACS with authority to fully approve a registration, conditionally register a product subject to additional data, or to deny the registration. A pesticide use may be restricted or limited through labeling or by creation of rules which regulate the use of a product. As in federal pesticide registrations under FIFRA, registrants are under a continual duty to report any new information which indicates that a pesticide has or may cause any unreasonable adverse effect on public health or the environment. DACS may also consider new information made available by persons other than the registrant.

Chapter 487 expressly exempts persons licensed or certified under Chapter 388 (mosquito control) from the licensing and certification requirements of Chapter 487. DACS has been delegated primary enforcement authority for pesticide misuse violations under FIFRA. Under this agreement, the Florida Department of Health and Rehabilitative Services is responsible for regulation of mosquito control programs and participates in a cooperative agreement with the EPA. Accordingly, the use of mosquito control pesticides is regulated primarily by HRS under the authority of FIFRA and Chapter 388, Florida Statutes.

Mosquito control programs in Florida may choose whether to participate in a state funded assistance program. The assistance program, which is implemented by the HRS, provides technical and monetary support for participating mosquito control programs, in exchange for increased state control

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*Id.* Rule 5E-2.031(3).

*Id.* Rule 5E-2.031(4).

*Id.* Rule 5E-2.031(6).

*Id.* Rule 5E-2.031(7). Specific rules which apply to the use of mosquito control pesticides are contained in Rule 10D-54, Florida Administrative Code. Rule 10D-54 is discussed later in this report and is contained in full in Appendix E.

*Id.* Rule 5E-2.031(8).

*Id.* Rule 5E-2.031(9).

FLA. STAT. § 487.081(4) (1991).

EPA/DHRS Consolidated Cooperative Agreement, FY-91, obtained from the Florida Department of Health and Rehabilitative Services, Entomology Services.

over the operations of participating programs. The assistance program is established by Chapter 388, Florida Statutes, and is implemented by HRS through Chapter 10D-54, Florida Administrative Code. Non-participating mosquito control programs must also comply with some of the requirements in Chapters 388 and 10D-54, although the statute and rule are not entirely clear regarding which requirements apply only to participating programs and which requirements also apply to non-participating programs.

Most mosquito control districts and large programs are participating operations. There are currently about 50 participating programs in Florida. Non-participating programs are usually small local government or private operations. There are currently hundreds of non-participating programs in Florida. All mosquito control operations must abide by federal pesticide regulations and many HRS rules. Mosquito control programs which participate in the HRS mosquito control program must submit monthly reports documenting their mosquito control accomplishments and expenditures. Mosquito control programs which are not participating in the HRS program must abide by HRS rules and must maintain records, but they are not required to submit monthly reports to HRS.

The following discussions examine the requirements which Florida law places on participating and non-participating programs. Unfortunately, it is difficult to determine how well non-participating programs are abiding by the regulations because there are no regular reporting requirements. An individual examination of each non-participating program's records is beyond the scope of this research project. Accordingly, the analysis of compliance and enforcement does not include data on non-participating programs. This section begins with a general discussion of the statutory authority for creation, operation, and regulation of mosquito control districts in Florida, and then discusses specific regulatory provisions which relate to protection of non-target species.

**A. Statutory Authority, Charge, and Organization of Mosquito Control Programs**

Chapter 388, Florida Statutes, provides statutory authority for regulation of mosquito control programs. Chapter 388 states it is the public policy of the state to control arthropods to a level that will protect human health and safety, protect the quality of life, promote economic development, and facilitate the enjoyment of nature. However, arthropod control must be conducted in a "manner consistent with protection of the environmental and ecological integrity of all lands and waters throughout the state."

The Florida Department of Health and Rehabilitative Services (HRS) is charged with administering Chapter 388 and adopting rules to regulate arthropod control. While ultimate authority to regulate arthropod control activities is placed with HRS, local governments are authorized to create mosquito control districts and have the power to do whatever is necessary to carry out the intent and purposes of Chapter 388. Mosquito control districts may use any chemicals approved by HRS but "only in such quantities as may be necessary to control mosquito breeding and not be detrimental to fish life."

Mosquito control districts may be composed of any city, town, or county, or any portion or combination of any city, town, or county, and possess the power to assess a special tax for the control of arthropods. Mosquito control districts may be governed by a district board of commissioners, composed of three to five nonpartisan elected persons, or, if no special board of commissioners has been formed, by the board of county commissioners of the appropriate county. Each member of the

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FLA. STAT. § 388.0101 (1989).

*Id.*

*Id.* § 388.361.

*Id.* § 388.021.

*Id.* §§ 388.161, 388.181.

*Id.* § 388.161(1).

*Id.* §§ 388.021, 388.221.

*Id.* § 388.101.

*Id.* § 388.241.

mosquito control district's board of commissioners is required to post a surety bond which is conditioned on the member's faithful performance of the duties under Chapter 388.

If a board of county commissioners has assumed the authority to regulate arthropods, the board may delegate this authority to the appropriate county health department. Delegation to county health departments is conditioned upon the county health department keeping all records and submitting all reports required by Chapter 388, following county commission purchasing procedures, and submitting monthly reports of expenses to the county commissioners.

**B. State Assistance to Mosquito Control Programs**

In addition to the power to tax, mosquito control programs may receive state assistance if they participate in the HRS mosquito control program. Mosquito control districts may receive state equipment and supplies, and state matching funds on a dollar to dollar basis if they submit an arthropod control plan to HRS and HRS approves the plan. Mosquito control districts with approved plans, known as "participating programs," must submit monthly reports to HRS detailing expenditures, activities, and accomplishments pertaining to arthropod control. Non-participating programs are not required to submit monthly reports, although they are subject to many other requirements of Chapter 388 and HRS regulations.

Participating programs, which receive state funds, must use state matching funds in a manner which is consistent with an HRS approved plan. State matching funds may be used for all types of control measures approved by HRS, including temporary control measures such as spraying, or for permanent control measures such as structural habitat manipulation. HRS has the duty to "guide,

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*Id.* § 388.131.

*Id.* § 388.251.

*Id.*

*Id.* § 388.261.

*Id.* § 388.341.

*Id.* § 388.281.

*Id.* Counties may receive up to \$15,000 per year on a matching basis, and this money can be used for all control measures approved by the department. *Id.* §§ 388.261(1), 388.281(1). In addition, districts may receive from the state up to 75 percent of the amount of local funds budgeted for control, and this money must be used for permanent control measures. *Id.* §§ 388.261(2), 388.281(2). However, if permanent

review, approve, and coordinate the activities of all county governments and special districts receiving state funds for furtherance of the goal of integrated arthropod control." The term "integrated arthropod control" is defined as the "implementation of arthropod control measures, including, but not limited to, the use of pesticides and biological control agents and source reduction, to control arthropods without an unreasonable adverse effect on the environment." This definition indicates that mosquito control districts must consider and minimize adverse environmental consequences of their control activities.

The term "unreasonable adverse effects on the environment" is defined as "any unreasonable risk to man or the environment, with due consideration of the economic, social, and environmental costs and benefits of the use of any arthropod control measure." This definition suggests a cost-benefit analysis must be conducted which considers health, economic, social, and environmental costs of the mosquito control program. However, the definition fails to designate the relative weights to be given to the factors being considered and does not define the term "unreasonable."

HRS is directed to supervise source reduction measures and to advise districts on the best and most effective measures to obtain temporary control and to permanently eliminate breeding conditions. Source reduction measures include controls for sanitary landfills and drainage, diking, and filling of arthropod breeding areas. HRS may discontinue state aid at its discretion if it determines the jointly agreed upon program for arthropod control is not being efficiently and effectively administered. In addition, if the arthropod problem in a particular district is reduced or eliminated, state funds will be reduced to the amount necessary to meet the actual need.

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control measures are not feasible, HRS may authorize the district to use the 75 percent matching funds for temporary control measures. *Id.* § 388.281(3).

*Id.* § 388.271(1).

*Id.* § 388.011(5).

*Id.* § 388.011(8).

*Id.* § 388.291.

*Id.* § 388.281(2).

*Id.*

*Id.* § 388.281(4).

## C. HRS Responsibilities Under Chapter 388, Florida Statutes

### 1. General

HRS must promulgate, adopt, administer, and enforce rules in accordance with Chapter 388. Specifically, HRS must develop: 1) criteria by which an increase or other indicator of arthropod population levels is shown to constitute a public health or nuisance problem; 2) criteria to govern aerial spraying of pesticides or other substances on private lands for control of arthropods, which "minimize the deposition onto and the potential for substantial adverse effects to environmentally sensitive and biologically highly productive public lands caused by such airborne substances;" 3) requirements that all pesticides be used in accordance with the registered label or otherwise be accepted by the United States Environmental Protection Agency or the Department of Agriculture and Consumer Services; 4) criteria which protect the health, safety, and welfare of arthropod employees, the general public, and the natural resources of the state; and 5) criteria to license applicators and "require record keeping and reporting of applicator activities in furtherance of the goal of integrated arthropod control."

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*Id.* § 388.361.

*Id.* § 388.361(2)(a).

*Id.* § 388.361(2)(b). When promulgating these rules, HRS must also consider the recommendations of the Florida Coordinating Council on Mosquito Control. *Id.* § 388.361(2)(b). The Council has a variety of responsibilities including research, developing guidelines to assist in resolving disputes arising from control of arthropods on public lands, and preparing reports on arthropod control activities in the state.

*Id.* § 388.361(2)(c).

*Id.* § 388.361(2)(d).

*Id.* § 388.361(4). *See supra* text accompanying note 305 (defining the term "integrated arthropod control").

## 2. Licensing

HRS rules require that applicators of mosquito control pesticides must be properly licensed or be working under the supervision of a licensed applicator. However, applicators applying mosquito control pesticides on personally owned land or agricultural land are exempted from the licensing requirement. To become properly licensed, an arthropod control pesticide applicator must submit an application to HRS and pass an examination which demonstrates the applicant possesses a "practical knowledge of the principles and practices of arthropod control and the safe use of pesticides and ... practical knowledge of vector-disease transmission as it relates to and influences application programs." In addition, applicators must keep accurate records so that HRS can assess, on a monthly basis, activities such as pesticide application, source reduction, water management, biological control, and surveillance.

## 3. Inspections and Enforcement

HRS has authority to inspect the premises of any licensee, to inspect lands upon which a licensee has applied or has been reported to apply arthropod control pesticides, to inspect storage and disposal areas, to inspect or investigate any complaints against licensees for injury to humans or lands, and to sample pesticides which the licensee is currently applying or is planning to apply in the future. HRS conducts routine inspections and attempts to inspect all mosquito control programs in the state once a year. HRS also inspects mosquito control districts in response to complaints about specific programs. In addition, HRS has the authority to enter into cooperative agreements with any other state or federal agency in order to carry out and enforce the provisions of Chapter 388. HRS has entered into a cooperative enforcement agreement with the U.S. Environmental Protection Agency.

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FLA. ADMIN. CODE Rule 10D-54.040 (Feb., 1987).

*Id.* Rule 10D-54.040(8).

FLA. STAT. § 388.361(5) (1989).

*Id.* § 388.361(6).

EPA/DHRS Consolidated Cooperative Agreement, FY-91, obtained from the Florida Department of Health and Rehabilitative Services, Entomology Services. *See infra* note 359, and accompanying text.

#### **D. HRS Declaration of a Threat to Public Health**

Chapter 388 authorizes the secretary of HRS to declare a threat to public health if "the department discovers in the human or surrogate population the occurrence of an infectious disease that may be transmitted from arthropods to humans." A declaration of a public health threat must include the geographical boundaries and duration of the threat. Once the secretary has declared a public health threat, the secretary "shall order such preventive treatment and ameliorative arthropod control measures as may be necessary to prevent spread of disease, notwithstanding contrary provisions of this chapter or the rules promulgated hereunder." The department must notify the departments of Agriculture and Consumer Services, Natural Resources, and Environmental Regulation within 24 hours of the declaration.

Public health threat provisions in Chapter 388 allow HRS to conduct whatever treatment is necessary to prevent the spread of disease, regardless of other provisions in Chapter 388 or HRS rules. Accordingly, provisions in the statute and rules protecting non-target species can be ignored in times of a declared public health threat. However, mosquito control programs must abide by the provisions contained in the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), unless the state obtains an emergency exemption from the administrator of the U.S. Environmental Protection Agency. Similarly, mosquito control programs must abide by the requirements of the Endangered Species Act, which prohibits takings of endangered or threatened species.

## **II. Florida's Mosquito Control Regulations and Estuarine Non-Target Species**

### **A. FIFRA and the Endangered Species Act**

Generally, mosquito control operations must abide by applicable federal regulations, regardless of conflicting state regulations. Applicable federal regulations include pesticide labeling and use requirements imposed by FIFRA, and requirements of the Endangered Species Act.

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FLA. STAT. § 388.45 (1989). "Surrogate population" means a population of non-human species, such as chicken flocks, that is monitored for certain infectious diseases

*Id.*

*Id.*

7 U.S.C. § 136p (1989).

The Endangered Species Act also provides for exceptions under certain circumstances. *See* 16 U.S.C. § 1539.

Mosquito control districts must also comply with labeling and use requirements contained in Chapter 487, Florida Statutes. FLA. STAT. §§ 487.011-487.166 (1989). Chapter 487 regulates registration, distribution

## **B. Surveillance of Mosquito Populations**

HRS rules direct mosquito control districts to apply pesticides only when the district has determined, through the use of designated criteria, that there is: 1) a specific need because of a potential for a mosquito-borne disease outbreak, 2) an increase in numbers of disease vector mosquitoes, or 3) a quantifiable increase in the numbers of pestiferous mosquitoes. Specific criteria to determine whether there has been an adequate increase in mosquito or other arthropod population to warrant the application of adulticides are listed in Table 2.

**Table 2. Criteria to Determine Whether to Spray Adulticides.**

- (1) When a large population of adult mosquitoes is demonstrated by either a quantifiable increase in, or a sustained elevated, mosquito population level as detected by standard surveillance methods.
- (2) Where adult mosquito populations build to levels exceeding 25 mosquitoes per trap night or 5 mosquitoes per trap hour during crepuscular (twilight) periods.
- (3) When service requests for arthropod control from the public have been confirmed by one or more recognized surveillance methods.
- (4) When counts as determined by normal surveillance methods in the daytime exceed 5 per minute for stable flies (dogflies) on beaches and bayshores.

FLA. ADMIN. CODE Rule 10D-54.036(1)-(4) (Feb., 1987).

## **C. Aerial Applications**

HRS rules provide that aerial applications for the control of mosquitoes on private lands, where there is a possibility that pesticides may be deposited on public lands which have been designated as environmentally sensitive and biologically highly productive, must be conducted in a manner to minimize the deposition onto such lands. In addition, all aerial applications of adulticides must comply with the criteria summarized in Table 3.

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and application of pesticides within Florida. However, Chapter 487 does not regulate the licensing and certification of applicators engaged in operations under Chapter 388, Florida Statutes. *Id.* § 487.155(1).

FLA. ADMIN. CODE Rule 10D-54.036 (Feb., 1987).

*Id.* Rule 10D-54.037(1).

**Table 3. Aerial Applications of Adulticides.**

- (1) Only in specific areas where surveillance indicates control is needed. Three-fold increase required along beaches or bayshores;
- (2) Must be labeled for aircraft application and used so they do not cause unreasonable adverse effects on the environment;
- (3) Must be timed to be most effective during mosquito activity periods (no later than two hours after sunrise or earlier than two hours before sunset);
- (4) Must be conducted with properly calibrated equipment;
- (5) Must be applied, taking into account wind speed and direction, so the pesticide is deposited on land (pesticide labels prohibit aerial application of adulticides directly over water);
- (6) Must maintain records for a minimum of three years (records must include the area treated, the application rate and the material used, the equipment and technique used, the name of the pilot in charge, and the date, time, temperature, and general wind speed and direction);
- (7) Must include pre-treatment and post-treatment surveillance records of mosquito presence; and
- (8) Must document apparent non-target effects.

FLA. ADMIN. CODE Rules 10D-54.036(5), 10D-54.037 (Feb., 1987).

HRS rules allow aerial applications on public lands identified as environmentally sensitive and biologically highly productive, of adulticides containing the active ingredients listed in Table 4. However, the use of these adulticides on environmentally sensitive and biologically highly productive public lands must first be authorized by a public lands control plan.

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*See infra* text accompanying notes 333-342.

**Table 4. Mosquito Control Adulticides Which May Be Applied Aerially to Environmentally Sensitive and Biologically Highly Productive Public Lands.**

Active Ingredient

chlorpyrifos  
fenthion  
malathion  
naled  
pyrethrins and piperonyl butoxide  
resmethrin  
propoxur  
bendiocarb  
resmethrin and piperonyl butoxide  
phenothrin

FLA. ADMIN. CODE Rules 10D-54.037(2)(b), 10D-54.046(6)(b) (Feb., 1987).

**D. Use Requirements and Natural Resources**

HRS rules specifically provide that all uses of registered arthropod control pesticides must be conducted in a manner consistent with the pesticide's labeling. In addition, all methods of control on private lands, where natural resources are of major concern, must be conducted so as to "protect the environmental and ecological integrity of the lands and waters."

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FLA. ADMIN. CODE Rule 10D-54.038.

*Id.* Rule 10D-54.039(1).

### **E. Mosquito Control on Public Lands**

In addition to regulating arthropod control activities on private lands, HRS regulates control activities on public lands where arthropods constitute a public health or nuisance problem. HRS rules require that all land management agencies identify environmentally sensitive and biologically highly productive public lands under their control. HRS rules require that land management agencies include, in their determinations of which land is environmentally sensitive and biologically productive, a statement of purpose for which the lands are managed, a description of ecological data upon which the determination is based, and a specification of the potential ecological harm which should be avoided in planning an arthropod control program. Land identified as environmentally sensitive and biologically highly productive is subject to a public lands control plan which the local arthropod control agency must propose. The public lands control plan must use methods which "shall be the minimum necessary and economically feasible to abate a public health or nuisance problem and impose the least hazard to fish, wildlife, and other natural resources protected or managed in such areas." All other public lands are subject to the local arthropod control agency's general work plan.

The proposed public lands control plan must specify: 1) the need for arthropod control on the identified lands, 2) periodic restrictions as applicable, such as during peak fish spawning times, 3) criteria to be used in determining application of pesticides, and 4) methods and rates of application for each pesticide.

Public lands control plans become effective upon mutual agreement of the land management agency and the local arthropod control agency. Until a public lands control plan becomes effective,

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FLA. STAT. § 388.4111(1) (1989).

*Id.* § 388.4111(2)(a).

FLA. ADMIN. CODE Rule 10D-54.042(3) (Feb., 1987).

FLA. STAT. § 388.4111(2)(a),(b).

*Id.* § 388.4111(1).

*Id.* § 388.4111(2)(a).

FLA. ADMIN. CODE Rule 10D-54.042(4)(b) (Feb. 1987).

FLA. STAT. § 388.4111(2)(b) (1989). If the land management agency and the arthropod control agency are unable to agree, the Florida Coordinating Council on Mosquito Control may recommend a plan to the two

arthropod control activities may only take place at the consent of the Board of Trustees of the Internal Improvement Trust Fund. If the adopted public lands control plan prohibits a local arthropod control agency from performing control activities on certain designated parcels of public land, then the agency is relieved of responsibility for arthropod control on those lands.

**F. Chapter 403 Alternative Permitting Process for Application of Pesticides to Waters**

Chapter 403, Florida Statutes, establishes a mechanism which allows approved mosquito control programs to apply pesticides to waters without obtaining a specific water pollution operation permit from the Department of Environmental Regulation (DER). Chapter 403 directs DER to enter into interagency agreements for HRS approval of mosquito control district applications of pesticides to waters. The interagency agreements must provide for public health, safety, and welfare, including environmental factors. Approved programs must use chemicals approved by the Federal Environmental Protection Agency, and apply the chemicals in accordance with the registered label instructions, state standards for application, and the provisions of the Florida Pesticide Law, Chapter 487, Florida Statutes.

HRS rules establish standards for participation in the alternative permitting process described in Section 403.088(1), Florida Statutes. A mosquito control district which wishes to exercise the alternative permitting process must complete a form provided by HRS which is then filed with DER.

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agencies. *Id.* § 388.4111(2)(c) (1989). If the two agencies are still unable to agree, either agency may petition the Land and Water Adjudicatory Commission to consider the proposed public lands control plan. A hearing officer will then conduct a hearing and issue a recommended order. The Land and Water Adjudicatory Commission may adopt or modify the proposed control plan, which then becomes binding on the land management agency and the arthropod control agency. *Id.*

*Id.* § 388.4111(2)(e).

*Id.* § 388.4111(2)(d).

*Id.* § 403.088(1).

*Id.*

*Id.*

FLA. ADMIN. CODE Rule 10D-54.046(1) (Feb., 1987).

*Id.* Rule 10D-54.046(2).

Upon approval by HRS, the district may apply pesticides to waters without obtaining a specific water pollution permit.

Pesticides which may be applied under this program include those which are labeled and registered under FIFRA or Chapter 487, Florida Statutes, and are composed of the active ingredients listed in Table 5.

**Table 5. Section 403.088, Florida Statutes, Alternative Permitting Process for Application of Mosquito Control Pesticides to Waters.**

Larvicides	Adulticides
distillate petroleum oils	chlorpyrifos
methoxychlor	fenthion
methoprene	malathion
chlorpyrifos	naled
fenthion	pyrethrins and piperonyl butoxide
malathion	resmethrin
temephos	propoxur
non-petroleum oils	bendiocarb
pyrethrins	resmethrin and piperonyl butoxide
allethrin	phenothrin
biological materials	

FLA. ADMIN. CODE Rule 10D-54.046(6)(b) (Feb., 1987).

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*Id.* Rule 10D-54.046(3).

*Id.* Rule 10D-54.046(5),(6).

HRS rules further provide that all pesticides must be applied in accordance with labeling instructions and good standards regarding safety and efficacy, and that records must be kept that meet the criteria specified in the rule.

### **III. Enforcement**

HRS has authority to enforce the provisions of Chapter 388, HRS rules, and certain provisions of FIFRA. HRS rules address the penalties for failure to comply with FIFRA and EPA rules. When the board of commissioners of a mosquito control district, or county, whichever is applicable, is notified that a mosquito control program director is violating state or federal laws or regulations, the board must take appropriate action to prevent future violations. If the board of commissioners of the district or county fails to take appropriate action when violations have been brought to their attention, or HRS determines that fines or sanctions should be imposed, then HRS has the duty to notify EPA of all evidence of violations, and EPA may take whatever action it feels is warranted.

HRS may enforce Chapter 388 and its rules by any appropriate action in circuit court, including, but not limited to, an application for a temporary or permanent injunction to restrain any person from violating the chapter or its rules. HRS may deny, suspend, or revoke any license, certification, or state aid if a person 1) violates any rule of the department or Chapter 388, 2) violates the Federal Insecticide Fungicide and Rodenticide Act (FIFRA) or any relevant EPA rule, or 3) fails to supply HRS with true information. HRS enforcement authority is summarized in Table 6.

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*Id.* Rule 10D-54.046(7),(8). Records must address the following factors: types of pesticides, amount of pesticides used, pesticide application rates, and costs of applications. *Id.*

*Id.* Rule 10D-54.034.

*Id.* Rule 10D-54.034(1).

*Id.* Rule 10D-54.034(5).

FLA. STAT. § 388.3711(1) (1989).

*Id.* § 388.3711(2).

**Table 6. HRS Enforcement Authority.**

Enforcement by all proper and necessary actions, including:

- (1) Temporary or permanent injunction.
- (2) Deny, suspend, revoke any license or certification.
- (3) Probation for up to 2 years but allow program to continue.
- (4) Administrative fines of \$25-\$500 per offense.

FLA. STAT. § 388.3711 (1989).

HRS has discretion to place an offending party on probation if it determines a more severe action would be detrimental to the public or would be unreasonably harsh under the circumstances. HRS may impose administrative fines of up to \$500 per day for each separate violation and must consider the severity of the violation, actions taken by the licensee to correct the action, and any previous violations by the licensee when determining the amount of any penalty. In addition, HRS must publish a quarterly list of all disciplinary actions, and this list is available to the public.

HRS is participating in a Cooperative Enforcement Agreement with the U.S. Environmental Protection Agency. Under this agreement, HRS shares enforcement authority with EPA and receives federal assistance in exchange for agreeing to meet certain EPA enforcement goals. There is currently only one person, hired jointly by HRS and EPA, who inspects mosquito control districts in Florida. EPA conducts bi-annual written reviews of the Florida program.

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*Id.* § 388.3711(3).

*Id.* § 388.3711(4),(5).

*Id.* § 388.3711(6).

EPA/DHRS Consolidated Cooperative Agreement, FY-91, obtained from the Florida Department of Health and Rehabilitative Services, Entomology Services.

#### IV. Research and Support

Chapter 388 established the John A. Mulrennan, Sr., Arthropod Research Laboratory, which is charged with developing formulations and application techniques for pesticides and biological control agents for the control of arthropods. The laboratory must make recommendations for safe and effective control of arthropods which create a health or nuisance problem, and must conduct environmental impact studies to determine the effects of pesticides, with a special emphasis on integrated arthropod control.

The Florida Medical Entomology Laboratory (FMEL) also provides support for mosquito control programs in Florida. FMEL conducts basic and applied research in biology and control of mosquitos, and provides quarterly reports to the HRS to assist the agency in performing its duties under Chapter 388.

Chapter 388 also creates the Florida Coordinating Council on Mosquito Control (Council). The Council has a variety of responsibilities including research, developing guidelines to assist in resolving disputes arising from control of arthropods on public lands, and preparing reports on arthropod control activities in the state.

The U.S. Environmental Protection Agency (EPA) has a laboratory in Gulf Breeze, Fla. where research is conducted on the effects of pesticides on the environment, including aquatic resources. In addition, there are several private laboratories in Florida where researchers have studied the effects of mosquito control pesticides on the environment. Mosquito control districts have also conducted research relating to mosquito control pesticides and non-target species.

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FLA. STAT. § 388.42(1) (1989 & Supp. I 1990). The John A. Mulrennan, Sr., Arthropod Research Laboratory is located in Panama City, Fla.

*Id.* § 388.42(1).

FLA. STAT. § 388.43 (1989). The Florida Medical Entomology Laboratory is located in Vero Beach, Fla., and is part of the University of Florida's Institute of Food and Agricultural Sciences. *Id.*

*Id.* § 388.46 (1989).

Researchers at the Harbor Branch Oceanographic Institution, located in Fort Pierce, Fla., and the Mote Marine Laboratory, located in Sarasota, Fla., have conducted research concerning mosquito control pesticides and non-target species.

## V. Summary

Chapter 388, Florida Statutes, establishes a fairly comprehensive framework for regulation of mosquito control districts. Of particular significance is the requirement that efforts be made at using integrated arthropod control. The concept of integrated control, commonly known as integrated pest management (IPM), was originally developed as a response to over-spraying by farmers attempting to control insects which destroyed their crops. Over-spraying of pesticides increases pesticide pollution, results in adverse effects to non-target species, and accelerates the buildup of resistance by target species. IPM also provides protection for organisms which are not the target of control and prevents excess pollution of the environment. Although it is clear that Chapter 388 embraces integrated arthropod control as a philosophy, it is not clear to what extent mosquito control districts are actually practicing integrated control.

A number of other deficiencies relating to implementation and substance serve to undercut the effectiveness of Florida's mosquito control regulations. Problem areas include pesticide labels, spray drift, surveillance and reporting requirements, enforcement, pest control philosophies, research, public education, and funding. The following section details specific problem areas that were identified through this research project and suggests solutions for these problems.

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E. ODUM, *FUNDAMENTALS OF ECOLOGY* 445-447 (1971). In the agricultural context, IPM has been defined as the use of multiple tactics in a compatible manner to maintain insect pest populations below levels which cause economic damage to the crop. G. Leibee, Report on Entomology, prepared for Open House and Research Update at the Agricultural Research and Education Center, Sanford, FL., Institute of Food and Agricultural Sciences, University of Florida (April 20, 1982).

E. ODUM, *FUNDAMENTALS OF ECOLOGY* 445-447 (1971).

G. Leibee, Report on Entomology, prepared for Open House and Research Update at the Agricultural Research and Education Center, Sanford, FL., Institute of Food and Agricultural Sciences, University of Florida (April 20, 1982).

## FINDINGS AND RECOMMENDATIONS

### PESTICIDE LABELS

Mosquito control pesticides used in Florida are registered by the U.S. Environmental Protection Agency (EPA) and the Florida Department of Agriculture and Consumer Services (DACS) for mosquito control. Labels are developed for pesticides as part of the registration process and are intended to protect the environment from unreasonable adverse effects of pesticide use. Users of pesticides must abide by all label instructions and warnings. Both EPA and DACS have authority to require that pesticide labels include adequate environmental warnings and directions for use. EPA or DACS can require modification of existing labels or cancellation of uses when a pesticide label is found to be inadequate. In Florida, a number of problems exist with respect to some mosquito control pesticide labels.

Some of the labels for Florida mosquito control pesticides contain conflicting warnings and directions for use, particularly with respect to whether the products can be applied to waters. For example, the label for Cythion, a formulation of malathion manufactured by American Cyanamid Company, states "avoid direct applications to lakes, streams, ponds, tidal marshes and estuaries." However, the label instructions provide how to apply the pesticide aerially for adult control "over [populated areas] where ... pleasure boats are present." The label for the larvicide Abate, a formulation of temephos manufactured by American Cyanamid, states "[t]his product is toxic to fish. Fish and other aquatic organisms in water treated with this product may be killed." However, the label instructions provide rates for application of Abate to "standing water, shallow ponds, lakes, woodland pools, tidal waters, marshes, swamps and waters high in organic content, and highly polluted waters." These labels do not provide clear guidance for pesticide applicators. The Florida Department of Health and Rehabilitative Services (HRS) mosquito control section has requested that EPA issue a policy statement clarifying these labels. To date, EPA has not responded to the HRS request. Appendix C contains examples of mosquito control labels with conflicting language.

It is not clear what is meant by "waters." Federal water pollution laws define waters broadly to include marshes, swamps, and tidal pools. Some labels state that applications to waters are not allowed, but that applications to swamps, marshes, and estuaries are allowed. Other labels state only that application of the pesticide to "waters" is prohibited. Large areas of wetlands, isolated tidal ponds, and marsh are sprayed regularly with pesticides which may be hazardous to marine organisms.

Some mosquito control pesticide labels state that the pesticide should not be applied where certain organisms, such as crabs, shrimp, and fish are "important resources." Examples include formulations of chlorpyrifos (Dursban) manufactured by Dow Chemical Company, Southern Mill Creek Products Company, and Cornbelt Chemical Company; formulations of malathion manufactured by American Cyanamid Company, Southern Mill Creek Products Company, and Clarke Outdoor Spraying Company; and Abate, a formulation of temephos manufactured by Southern Mill Creek Products Company. The label for the larvicide Pyrenone, which is a formulation of pyrethrins and piperonyl butoxide manufactured by Fairfield American Corporation, states "[t]his product is toxic to fish, shrimp, crabs and other aquatic organisms. Do not apply directly to lakes, streams, or ponds. May be used in mosquito breeding areas such as marshy areas, pools and ponds where fish, shrimp, crabs and other desirable aquatic animals will not be harmed." These labels are subjective and ripe for abuse. Although some of the labels direct the applicant to consult with the state game and fish department, others provide no additional direction. Appendix D contains examples of mosquito control pesticide labels which allow applicators to subjectively interpret environmental factors.

Florida mosquito control regulations include a list of pesticides which may be applied to waters of the state subject to approval by the HRS and the Department of Environmental Regulation. However, the labels of many of these pesticides prohibit applications to waters. Appendix E contains examples of label precautions for pesticides which qualify for application to waters under Rule 10D-54.046, F.A.C.

**Recommendation #1**

*The DACS and the EPA should clarify inconsistent mosquito control pesticide labels. Specifically, the labels should be changed to remove ambiguity as to whether drift and indirect applications to water constitute violations.*

**Recommendation #2**

*The DACS and the EPA should clarify the meaning of "water" as it is used in labels.*

**Recommendation #3**

*The DACS and the EPA should clarify what is meant by "important resources" and should state who is responsible for making this determination.*

**Recommendation #4**

*Rule 10D-54.046, FLA. ADMIN. CODE (Feb. 1987) should be amended to remove pesticides whose labels prohibit application to waters.*

## **PESTICIDE DRIFT**

Most significant problems with mosquito control pesticides and non-target species result from aerial applications of mosquito adulticides. Pesticide effectiveness is enhanced if slow moving winds are present, thereby causing the pesticide to stay suspended in the air longer and to cover a greater area. Fast moving winds, or changes in wind direction, may cause pesticides to move out of the targeted area. Changes in wind direction and speed are particularly critical in areas adjacent to water. Shifting winds may cause pesticides released over water, which are intended to drift and be deposited on land, to be deposited into water. Similarly, shifting winds may cause pesticides released over land to be deposited in water. HRS personnel and enforcement records indicate that spray drift and spray releases into water continue to occur. Current EPA and HRS enforcement policies are unclear with respect to pesticides which drift and are deposited in water.

### **Recommendation #5**

*The EPA and HRS should clarify whether applications of pesticides to water, by drift or by direct application, constitute violations of mosquito control pesticide labels.*

## **SURVEILLANCE**

Chapter 388, F. S., requires that all mosquito control programs assess the apparent effects of aerial applications of mosquito control pesticides on non-target species. Mosquito control district personnel and HRS officials indicate that many districts do not have the resources or expertise to regularly monitor effects of aerial applications of pesticides on non-target species. In addition, the term "apparent effects" is vague and subject to varied interpretations. Ultimately, it is doubtful that many mosquito control programs have the resources to effectively monitor non-target effects.

Mosquito control programs are also required to conduct surveillance prior to spraying mosquito control pesticides and may spray only if mosquito populations reach levels designated by HRS rules. Mosquito control programs must also assess mosquito populations after spray events. It is unclear whether mosquito control programs routinely conduct surveillance to assess mosquito populations before and after spray events. In addition, there has been criticism of some of the surveillance techniques used by mosquito control programs. The current rule allows the use of "recognized surveillance methods." Certain techniques, such as monitoring of telephone complaints by citizens, may not consistently provide an accurate indication of mosquito population levels.

**Recommendation #6**

*The HRS should amend its rule to define what is meant by "apparent effects" and should provide minimum standards for mosquito control programs to follow in assessing effects to non-target species.*

**Recommendation #7**

*State laws relating to assessment of non-target species should be rigorously enforced.*

**Recommendation #8**

*State laws requiring pre- and post-spray surveillance of mosquito populations should be rigorously enforced.*

**Recommendation #9**

*HRS should develop minimum guidelines detailing which surveillance techniques are acceptable indicators of mosquito population levels. HRS should insure that accurate surveillance techniques are used.*

**REPORTING REQUIREMENTS**

Chapter 388, F. S., requires that all mosquito control programs participating in the HRS program submit monthly reports to HRS detailing expenditures and work accomplishments. Although participating mosquito control programs are regularly submitting reports to HRS, the reporting forms emphasize the amount of money spent and the total acres or miles treated and do not require any reporting of environmental monitoring or effects. Accordingly, HRS review of environmental monitoring by mosquito control programs is limited to occasional HRS inspections of the programs. Appendix H contains HRS monthly reporting forms.

There are a significant number of mosquito control operations which do not participate in the HRS program. Most of these operations consist of municipalities, condominium associations, or other private pest control operations. While these programs must abide by most HRS regulations, they are not required to submit monthly reports. Accordingly, the only state oversight of these programs occurs when HRS conducts an inspection of the program, either routinely or in response to a complaint.

**Recommendation #10**

*HRS should require that participating mosquito control programs report environmental monitoring and surveillance.*

**Recommendation #11**

*HRS should require that all mosquito control programs submit reports to the regulatory agency, whether or not the program is participating in the HRS mosquito control program.*

**Recommendation #12**

*Chapter 388, F.S., should be amended to require non-participating mosquito control programs to submit monthly reports to HRS.*

**ENFORCEMENT**

The enforcement authority of HRS is not being fully utilized. Prior to 1986, HRS oversight of mosquito control programs primarily involved monetary and technical support. In 1986, Chapter 388, F.S., was amended to provide HRS with explicit enforcement authority. HRS may apply for an injunction, revoke a license, place an offending party on probation, or impose administrative fines from \$25 to \$500 per day. Despite this additional grant of authority, HRS has been reluctant to assume the role of an aggressive enforcer. To date, the HRS mosquito control rule, Chapter 10D-54 FLA. ADMIN. CODE (Feb. 1987), has not been amended to reflect the 1986 authorization to impose administrative fines.

While HRS does conduct inspections and write warning letters, no other enforcement options have been utilized despite apparent violations of state and federal law. HRS currently has one inspector for the entire state of Florida. Many of the investigations concerning aerial applications of pesticides to waters have been brought to the attention of HRS by citizens and the Department of Natural Resources. Ultimately, the lack of enforcement actions by HRS stems from a combination of factors, including vague and ambiguous pesticide labels, insufficient numbers of enforcement personnel, and inadequate dedication to rigorous enforcement. Figure 5 illustrates recent trends in enforcement by HRS.

**Recommendation #13**

*Enforcement of mosquito control laws could be improved by placing the enforcement authority for Chapter 388, F. S., in a separate state agency. HRS should retain responsibility for support and oversight of mosquito control programs.*

**Recommendation #14**

*The agency responsible for enforcement should establish and practice a rigid enforcement policy.*

**Recommendation #15**

*More personnel should be provided for enforcement. More funding should be provided for all aspects of enforcement. Recommendation #25 discusses potential funding sources.*

**Recommendation #16**

*The penalties available under Chapter 388, F. S., should be upgraded so that they will act as a real deterrent to violations of state and federal pesticide laws. The current maximum limit of \$500 per violation may not be sufficient to deter violations by mosquito control programs with large operating budgets. The penalties should be upgraded to reflect federal guidelines under FIFRA (up to \$5000 per offense), including provisions for criminal penalties (up to \$25,000 or imprisonment for one year, or both).*

**Recommendation #17**

*Chapter 10D-54, FLA. ADMIN. CODE (Feb. 1987) should be amended to reflect HRS enforcement authority.*

**Recommendation #18**

*The agency responsible for enforcement should conduct random unannounced inspections of mosquito control programs.*

**Recommendation #19**

*State agencies and individuals should continue to bring violations of Florida's mosquito control regulations to the attention of HRS, and whatever state agency is charged with enforcement under a future regulatory scheme.*

## **INTEGRATED PEST MANAGEMENT**

Participating mosquito control programs are required to employ integrated pest management (IPM) practices. However, HRS monthly reporting forms do not require any reporting of IPM practices. Appendix H contains HRS monthly reporting forms. Chapter 388, F. S., and Chapter 10D-54, F.A.C, are unclear as to whether non-participating programs are required to follow IPM practices. In addition, non-participating programs are exempt from reporting requirements and are therefore not regularly monitored.

A good IPM program should minimize adverse effects to the environment while maintaining mosquito populations at acceptable levels. Typical IPM techniques include minimal use of pesticides, rotation of pesticides, avoidance of spraying areas containing particularly sensitive non-target species, avoidance of spraying at times when non-target species are particularly vulnerable to pesticides, use of spray techniques which are least harmful to non-target species, and use of alternatives to pesticides, including biological control. HRS mosquito control personnel have indicated that the degree to which mosquito control programs follow IPM practices varies widely with the monetary resources, geographical characteristics, and philosophical attitude of individual districts.

### **Recommendation #20**

*All mosquito control districts, participating and non-participating, should be required to implement and report IPM practices, including: assessment of non-target species within their jurisdiction which are likely to be adversely affected by spraying; avoidance of spraying in areas containing sensitive non-target species; avoidance of spraying when non-target species are most likely to be affected; determination of which application techniques pose the least risk to non-target species; and use of alternatives to pesticides, including biological control.*

## **ALTERNATIVES TO PESTICIDES**

Mosquito control pesticides may cause adverse effects to certain non-target species. Alternatives to pesticides do exist, but significant research is needed before those techniques might be used for large scale control. Potential alternatives include source reduction, biological control, biotechnology, repellents, and attractants.

Permanent control measures, such as impounding and draining wetlands, are generally frowned upon by environmental and land management agencies because they result in destruction and degradation of wetlands.

**Recommendation #21**

*There should be increased emphasis placed on research into alternative methods of control. Adequate funding should be provided to impartial and qualified scientists. Recommendation #25 discusses potential funding sources.*

**Recommendation #22**

*Re-construction of early permanent control projects could result in improved mosquito control and environmental benefits.*

**RESEARCH**

Scientists indicate that many of the effects of mosquito control pesticides on non-target species are unknown. While direct effects may be fairly easily observed, indirect effects are more difficult to detect and may require complex, time consuming, and costly research. Particularly, research is needed regarding the sublethal and long term effects of these pesticides on non-target species. Although the Florida Medical Entomology Laboratory and the John A. Mulrennan, Sr. Laboratory both conduct mosquito control research, there remains a serious need for research in this area.

**Recommendation #23**

*Significant research needs to be done regarding the effects of mosquito control pesticides on non-target species. Recommendation #25 discusses potential funding sources for additional research.*

**FUNDING**

HRS does not have sufficient monetary resources to adequately regulate mosquito control operations in Florida. Unfortunately, funding for the HRS mosquito control program was reduced this year by over 75 percent.

**Recommendation #24**

*Increase funding for state oversight of mosquito control programs in Florida, particularly in the areas of public education, research, and enforcement. Possible mechanisms for obtaining funding include: an excise tax on mosquito control pesticides; a legislative mandate requiring mosquito control districts to increase taxes within their district; and an appropriation from the legislature. The additional funds should be controlled by the state agency (or agencies) responsible for state oversight and enforcement, and should be designated specifically for public education, research, and enforcement.*

## **LEGAL REMEDIES**

Specific pesticide registrations could be challenged under FIFRA. An interested person could challenge a registration by requesting a special review procedure, or by participating in a re-registration procedure. Interested persons may submit newly discovered scientific data concerning a particular pesticide use. These procedures could result in the modification, relabeling, suspension, or cancellation of a pesticide use.

The Endangered Species Act could be used to challenge the registration and use of mosquito control pesticides which are adversely affecting endangered or threatened species. Specifically, interested persons could take the following actions: 1) Notify the EPA or USFWS of instances of mosquito control pesticides harming endangered or threatened species; 2) Initiate a citizen's suit to challenge an EPA registration of a particular mosquito control pesticide which is harming endangered or threatened species; or 3) Initiate a citizen's suit to request an injunction against a mosquito control district from spraying pesticides which harm endangered or threatened species.

Section 403.412, F. S., authorizes citizen's suits to enforce laws relating to protection of environmental resources. This provision could be used to compel HRS to enforce Chapter 388, F. S., Chapter 10D-54, F.A.C., and FIFRA. It might also be possible to use Section 403.412, F. S., to challenge a pesticide use approved by the Florida Department of Agriculture and Consumer Services. Although a cause of action would probably exist under Section 403.412, this may not be a good approach because the non-prevailing party must pay attorney's fees.

### **Recommendation #25**

*As necessary, the Endangered Species Act citizen's suit provision should be used to enjoin applications of mosquito control pesticides which harm endangered or threatened species.*

### **Recommendation #26**

*Legal remedies available under FIFRA and Florida law should be considered if there is evidence of ongoing violations and other options have failed to produce adequate results. Unfortunately, actions of this type are usually both costly and lengthy.*

## **PESTICIDE REVIEW COUNCIL**

The Pesticide Review Council has the duty to recommend scientific studies of pesticide uses which may pose an unreasonable adverse effect on the environment. The Council also has the duty to make recommendations regarding the sale and use of pesticides.

**Recommendation #27**

*An interested party could petition the Pesticide Review Council to consider recommending that additional label restrictions be placed upon existing labels of pesticides registered for mosquito control use in Florida.*

**FLORIDA COORDINATING COUNCIL ON MOSQUITO CONTROL**

The Florida Coordinating Council on Mosquito Control is charged with making recommendations regarding research priorities for mosquito control. In addition, the Coordinating Council must report to the Pesticide Review Council and other governmental organizations on mosquito control activities in Florida.

**Recommendation #28**

*An interested party could petition the Florida Coordinating Council on Mosquito Control to consider recommending that additional research be conducted and that additional label restrictions be placed upon existing labels of pesticides registered for mosquito control use in Florida.*

**MOSQUITO CONTROL DISTRICT WORK PLAN BUDGET**

Mosquito control programs which are receiving state funds from HRS must adopt a work plan budget which includes a budget and a plan of operations. Work plan budgets must be adopted at a public hearing. Chapter 388, F. S., requires that the governing board of the mosquito control district consider objections which are filed against the tentative detailed work plan budget. Accordingly, the public hearing presents an opportunity for interested citizens to comment on the budget and plan of operations of the mosquito control program.

**Recommendation #29**

*The public should scrutinize the work plan budget to make sure it contains adequate proposed expenditures for environmental monitoring, including assessment of non-target species which are likely to be affected by spraying, assessment of non-target species which are known to be affected by spraying, and development of a legitimate Integrated Pest Management Program. The work plan budget should also contain adequate funding for routine pre- and post-spray surveillance. Monetary appropriations for specific pesticides could also be challenged at this time.*

## **PUBLIC AWARENESS AND ATTITUDES**

Mosquito control in Florida is driven to a large extent by public expectations and desires. Many residents and tourists in Florida have grown to expect mosquito free conditions and are increasingly intolerant of relatively low levels of mosquitos. The declaration of legislative intent in Chapter 388, F. S., reinforces the idea that reduction of mosquito populations is a desirable and necessary goal. Florida's mosquito control regulations allow for citizen input regarding the need to spray, and often spray events are instigated by citizen complaints of too many mosquitos.

Citizens may be unaware of the potential harm of mosquito control pesticides to human and other non-target species, and may be unfamiliar with concepts such as resistance, bio-accumulation, sub-lethal effects, long term effects, and biological control. Old time Florida residents coped with intense mosquito populations by avoiding mosquito infested areas during certain times of the day or year, and by wearing appropriate clothing. Today many repellents are available which offer effective protection from mosquitoes.

With the recent outbreaks of St. Louis and Equine Encephalitis, public pressure has increased to spray mosquitoes. While the severity of those diseases should not be disregarded, it is important to remember that actual occurrences of the diseases are very rare. Most mosquito control efforts in Florida are targeted at non-disease carrying nuisance mosquitoes.

Representatives of HRS and the Florida Medical Entomology Laboratory have indicated that past efforts at public education have focused primarily on prompting people to eliminate mosquito breeding areas on their own property. While this is a laudable goal, many public education efforts have neglected to inform citizens of the negative health and environmental consequences of mosquito control pesticides. A more informed public might become more tolerant of moderate levels of mosquitoes.

### **Recommendation #30**

*HRS should inform people of the dangers of mosquito control pesticides to humans and other non-target species. Informed people are more likely to change their attitudes and become more tolerant of mosquitoes.*

### **Recommendation #31**

*Mosquito control spraying should be avoided on publicly held lands for which the management goal is to approximate a natural environment.*

## Appendix A. Figures

Appendix B. Mosquito Control Pesticides in Florida

Appendix C. Mosquito Control Pesticide Labels With Conflicting Language

Appendix D. Mosquito Control Pesticide Labels Which Allow Subjective Interpretation by the Applicator

Appendix E. Label Precautions for Mosquito Control Pesticides Qualifying for Application to Waters

Appendix F. Chapter 388, Florida Statutes (Mosquito Control)

Appendix G. Florida Department of Health and Rehabilitative Services Mosquito Control Rule

Appendix H. Florida Department of Health and Rehabilitative Services Monthly Reporting Forms