

## PESTICIDES AND WILDLIFE - THE EFFORTS TO RESOLVE A DILEMMA

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Abstract: Many local, state, and national groups have moved to eliminate DDT and other chlorinated hydrocarbons via a "ban" route, with little consideration for the social, economic or political implications of such actions. Also, there has been insufficient awareness that all compounds which may be classified as chlorinated hydrocarbons do not behave similarly, and that blanket elimination of chlorinated hydrocarbons would pose serious, if not insurmountable problems for agriculture, public health and structural pest control.

The uses of some chlorinated hydrocarbons have been reduced significantly in recent years, beginning prior to the current concern. Since 1964, 64 dieldrin, 67 aldrin, and 25 endrin uses have been withdrawn, including most uses involving application to non-agricultural wildlife habitat and aquatic environments. Replacements for these and other chlorinated hydrocarbons will come slowly, requiring up to \$6 million and 8 years to develop. As in the past, field studies to determine the effects of new compounds on fish and wildlife will continue to be conducted in cooperation with State Fish and Game Departments, Cooperative Wildlife Research Units and the U. S. Fish & Wildlife Service.

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Considering pesticides and wildlife, my position as a chemical company wildlife biologist is rather unique. During the past 18 years, while with the Bureau of Sport Fisheries and Wildlife, I worked closely with agriculture and agriculture-wildlife related problems - in Oregon, Washington, Montana and the Mid-west. I was the first Chief of the Branch of Pesticide Surveillance and Monitoring of the Bureau, and also spent two years with the Pesticides Regulation Division, U. S. Department of Agriculture, evaluating pesticide effects on fish and wildlife resources and the environment. During the past year with Shell, I've generally functioned in a similar capacity. This has provided an opportunity for a very broad view of the relationship between agriculture, its chemicals, and fish and wildlife resources. My comments today are therefore based upon consideration of a number of factors including wildlife management, agriculture, the role of the regulatory agencies, and industry's view of the current environmental situation.

Although not widely publicized, many industrial organizations, including Shell, have developed staffs oriented toward environmental conservation. Because I'm a part of this effort, I'm tempted to philosophize a bit about the role of the chemical industry in environmental quality affairs and wish that time here would allow for it. When I reported for work with Shell, I was charged with the responsibility for aiding in the development of an environmental policy or approach to a consideration of the environment which would not only be compatible with the

basic mission of the company but would enhance and strengthen the organization in fulfilling its obligations to our society and its environment.

While I feel that I'm far from fulfilling this charge, this has been the most challenging, interesting and personally satisfying period that I have ever experienced since I started the wildlife game in 1952. Frankly, I'm mighty proud to be a part of the Shell group. I sincerely hope that in the near future similar opportunities will develop for a wide variety of natural resource talent with other industrial organizations.

For many chemical companies today a subject like environmental quality has such breadth and scope that it would be possible to touch only on fragments of it even if we were to devote the entire day to the subject. In order to narrow the parameters somewhat, and considering the fact that chemical companies, pesticides, the environment and wildlife tend to make up an identifiable and much publicized package, I'll limit my discussion to these.

You can all appreciate the fact that the rather emotion-charged demand for a ban on some chemicals, especially DDT, by many local, state and national groups resulted in some initial rather stiff resistance on the part of some chemical groups. Personally, I can understand it - and aided and abetted such resistance when it appeared logical and proper. This stems largely from my experiences with the Bureau, the Pesticides Regulation Division and with Shell. One gets a pretty good look at pesticides, wildlife and the environment - and becomes somewhat of an ecologist under these conditions. Pesticides are essential to good agriculture, clean food and public health and will continue to provide the principal protection against injurious or noxious organisms for many years to come. However, the trend to reduce some compounds and uses began years ago - was progressive, orderly, and as rapid as was compatible with agriculture and public health needs. An acceleration of this trend at this time could cause extensive hardship.

On the other hand, the current wave of concern for environmental quality, although disturbing in the manner in which it's discussed for the public, is realistic (in its broadest sense), is normal, should have been anticipated, and unquestionably is long overdue. It's unfortunate that pesticides became the number one target, and were assailed by so much emotion - because they're only a small part of our current environmental dilemma. But, the fact that they're toxic, may affect several species, and so forth, has resulted in an unnecessarily evil image in the eyes of the public, and perspective, objectivity and coordination of effort which is so essential to solving gross environmental contamination has taken a back seat.

Some have intimated that the chemical industry is unresponsive and resistant to change. From my own experience, long before I joined Shell, I can say, "This is not so". Of the hundreds of pesticide compounds and thousands of formulations, little public attention is given to any but DDT and a closely allied group of chlorinated hydrocarbon insecticides. These are the subject of attention because of their persistence, toxic nature, widespread use, and occurrence in the world. Because of some of these characteristics, considerable effort is being directed toward banning or eliminating these products, and yet, the elimination of certain uses of this group of compounds has been in progress for at least the past six years. Following the report of the President's Science Advisory Committee on

Pesticides in 1963, Shell, as a basic manufacturer of aldrin, dieldrin and endrin, instituted a critical evaluation of the registered uses of these compounds. During the next five years, and prior to the current debate about these materials, Shell voluntarily withdrew those uses which were likely to contribute significant residues to meat and milk animals, or to segments of the environment, including man. Since 1964, 64 dieldrin, 67 aldrin and 25 endrin uses have been withdrawn. Most uses of these products which involve direct application to significant, non-agricultural wildlife habitat, especially aquatic habitats, were deleted from registered uses several years ago. Those uses which are currently in effect, include only essential agricultural and non-agricultural uses, including ornamentals and lawns, and those uses for which substitute compounds are not available. In December 1969, we requested the cancellation of dieldrin for moth-proofing, based in part upon data from the National Pesticide Monitoring Program.

Compounds to replace the chlorinated hydrocarbons will not come easily. Perhaps as many as 80,000 chemicals are screened by chemical company research and development groups each year. Of these, only one out of 100 will be carried to the next step - the determination of toxicity. The other 99 are found to have no usable biological activity. Then the one chemical in a thousand that shows both pesticidal activity and passes a toxicological evaluation is carried through a series of other evaluations and test marketings. According to an Arthur D. Little survey, only one out of 36,000 products synthesized reaches the market.

Approximately 40 chemical companies are engaged in pesticide research. The annual expenditure for this is in excess of \$60,000,000, most of it spent by a handful of the 40 firms. In developing a product, costs range from 2 1/2 to \$6,000,000 and anywhere from 3 to 8 years to develop, evaluate, register and market. The financial risk is enormous.

The U. S. Department of Agriculture, Pesticides Regulation Division, under the terms of the Federal Insecticide, Fungicide and Rodenticide Act has the authority to regulate the use of pesticides shipped in interstate commerce. Registration of each compound and formulations thereof is required by the U. S. Department of Agriculture, and such registrations are reviewed by the U. S. Department of the Interior, Fish and Wildlife Service for uses which may have an impact on fish and wildlife resources and by the Department of Health, Education & Welfare from a standpoint of human health and safety. This joint review is conducted before registration is granted.

At any point in the registration procedure, any of these three agencies may require additional field studies, residue analyses or other data to assure them that the compounds will perform as claimed and that it will pose no undue hazard to man or natural resources. When pesticides are to be used on a good crop, then a tolerance must be established by the U. S. Food and Drug Administration and this, too, must be granted before the U. S. D. A. will register the product. By the time a pesticide is finally registered, the safety to man and his environment has been carefully investigated and assured, within the framework of the evaluation given to it by the various agencies, when used according to its labeling.

The immediate suspension of the use of many of the chlorinated hydrocarbon compounds and the replacement with substitute bio-degradable products is not nearly as simple as some would believe. Shell has not investigated chlorinated hydrocarbon compounds for more than 10 years, but rather has conducted research in the area of rapidly degradable products. During these years few chemicals have been developed to a stage where they are suitable as replacements for the chlorinated products and the search will continue to be laborious and slow. Also because of the volume of new data which are now being required for registration of either a new compound or a new use of an existing compound, particularly in the area of environmental safety, few chemical organizations are in a position to conduct the research which is required before a product can be registered. The end result of much of this may be that out of it will not come more compounds to replace the chlorinated ones, but rather fewer.

During the recent years of pesticide wildlife concern, the chemical industry has sought the council of natural resource people in the government and universities. Simple laboratory tests which isolate a few environmental variables have been offered and are still used as valuable indicator tools. It has become apparent, however, that many environmental factors cannot be accounted for in such tests, and that compounds often behave differently in the field than in the laboratory. Under a wide range of environmental variables, statistically sound tests based on natural field conditions have been difficult to come by - if not impossible. To date, neither the Fish and Wildlife Service nor the U. S. Department of Agriculture have been able to establish protocols for such tests. Industry has sought and received help from the Fish and Wildlife Service and from the California Fish and Game Department in monitoring pesticides under field conditions both prior to and subsequent to registration. A National Agricultural Chemical Committee for Field Study Protocols has been formed, including Gene Kenaga from Dow Chemical, Chuck Dunne from Hercules, Don Spencer from NACA and myself. We have met with personnel of the California Fish and Game Department to discuss better field study protocols. Later, we will visit with at least 2 other State Fish and Game Departments to obtain assistance and concurrence in the objectives which we hope to achieve, before going back to the U. S. Department of Agriculture with field study proposals. There is a tremendous amount yet to be done in this area, and we feel that we have only scratched the surface.

During the last 3 years, the California Department of Fish and Game provided us with assistance of inestimable value in conducting field studies with AZODRIN. During this period efforts were made to reduce the number of variables and unaccountable factors to a minimum. The end result was a radio-telemetry study last year under actual pest control operations. I personally believe it was the best field study of this type that has ever been conducted, and will lead to more studies of a similar nature. To a large degree, our experiences and frustrations here with field studies led to the creation of the NACA Committee and our continuing association with "Red" Hunt and his group to develop field studies with fewer variables and less bias.

Before concluding, I'd like to address myself briefly to current publicity regarding DDT and other chlorinated pesticides. I've attended many state pesticide hearings, and have testified at four. The most recent, in Florida, points out vividly a rather dangerous trend. The bill in question at the hearing was one to "ban chlorinated hydrocarbons" in the state. Now in the broad sense, "chlorinated hydrocarbons" encompasses approximately 75 insecticides and 57 herbicides. To pass such a bill would bring agricultural and public health efforts and structural pest control crashing down around their ears. Each of these compounds is a separate, identifiable, patentable entity, and must be considered as such.

Further, there is a tendency, both in such hearings and in the press to assign the alleged sins of one compound to all compounds generally in the group. This must stop. At present, environmental damage can only be related to one compound, and the National Monitoring data generally show the others to be present in various species in rather low levels, trace amounts, or not detectable. I wish there was time to expand on this here, but I'm mentioning it only to emphasize the need for caution in accepting all that's being said about "chlorinated hydrocarbons".

In conclusion, it should be mentioned that industrial groups like Shell participate in a wide variety of environmentally oriented programs which are not necessarily basic to the mission of the organization. In 1962, the Shell Oil Company contributed \$45,000 to the World Wildlife Fund and again in 1968 or '69 contributed an additional \$15,000. Late last year I had the pleasure of spending a day with a gentleman from ESSO at a small farm in Massachusetts where a young professor from Framingham State College enthusiastically showed us his work in de-oiling oil soaked waterfowl, and the directions that his work was taking rehabilitating such birds before they were released back into the wild. This resulted in a \$10,000 grant from the American Petroleum Institute to further his investigation. My most recent involvement in an outside activity, and one with which I am particularly pleased, is participation on a Task Force of the International Biological Program to aid in the development of a model station for the Global Network for Environmental Monitoring.

In brief, the chemical industry has long participated in various types of environmental quality efforts, but I think that today they are expressing more concern about environmental quality than at any other time in the history of the industry. Shell is not concerned simply because our population has become more demanding and the laws more restrictive. It is, I believe, concerned because it recognizes that we are approaching a very critical time, in which the volume of our living space, the availability of natural resources, the extent of all forms of environmental contamination, and the growing world population are inevitably going to collide. An organization like Shell, with a responsibility toward our society, must participate in governing and controlling the various forces which appear headed for that environmental collision.