EPA JOURNAL

Farmers and the Environment

Agriculture and the Environment

In this issue EPA Journal reviews some of the new directions in pest control, cancer protection, land use and new programs to guard against rural water pollution problems. Articles on the sometimes controversial subject of Integrated Pest Management include one from Secretary of Agriculture Bob Bergland, two from EPA officials and the views of a representative of an agricultural chemical trade association and a noted academic authority. In the health area, the magazine reviews steps being taken to guard people from pesticides which might cause cancer and also explains EPA's proposals to help rid drinking water of organic chemical contaminants. Plans for three major environmental celebrations this spring are outlined. Margaret Mead, the famous anthropologist and educator, has provided an eloquent assessment of the meaning of Earth Day. EPA's Region 3, with headquarters in Philadelphia, has supplied the latest in a continuing series of articles from the Agency's Regional Offices around the Nation. □

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Cover: Farmer in his field at sunset.
Inside cover: A thresher cuts a swath through a wheat field.
Back cover: Sunset illuminates farm buildings.

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The Role of Agriculture in the Environment

By Administrator Douglas M. Costle

We live in an age of industrial and chemical pollution on farms as well as in cities.

In the early 1970's, national environmental efforts concentrated on controlling the highly visible water and air pollution coming from our cities and their great industrial complexes. These battles against municipal and industrial point sources of pollution are by no means won. As a Nation, however, we have made very considerable progress in cleaning up both our air and water.

This progress brings into focus a less visible, but more widespread problem, that of non-point sources of pollution, primarily runoff.

As farming has become more technological—and as our understanding of natural systems grows more complete—the relationship of non-point source pollution to water quality is becoming clearer. On the smaller scale, we must learn to control sediment runoff—from urban areas as well as agricultural ones. On the larger scale, we must protect entire watersheds and our underground water supplies.

Generally in the treatment of non-point source pollution in agricultural areas, voluntary cooperation will get the job done. Clearly there is a great deal yet to be accomplished. Thirty-seven States have already indicated to us that non-point source pollution could prevent attainment of the statutory goals of fishable, swimmable waters.

As an example of how a non-point source problem can be handled, I can report that as early as 1972, EPA funded what became known as the Black Creek project, through the Allen County soil and water conservation district in Indiana. The project was designed to assess and help solve the problems of sediment runoff in the Maumee River Basin. Careful assessment—supported by scientific help from a local university—proved that the major source of the water quality problem in Black Creek was restricted to a small portion of the land. The local farm community then cooperated by applying several traditional—as well as some innovative—approaches to solve the problem. One lesson everyone learned was that a solid assessment of the problem is a critical first step to solving it.

I might add, parenthetically, that runoff is not exclusively agriculturally caused. Poorly planned urban development, poorly managed construction, the paving over of our lands—are each, in their way, a real problem needing focus and attention.

A challenge we all face today is the control of toxic substances in our land, air, and water. Modern agriculture, like the rest of our civilization, has benefited greatly from chemicals that increase production. But we're going to have to face up to the fact that we are living in an age of industrial and chemical pollution—on the farm as well as in the cities—that is far more serious than anyone had imagined. As President Carter has said, "The presence of toxic chemicals in our environment is one of the grimmest discoveries of the industrial era." In the last few years science has been telling us in no uncertain terms that some chemicals, including some pesticides, have totally unexpected side effects which increasingly threaten human health.

The production of synthetic organic pesticides has risen 800 percent in the last 30 years. We, as a Nation, now use 1.6 billion pounds of these chemicals a year. Of course, there are also toxic chemicals that occur in nature. But whether created synthetically or naturally, it is essential that we do whatever we can to control them.

The alarming and steadily increasing rate of cancer in our society and the growing evidence that much of it may be induced by cancer-causing agents in our air, soil, and water, as well as in our workplaces, is alarming.

Congress responded to this threat by passing the 1976 Toxic Substances Control Act. EPA is now moving to implement that Act. In doing so, we are just beginning to define the dimensions of the problem—and those

dimensions are enormous. For example, we are now compiling an inventory of all chemicals presently in commercial production or use in this country. We started with an estimate that there would be 30,000 such chemicals. Today we are up to 70,000 and the list keeps growing.

Not all these chemicals are cancer-causing, of course. The list includes common, necessary items like table salt, but the point is that many of these chemicals are widespread in our environment, and some of them are dangerous.

Another major challenge facing the U.S. is the preservation of agricultural land.

All across the United States today, people—city people—are beginning to realize what farmers have known for too long a time. One of America's great resources is in danger: agricultural land is rapidly going out of production. More than one-and-a-half million acres are being lost each year. We simply cannot afford that. As Will Rogers once said, "The one thing they aren't making any more of is land."

The pace of suburbanization increasingly threatens farmland. With the growth of suburbia, too many farmers find land values, taxes, and the price of labor skyrocketing, making it almost inevitable that the only solution left is to sell their farms, causing the fabric of one farming community after another to be torn apart.

EPA has its own vested interest in this problem. The U.S. needs those farmlands, not only in terms of food production, but also for their value as natural filters and buffers. While EPA programs in the past have not always been sensitive enough to any potential adverse effects on farmlands, today we realize how valuable preserving farmland is to carrying out our own responsibilities.

Among other steps, we are:

Revising the construction grant program for building sewage treatment facilities so as to minimize the pressure to take farmland out of production.

Seeing to it that there is a thorough review of environmental impact statements on any actions that will affect agricultural lands.

Clearly, as the 208 planning program moves forward, some tough choices lie ahead—at the local, State and Federal levels. Even with the new monies that Congress has authorized, there will not be sufficient Federal funds to pay for the control of practices needed in every soil and water conservation district. We will need to encourage achieving the goals of the Water Act by voluntary means. If and when those means do not succeed, we need to ensure that there is an effective, reasonable regulatory back-up to get the job done in a timely fashion.

On the local level conservation districts in six States to date have played a crucial political role in shaping such fall-back regulatory systems. In another dozen States, conservation districts are now playing a major role in working out sensible regulatory procedures.

I believe that conservation districts are moving rapidly and effectively to enlarge their role. A quotation from Vance Ehmke, Newsletter Editor, Kansas Association of Conservation Districts, lays it pretty much on the line. What he says of Kansas conservation districts is likely to be true for many other States.

"Like it or not," says Ehmke, "Kansas Conservation Districts will have to face some tough problems in the next few years. The day of voluntary compliance by farmers in stopping erosion from their land may be drawing to a close.

"But let's face facts: No farmer is going to appreciate being told to control his non-point sources of pollution such as field runoff. Farmers are one of the most fiercely independent races of people on the face of the Earth. But there's not much of a correlation between independence and our pollution problem. And again, let's face facts: Silt and sedimentation are the biggest sources of pollution in this country." □

The Old Order Changeth

By Bob Bergland,
Secretary of Agriculture

I was born into a world in which there were no pesticides of importance. No chemical fertilizers of much importance. Not very sophisticated farming techniques. And now they're commonplace.

I can remember listening to a Secretary of Agriculture when he talked about exports of a billion dollars a year. That was 20 years ago. Now it's $24 billion and is our single most important export earner.

What has happened in agriculture since those days has provided us with a lot of creature comforts and security as well as problems most of us never could have envisioned.

Our views and opinions are shaped by what we have experienced in our lifetimes. I know mine have been. This is why, as Secretary of Agriculture, I have to support initiatives that answer today's needs.

This is not too difficult, since some of the frictions we so often hear about between groups are overdramatized. Farmers are not always at odds with environmentalists and, by any standard, farmers are environmentalists.

I've farmed all my life, and I've always regarded the consumer to be my customer—not my enemy. And this goes for all the large amorphous groups in our society that always seem pitted against one another.

We can act in the general good and frequently within the commonality of interest of many groups. This is certainly true of Agriculture and EPA. I know the relationship between the two agencies has been sometimes less than constructive in the past, but I see no reason for this.

When I came in we decided that it made sense to initiate an improved era of cooperation between Agriculture and EPA. We do have a constant need to sit down and work out our differences.

We have a liaison with EPA and we're improving upon that. I meet with Administrator Douglas Costle frequently and we have developed a good working relationship. Others in USDA work closely with the EPA staff on a regular basis.

We agree that the USDA role will be as advocate in formal review of pesticide use and other issues like it. We will present information on all the benefits that these compounds can produce. EPA will raise questions about costs and risks and we will comment on those. We both have the responsibility of presenting all the information possible for the experts to use in making their decisions.

USDA will be involved in the cancellation, reregistration and review of all pesticides. Of course, we will not be involved in initial registration because Congress delegates that authority to EPA. However, we and the Land Grant University cooperators conduct experiments in solving pest control problems, and that data is helpful in the registration process.

If a manufacturer has a compound which is advertised to control a certain pest, we'll comment on whether or not that pest is a serious problem, and probably on the economics of the losses. When we get into the cancellation and reregistration, however, we are involved deeply and we intend to get even more involved.

The challenge will be one of understanding one another and making progress against demanding schedules that have been set.

At times we will encounter situations in which a set course of action is prescribed with no room for debate. The Delaney Clause, for instance, does not give us any room at all. It says, in effect, that if any compound presents a potential cancer risk, under any circumstances, it is subject to being banned.

Congress may well re-examine the Delaney Clause to see whether it is properly constructed.

On the issues in which we have room to act, our counterparts in other departments will find us, I hope, knowledgeable and not restrictive in our approach to problem solving. I have brought people on board who understand what pesticides are all about . . . who understand environmental concerns . . . who understand the need for chemicals and the economics of the industry . . . who understand risks and benefits.

In December I announced the pest management policy for the Department of Agriculture. It reflects a broadened approach. It gives complete support to integrated pest management methods to control agricultural pests.

In terms of research this means strong support of work on resistant crop and livestock varieties, beneficial organisms, cultural practices and selective biological and chemical pesticides as well as other innovative methods, proven or potentially effective in controlling pests.

The policy also calls for cooperative projects to demonstrate the latest in pest management technology to all pesticide users, from homeowners to farmers.

Faced with high costs and sometime short supplies of chemicals and fuels, farmers are looking for ways to cut all necessary costs. They are receptive to the ideas of surveying pest populations, applying pesticides at times and in quantities just sufficient to do the job. They appreciate predator insects that feed on destructive agricultural pests.

At the same time the policy statement recognizes the need for pesticides in many IPM programs.

It does affirm our commitment to doing research and providing information that will help the everyday American who deals with pest problems, not just large operators. Finally, we confirm that in dealing with other countries we will be guided by the same concerns that guide our actions at home.

I feel that the USDA's pest management policies today are a reasonable progression from where we have been to where we are going. And we intend to keep abreast of the times by remaining flexible, practical, and reasonable on these issues. □

Edwin L. Johnson

EPA's Role in IPM

In Texas and California some cotton growers have cut pesticide use—and costs—in half. Out in Washington State a pea grower has young people counting the number of insects in a given area (usually several rows) before deciding whether or not to spray. In the East, apple growers and soybean producers are beginning to use biological controls on insect pests.

All of these persons are involved in the use of growing technology called integrated pest management (IPM).

IPM is a systems approach to pest management and a program that combines pesticide use with other pest control techniques. It is not a futuristic dream—it is here now."

What are the events that have brought about this increased interest in IPM? A quick look at the history of chemical use since World War II provides the answer.

Modern chemicals developed in the late 1940's gave the American farmer a means of controlling pests at low cost. Some of these chemicals provided spectacular results and were persistent enough to give long-term crop protection, causing many users to drop the more traditional preventive forms of pest control. This increased dependence on the use of pesticides had led to pest resistance, secondary pest problems, undesirable crop residues, and nontarget

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effects such as the killing of bees and other beneficial insects. Modern agriculture developed since World War II resulted in the use of pesticides as the major control tool available to pest managers, a tool which was successful and economical. Today, however, increased energy costs and environmental concern have required a shift in farming methods. It has been demonstrated that integrated pest management systems can operate under these new constraints while maintaining, and in some cases increasing, agricultural productivity.

Integrated pest management is an interdisciplinary approach to pest control, incorporating a number of the biological and farming sciences. It is a science in its own right, based on a knowledge of each pest, its environment, and its interaction with natural enemies. In addition IPM takes into account the crop being grown, cultural practices specific to that crop, and a consideration of all available tools to control the pest and produce the crop. Frequently the term integrated pest management is confused with biological control. EPA stresses that biological control is only one component of IPM. The agency also stresses that chemical pesticides often are part of a particular IPM strategy.

Integrated pest management is not new. The rapid development of numerous and relatively inexpensive pesticides after World War II put IPM on the back burner of American food and fiber production. Environmental concern, pest resistance, higher material and labor costs, and government regulations have brought it to the forefront in recent years.

IPM contrasts sharply with the currently more common practice of spraying "by the calendar" without first determining a need for such pesticide applications. In the allocation of resources, IPM offers the alternatives of more efficient pesticide use and reduced costs.

EPA was assigned responsibility by a 1975 amendment to the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) to make IPM information available upon request in cooperation with the U.S. Department of Agriculture. In response to requests to date, the Office of Pesticide Programs has developed and sent out thousands of copies of technical and nontechnical IPM publications to extension personnel, libraries, researchers, environmentalists, growers and the general public. In addition this office has conducted conferences, made speeches and is lending information and expertise to the production of an hour long television presentation of IPM to be aired in May of 1978 as part of the NOVA series on public television.

Farmers, ranchers, and homeowners are now asking for more and more information of IPM. EPA is working closely with other federal agencies to fill this growing need.

In addition to supplying information to the public, the Office is improving access to information pertaining to pests, pest control methods, and IPM, and developing improved processes for the registration of pheromones, hormones and other nonconventional means of pest control commonly employed in IPM strategies. It also is exploring incentives for increased private sector involvement.

Agricultural pest management decisions affect the environment, commodity production and production costs. While the pesticide user is motivated by profit, society is also concerned about adverse environmental effects. Congress has recognized IPM as a means of reducing the adverse effects of pesticide use.

The President has called for a national integrated pest management strategy. The Environmental Protection Agency will be working closely with the Council of Environmental Quality, the United States Department of Agriculture, the State Department's Agency for International Development, National Academy of Sciences, National Science Foundation, and with the private sector in response to the President's request.

IPM is not a return to the "bad old days" when little boys picked beetles off potato plants for a penny a jar. It is, instead, a move toward pest control that uses pesticides efficiently together with other methods to help us produce the food we need to the farmer's advantage and with a minimum impact upon the environment. □

Forum

This section of the magazine provides an opportunity for discussion of current environmental issues by authorities who may view them from different perspectives.

IPM Evolution or Revolution?

By James R. Mills

What is Integrated Pest Management (IPM), and what isn't it? You get about as many answers as there are people involved. Everyone has his own idea of what it should do. And therein lies one of the major difficulties which must be overcome if the notion is to achieve much of the promise which its proponents claim for it.

The big push for IPM at the Federal level results from a mix of different motives, some of which are philosophical, some political, some scientific, and in some instances, practical. This article is an attempt to address these and other aspects with a pragmatism which hopefully will shed more light than heat.

It came as a surprise to me when, in the early 1970's, IPM was unveiled as a "new approach to pest control" by a group within the USDA. During my college studies and the eight years following in the 1950's as a county agent, I had studied and worked with the practical matter of pest control. The terms and tools available included resistant varieties, crop rotation, cultural practices, hot water seed treatment, fly-free planting dates, physical barriers, harvest dates, hosts and alternate hosts for both pests and beneficial species, timing of sprays, harvests, and the like.

Later, as both a working newsman and as the news editor at the Ohio Agricultural Research and Development Center, I followed and reported on new additions to the "package of practices" made possible and available to farmers and growers through basic and applied research. Throughout the entire period I remained a practicing conservationist, and continue to do so. This is not a dichotomous position; all things are related and are not mutually exclusive in a biological and scientific sense. One needs to recognize the legitimacy of each concern. With this in mind let's look at Integrated Pest Management to see if we can gain some perspective.

Pest management has been a constant concern of the farm community for many years. The ability to control (or not to control) a wide variety of crop pests has left

an indelible mark on recorded history. It is generally accepted that the main difference that sets U.S. agriculture apart from that of most other countries is the traditional freedom of choices a farmer in this country could make to manage his resources.

The big element in whether he will or won't use new ideas or technology is whether it has a practical use on his farm and how it may fit into his system. As a sharp manager he is interested in whether he can reduce costs without sacrificing yield; whether he can increase yields through more efficient allocation of inputs; and since his income is dependent upon both yield and quality, the net impact on final yield and grade of whatever crop he is growing.

IPM as a philosophy for pest control is naturally appealing to a large number of people for a variety of reasons. The environmentalist is offered the hope or promise of reduced use of pesticides; the farmer may see a chance to reduce costs; the scientist, the possibility of more dollars for his own area of research; and the politician a chance to identify with a popular cause. Such appeals are understandable. But they may have led to a level of rising expectations well beyond the ability of the IPM program to produce.

Agricultural practices, including pest management techniques, are not haphazard acts. Rather, they are simply management tools which a farmer adapts to his operation after long-term scientific research indicates to him that a particular tool may fit his local conditions. This is a necessary arrangement by which the farmer tests the effectiveness and dependability of a technique, year in and year out. Practices don't change overnight. Many years are usually needed to apply the "test of time." The farmer has only a few months out of each year to experiment, and to find out what works best in his fields.

Those who would have sudden changes imposed upon farmers for various reasons might well place themselves in his position. Standing in his shoes, you can see that his crop yield and quality represent his only source of income, interest on a substantial investment, retirement, social security, unemployment insurance, and education for his children. Farming is already enough of a gamble that the farmer has been called the eternal optimist, putting substantial investments in the ground each Spring and praying that weather and environment don't combine to cancel out all his efforts. His payday, so to speak, comes with the harvest, rather than once a week or once a month. Quite candidly, there is every reason why the farmers of the country might not be expected to jump on the IPM bandwagon until they are sure that it fits their needs. Results with a single insect species in an orchard are not equatable to other species in corn, soybeans or cotton.

Despite its popular appeal, the fact of the matter is that the concept, while promising, is still pretty much in its infancy in the minds of most researchers and farmers. Too much so to risk the fate of a crop on it. And this is a normal state in the orderly advance of science and agriculture.

Singh (1971), an agricultural banker, stated the danger of bringing precipitous change to agriculture when he stated that "... in evaluating an agricultural problem it is vitally important to be acquainted with many disciplines because inadequate advice is not much help to the farmer. Quite often the expert's opinion is exaggerated.

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The Future of Integrated Pest Management

By Carl B. Huffaker

Agriculture is our most important endeavor. It enables us to feed, house, and clothe ourselves. (Other endeavors participate in satisfying these basic needs and in elaborating our lives beyond them.) Agriculture, which includes forestry, has also become our mainstay in helping to alleviate the acute problem with our international balance of payments deficit.

The American farmer has proved to be the world's greatest innovator in the production of food and fiber crops. No other country comes even close to our own in production per man engaged in agriculture. Much of the phenomenal gain in production per acre and per man hour engaged since World War II has been occasioned by increased use of fertilizers, use of better varieties, improved and expanded irrigation, heavy use of pest-control chemicals and by improved mechanization, which has enabled better timing of plantings, cultivation, and harvesting, and at the same time has reduced the labor and labor costs involved.

Much of this gain has been claimed to be due to increased use of better pesticides than we had before. The USDA has estimated that if no pesticides were used the American farmer would lose some 70% of his production to pests. On the other hand, Professor David Pimentel of Cornell University has estimated that, with various reallocations in land use and the growing of less susceptible crops or the same crops in less susceptible areas, etc., the agriculture losses from deleting all pesticides would be far less than this—in fact, only about 16%, but with much heavier losses than the average for such crops as the deciduous fruits, potatoes, and cabbage. These two estimates illustrate the broad gap that exists in our thinking and our facts relative to the need for, and value of, using pesticides. I will not, however, try to ascertain which estimate is nearer the truth. The fact remains that we cannot afford to

Dr. Carl B. Huffaker of the University of California has had the lead responsibility for a national integrated pest management program supported by the National Science Foundation, EPA, the U.S. Department of Agriculture and 18 universities.

delete the use of pesticides, except perhaps for some crops and areas, even if Pimentel's estimates were more nearly correct.

It is clear, however, that reduction in the use of pesticides is both highly desirable (even demanded by an aroused public) and practical. It is desirable because the farmer cannot afford to apply these chemicals at their current costs and levels of use, because excessive use itself creates the demand for still heavier use (since natural enemies are killed off) and because it endangers the health of our workers and the public in general, threatens our wildlife and domestic stock and contaminates our air and water. I will not go further into these items—it is the old refrain again. Reduction of pesticide use is practical because equally good or better, and often less risky and more enduring pest control can be achieved with less use of pesticides. I do not say *without* use of pesticides, or by use of *alternatives* to pesticides. By and large, pesticides will continue to be required for many, if not most, of our pest control problems. They are our most reliable solution for an *immediate* problem. Alternative tactics will furnish a complete solution for the whole complex of pests on a crop for only a minimal number of situations.

But by employing pesticides judiciously and selectively, their use can be made to augment the control that can be had by use of such alternatives—perhaps not for some pests, but more generally, for the whole complex of pests on a given crop. The overall pesticide reduction possibilities are readily apparent, and many programs illustrating such have already been proved to be economical for growers. This has been accomplished by utilizing a truly new approach, a new technology of pest control, which is fast becoming a new technology of crop production—integrated pest management in the full sophisticated sense.

How did this come about, and where is it going? I must deal briefly with the general justification for establishing a program to gain the necessary information and scientific basis for IPM. This requires a brief discussion of the familiar dilemma with respect to the need to produce increasing quantities of cheap food and fiber in ways that are not in the long run counterproductive through breakdown of effectiveness, escalating costs, or hazards to public health and the environment.

Shortly after World War II pest control had shifted largely from a biological discipline to a chemical one. This era of such dependence on pesticides provided, indeed, spectacular insect control. There was also effort to develop crop varieties concentrating only on high yields, with disregard for resistance to insects. Both of these "advances" with time came up short, as you have often been told. Neither has rested on the broad ecological dictum of considering the whole interacting system. One reason is that scientists are by nature specialists and individualists; we like to do our own thing. To a regrettable degree individuals, departments of research and extension in the same university and to a greater degree those in different universities, have concerned themselves very little with what the others were doing. A major objective has been to bring diverse expertise and institutions to bear on the common problem(s). A second major objective has been to develop a deeper appreciation of the complexity and integrity of agricultural ecosystems and their processes.

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Integrated Pest Management From Concept to Reality

By Steven D. Jellinek

Integrated Pest Management (IPM) is not new. IPM methods of one kind or another have been used for years —and farmers tend to get a little annoyed, and understandably so, when government bureaucrats talk about "integrated pest management" as if it is the first agricultural improvement since the horse-drawn plow.

Ecologically oriented pest-control strategies were pursued in the United States long before today's widespread use of petroleum-based pesticides. Entomologists working on the boll weevil during the first few years after its invasion into this country from Mexico in the early 1890's for example, made exceptional contributions. Without insecticides, they employed tactics that included use of resistant varieties, phytosanitation practices, and various biological controls. While we do not know how effective this system was by today's standards, it was effective enough to be used even after calcium arsenate was introduced in the early 1920's.

As we all know, the advent of petroleum-based pesticides, along with aerial applications, halted or greatly reduced the use of ecologically oriented pest control techniques in cotton and other crops.

Today, there are some very good reasons for us to take a new look at some of these past practices to control pests and stimulate agricultural production and productivity. We are beginning to see that there are limits to the advances that chemical pesticides have created. IPM techniques—vastly improved and expanded in recent years—offer one way to go beyond these limits, to better serve a world that is constantly in need of more food.

A number of factors suggest that there are sound economic, social, agricultural, and public health reasons for exploring and utilizing alternatives, substitutes, and supplements to petrochemical-based pesticides:

• First, petroleum-based pesticides have become, and will continue to be, dramatically more expensive. Eighty percent of the billion pounds of pesticides used in the United States each year are petrochemically based—that is, the active ingredient is a petroleum derivative. This figure does not include pesticides whose production or extraction processes require petroleum-based solvents, nor does it account for the use of petrochemicals as "inert" ingredients in non-petrochemical pesticides.

• Second, the ability of pests to develop resistance to chemicals continues to erode the effectiveness of conventional pesticides. As California farmers know very well, scores of insect species no longer succumb to the chemicals that were originally designed to eliminate them. Other pests have become economically important because chemicals have eliminated their natural enemies.

• And third, there is growing public concern over health and environmental hazards resulting from the extensive

Steven D. Jellinek is EPA's Assistant Administrator for Toxic Substances. This article was excerpted from a speech Jellinek gave on Dec. 6, 1977, to the State of California Integrated Pest Management Conference.

use of chemical pesticides. Science is improving our ability to identify and quantify these health and environmental risks, thereby generating a constantly growing body of hard evidence to back up this public concern.

EPA, under the Federal Insecticide, Fungicide, and Rodenticide Act and the new Toxic Substances Control Act of 1976, is firmly committed to reducing the serious health and environmental risks created by hazardous chemical substances.

President Carter's Environmental Message said:

"The presence of toxic chemicals in our environment is one of the grimmest discoveries of the industrial era. Rather than coping with these hazards after they have escaped into our environment, our primary objective must be to prevent them from entering the environment at all."

IPM is an important component in these goals. It is an environmentally protective approach to meeting our needs for food and fiber. It is an approach that emphasizes the use of natural control factors and de-emphasizes the rote use of chemical pesticides. It does not mean the elimination of chemicals from the farmer's battery of tools to control pests. It does mean emphasis on using a variety of tools for pest *control*—not pest *eradication*.

Some people contend that the IPM revival is simply a return to past practices that cannot meet today's needs. Those who question the current interest in IPM development charge that its proponents are rediscovering techniques that many wise farmers have known about for years, and that farmers do not want to go back to methods that were overtaken by the development of effective and economical pesticides.

The present concept of IPM, however, does not mean a return to the hoe and mule.

As an advanced scientific system, IPM relies on the best experience of many disciplines to develop modern pest management strategies that are practical, effective, economical, and protective of both public health and the environment. Classical farming practices such as use of pest-resistant varieties, crop rotation, irrigation techniques, and tilling methods certainly are important components of IPM. But these techniques must be coupled with modern strategies possible through sophisticated scientific, economic, and technical skills.

Foremost among these new strategies is awareness of the status of each pest problem at a given time. The temporal and localized nature of pest management programs require a carefully tuned and sensitive approach that uses knowledge and information about the pest itself, the condition of the host, the prevailing climatic factor, the potential for biological and natural controls, and the proper timing of chemical application.

While we still have a lot to learn from research, many of the means necessary to implement IPM strategies are available and are being used. Others will become accessible in the near future. But none of this will count if farmers fail to adopt IPM techniques and instead rely wholly on chemicals as crop "insurance." Farmers are realistic business people. They need hard evidence from a credible source that IPM will produce adequate pest control and be economically feasible. The evidence is there, and it is growing.

The fact is, integrated pest management programs, employing IPM consultants, almost always save growers more money in insecticide application costs, as opposed to conventional chemical control, than the cost of their services.

Large-scale field programs have demonstrated the practical feasibility of using IPM on major agricultural crops. These have demonstrated that there is no reduction in crop yield or quality, and that greater net profits can be realized than would have been possible with conventional pesticide-control programs.

Other, more recent examples illustrate that IPM is more effective, less costly, and less hazardous to people and the environment than pesticide-based, conventional pest-control strategies. But IPM development and implementation continue to move at a snail's pace. Only a small percentage of U.S. farmers have adopted modern IPM technology. For the most part, IPM has been used only in areas where high levels of insecticide resistance have developed in insect pests, thereby forcing farmers to seek alternative solutions to conventional pesticides.

A variety of factors contribute to this slow development and implementation. Although many researchers have made significant contributions to IPM, there remains a widespread lack of understanding and support for multidisciplinary IPM research and for companion educational and demonstration programs. Also, there still are a number of major crops for which reliable IPM techniques have not been developed. This work will require more researchers, educators, and others who really understand the IPM concept.

Even when an IPM strategy is developed, it is very difficult to translate its advantages and necessity to farmers and others, including commercial credit institutions, who often remain bound to chemical control techniques by faith and tradition. Many perceive the risk from pest damage to be much higher than is warranted by actual circumstances. They continue to use pesticides on a preventive, often needless schedule as a form of insurance rather than risk making a wrong decision based on actual need. This use is fostered by those who traditionally provide the information that growers use to make decisions on pesticide use.

As a former employee of the Council on Environmental Quality, I have been interested in IPM since the Council's 1972 report on the subject. At EPA, I am now able to help implement the concepts and policies recommended in that report and by CEQ's forthcoming new report on IPM. I am looking forward to working with CEQ, the U.S. Department of Agriculture, the land-grant university system, and the States in promoting the adoption of integrated pest management. □

Guarding Against Cancer

by Dave Cohen

One of EPA's most difficult tasks is the responsibility to protect the American people from possible long-term health hazards, including the risk of cancer, which may be involved in the use of certain pesticides.

To date, EPA has cancelled some or all uses of the pesticides DDT, Aldrin, Dieldrin, and Mirex, and temporarily suspended uses of the pesticides Heptachlor, Chlordane and, most recently, DBCP. In each case, at least part of the reason leading to the government's action was the belief that the pesticide in question could cause cancer in some proportion of the general population.

How does EPA arrive at this conclusion, and how accurate is it? Furthermore, how does EPA go about deciding what the fate of a given substance should be, after being confronted with evidence that it might be carcinogenic?

Dr. Elizabeth L. Anderson, Executive Director of EPA's Carcinogenic Assessment Group, an advisory body which assesses the possible health risks of suspect carcinogens entering the environment, states: "In general, two decisions must be made with regard to each potential carcinogen. The first is whether a particular substance constitutes a cancer risk. The second decision is what regulatory action, if any, should be taken to reduce the risk.

"The laws which EPA enforces," she explained, "are significantly different from the Delaney Clause in the Food, Drug and Cosmetics Act which provides for the mandatory prohibition of *any* carcinogenic food additive."

It was the Delaney Clause which recently attracted public attention when the Food and Drug Administration proposed banning saccharin, the artificial sweetener.

"EPA's approach to regulating suspected carcinogens, such as those in the area of pesticide compounds, involves weighing all major considerations," Dr. Anderson explained. "The Agency emphasizes that every effort must be made to reduce environmental contamination by carcinogens to the lowest level while taking into account the social and economic impacts of that action."

For example, last December EPA called for a formal review of the pesticide ethylene dibromide, or EDB, which has been used in several ways in the U.S. since the mid-1950's. It is injected into the soil to control destructive roundworm "nematodes" before planting peanuts, tobacco, and vegetables such as tomatoes, lettuce, carrots, string beans, and potatoes. It is also used to fumigate vegetables, grapefruit and other citrus crops in California, Florida, Hawaii, and Texas in order to destroy fruit flies. And it is applied to grains in storage elevators to eliminate weevils, borers, and other bugs.

Preliminary studies show that the ban of EDB could result in an estimated grain loss valued at $249 million per year, boost tobacco growers' pest control costs by $3.3 million per year, cut peanut farmers' yields and increase pesticide costs by $608,000 per year, increase vegetable farmers' cost for substitute pesticides $10 to $20 per acre, and prohibit shipment of fruit and vegetables worth $43.3 million per year in interstate commerce or overseas for fear of increasing the range of certain harmful fruit flies. (At present, several foreign countries, including Japan, will not accept U.S. fruit not treated with EDB, and no substitute compounds now exist to fumigate stored citrus.)

These are the social benefits and economic impacts associated with EDB. But weighing against use of this chemical are these findings: A National Cancer Institute study conducted from 1972 through 1974 showed that EDB, when introduced into the stomachs of mice and rats, caused stomach tumors that spread to other organs. Also, experiments have indicated that the chemical can damage the genetic material in bacteria, plants, insects, and mammalian cell cultures. And U.S. and Israeli studies conducted over the past 20 years show that bulls and rats exposed to EDB suffer temporarily lowered sperm levels or sterility.

EPA has several options when confronted with evidence of a potential adverse health effect. Short of drastic action—suspension—EPA has developed a review process which is designed to hear all sides of a question regarding any potential risk. The pesticide can be used during the review period. All segments of society—agriculture, industry, environmentalists, consumer groups, etc.—are welcome to participate in this review process. EDB is presently the subject of this type of review.

"This review process—technically called a rebuttable presumption—does not constitute a ban," said EPA pesticides chief Edwin L. Johnson. "We publicly announce the potential hazards of the chemical, in this case EDB, which have been indicated by laboratory tests. At the same time, the makers and the users of the pesticide are given the chance to challenge the studies' validity, submit information about human exposure, and cite the pesticides' merits and advantages. While the review is in progress the product may continue to be used and sold.

"Then," Johnson stated, "we must decide what actions to take regarding the compound. Through information gathered in its review process, EPA hopes to reach regulatory conclusions on EDB and other pesticides that may pose some degree of cancer risk."

Often, a significant part of the information which the Agency must review involves the results of testing laboratory animals.

The initial determination that a substance is carcinogenic is a difficult task. Obviously, testing suspected cancer-producing chemicals on humans is not feasible. Furthermore, the latency period for cancer in humans can be as long as 50 years. Thus, scientists have turned to animals to help them assess what substances might cause cancer.

"With present methods, we cannot be absolutely certain," said Dr. Roy Albert, who is Chairman of the Carcinogenic Assessment Group, and Deputy Director of the Institute of Environmental Medicine, New York University Medical Center. "The best available evidence that an agent is a human carcinogen is provided by adequate epidemiological data backed by animal tests.

"We do know this much: Most substances known to cause cancer in humans will do so in animals. On the other hand, substances that are not carcinogenic usually do not cause cancer in animals. The number of substances that cause cancer in lab animals is small compared to the total number which have been tested.

"Admittedly, our methods are not perfect. But animal testing is still the best red-flag alert regarding a substance that might cause cancer," Dr. Albert said.

EPA has published guidelines for carcinogenic risk assessment. "The development of these guidelines," Dr. Anderson explained, "is independent but complementary to those of the National Cancer Institute. Their

Dave Cohen is an Assistant Editor of EPA Journal.

report recognizes the complexity of the problem of characterizing agents as human carcinogens. It points out the 'lack of absolute certainty in identifying an agent as a human carcinogen from animal data.' This approach corresponds to the EPA's 'weight of evidence' approach in which the evidence is regarded as a warning signal."

The preamble to EPA's formal cancer assessment procedures states that "cancer is the second-ranking cause of death in this country; it has a particularly severe impact on the affected individuals and their families in terms of physical and mental suffering and economic costs.

"There is evidence that a substantial amount of human cancer is caused by chemical and physical agents in the environment . . . (Scientific) programs, currently testing hundreds of substances, are beginning to show that some important industrial and agricultural chemicals are carcinogens for animals and are, therefore, candidates for regulatory actions."

The American Cancer Society estimates that one in every four Americans now living will develop cancer, and only about one third of those who get it stand a good chance for survival.

Are some of the seeds of cancer being sown down on the farm, or is the Environmental Protection Agency creating needless economic hardship through its pesticide control program?

In the words of Edwin Johnson, "For any pesticide which may require an official review, EPA wants all viewpoints to receive full consideration. In the end, the buck stops with us and we must make a decision. The bottom line is that there is no easy way out." □

Animal Tests and Human Cancer

Dr. Richard Bates, the Food and Drug Administration's Associate Commissioner for Science, was recently interviewed in FDA Consumer magazine on the significance to human health of animal tests for cancer. The following excerpts are from that article.

Even if tests in animals are necessary, isn't it a big leap to use information from rat tests to say what may happen in humans? Rats and man, other than being mammals, differ in important ways. What meaningful information can we learn from rat studies?

A lot. We human animals share basic biological mechanisms with other animals, and apparently one of those basic biological mechanisms involves getting cancer. Insects get cancer, fish get cancer, plants get cancer. And cancers in laboratory animals are essentially the same as cancers in human beings. Also, with the possible exceptions of arsenic and benzene, all substances known to cause cancer in people also cause cancer in laboratory animals. We can't purposefully set up an experiment to see if substances known to cause cancer in animals also cause cancer in humans, but it would be foolhardy to assume they won't.

Rats and humans have similar genetic mechanisms and generally similar enzyme mechanisms to deal with foreign chemicals such as those associated with cancer. Even bacteria have genetic mechanisms so similar to humans that they are being used in a new test for chemicals. If a chemical causes the bacteria to mutate, there appears to be a strong possibility that the chemical may be cancer-causing.

Isn't it a fact, though, that if you overload any animal's system with a chemical, you are going to find cancer? Isn't it just common sense that too much of anything will give you cancer?

It's common sense that the world is flat too. And this business about too much of anything giving you cancer is like a flat world: it won't hold water. Thousands of substances have been tested in huge amounts in animals. Too much will kill the animal. But only cancer-causing substances cause cancer. Other things will poison an animal or a human, but won't cause cancer. A study sponsored by the National Cancer Institute tested 120 pesticides and industrial

chemicals in mice at high doses. Only 11 were found definitely to cause tumors. And these chemicals were not randomly selected. The majority of them were picked because they already were suspected of causing cancer. Despite this, and despite the very high doses fed the mice, most of these suspected cancer-causing chemicals did not cause cancer. Other studies have supported these findings that high dosage alone will not cause cancer.

But why feed these animals so much? It just seems that giving them such extraordinary large amounts can't produce findings useful to humans.

Using high doses is the only really practical way to determine if a substance will cause cancer in a small proportion of the people who use it. You see, if we assume that a low dose of a chemical might cause cancer in one out of every 100,000 humans or animals, then a test to detect this one cancer could take as many as 100,000 animals, even more. Now I realize that one in 100,000 sounds like an insignificant number, but that works out to 2,000 cases of cancer in our total population of more than 200 million.

Obviously, a test with 100,000 animals would be impractical. There aren't enough animal breeders, tissue examiners, time, or money for that kind of job. What scientists can do, however, is use a smaller number of animals and increase the dose of the chemical being tested. Roughly speaking, if you use ten percent of the numbers of animals that would give meaningful results at a low dose, then you must increase the dose by ten times to make up for the smaller number of animals and get results that are statistically meaningful. This gets results faster and at an acceptable cost. The method works because of the shorter lifespan of a rat—about 2 years—and the faster rate at which animals metabolize and excrete a substance in comparison to man.

But how can these animal tests using large doses of a chemical be relevant to humans who use much lower doses of something like saccharin?

It is true that there is no way of predicting, exactly, on the basis of animal tests, how many humans will develop cancer from using a given product, but there are methods by which scientists can make estimates. (In the case of saccharin, FDA scientists calculate that even moderate use of saccharin over a lifetime by every American might lead to the possibility of up to 1,200 additional cases of bladder cancer a year. With thousands of Americans dying from cancer every day, this additional risk is one we can do without).

There is something else that should be kept in mind. That is that experimental animals get a special kind of treatment, something humans do not. Only healthy animals are used in laboratory tests; they live in a protected environment and are well fed. They are usually exposed to only one suspect chemical.

Dr. Richard Bates

Most humans, on the other hand, do not live in sheltered environments, without stress and with a guaranteed snug bed and nutritious three squares a day. Our population includes the ill and the weak—people who would be comparatively more susceptible to cancer than test animals. And we are exposed to not one, but many environmental dangers, some of which may interact to multiply our risk of cancer. So this is another reason to pay careful attention when we find that any chemical, regardless of dose, causes cancer in test animals.

You say "regardless of dose," but I still can't keep from thinking that there is a relationship between the dose of a chemical and its ability to trigger a cancerous reaction.

To a degree it does depend on how much. If you decrease the size of the dose of a cancer-causing substance to which people are exposed, fewer of them will get cancer. The rub is we can't guarantee that even if we keep lowering the dose no one will get cancer. When you are dealing with cancer-causing substances science has yet to find a dose small enough—what might be called a no-effect dose level—that we are certain that no cancer will be caused.

Which means what?

It means that although it may seem logical that a threshold should exist below which even the most potent cancer-causing substances would be harmless, there is simply no theoretical or experimental basis to support this theory. Life would be much simpler for those of us who seek to determine the relative hazard of chemicals and to devise regulations if there were firm no-effect levels for cancer-causing agents. But there simply are not.

Well, if you use a high dose, then, and no cancer shows up, haven't you proved that the substance being tested obviously does not cause cancer?

That seems logical too, but unfortunately the situation is a bit more complex. A negative finding in one species does not prove that the substance is harmless for all species. Let me give you an example. A chemical being developed as an insecticide, 2-acetylaminofluorene, was tested on guinea pigs and found to be harmless. In contrast, rats given the chemical developed cancer. It was found that the chemical needed to be metabolized (broken down in the body) in a certain way in order to cause cancer. Rats metabolize it in this way; the guinea pig has another way of metabolizing it. It should also be noted that man metabolizes this chemical in the same way as the rat.

Now, if those testing the chemical had been content to rely on one species, the guinea pig, this really potent substance would have been given a clean bill of health. Thus, when we hear that saccharin doesn't appear to cause cancer in some primates, we cannot take this information and say it proves that the substance will not cause cancer in man.

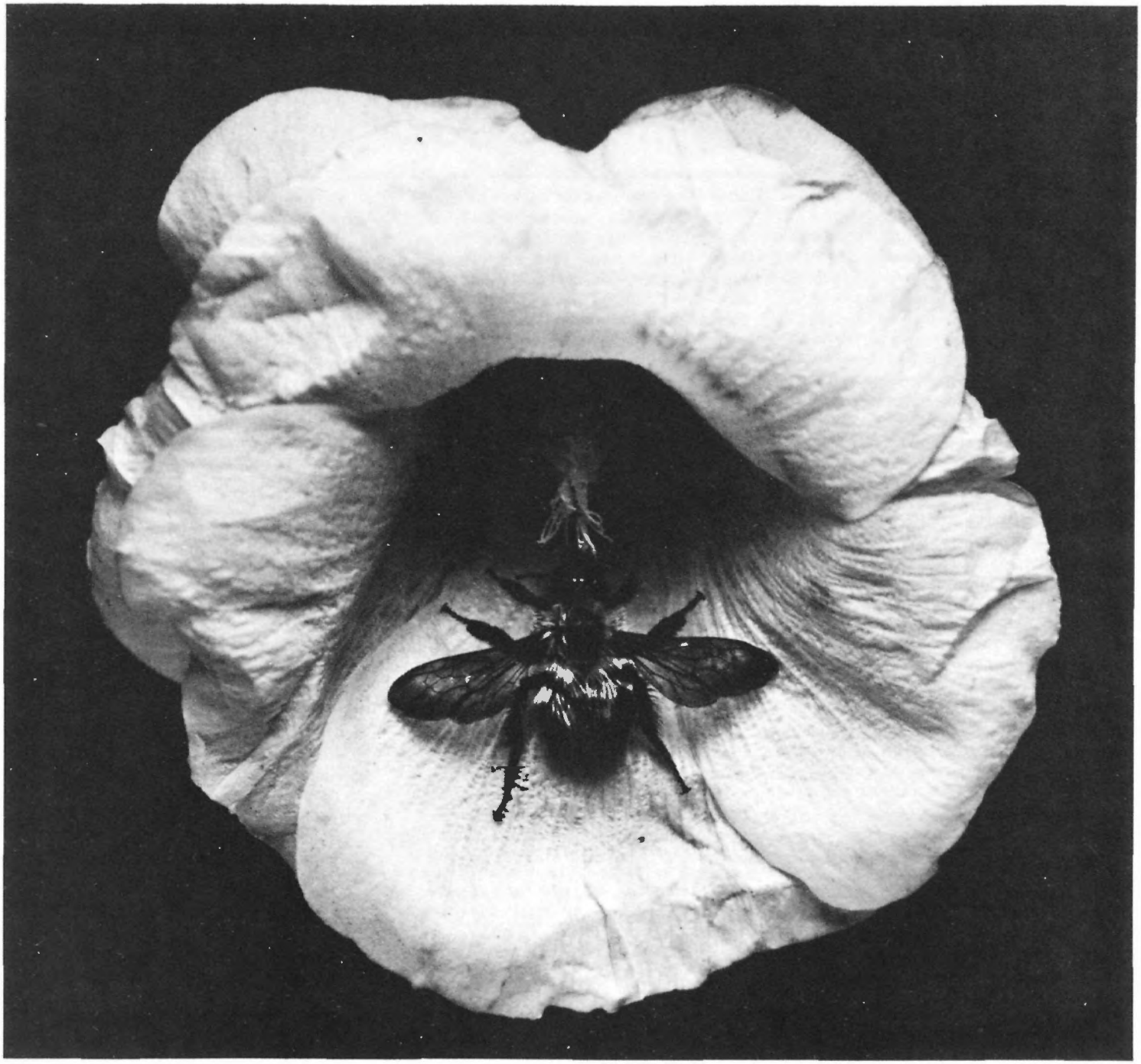
Are animals more susceptible to cancer than humans?

Given the great variety of species of animals and types of cancer as well, it would be impossible to give a simple yes or no answer to that question. There is no doubt, however, that cancer is one of our most serious human health problems. Dr. David Rall, director of the National Institute of Environmental Health Services, says the fact that 385,000 people are dying from cancer a year is telling us something. It is telling us that, for many people, the body's ability to deal with and eliminate or neutralize cancer-causing chemicals is being overwhelmed. There are too many of them. They overload the body's defense mechanisms.

So, all these points, together with others I mentioned earlier, add up to the fact that we must not take it lightly if we find that any chemical causes cancer in test animals. □

Truman Temple

Pesticides and Bees



"The public will become aware of the problem when apples start costing $15 apiece."

That's the way one beekeeper sums up a controversy now raging between the honey-producing industry and users of pesticides that are allegedly destroying bee populations across the land. Because many crops depend on pollination by bees, some observers fear that excessive bee mortality will bring food shortages and higher prices.

Bees are in danger for a variety of reasons. Their habitat is being disrupted and in many cases destroyed by the spread of urban development and highways. They are afflicted like other beneficial insects by environmental pollution. In recent years, they also have been killed off in large numbers by the use of pesticides.

Bees are the foundation of an industry that most people take for granted but which makes a major contribution to our food in unseen ways. There are more than 210,000 beekeepers in the United States. Most of them—about 200,000—are

Continued on page 39

Truman Temple is Associate Editor of EPA Journal

Fooling Insects

By Larry O'Neill

The technique of using an artificial sex perfume to confuse amorous male moths will help protect the U.S. cotton crop from one of its worst pests.

The moths in this case are the pink bollworm, whose young are proficient destroyers of southwestern cotton. The pheromone or man-made sex scent technique for controlling them has been field-tested for safety and effectiveness and registered by the Environmental Protection Agency to allow commercial marketing.

The artifical sex allure is used to distract the male moths and keep them away from fertile females.

The pheromone, made by the Conrel Co. of Norwood, Massachusetts, serves to exemplify an increasing number of pesticides that curb unwanted species by disrupting their life cycles or afflicting them with large doses of natural diseases.

These pesticides include genuinely natural substances, such as insect viruses, diseases, and pathogenic fungi, and man-made counterfeits such as the pheromone described above.

No single label may adequately describe all of them They are sometimes called "natural controls," sometime "biologicals," and at other times "third generation pesticides"—the first two generations being a handful of compounds developed around the turn of the century, such as the copper-based "Paris Green," and the multitude of chemical pesticides created after World War II, of which DDT is probably the best known example.

Whatever you call them, these newer pesticides have major environmental advantages over the numerous persistent, broad-spectrum compounds, such as DDT, chlordane, and dieldrin, that have dominated U.S. pest control. One observer compares natural controls to conventional pesticides as using "a rifle with a telescopic sight versus a shotgun."

But natural pesticides are not necessarily a panacea. They do have some drawbacks.

Conrel's pheromone, trade-named "Gossyplure," illustrates both the promise and problems of these pesticides that fool insects.

For example, Gossyplure, like certain other biologicals, is extremely specific in the types of insects it affects. In fact, it affects only one: the pink bollworm.

As a result, it appears to do no harm to beneficial insects that may themselves prey upon the worms. In addition, the scent appears to cause no ill effects in people.

On the other hand, this specificity may be a bane as well as a boon.

"In some cases, a biological's effectiveness against only one or a few pests results in a limited market," according to EPA's Jim Touhey, Chief of Pesticide's Efficacy and Ecological Effects Branch.

"This in turn can make it difficult for the developer to recoup his research investment and the money spent in conducting the various safety tests required by EPA for registration. Some type of assistance, government or otherwise, may be necessary to encourage new products in this area."

Another difficulty of third generation pesticides is that special knowledge and care are sometimes needed to make them work. Take for example "Altosid," a chemical cousin of a natural mosquito hormone manufactured by the Zoecon Corp. of Palo Alto, California.

Altosid will not kill just any mosquito at just any time. Rather, to be effective, it must be applied to breeding waters of the "floodwater mosquito" (a major variety) during certain stages of it progression from a worm-like larva to a winged adult. During these times, the hormonal action of the pesticide will deform juvenile mosquitos so that they soon perish. It will not even slow down an adult mosquito.

Finally, certain natural controls may not be able to entirely substitute for more toxic chemicals. Rather, the two must sometimes be combined in a type of pest control called "integrated pest management." For example, Gossyplure alone would probably not control pink bollworms over an entire cotton season to the point where no other pesticide treatments were needed. But it ought to reduce the frequency of these treatments, thus providing an additional measure of human and environmental protection. Similarly, insect scents used to trap pests in the field can provide an index of pest build-ups so that pesticide sprayings

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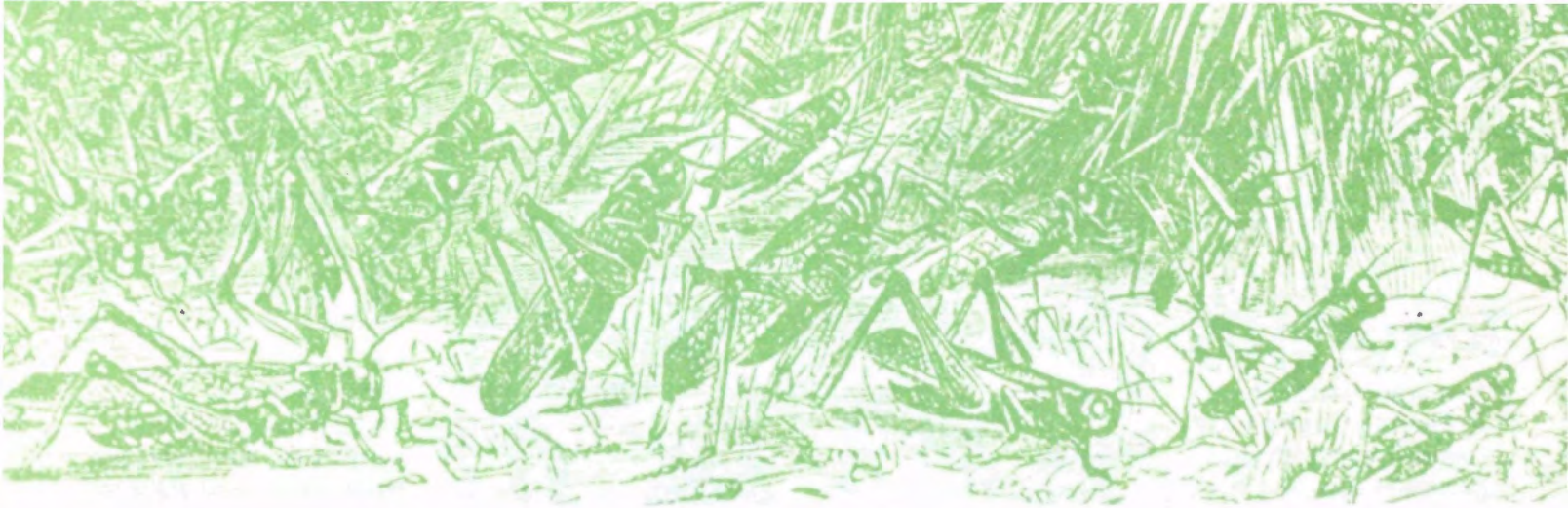


can be properly timed and limited to those areas that really need them.

Martin Rogoff, an EPA Associate Division Director in the pesticides program and a former developer of viral and bacterial insecticides, said that "increased acceptance of biologicals may depend upon farmers and commerical users changing their understanding of and attitudes toward pest control.

"Growers are used to spraying a field and watching the insects drop shortly afterward. But because they operate on natural principles and are not fast-acting poisons, natural controls may take several days to decimate a pest so that growers notice fewer of them."

"This is not to say that biologicals, be they natural substances or man-made copies, are inferior to conventional pesticides," he noted. "A farmer's bottom line is crop yield and profits. Biologicals have demonstrated that they can put money in growers' pockets."

Advocates of natural pesticides can point to an impressive performance on their part. For example, the granddaddy of biologicals—"Bacillus popilliae," better known as milky spore disease—has been a major weapon for reducing populations of ornate but destructive Japanese beetles in this country.

Identified by the U.S. Department of Agriculture and first marketed in 1939, milky spore disease disrupts the equivalent of a blood system in ground-dwelling Japanese beetle grubs. This is a genuinely natural pesticide consisting mainly of ground up infected grubs. It is applied as a dust on residential and park property. It is not widely used in agriculture since plowing stirs up the soil too much to make milky spore effective.

This beetle illness has never been noted to cause problems in people or other forms of life.

Another insect bacterium, "Bacillus thuringiensis" or BT, does not fit the mold of a one or two-pest biological. First marketed by the Nutrilite Co. of Buena Park, California, BT is now approved for use against more than 30 caterpillar pests all of the same insect order.

Crops treated with this disease agent include alfalfa, corn, celery, beans, broccoli, cabbage, cucumbers, peas, potatoes, soybeans, and tomatoes. Several BT products are available for backyard flower and vegetable gardeners including "Dipel," "Thuricide," and "Biotrol."

Two other natural controls now registered by EPA are insect viruses of a type called "nuclear polyhedrosis."

One kills cotton bollworms and budworms, which along with boll weevils, are the major scourges of cotton in the Southeastern U.S. But this virus, developed by Sandoz, Inc. of Homestead, Florida, was dealt a setback about two years ago when the chemical pesticide with which it was to be combined was taken off the market by its manufacturer as a possible human cancer threat.

The U.S. Forest Service developed the other virus to control the notorious Douglas fir tussock moths that reach epidemic proportions in the Northwest every five to ten years. The caterpillar young of this insect can strip the needles off commercially valuable fir trees to the point where the trees weaken and die.

The last major moth outbreak in 1973 caused $77 million worth of timber damage, according to the Forest Service.

Approved in 1976, the virus should help eliminate any future repetition of the 1974 emergency in which EPA allowed use of the cancelled pesticide DDT against the moths because no effective substitute was available.

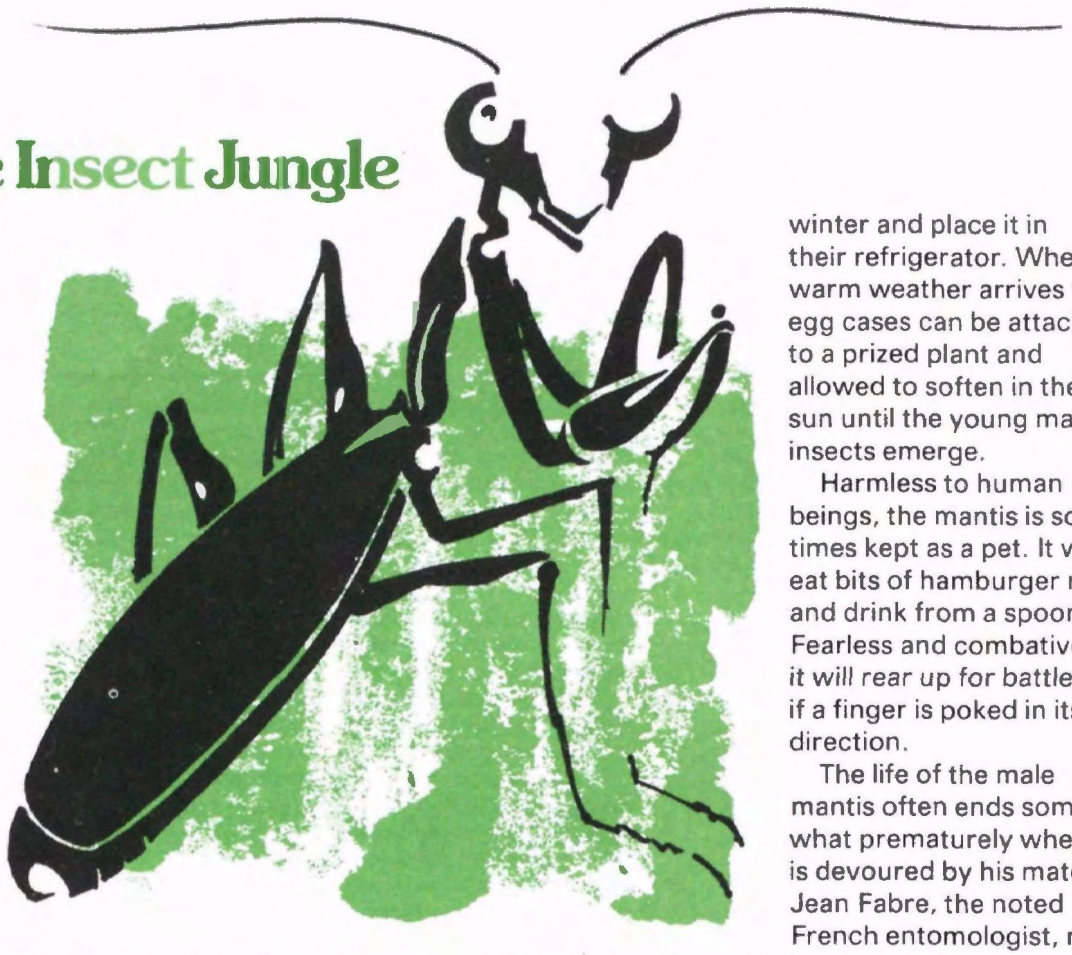
Still, a Forest Service spokeswoman said that not enough of the disease would probably exist even by the early 1980's to treat the next anticipated moth explosion. What does exist will be used, she said. But some chemical controls will have to be employed as well.

Biologicals now being reviewed by EPA for possible registration include a plant bacterium to prevent a serious disease in fruit trees and another virus for controlling gypsy moths, which ravage the foliage of eastern hardwood trees.

Natural controls not yet registered by EPA but field-tested under Agency permits are:

- a fungus that destroys certain weeds competing with rice plants for soil nutrients and thus reducing the size and yield of this crop.
- a different fungus to control certain "mite" bugs that retard the number and size of citrus and other fruits. These mites are currently considered the number one citrus pest in Florida, costing growers more than $13 million per year in chemical treatment costs.
- a protozoan to control grasshoppers on western livestock grazing land.
- a pheromone of the elm bark beetle that helps spread Dutch elm disease, which now fells some 400,000 U.S. elm trees annually. This beetle scent would entice the bugs to baits poisoned with a chemical insecticide.
- additional uses of BT bacterium to curb insect pests on alfalfa, corn, peanuts, sorghum, and wheat. □

Terror in the Insect Jungle



One warm morning this Spring a bizarre baby insect will emerge from a walnut-size egg case on a weedy plant and dangle head down on a silk-like thread.

This tiny creature will then work itself free of its birth sac and, along with dozens of brothers and sisters being born from the same egg case, will find a twig where its chitin shell can harden in the sun.

Soon this new born creature is ready to begin its role in life as the terror of the insect world and one of humanity's best friends.

It is the praying mantis, so called because of its habit of holding its forelegs raised as though in silent prayer.

Despite its often reverent attitude, the mantis is a largely indiscriminate and highly efficient killer. It is also one of the beneficial insects that can help protect your garden from some of the billions of insect pests being born this spring that will attack garden plants and farm crops.

Much larger than the ladybug, another well known beneficial insect, the mantis will consume far more pests.

As a hunter the green and brown mantis generally waits motionless on a twig or hidden among leaves for its victim. Sometimes, however, it creeps forward like a tiger.

Once the prey is within reach, the mantis shoots out its barbed and powerful forelegs and clamps them shut over the back of its victims. Then the mantis begins its meal by biting into the back of the insect's neck to sever the main nerve ganglia.

While the mantis will eat some beneficial insects, most of its diet consists of the bugs we most want to destroy.

As a result, there are nurseries that sell mantis egg cases for use in gardens. Of course, there is no guarantee that the mantis will stay in your yard if the hunting is better elsewhere.

Some people buy an egg case or find one outdoors in winter and place it in their refrigerator. When warm weather arrives the egg cases can be attached to a prized plant and allowed to soften in the sun until the young mantis insects emerge.

Harmless to human beings, the mantis is sometimes kept as a pet. It will eat bits of hamburger meat and drink from a spoon. Fearless and combative, it will rear up for battle if a finger is poked in its direction.

The life of the male mantis often ends somewhat prematurely when he is devoured by his mate. Jean Fabre, the noted French entomologist, reported that one female mantis he observed consumed eight of her suitors. Another female, according to the horrified Fabre, turned its head and began to eat the male during the mating act.

The reason for this ruthless cannibalism is the economy of nature, according to Edwin Way Teale, a well known authority on insects.

"The male has served his purpose in life when he fertilizes the female," Teale says. "If he dies when his mission is fulfilled, the food he would otherwise consume is saved. This cannibalistic instinct, it is believed, dates from some long-ago age when food was at a premium."

The destruction of one insect by another plays a significant role in maintaining the critical balance that allows other animals and plants to survive.

In the long process of evolution, insects have become the dominant group of animals, far exceeding all others in numbers.

The progeny of one pair of houseflies in one summer would be 191,000,000,000,000,000,000 if all the eggs hatched successfully and the young survived, scientists estimate.

Fortunately, other insects and animals such as birds, as well as weather, hold in check these potentially staggering populations.

The dangers of thoughtless tampering with this delicate balance of nature are obvious. —C.D.P.

People

Gloria Steinem, (second from left) editor of MS. magazine, visited EPA recently to discuss with Deputy Administrator Barbara Blum the ties that exist or could be developed between environmentalists and women's organizations. Also present at the meeting were Beth Sullivan, (left) Special Assistant to the Deputy Administrator, and

Hazel Henderson, (seated on the couch with Deputy Administrator Blum) Co-director of the Princeton Center for Alternative Futures. Also attending the meeting but not shown were Byron Kennard, Co-Director of Environmentalists for Full Employment, and Joan Martin Nicholson, Director of the Office of Public Awareness.

Barbara Blum

The EPA Deputy Administrator has received the honor of being nominated for the Ladies' Home Journal "Women of the Year" program for 1978.

According to Lenore Hershey, Editor of the magazine, "there are ten women named in each of eight categories by a panel of authorities and our own editors. Final selections are made first by popular vote—readers send in their ballots and these are computed—and then by a blue ribbon jury, which makes its determinations from the names receiving the most votes."

Blum has been nominated in the category "The New Social Responsibility." Other nominees selected in that group include First Lady Rosalynn Carter; Robin Chandler Duke, Chairperson of Draper World Population Fund; Marian Wright Edleman, Director, Children's Defense Fund; Frances T. "Sissy" Farenthold, President, Wells College; Sister Ann Ida Gannon, former President, Mundelein College; Carolyn R. Payton, Director, Peace Corps; Felice Schwartz, President and Founder of Catalyst, a national organization for women's career needs; Eunice Kennedy Shriver, Executive Vice President of the Joseph P. Kennedy, Jr. Foundation and Founder of Flame of Hope, Inc.; and Nan Waterman, Chairperson, Common Cause.

Ballots for the sixth annual Women of the Year program appear on pages 77-78 of the February Ladies' Home Journal. All ballots must be postmarked no later than March 15. Results will be announced in a Spring issue.

Sheila M. Prindiville

She is the new Deputy Regional Administrator for EPA's Region 9 office in San Francisco. Prindiville has been with the Federal Government for 14 years, seven of them with EPA. She is a recipient of the William A. Jump Memorial Foundation Meritorious Award (1974), and the EPA Gold Medal for Exceptional Service (1976).

As Director of Region 9's Water Division, she was credited with a major role in the delegation of the Region's Construction Grants Program to the State of California. She has also served as Director of the Region's Management Division, and as Special Assistant to the Administrator in Washington, D.C.

Prior to joining EPA. Prindiville was with the Agency for International Development, 1964-1969, and the Office of Economic Opportunity. She is a graduate of Mundelein College, and has an M.A. in International Relations from Georgetown University.

James A. Chamblee

The Chief of the Needs Assessment Section, EPA Office of Water Program Operations, has received an Award of Special Merit from the Association of Records Managers and Administrators. Chamblee is credited with reducing a 37-page Federal questionnaire to a single page.

He was one of 45 Federal employees who were honored at this year's Federal Government Paper Work Awards ceremony for outstanding contributions in improving records and information management systems. Presentation of the awards was by Dr. James B. Rhoads, Archivist of the United States.

Chamblee also received praise from Barbara Blum, EPA Deputy Administrator, who earlier this year initiated a paperwork reduction program that includes regulatory reform and a significant lessening in information requirements in the Agency's reporting system. The Agency-wide program is in keeping with President Carter's commitment to regulatory reform throughout the Government.

The questionnaire that Chamblee greatly simplified is used in the biennial national survey of the need and estimated costs for sewage treatment facilities in the Nation's communities. The new form was used in the 1976 survey, resulting in a savings of 720,000 printed pages.

Dolores Gregory

The former Director of the Division of Visitors and Information Exchange, Office of International Activities, has taken a position at the Department of State in the Office of Environmental Affairs. In her new role, she conducts liaison activities with international organizations such as the United Nations Environment Programme (UNEP), World Health Organization, and the Food and Agriculture Organization.

Before taking on her new job, she was responsible for EPA exchanges with national environmental agencies in other countries. She also developed and managed the International Documents Exchange under which EPA trades reports with sixty environmental centers around the world. The foreign

reports collection is used extensively to keep EPA staff, and other interested groups, informed of environmental management and legislative developments in other countries. She received her degree in chemistry at Duke University in 1954.

People

Warren R. Muir
He has been deisgnated to be the Deputy Assistant Administrator for Testing and Evaluation by Steven D. Jellinek, Assistant Administrator for Toxic Substances. Dr. Muir's appointment is subject to Civil Service approval.

Dr. Muir comes to EPA from the Council on Environmental Quality, where he served as a Senior Staff Member for Environmental Health since June 1975. There he was responsible for developing and supervising all aspects of CEQ programs in the areas of toxic substances, environmental health, pesticides, integrated pest management, occupational health, and consumer health, as well as systems for monitoring, storage and analysis of environmental data.

As a Staff Member at CEQ, 1972-75, Muir was responsible

Marilyn C. Bracken
She has been chosen to be Deputy Assistant Administrator for Program Integration and Information in the Toxic Substances program, subject to Civil Service Commission approval.

Dr. Bracken comes to EPA from the Mitre Corporation where she was Department Head for Energy and Environmental Information Systems.

At Mitre she was responsible for projects concerning the assessment of potentially toxic substances in the environment and workplace, and analysis of bioassay systems and technical information systems requirements.

From August 1973 to October 1976 she served as Director of the Division of Scientific

Edwin L. Johnson
The Deputy Assistant Administrator for Pesticide Programs will continue to serve in that capacity, Steven D. Jellinek, Assistant Administrator for Toxic Substances, has announced.

Johnson has served as Deputy for Pesticide Programs since April, 1975, managing and directing the pesticide activities of the Agency, which include the development of strategic plans for controlling adverse effects of pesticides and for the establishment of policies and regulations which will lead to a more judicious and environmentally acceptable use of pesticides.

Johnson is a 1957 graduate of Yale, where he earned his BE in Civil Engineering. He received a Master's in Public Administration in 1962 and a Master's in Economics in 1963 from Harvard.

Edith Tebo
She has been appointed Director of the recently established Great Lakes National Program Office located in Region 5. As Director of the Program Office, Tebo will support Region 5 Administrator George R. Alexander in his management of the Great Lakes National Program.

The Program Office will provide technical support, surveillance, research, special

Richard L. O'Connell
Formerly Director of EPA's Region 9 Enforcement Division, he has recently accepted a one-year assignment as Director of Hawaii's Office of Environmental Quality Control through a State and Federal Agreement. In his new role, O'Connell serves directly under Governor George R. Ariyoshi. His responsibilities include acting in an advisory capacity to the Governor on all matters relating to environmental quality control.

In over twenty-five years of service with various Federal agencies, O'Connell was with the U.S. Air Force in the Medical Service Corps, 1951-1956; the U.S. Public Health Service, 1956-1966, and the Federal Water Pollution Control Administration, 1966-1970.

He has been with EPA since 1970. As Director of the Region 9 Enforcement Division, his responsibilities included applying regulatory controls and monitoring compliance with enforcement of all Federal environmental programs under EPA's jurisdiction affecting industries and municipalities in California, Nevada, Arizona, Hawaii, Guam, American Samoa and the Trust Territories.

W. Edward Wood
He has been named Director of the Rhode Island Department of Environmental Management by Governor Joseph Garrahy. Wood is a former reporter for the Providence Journal-Bulletin. He also served on the State's Public Utilities Commission and as Deputy Director of the Rhode Island Department of Natural Resources.

The new position is a Cabinet level office and is responsible for the State's major environmental programs. Wood replaces William W. Harsh who left the Directorship last October to work on natural resources reorganization for the Office of Management and Budget in Washington, D.C.

James Byrne
He has been appointed Director of Personnel for EPA Region 5. Byrne was formerly employed in personnel by the Department of Interior and the Department of Health, Education and Welfare in Washington, D.C., and Nevada. In his new position, he will be the personnel chief for more than 600 employees in the professional, administrative, scientific, and clerical areas.

for policy development and oversight of Federal programs relating to toxic substances, pesticides, integrated pest management, occupational health, and environmental monitoring and education.

From 1971 to 72 he was a Staff Assistant at the Office of Management and Budget where he headed several task forces responsible for oversight of Federal programs relating to toxic substances.

Dr. Muir received his BA from Amherst College, Amherst, Mass., in 1967. He received an MS from Northwestern University in 1968, and received his Ph.D. from that institution in 1971. In 1978 he received an MHS from Johns Hopkins University.

Robert J. Mitkus

He has been named Director of Region 3's Surveillance and Analysis Division. With that EPA Region since 1973, he has previously held the posts of Executive Assistant to the Regional Administrator, Deputy Director of the Office of Congressional and Public Affairs, and Chief of the Program Planning Branch of the Management Division. Mitkus was a management and administrative analyst with the Department of Defense in Philadelphia before coming to EPA. He received a Bachelor of Science Degree in Industrial Management from LaSalle College, Philadelphia, in 1964.

Coordination in the Bureau of Biomedical Science, U.S. Consumer Product Safety Commission, performing program interface functions between the Bureau and Commission Field offices and laboratories. The Division's responsibilities also included the coordination and development of information processing systems and the development of mathematical models for research and regulatory problems.

From June to September of 1975 she served as Special Assistant to the Executive Director at the Commission, where she prepared studies and position papers regarding regulatory decisions in the course of her duties.

Dr. Bracken received her BS in 1957 from Carnegie-Mellon University in Pittsburgh; her MA from the American University in Washington, D.C. in 1967, and her Ph.D. from that school in 1971.

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studies, remedial programs and environmental planning, as well as program administration, management and reporting functions essential to an effective national program

Dr. Tebo has been employed by the U.S. Army at Fort Monmouth, N.J., since 1952, where she served as Chief of the Laser Components Team, Laser Tech Area, CS&TA Laboratory.

She holds a Ph.D. from the University of Virginia and has done post doctoral work at Harvard University. She is the author of many articles on lasers which have been published in technical journals and government publications.

David R. Alexander

He has been designated to be the Deputy Regional Administrator of EPA's Region 7 Office in Kansas City. Previously, he was Director of the Program Management Division of the Motor Emission Laboratory in Ann Arbor, Mich.

Before joining the Agency in 1971, Alexander worked with the Planning Research Corporation, which performs various sorts of analyses for industry and government.

Alexander received his Bachelor's Degree in Economics in 1960 from Northwestern University in Evanston, Ill., where he has also done graduate work. The appointment is subject to Civil Service approval.

Earl N. Kari

He has been designated as the new Deputy Regional Administrator for EPA Region 6, Dallas. The appointment is subject to Civil Service approval.

In announcing her selection, Regional Administrator Adlene Harrison stated, "Earl started his government career in March, 1960, with the Public Health Service and has been employed in environmentally-related programs since that time. His work experience includes serving as the Regional Director, Ohio Basin Region, of the Federal Water Quality Administration. He has been the Deputy Director of the Environmental Research Laboratory in Corvallis, Or., since November, 1971, where he shared fully in the planning, developing, organizing, and directing of the national research and development program assigned to the laboratory.

"Earl has a strong background for his new responsibilities, and I know that he will make a valuable contribution to the continuing success of EPA's Region 6 programs," Harrison added.

Byrne received his BS degree from the University of Maryland in 1968 and has done advanced study in personnel matters at other universities.

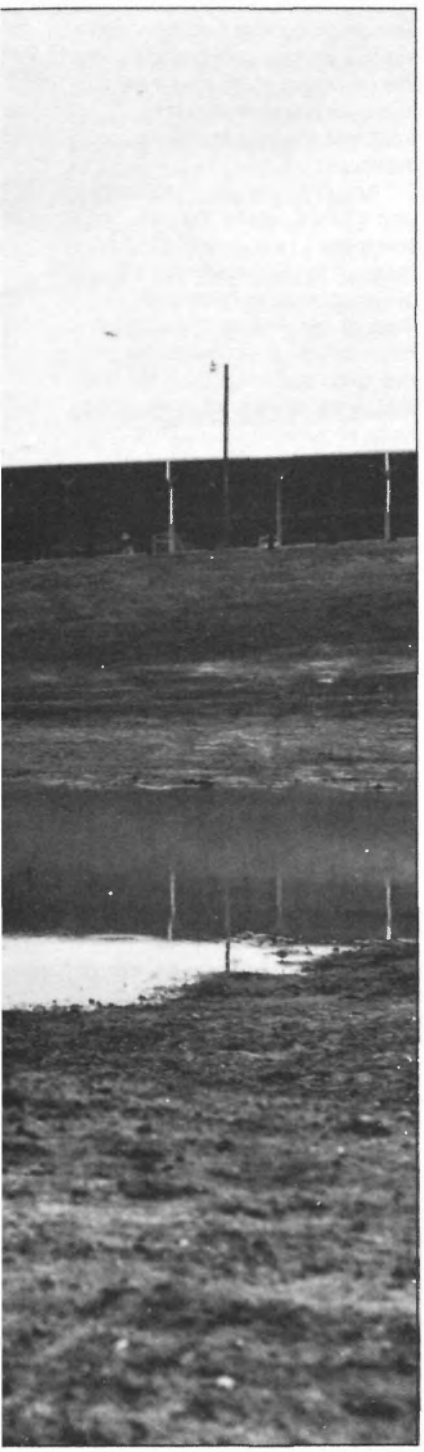
Richard E. Stanley

He has been confirmed as Deputy Director of the U.S. Environmental Protection Agency's Environmental Monitoring and Support Laboratory in Las Vegas, Nev.

Stanley, a veterinarian with additional degrees in zoology and radiation biology, has been associated with the Las Vegas pollution monitoring research laboratory since 1966. He has been acting deputy director of the laboratory since Sept. 30, 1977, pending confirmation of his appointment by EPA Headquarters in Washington.

Before coming to Las Vegas, Stanley was an Air Force officer for seven and a half years and had a private practice of veterinary medicine in Ohio. He is a member of the American Veterinary Medical Association and the American Association for the Advancement of Science. His confirmation was announced by George B. Morgan, laboratory director.

Model Farm Projects



The United States Department of Agriculture and the Environmental Protection Agency have joined forces to accelerate efforts that will help maintain productive soil and improve the quality of the Nation's waters.

The joint effort, called the Model Implementation Program (MIP), has been launched under an agreement of cooperation signed by Agriculture Secretary Bob Bergland and EPA Administrator Douglas M. Costle.

The two agencies will pool existing resources and expertise to demonstrate the united efforts necessary to clean up water quality problems caused from nonpoint water pollution sources. These sources would include such things as sediments from croplands, forests, road and stream banks, animal wastes from feedlots and pastures, and nutrients and pesticides from agricultural lands.

All of the fifty States and four Territories are presently developing areawide and statewide water quality management plans as mandated by Congress under Section 208 of the 1972 Amendments to the Clean Water Act. The Model Implementation Projects program is an effort to implement a local plan and will give emphasis to local and State control. It is expected the projects will be completed in two to three years.

The cooperative program is being conducted under the direction of Joseph A. Krivak, Chief of EPA's nonpoint source water program, and the USDA 208 work group. The USDA 208 group is made up of the Soil Conservation Service, the Agricultural Stabilization and Conservation Service, Cooperative Extension Service, the Agricultural Research Service, the Cooperative State Research Service, the Economic Research Service, the Forest Service, the Farmers' Home Administration and the Rural Electric Association. These USDA 208 work groups are formed both nationally and in each State and have well established arrangements for working with farmers, ranchers, and others whose activities in rural areas affect water quality.

The seven MIP's were selected from 50 applications from 42 State USDA coordinating committees in cooperation with many local and State conservation and water quality pollution control agencies.

The Model Implementation Projects selected are:

Indiana—Stotts Creek and Eagle Creek watershed where heavy sediment loads are affecting water quality.

Nebraska—Maple Creek watershed, essentially a cropland area, with an exceptionally high annual soil loss. Sediment and accompanying nitrogen, phosphorus, and pesticides are polluting many of the 230 miles of streams in the project area.

New York—Delaware River West Branch watershed where agricultural and forest harvest activities have caused serious erosion and sediment problems.

Oklahoma—Little Washita River with typical south central Oklahoma water pollution problems caused by sediment from gullying cropland and county roadsides as well as oil and gas development.

South Carolina—Broadway Lake watershed east of Anderson City, where serious degradation of water quality stems from sedimentation, agricultural chemicals, and animal waste.

South Dakota—Lake Herman, natural lake near Madison in Lake County, a recreational lake with water pollution problems that include soil erosion and sedimentation.

Washington—Sulphur Creek, Yakima County, whose chief pollution problem is due to the sedimentation, salts, and nutrients from irrigation return flow.

Funds for the Model Implementation Program will come from various EPA and USDA on-going programs, including EPA's clean lakes program, and research and development activities, and from several USDA programs from which the Agricultural Conservation Program will be a major contributor.

USDA and EPA officials are encouraging the applicants from the 35 states not selected for this initial program to implement their projects even though they have not received national designation. □

Organic Farming

Many farmers are now growing crops by "organic methods" and have either reduced their use of chemical pest controls or stopped using them. The following article contains comment from some of these farmers.

We're motivated by economics, pure and simple . . . none of us in farming wants to spend a dime on anything—whether it's machinery, labor, or spray."

This is the explanation given by Mike Shannon for the drastic reduction in use of chemical pesticides on the 30,000 acres he farms in the rich San Joaquin Valley in California.

Shannon was quoted in a recent Page One article in the Washington Post, which noted that farmers now turning to organic methods range from "the largest irrigated farming operations in the United States . . . to small family-owned plots."

His S-K ranch has been able to reduce its pesticides use by two-thirds.

The S-K ranch owns a pesticide supply company and a crop-dusting service, but Shannon says he'd rather not spray. "It costs money," he says. "We have the planes, but I'd rather not touch them."

Farming with less pesticides is not limited to farms like Shannon's. "We quit using

Mrs. Walter Hobbie gathers eggs from the flock of 500 laying hens.

chemical fertilizer back in 1967 and I'll never use it again," said K.C. Livermore, a Nebraska farmer who raises alfalfa, oats, soy beans, and corn on 160 acres of his own land and another 100 rented, about 30 miles northwest of Omaha. "We've done much better without chemicals. We were hurt some at first when we switched over because we had to get the soil back in balance, get the poisons worked out of it. But in our fourth year there was a big turnaround and now we're outyielding our 'chemical neighbors' by far.

"A friend on my west side, who farms almost 800 acres, quit chemicals about the same time I did. We've both had the same result. We're getting along better without them. We don't poison the wildlife. We don't poison the bugs. We have worms in the soil. The pheasants and other birds accumulate on our property where they have a chance to roam. We have more of them than on the chemical side."

Walter Hobbie farms a half section in South Dakota, north of Sioux Falls. "It's not just the cost of chemicals," Hobbie said. "Look at what you're putting in the ground. You know that poison has to go somewhere. Do that for a number of years, you get it in your animal feed, and sooner or later its going to get into us.

"I use very little pesticides, no more than the little bit I have to. I make as much or more profit off of an acre than those who do use chemicals. I think the number of people that are getting away from chemicals is growing. They see it ain't the thing to do, with all these poisons."

Don Hart of Gruver, Texas, would likely agree with Hobbie's sentiments. Hart farms 1,800 acres of irrigated crop land. His principal crops are corn, wheat, alfalfa, and during a good year he maintains a large number of feeder cattle.

"I still use some chemicals, both fertilizer and pesticides, though on a reduced basis. Actually, I started studying nutrition because I had a sick wife and boy. We had been eating the normal processed foods. We got away from these as much as possible and the health of the whole family improved.

"Any time you get into nutrition it leads you to the soil. The soil is the key to healthy food."

How do the new breed of organic farmers cope with insects and weeds? "We don't have an insect problem like our chemical neighbors do," K.C. Livermore said. "We don't have an altered plant. Our plants are natural and healthy. They pick up antibiotics from the soil, which turns insects away as nature intended. And we have insects, like ladybugs, which fight off the enemy insects. Ladybugs thrive on our farm.

"Also, as soon as you get a natural, healthy soil, there isn't any weed problem. Nature put in weeds to protect the soil. Weeds grow down in the soil and pick up trace minerals, and as they die they deposit these minerals on the soil's surface.

Hobbie and his son Gary load alfalfa bales onto a conveyor that will carry them to the barn loft.

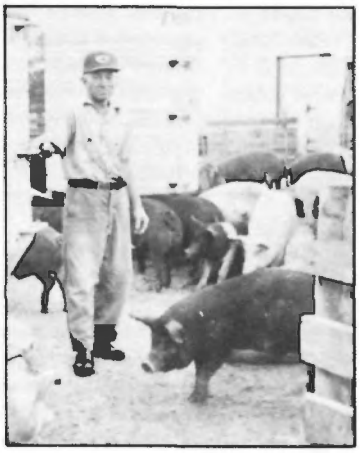
"And when you have your soil in balance, weeds just don't grow as fast and you don't grow as many of them. Another thing is that when we used chemical we had a clotty soil. Now it will run through your hands just like flour at times. Earthworms and other life in the soil are alive and can loosen it. It's easy to push the weeds right over when we cultivate."

Farmer Hobbie has had the same experience: "If you have a balanced soil, and you have the right minerals in it, you won't have any problem with bugs. It's when the soil isn't balanced that plants get weak That's the the time when the bugs go to work."

And Don Hart, the farmer from Texas, concurs with this approach: "I'm trying to get to a balanced type of farming which will give me hardy plants and will control the pests by way of natural predators."

All of the farmers interviewed by the EPA Journal relied on conventional methods of farming such a crop rotation and simple tandem, heavy disc, or chisel plows.

"I cultivate my corn once or twice," said K.C. Livermore. "Our chemical neighbors, even after using a herbicide, cultivate three or four times on corn. On beans, some of them go seven times. I seen one of them out there cultivating in August yet. Our rows are both 40 inches, but they have to plant 20 to 30 days before me.



Walter Hobbie raises these feeder hogs on organically grown grain from his farm.

"We've never run a dryer for our corn either, and never intend to. It costs a lot of money to run. So we make less trips across the field than they do, and we save on drying expenses. Beyond that our rainfall goes in the ground, because we have earth worms and other biotic activity, so we don't get any runoff, and therefore we need less or no irrigation."

K.C. Livermore's incredible success with organic farming has been written about on the front page of the Los Angeles, as well as in the New York Times. "You would never have believed it," he said. "We outyielded our neighbors by 100 percent or better on everything during recent drought conditions. We have a root system that goes down and gets the water. We have a plant that picks up nitrogen from the air. People have come from all parts of the State, and they just stand in amazement," said Livermore.

"Even my sons used to farm with chemicals," said Walter Hobbie, "but they've switched over. Now they don't use chemicals either."

Each organic farm seems to have its own requirements. Walter Hobbie uses gypsum and organic fertilizers on his soil. "Yes, gypsum, the mineral," he explains. "They mine it on the Mississippi down around Des Moines." K.C. Livermore, on the other hand, relies heavily on animal manures and compost. "It's good fertilizer. It puts organic matter back in the soil," he said.

But organic farming can have its difficulties, and perhaps none more trying than to find a qualified person to test the soil. Don Hart said that it has been a battle. He claimed that most consultants seem to be connected with a certain kind of additive and suggest that only theirs will work—not unlike a doctor who owns the drug store filling prescriptions.

"A good consultant should know both nutrition and soil, tell you what you need and what you as a farmer can do. But good consultants are hard to come by," he said.

The Washington Post story reported that the Shannon farm in California has been advised by a man named Richard Clebenger, a 36-year-old agronomist. He is one of few people in that geographical area who do this sort of counseling. And although as Clebenger himself says, "there still are a lot of farmers . . . who can't sleep right unless they've given their fields a good spray," his business is now worth $400,000 and advises more than two dozen clients.

For the self-taught K.C. Livermore, it was easier. "There was one big chemical dealer in the area who kept coming around," he recalled. "But when he saw that we really were done with chemicals, he said to me, 'You'll do all right.'

"We'd like to see this thing get turned around," Livermore went on. "We'd like to see the wildlife and the birds back here like it was in the 1940's and 50's. Is that a profitable way to farm? You bet it is. We use one-fourth less input and get as much or more back than anybody else. That should be real easy to calculate in your mind . . ." □

A Farmer's Guide to EPA

by Chris Perham

While farmers have a close personal involvement with the environment, most of them don't have the time to keep up with all Federal regulations and programs. Often, however, the information EPA has available can be important and helpful to agricultural operations.

The following guide is designed to highlight some of the ways that EPA regulations affect farmers. The first point of contact for information is usually the local agricultural organizations and the county, regional, and State environmental agencies. EPA has ten Regional Offices (see opposite page for location) across the country that work with these agencies and can help provide information for farm groups.

Non-technical publications about EPA's involvement in all aspects of environmental protection are available from the Office of Public Awareness at the Regional Offices. Information on individual programs follows:

Chris Perham is an Assistant Editor of EPA Journal.

Pesticides

Congress passed the Federal Insecticide, Fungicide, and Rodenticide Act in 1947 to deal with the dangers posed by certain pesticides. This act was administered by the Department of Agriculture until EPA assumed authority for it in 1970. In 1972 the Federal Environmental Pesticide Control Act amended the act of '47 and expanded the responsibilities of EPA to include regulation of all pesticides in interstate and intrastate commerce, and to provide civil and criminal penalties for misuse of pesticides. The law requires that all manufacturers of substances for sale in the United States to control pests must register their products with EPA.

EPA is also directed to classify pesticides for general or restricted use according to their potential risk to the user or the environment. The Agency has set standards for the certification of people who use restricted pesticides. Restricted use pesticides may only be used by, or under the direct supervision of, a person certified to use them.

If a chemical poses an unreasonable hazard the EPA Administrator may suspend its use or permanently cancel the registration. These decisions can be appealed by the manufacturer. EPA can authorize emergency use of an unregistered pesticide, experimentation, and research into new applications.

The law also requires that all registered pesticides must be labeled with instructions for use, and that EPA outline procedures for storing and disposing of pesticides.

Registration

EPA gathers scientific evidence about the health effects and effectiveness of pesticides. Before a product can be registered the law requires the manufacturer to prove that the product when properly used is effective against the pests listed on the label, that it will not pose an "unreasonable" risk to people or the environment, and that it does not leave illegal residues on food or feed. A tolerance level for residues of pesticides for food commodities must be established by EPA.

EPA recently restricted certain uses of 23 pesticide ingredients and is considering restriction of others. Those not restricted will remain for general use. Restricted products will be labeled as such, and instructions for use must be clearly spelled out on the label. It is against Federal law to use any pesticide in a manner inconsistent with label directions.

Pesticide Applicator Certification

The law requires certification of people who wish to use the restricted pesticides. EPA has set standards for the certification of applicators but the States actually conduct training and certification programs. Training is conducted with the State Cooperative Extension Service and includes instruction on safe pesticide use, and disposal, pest identification, pesticide labeling, and other aspects of handling these chemicals. Farmers are classified as private applicators.

Suspended and Cancelled Pesticides

If there is a significant question about the safety of effectiveness of a registered chemical EPA can take action to cancel products which contain it. If a cancellation notice is issued, the manufacturer may appeal this action and the product can be produced and sold while the administrative review process is followed. If the Administrator decides, on the basis of scientific evidence, that a pesticide poses an "imminent hazard to the public welfare" he can immediately suspend the registration, and stop the production and sale of the pesticide during the review process. In such a case, an expedited hearing can be requested by the manufacturer. Lists of suspended and cancelled pesticides are available from the Pesticide Program in the Regional Offices. The Agency strives to offer lists of alternatives to products that can no longer be used.

Rebuttable Presumption Against Registration

The 1972 law also requires EPA to investigate all previously registered pesticides to ensure they meet the updated safety requirements. In order to identify and review the products which may not meet today's safety requirements the Agency has developed a process called "rebuttable presumption against registration."

A pesticide that shows potentially dangerous characteristics can be a candidate for this process. This does not mean that the chemical is banned. It means that EPA is gathering extensive scientific information in order to evaluate the risks and benefits involved in use of the pesticide.

Pesticides are targeted for review if they are highly toxic and can pose a threat of immediate poisoning to people or animals, if they can cause serious long-term health problems (tumors, mutations), or if there is no emergency first-aid treatment for them. Approximately 25 pesticides are involved in the review process at this time. A complete list is available from the Pesticide Program at the Regional Offices.

The final outcome of the review can be that the pesticide will be fully registered, that some or all uses will be restricted, or that the Agency will announce an intent to cancel some or all uses—or a combination of these options. Manufacturers and users can request hearings to challenge a decision to cancel the product affected. The only pesticide that has been cancelled through the rebuttable presumption process against registration thus far is kepone.

Fieldworker Reentry

Farmers should not allow field-workers to enter fields that have been treated with pesticides until sprays have dried or dusts have settled. Longer waiting periods are required for certain pesticides. People who must enter treated fields before waiting periods are over should wear protective clothing; long sleeves, long pants, socks, boots, and a hat. Warning signs should be posted at entrances to treated fields or workers should be informed about the dangers posed by pesticides. Pesticides warnings should be presented in language understandable to the workers. More information about the waiting periods for specific chemicals can be obtained from the Pesticide Program at the Regional Offices.

Safe Storage and Disposal of Pesticides

Section 19 of the 1972 law required EPA to set guidelines and regulations for storage, handling, and final disposition of pesticides and pesticide containers.

Agency guidelines require that pesticides be stored in areas where they will not be subject to wind or flood waters. Structures should be well-ventilated, fire-proof,

easily accessible, away from food or feed, and clearly marked with warning signs. Records of the quantity, type, and locations of the pesticides should be kept up-to-date, along with plans for dealing with leaks and spills. If large quantities of pesticides are stored this information should be made available to local police, fire, and public health departments.

If leftover pesticides cannot be used or returned to the dealer EPA offers guides for disposing of the remainder. Some States have approved incineration facilities. Farmers are cautioned not to attempt to burn pesticides themselves. Specially designated landfills can also be used for chemicals that cannot be incinerated. Some pesticides can be plowed back into the soil, or treated with chemical processes that render them non-toxic. More information on all of these processes is available from the Pesticide Program at the Regional Offices.

Used pesticide containers should be triple-rinsed, with the waste liquid recycled into new bathces of the pesticide. The cleaned containers can be returned to a dealer or drum reconditioner for reuse, sent to a scrap dealer for recycling, or placed in an approved sanitary landfill. Detailed information on rinsing and disposal is available from the Pesticide Program in the Regional Offices.

Water

A sweeping effort to clean up the Nation's waters was initiated in 1972 when Congress passed the Federal Water Pollution Control Act Amendments. The Act set water quality goals and established provisions for curbing and eliminating water pollution. These goals were clarified and updated by the 1977 Clean Water Amendments. Congress gave EPA the authority for implementing the Act but reserved the primary responsibility for water pollution control for the States.

A major part of the effort to control water pollution involves citizen participation in clean-up plans under the Areawide Water Quality Management Planning Program. This effort, often called the 208 program because it was authorized by Section 208 of the Act, calls on States to identify sources of water pollution and make provisions to resolve the problems. In many areas agricultural activities have been identified as a major source of water pollution. Farming contributes to pollution from croplands runoff because of erosion which carries nutrients, pesticides, and sediment into streams and lakes. EPA refers to this pollution an non-point source, since it generally cannot be collected and treated. The only way to control it is through better care and management of water and land resources.

Under the 208 program each State designates areas that have the most critical water quality problems for management plans. A local or regional agency is selected to carry out the planning process, with help form committees made up of local citizens. In addition to Area-wide Planning, the State has the responsibility for developing Statewide Water Quality Management Planning processes as well.

The planning process includes identifying the problem, locating pollution sources, recommending guidelines for Best Management Practices to curb this pollution, recommending regional programs if necessary, and recommending State or local agencies best suited to implement the long-term water quality management program.

To ensure that agricultural problems are given adequate consideration by the 208 planners, farmers should contact local agencies like the Cooperative Extension Service, the Soil and Water Conservation District, the Agricultural Stabilization and Conservation Service, and Soil Conservation Service, or other farm organizations to find out how advanced the plan is, and how they can get involved. More information is available from 208 Public Participation Specialists at the Regional Offices.

Some Best Management Practices for agriculture under the 208 program have been outlined by EPA. These include conservation practices that have been used for many years including terracing, contour strips, and minimum tillage. Best Management Practices information is available through the Nonpoint Source Office at the Regional Offices, and from the agricultural agencies listed above.

Farmers can get financial assistance for establishing pollution abatement practices from several sources. EPA has cooperative programs with the Department of Agriculture to implement long-term soil conservation for improving water quality under approved 208 plans. The Federal Government can pay up to 50 percent of the cost of installing control mechanisms to reduce agricultural runoff. The Small Business Administration also has a loan program to assist farmers in implementing control techniques. Likewise the Farmer's Home Administration provides low-cost loans for some conservation practices. Some State and local programs exist as well. Information on these programs is available through the Regional Offices.

Air

Under the Clean Air legislation, EPA does not regulate farmers directly. The Agency has done research on ways to control dust and particulates that escape during agricultural activities. This information is available through the Air Program at the Regional Offices. Most controls on farm activities come through State Air Quality Implementation Plans, where methods such as open-field burning are sometimes restricted or banned. More information on State programs can be obtained from State and local air quality agencies. A directory of government air pollution control agencies is available from the EPA Library (MD-35), Research Triangle Park, N.C. 27711.

Research and Development

A wide variety of agriculturally-related scientific studies are carried on in EPA laboratories and through grants and contracts with universities, research organizations, and public agencies. The research and development program has many ongoing projects that may be of interest to farmers, including studies on salinity problems related to irrigation, studies of the effects of pesticide runoff on water quality, and studies of the effects of air pollution on vegetation. Reports of EPA findings in these areas can be obtained from the Research and Development representatives in the Regional Offices, or from the Technical Information Division (RD-680), EPA, Washington, D.C. 20460.

States Served by EPA Regions

Region 1 (Boston)
Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
617-223-7210

Region 2 (New York City)
New Jersey, New York, Puerto Rico, Virgin Islands
212-264-2525

Region 3 (Philadelphia)
Delaware, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia
215-597-9814

Region 4 (Atlanta)
Alabama, Georgia, Florida, Mississippi, North Carolina, South Carolina, Tennessee, Kentucky
404-881-4727

Region 5 (Chicago)
Illinois, Indiana, Ohio, Michigan, Wisconsin, Minnesota
312-353-2000

Region 6 (Dallas)
Arkansas, Louisiana, Oklahoma, Texas, New Mexico
214-767-2600

Region 7 (Kansas)
Iowa, Kansas, Missouri, Nebraska
816-374-5493

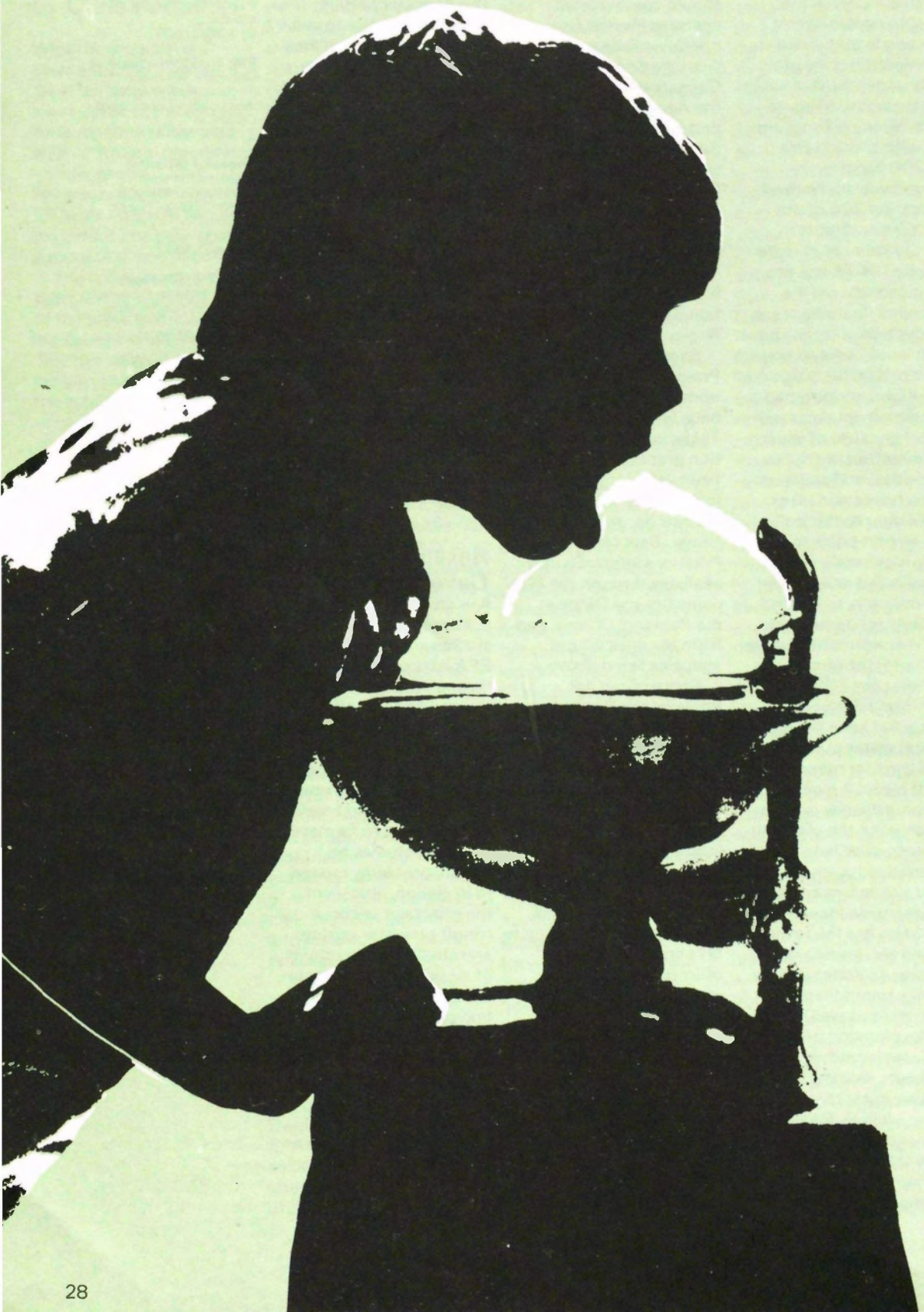
Region 8 (Denver)
Colorado, Utah, Wyoming, Montana, North Dakota, South Dakota
303-837-3895

Region 9 (San Francisco)
Arizona, California, Nevada, Hawaii
415-556-2320

Region 10 (Seattle)
Alaska, Idaho, Oregon, Washington
206-442-1212

Drinking Water Reform

By Victor J. Kimm



The Environmental Protection Agency believes that based upon current scientific knowledge, long-term exposure to organic chemicals in drinking water poses a risk to public health, including a cancer risk, and should be regulated as prescribed under the provisions of the Safe Drinking Water Act.

EPA accordingly has proposed regulations that will require major treatment changes in many of our Nation's water supply systems. The regulations are based upon recent findings concerning the widespread prevalence of these substances and their potential health risk.

The application of sophisticated analytical techniques in the early 1970's enabled researchers to begin to identify and quantify many trace organic contaminants in drinking water. Thus far about 700 specific organic substances have been found in drinking water, even though current analytical techniques measure only a portion of all the organic substances potentially present. However, EPA anticipates that its list of specific organic contaminants of concern will increase with advances in analytical techniques.

EPA is concerned with two elements of the problem of organic chemicals in drinking water. The first is a family of compounds called trihalomethanes (THM's), including chloroform, which are produced during conventional water treatment due to the interaction of chlorine added for disinfection and naturally occurring substances present in the untreated water.

Chloroform is a known animal carcinogen. With chlorine disinfection, the Nation's water utilities have virtually eliminated waterborne diseases such as typhoid. EPA is very concerned that the bacteriological quality of drinking water not be sacrificed as we move to reduce THM levels. Fortunately, technology exists to allow both reduction of THM levels and adequate disinfection.

The second part of the prob-

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lem deals with a wide range of specific man-made or synthetic chemicals which enter drinking water due to pollution of our water sources. These organic contaminants are not significantly reduced by conventional water treatment practices. Rather than deal with such contaminants on a case-by-case basis, EPA believes that the use of an available technology will provide broad spectrum removal of groups of organic chemicals and provide the best health protection with the least complicated regulatory approach.

Although organic contaminants can cause both acute and chronic effects at higher levels, EPA's primary concern is with their potential contribution to elevated cancer risks at the low concentrations in which they appear to occur in drinking water. At this time, no one understands the specific causes of cancer, but there is growing agreement within the scientific community that prolonged exposure to carcinogenic contaminants in the environment, including food, air, and water contribute to the incidence of this dread disease which accounts for about 350,000 deaths annually. Other long-term risks such as mutagenicity and teratogenicity also are of concern. (Mutagenicity is the tendency to cause mutants, that is, genetically abnormal offspring. Teratogenicity is the tendency to produce birthdefects.)

EPA, other Federal agencies, and many other public health institutions around the world have adopted a policy of limiting human exposure to carcinogens to the maximum degree feasible. This is consistent with, and carries out, the protective philosophy of the Safe Drinking Water Act.

As with most pathways of exposure to cancer-causing agents in the environment, there is no direct evidence that consumption of drinking water has actually caused human cancers. However, EPA believes that such carcinogens when present in drinking water pose an unreasonable risk to public health. We cannot quantify the magnitude of the risks since there are many unmeasured and untested chemicals in drinking water and because the extrapolation models are imprecise and require more comprehensive national occurrence data than is currently available.

However, EPA has long pursued a policy of reducing human exposure to identifiable carcinogens to the extent possible. In order to do so, EPA is beginning a two-pronged attack on the problem by requiring more stringent control of the discharges of toxic and hazardous pollutants as well as the development of control technologies within water supply facilities to provide an added level of health protection. The former effort will be carried out under the water pollution control and solid waste programs administered by EPA and the latter action under the Safe Drinking Water Act.

Improved control within a water treatment facility is also needed where hazardous substances are inadvertently produced during normal treatment operations or where the source of drinking water is subject to significant upstream waste discharges and contamination from agricultural and urban sources. Even the best wastewater treatment plants don't remove all pollution and are subject to periodic upsets. Furthermore, surface waters are also subject to other planned discharges and spills.

The two interim primary drinking water regulations about to be proposed by EPA will be (1) an interim maximum contaminant level (MCL) of 0.10 milligrams per liter of water or 100 parts per billion for trihalomethanes, and (2) a treatment technique requiring the addition of granular activated carbon to the water treatment plants of systems vulnerable to significant contamination from synthetic organic contaminants in their raw water source. Alternative treatment techniques may be substituted if they can be shown to produce equivalent reduction of a broad spectrum of organic contaminants.

The THM regulation would become effective 18 months after promulgation to allow time for the utilities to conduct monitoring on a prescribed frequency and modify treatment operations where necessary. This would also allow States sufficient time to modify their regulations to incorporate these changes. The regulations would apply initially to systems serving populations greater than 75,000. However, systems serving between 10,000 and 75,000 people would also be required to monitor their water supplies and report the results to EPA and the States. Since this is an initial action based upon feasibility, EPA expects that the maximum contaminant level would be lowered and the coverage extended over time.

The treatment technique would also be initially applicable to communities serving populations greater than 75,000 which are vulnerable to contamination by synthetic organic chemicals of their source of raw water. Thus, although 390 water systems are in that category, only about 50 would actually be required to make significant changes in their treatment systems. The impacted systems would be required to develop plans for using granular activated carbon on a case-by-case basis following sound engineering practice. This work would normally include pilot studies to select types of carbon contact time and carbon regeneration frequencies to provide the criteria to design a system tailored to the unique characteristics of the local water and existing treatment processes. Those systems not subject to significant contamination by synthetic organic chemicals would be granted variances from the treatment requirement.

Assuming that about 75 systems are ultimately required to modify treatment practices significantly, the total capital expenditures will be about $350 million to $450 million over a three to five year period and annual expenditures thereafter of about $50 million to $60 million per year. For the large systems, we estimate that the average cost per capita served will be between $3.50 and $6.50 per year and that a typical residential family's bill might increase $5 to $10 per year.

EPA is limiting these regulations initially to public water systems that serve 75,000 or more people. These systems serve a total of 100 million people or half of all Americans served by public water systems. There are several reasons for this limitation. First, these larger systems generally have the engineering sophistication and highly trained personnel necessary to implement a technology which is not now standard practice in this country. Second, for the THM regulation, we do not want the smaller, less sophisticated systems to make changes in their disinfection practices which could, without adequate control, lead to less effective disinfection. In addition, the limited technical assistance capacities of EPA and the States make it necessary to limit the number of impacted systems. However, EPA will extend coverage over time for systems of all sizes as soon as it is feasible to do so.

EPA views the proposed regulations as the first step toward controlling organic contaminants in drinking water. The knowledge and experience gained from the implementation of these regulations will help us in a number of ways in the future. Most importantly, the American water works industry will get practical experience with and gain confidence in the granular activated carbon treatment technology. The private sector will be further encouraged to develop less costly alternative technologies. The problems that undoubtedly will be encountered, and their solutions, will enable us to judge the extent to which the technology can be extended to small public water systems. Finally, the data that will be gathered from pilot studies and the required monitoring will form part of the data base along with an intensive, concurrent EPA research effort that our Agency will need to develop maximum contaminant levels for specific synthetic organic chemicals and to revise the THM standard in the Revised Primary Drinking Water Regulations. □

Spring Environmental Season

By Ruth Brown

This Spring, three world-wide events will focus attention on the global nature of environmental problems and our need to reaffirm our commitment to the care of our planet. The season will begin with Earth Day on March 20, continue through Sun Day on May 3, and conclude with World Environment Day on June 5.

The organizers of these events in the United States have joined forces to gain public attention and support for activities that will take place in communities throughout the Nation. Celebrations will involve broad segments of the population including labor unions, school, industry, civic, business, consumer, and environmental groups. Plans include teach-ins, fairs, and block parties with an environmental theme, exhibitions of conservation measures and energy alternatives, tree plantings, cleanups of parks, waterfronts, and playgrounds, bicycle rides, hiking trips, recycling projects, and environmental poem and song contests.

Public participation is encouraged. Activities should reflect an individual's specific interest, which may relate to his or her community, employment or lifestyle. It will be a chance for you or your group to stand up and let the world know you are concerned about the environment.

Earth Day was organized in 1970 by the Earth Aid Society, which is dedicated to establishing an "equilibrium between man and nature." The Society sponsors a joint membership program that supports the programs of five prominent conservation groups: The International Oceanographic Foundation, The National Audubon Society, The National Wildlife Federation, The Wilderness Society, and The World Wildlife Fund.

In addition, the Society awards seven annual environmental prizes recognizing outstanding achievement in areas of world-wide concern and publishes an Earth Almanac which is an annual assessment of the current state of the world's natural resources.

This year's Earth Day celebration will be highlighted by the ringing of the United Nations Peace Bell, which will inaugurate the various events being developed to occur on Earth Day across the United States and throughout the world. The bell will be rung at 6:30PM, EST as this is the instant of the vernal equinox when the position of the sun, in its course through the universe, causes day and night to be of equal length on Earth. The equinox brings Spring to the Northern Hemisphere and Autumn to the Southern Hemisphere. At this time all peoples of the Earth are encouraged to pause and devote a moment to pledge themselves to protect and nurture Earth life. Margaret Mead, 1978 Earth Day Chairperson, reminds us that "Earth Day celebrates the interdependence within the natural world of all living things, humanity's utter dependence upon Earth—man's only home . . ."

Sun Day is a project of Denis Hayes, an environmental activist who was a leading promoter of the first Earth Day celebration. He is now with the Worldwatch Institute, an independent, non-profit research organization created to identify and to focus attention on global problems. Mr. Hayes feels that we must make a rapid transition from dependence on oil to an era of "safe, nonpolluting, decentralized energy sources" dominated by solar power.

Plans include lectures, conferences, debates, tours of solar homes, a traveling slide show depicting agricultural uses of sun, wind, methane, and other fuels available right on the farm, technology fairs, sun art shows and a barrage of media publicity aimed at making the general public aware of the potential and feasibility of solar energy and alternate energy sources.

Most localities are concentrating on a one-day program but Sun Day in New York City will run from May 3 to May 6 and include events that will involve participation by hundreds of thousands of metropolitan residents. An internationally-oriented early morning ceremony at the United Nations will kick off the celebration, which will include seminars on economic opportunities in solar energy, continuous film programs, concerts, and a Solar Energy Show at New York City's Old Custom House. A massive public rally is scheduled for May 6 in Central Park.

World Environment Day 1978 will mark the Sixth Anniversary of the Stockholm Conference on the Human Environment. It was in 1972 that the United Nations first officially faced the crucial nature of international environmental issues. The effectiveness of the Conference was enhanced by the participation of citizen and voluntary organizations throughout the world. The U.S.-based organizations were instrumental in helping to formulate our Nation's policy on international issues.

The Sierra Club is one of the organizations that participated at the Stockholm Conference and since 1972 has developed an active international program, which concentrates on a number of environmental problems that transcend political boundaries. Among them are efforts to prevent pollution from ships, assess ocean policy alternatives, assure the preservation of tropical rain forests, and to help decide the course of development in Antarctica.

This year the Sierra Club, cooperating with the U.S. Environmental Protection Agency and the United Nations Environment Programme, will coordinate World Environment Day activities in the United States.

Hundreds of non-governmental organizations have been asked to work with their State and local chapters to plan a wide range of activities. These include arranging for environmentalists to speak on local talk shows, holding fund-raising dinners and car washes for the benefit of local environmental groups, encouraging mayors to issue special proclamations, planning guided tours through parks and gardens, running poster contests and encouraging participation by all local schools. New York's Rockefeller Center will be the site of a major day-long Giant Earth Fair featuring environmental exhibits, speeches, music and dance on June 3.

The U.S. Environmental Protection Agency, through its Headquarters and Regional Public Awareness Offices, can help advise you of the numerous activities planned in your area during the Environmental Season. In addition, the Agency invites individuals and non-profit organizations to apply for limited amounts of funding from the Regional Offices if they would like to stage their own celebrations.

Show that you care. The quality of life depends on the quality of our environment. □

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Earth Day

By Margaret Mead

Margaret Mead, an internationally recognized anthropologist, educator, and activist in world affairs, is the 1978 Earth Day chairperson.

Earth Day is the first holy day which transcends all national borders, yet preserves all geographical integrities, spans mountains and oceans and time belts, and yet brings people all over the world into one resonating accord, is devoted to the preservation of the harmony and nature and yet draws upon the triumphs of technology—the measurement of time and instantaneous communication through space.

Earth Day draws on astronomical phenomena in a new way; using the vernal equinox, the time when the Sun crosses the equator making night and day of equal length in all parts of the Earth. To this point in the annual calendar, EARTH DAY attaches no local or divisive set of symbols, no statement of the truth or superiority of one way of life over another.

But the selection of the March equinox makes planetary observance of a shared event possible, and a flag which shows the Earth as seen from space appropriate. The choice has been made of one of two equinoxes, the springtime of one hemisphere, the autumn of the other, making the rhythmic relationship between the two capable of being shared by all the people of the Earth, translated into any language, marked on any calendar, destroying no historical calendar, yet transcending them all. Where men have fought over calendrical differences in the past and invested particular days like May Day or Christmas with desperate partisanship, invoking their God with enthusiasms which excluded others, the prayers for EARTH DAY are silence—where there is no confusion of tongues—and the peal of the peace bell ringing around the Earth, as now satellites transform distance into communication.

Earth Day celebrates the interdependence within the natural world of all living things, humanity's utter dependence upon Earth—man's only home—and in turn the vulnerability of this Earth of ours to the ravages of irresponsible technological exploitation. It celebrates our long past in which we have learned so much of the ways of the universe, and our long future, if only we apply what we know responsibly and wisely. It celebrates the importance of the air and the oceans to life and to peace. On the blue and white wastes of the picture of Earth from space, there are no boundary lines except those made by water and mountains. Yet in this picture of the Earth, the harsh impersonal structures of world politik disappear; there are no zones of influences, political satellites, international blocs, only people who live in lands, on land, that they cherish.

Earth Day is a great idea, well founded in our present scientific knowledge, tied specifically to our solar universe. But the protection of the Earth is also a matter of day-to-day decisions, of how a field is to be fertilized, a dam built, a crop planted, how some technical process is to be used to enrich or deplete the soil. It is a matter of whether the conveniences of the moment are to override provision for our children's future. All this involves decisions, some taken by individuals, some by national governments, some by multinational corporations, and some by the United Nations. Planetary housekeeping is not—as men's work has been said to be—just from sun to sun, but, as has been said, like women's work that is never done. EARTH DAY lends itself to ceremony, to purple passages of glowing rhetoric, to a catch in the throat and a tear in the eye, easily evoked, but also too easily wiped away.

Earth Day uses one of humanity's great discoveries, the discovery of anniversaries by which, throughout time, human beings have kept their sorrows and their joys, their victories, their revelations and their obligations alive, for re-celebration and rededication another year, another decade, another century, another aeon. But the noblest anniversary, devoted to the vastest enterprise now in our power, the preservation of this planet could easily become an empty observance if our hearts are not in it. EARTH DAY reminds the people of the world of the continuing care which is vital to Earth's safety.

region 3 Report

By Jack J. Schramm
Regional Administrator

When I was first asked to be the Regional Administrator of the Middle Atlantic Region of EPA, I was surprised. After all, I was a Missourian and really didn't know the region very well. But in the few short months I have been here, I have learned much.

This is a troubled Region, and it is very easy to see why.

People make pollution, and the closer people are to each other, the more pollution they make and the greater its adverse impacts. Region 3 has the second highest population density of any of the EPA Regions.

Manufacturing makes pollution. Region 3 ranks third among Regions in this activity.

Extraction of minerals from the ground makes pollution. Region 3 is second in mineral production, first if petroleum is included.

All these items together mean that Region 3 has among the worst, the most numerous, and the most concentrated pollution problems of any Region.

Nearly every major city in Region 3 fails to meet air quality standards for two or more criteria pollutants. Nearly the entire Region will fail to meet standards for photochemical oxidants if something is not done about air pollution.

Many rivers, streams and lakes of the Region are badly polluted by industrial and municipal discharges, runoff from urban and agricultural areas, or acid drainage from active and abandoned coal mines. Toxic materials that threaten our health and endanger our drinking water supplies continue to show up in unexpected places.

Over the past years, Region 3 has had many successes, and pollution in many areas has been reduced. But like many other new agencies anxious to get immediate results, EPA tended to tackle the easier problems first. Thus, many of the solutions to the tougher problems have been delayed . . . or the problems avoided. My first major goal for Region 3 is to uncover and resolve the problems that have festered here over time.

One of the most important of these problems is water pollution from the city of Philadelphia. Over half of the pollution entering the Delaware River comes from the city's three sewage treatment plants. The solution lies in accelerating the construction of expanded and upgraded sewage treatment facilities. The city also dumps its sewage sludge in the Atlantic Ocean. Although both the EPA and Congress have mandated that ocean dumping must end by 1981, the city has not yet found acceptable land-based alternatives. At this writing, we are actively negotiating with the city to resolve both of its water pollution problems.

The steel industry continues to be a major air pollution source in the Region. Earlier consent orders signed with the Jones & Laughlin Steel Company for its Pittsburgh Works and the U.S. Steel Corporation for its Clairton Coke Works were viewed as major milestones in reducing air pollution from the steel industry. However, the recent economic problems of the industry forced the companies to change some of their plans, and the new Clean Air Act Amendments have also made it necessary for certain portions of the consent orders to be reconsidered.

Air Pollution

Air pollution caused by automobiles remains a major problem in most of the large cities of the Region. While exhaust emission controls have significantly reduced the pollution levels coming from automobiles, they will not be enough to ensure attainment of national air quality standards. I am convinced that transportation control plans, especially Inspection and Maintenance programs for automobile exhaust emissions, remain the only alternatives that will work. For some time we have been trying to get Pennsylvania to start an Inspection and Maintenance program. The State has not been responsive, and last February we were forced to bring suit against the State. It appears that lengthy court action may be necessary.

These are all tough goals, but I believe they can be attained. The key is that everyone must work together in a spirit of cooperation and common purpose. Too often in the past, those that cause pollution, especially industry, and the EPA have been antagonists. My experience has proven to me that this situation need not continue. Industry forgets that EPA's goal is to end pollution, not make life tough for businesses. We would always rather help a polluter find a way to solve a problem, than have to take enforcement action. When I drafted and sponsored environmental laws as a State legislator in Missouri, I was heavily lobbied by business interests. While the laws I proposed were not exactly what they always wanted, I believe that they considered my approach to be fair. The approach I favored as a Missouri legislator was reflected in the wisdom of the legal philosopher who held that law with no exceptions is bad law, while law that is all exceptions is no law at all. I trust that Region 3 businesses will also consider this approach to be fair.

But I am no longer a legislator and now wear another hat—the hat of an administrator. I can no longer propose new laws or policy. I must now implement what is already on the books. But even though my role is different, I believe that my philosophy regarding the law can also be adapted to enforcement of the laws; i.e., "an enforcement policy that provides no exceptions is bad policy, while an enforcement policy that is all exceptions is no policy at all."

While industry has long considered EPA as being too tough and unreasonable, environmentalists have many times felt that EPA has been too easy on polluters. I have always considered myself an environmentalist, and having viewed the world both from within EPA and without, I believe that the problem lies not in EPA being either too tough or too easy, but in industry and environmentalists taking parochial positions that become mutually exclusive. After digging their trenches, many cannot then see that what is right for General Motors (or the Sierra Club) is not necessarily right for the United States. The answer to a polluting industry is not "close the bum up." The answer to the need for a very expensive piece of pollution control equipment is not "forget it, or how about five years from now."

Solutions

The solutions to many of our more important problems can be found in developing compliance techniques that get the job done and, at the same time, preserve our economic vitality. All too often, many of these problems become embroiled in politics or in endless bickering and nitpicking. That is unfortunate because, more often than not, technical solutions are available. But to make them work, public officials, business and industrial leaders, indeed the public itself, must drop their

parochial attitudes. They must take the position that is best for society as a whole . . . and for the Region as a whole.

That is a difficult thing to do. It requires that we stop shouting *at* one another and start communicating *with* one another. It requires listening to one another. It requires civility and patience and reason. It requires a clear vision of what our society's goals are. And it requires a determination to make the participants in this process respond in ways that are consistent with those goals.

As a relative outsider to Region 3, I bring to my responsibilities no preconceived notions regarding who the guilty are. I am thereby permitted the luxury of taking a fresh look before making a decision. I am personally not interested in laying blame but rather in getting results . . . results that clean up the environment and protect the public.

One thing does bother me, and that is the public image of EPA. I am not talking about the Agency's image as perceived by the special interest groups but our image as perceived by the general public. Many public opinion polls have shown that the people hold a low opinion of bureaucracies in general, and the Federal bureaucracy in particular. I think this opinion is unfair, and particularly so in the case of EPA. I have rarely seen a more able and genuinely dedicated group of people. And they are dedicated not just in a professional sense, but also dedicated to the ideal of a clean environment and an enhanced quality of life.

But we sometimes inadvertently bring public opinion down upon ourselves by presenting a bureaucratic image to the public. All too often we quote laws and regulations as the justification for our decisions. While laws and regulations must be obeyed, a bad decision invariably results if there is no logical explanation for that decision. Perhaps the decision in such cases is not technically bad, but it is bad for the image of the Agency. We have all seen necessary Agency programs collapse completely when the public cannot understand them or support them. The transportation control plans of past years are a good example.

So we must make additional efforts to ensure that our decisions are understandable and logical and based on facts. We must comply not only with the letter of the law but its spirit. We must involve the public in the rulemaking and decisionmaking process whenever possible and appropriate.

Difficult Days

Let me make a further and related observation. These are difficult days for environmental concerns. They used to be "motherhood and apple pie." But now the decisions are tougher. They often appear to affect other important national goals—adequate energy supplies and full employment, to name the two we hear most about. If the American people feel that they must choose between equally compelling national goals, our decisions will become even more controversial.

Our task, then, is to convey to the public, realistically and persuasively, that all of these goals are compatible, that we in EPA share them, too, and that they are all achievable. Difficult in the coal mines of West Virginia? Difficult in the steel mills of Pennsylvania? Yes, of course. But we are not without our allies even in those places, although they themselves sometimes find the going rough. Let us, then, give them added support. Let us rebuild our natural constituencies, and add others. In this process, let us not speak to our fellow citizens of amendments and regulations but of hearts and lungs and livers and kidneys—of life itself.

And, finally, let the EPA voice be heard in the highest councils of government calling for a cross-fertilization of national goals, endorsing goals other than our own, and clarifying strategies to attain them. Let us ourselves *not* be parochial! And if EPA excellence and leadership can be an example to all of government in the very difficult zero base budgeting process, why cannot we set yet another example of excellence and leadership in the bold suggestion of an integrated national policy—and strengthen our public image, our credibility, and the effectiveness of our own mission in the process?

When these steps are taken, perhaps we will see stronger support from the public, as well as from industry and the environmental groups. With their help we have a right to greater expectations. So it is that I look forward to the next few years . . . years in which Region 3 will experience its greatest challenges yet. We—all of us in the Region—like to think we're ready. □

Around the Nation

Certificate of Appreciation
The Norwood, Mass. Women's Community Committee, Inc. has been awarded the Region 1 Certificate of Appreciation in recognition of its many efforts to improve the quality of life in its community. The Certificate, signed by Region 1 Administrator William R. Adams, Jr., is given to groups and individuals in New England who have made meaningful contributions toward an improved environment. The Women's Committee has worked to educate Norwood residents about the need to protect the environment around them. They have sponsored community clean-ups, prepared slide shows for elementary schools about recycling, planted flower boxes, sponsored campers at the Massachusetts Junior Conservation Camp, and issued policy statements stressing the importance of protecting the town's water supply.

EPA Comments on Dickey-Lincoln
Region 1 has notified the Army Corps of Engineers of serious environmental concerns about the proposed Dickey-Lincoln hydro-electric project in northern Maine. EPA has been reviewing the Draft Environmental Impact Statement prepared by the Corps for the hydro-electric project.
In a letter to the Corps, Region 1 Administrator William R. Adams, Jr. commented that the project would result in violation of water quality standards and would compromise the recreational potential of the area. Adams also noted that the Draft Environmental Impact Statement identifies a number of other sites in New England with better capacity and generation potential than Dickey-Lincoln. These alternative sites would consume less land and water area and would have a better cost/benefit ratio, according to the statement. The Agency believes that these and other options deserve a more thorough environmental and economic analysis.

The comments made by EPA and others will be considered by the Corps and incorporated into a final impact statement, due next August, which will help determine the fate of the project.

Sludge Connection Denied
Region 2 Administrator Eckardt C. Beck has debunked the reported theories that unexplained explosions off the New Jersey coast may be related to ocean dumping of sewage sludge and garbage. "In the first place," said Beck, "garbage is not dumped in the ocean—it is disposed of in landfills or by incineration. Any illegal dumping of garbage could not be in sufficient quantities to generate explosive methane gas. In the second place, methane cannot be generated by sewage sludge except in anaerobic conditions—that is, in the absence of oxygen. The current condition of the coastal waters is highly oxygenated, according to our recent monitoring results. Furthermore sludge has been dumped at the New York-New Jersey disposal site for years without evidence of methane formulation."

Chesapeake Bay Study Set
Region 3 has announced plans for several major water quality related studies for the Chesapeake Bay. The studies will investigate such problems as toxic materials, eutrophication, and submerged aquatic vegetation. Future studies being considered include dredging and spoil disposal, wetland alterations, hydrological modifications, fisheries modifications, boating, and shipping. The plans were announced after a meeting of the Chesapeake Bay Policy Steering Committee, which is made up of EPA staff from Region 3 and Headquarters, State representatives, and citizen representatives.

Drinking Water Contamination
Region 3 has recently completed a notification process that began with the discovery of carbon tetrachloride in Philadelphia drinking water last November. The City of Philadelphia had notified EPA that abnormally high levels of carbon tetrachloride, a suspected carcinogen, were turning up in treated drinking water. Subsequent tests traced the contaminant to chlorine used in the treatment process. Philadelphia removed the contaminated chlorine from use and EPA went to work tracing the chemical back to its manufacturer. Then every water supply utility that could have received part of the contaminated shipment was notified. A total of 133 water supply systems, 74 in Region 3, the remainder in Regions 1 and 2, were warned of the possible danger.
Regional officials took steps to ensure that the chlorine manufacturer would control carbon tetrachloride contamination in the future. EPA officials also met with the Chlorine Institute, a manufacturer's association, to develop an interim standard for carbon tetrachloride in chlorine.
Region 3 is working with EPA Headquarters and the Chlorine Institute on a final chlorine standard.

Plant Opposed
A number of people turned out in Jupiter, Fla. to testify against a $10 million municipal wastewater treatment plant. Not all the citizens of the community, located near West Plam Beach, are against the plant but some 50 people spoke at the hearing, many of them opposing any discharge into the Loxahatchie River. Opponents see the plant as a stimulant to growth and in conflict with their goals of limiting development and population expansion in the area.

Elsewhere in the Region
EPA has granted $83,000 to Tampa, Fla. to implement a voluntary automobile inspection and maintenance program.
Region 4 personnel, accompanied by representatives of the Manufacturers of Emission Controls Association, have visited Tampa to start work on the program.
The State of Mississippi has requested an emergency exemption under Section 18 of the Federal Insecticide, Fungicide, and Rodenticide Act for the Mississippi Imported Fire Ant Authority to apply degradable Mirex. Several other States are likely to seek similar exemptions.

Some 200 Federal officials from 25 agencies attended a Region 4 workshop on Environmental Impact Statements. The topics covered included new rules from the Council on Environmental Quality, endangered species, unique farmlands, and archeological review.

Scott Paper Company of Mobile, Ala. has signed a consent decree with Region 4 for its failure to meet a July 1, 1977 deadline calling for use of best practicable technology. The firm agreed to pay a $50,000 fine.

REGION 5

Air Citation

Region 5 issued a 30-day Notice of Violation under the Clean Air Act recently to the Metropolitan Waste Control Commission of the Twin Cities area, to control air pollution from its Wastewater Treatment Plant near Pig's Eye Lake in St. Paul, Minnesota. Regional Enforcement Director James O. McDonald said the notice was directed at eight sewage sludge incinerators emitting over 3,976 tons of particulate matter a year in violation of State Air Pollution Regulations. The regulations allow emission of 104 tons of particulates a year. McDonald said ambient air quality levels for particulates in the area near the plant are among the worst in the State and violate the National Ambient Air Quality Standard for health. Pollution control equipment on three of the incinerators that previously enabled them to achieve an adequate level of emission reduction has been deactivated by the Commission. A total of seven incinerators are presently uncontrolled. The remaining incinerator has inadequate control equipment.

REGION 6

Texas Assumes Emission Offset Responsibility

The Texas Air Control Board has agreed to implement the Federal requirement for emission offsets in Texas. Adlene Harrison, Regional Administrator, said the decision is "in the best interest of the people of Texas, industry, the State and EPA."

Harrison said the Texas board has demonstrated that it has the technical capabilities to effectively ease air pollution in a way that will assure clean, healthy air throughout Texas. This is the first step toward a program that would allow a new industrial source to go to a single agency, the Texas Air Board, to apply for all air pollution control permits.

Emission offsets are required by the 1977 Clean Air Act when construction of a new pollution source is proposed in an area that exceeds the national ambient air quality standard. In order to permit construction, the emissions from existing sources in the area must be reduced (offset) by more than the emissions from the new facility. The new source must use the best available control technology to prevent significant deterioration in areas where air quality is better than the national standard. Since the decision was announced, the staff has been working to finalize the details for providing Federal grant funds to the air pollution control agency.

REGION 7

Cedar River Polluted

Region 7 Administrator Dr. Kathleen Camin has ordered an "in-depth evaluation" of pollution in the Cedar River. The Iowa Department of Environmental Quality ordered Salsbury Laboratories to stop dumping wastes and remove all pollutants from its 5-acre site on the river south of Charles City, Iowa, after toxic wastes from the laboratory were found in the drinking water of Waterloo, Iowa, 50 miles downstream. Salsbury Laboratories produces chemical products for industry and pharmaceutical products for veterinary uses. It has used a dump on the Cedar River as a sludge disposal site since 1953. EPA staff and Hickock Associates, a State contractor, took many samples of the dump, river water, and drinking water, and found that arsenic, phenols, and other chemicals had leached into the river sediment.

Interagency Forum Held

"Working Together for Health and Safety" was the theme of an interagency forum held recently, in Kansas City, Mo. The forum was sponsored by EPA, the Consumer Product Safety Commission (CPSC), the Food and Drug Administration (FDA) and the Occupational Safety and Health Administration (OSHA). It provided an opportunity for citizens to voice their concerns about the regulatory actions of each agency.

REGION 8

Jetport Proposal Studied

Noise Control personnel and members of the regional evaluation branch are reviewing a proposal from the Federal Aviation Administration to extend the runway at Jackson Hole Airport, Jackson, Wyoming which is located in Grand Teton National Park. This would allow the airport, the only one located in a national park, to accommodate commercial jet aircraft. The 2,000 foot runway extension would accommodate regularly scheduled jet aircraft, and an unknown number of charter jets. EPA personnel are carefully evaluating the effects that noise from the jets would have on the pristine wilderness environment of the park. While the provision of jet service would increase the convenience to one percent of those travelling to the Jackson Hole area, it could also destroy the very qualities of the park sought by over 4 million visitors annually. This factor and others are being considered by EPA while developing the Agency's position on this important and controversial issue.

REGION 9

Cooperative Effort

An Interagency Inspector's Orientation Program has been established in Region 9 as part of a cooperative effort by EPA and three other Federal agencies—Food and Drug Administration, Occupational Safety and Health Administration and the Consumer Product Safety Commission. The program describes each agency inspection program and emphasizes the inter-relationship of the various agency inspection programs.

REGION 10

Lake Restoration Grants

Region 10 granted $1,717,562 to Longview, Washington recently for the rehabilitation of the city's Lake Sacajawea, raising the lake restoration grants total in the Pacific Northwest to more than $4 million. Lake Sacajawea, a 53-acre body of water, has eutrophication problems that have prevented the 60,000 people who live nearby from enjoying the lake to its full potential. Seven lakes in Washington and one in Oregon have received EPA funds for restoration work. In two cases the goal is to protect drinking water sources, in the six others, it is to enhance recreational uses.

IPM—Evolution or Revolution?

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It may, for example, be technically correct but economically catastrophic." Thus, it would seem prudent to resist the temptation to propose or impose seemingly obvious and appealing simplistic solutions to complex pest problems based upon appeal alone. It also seems obvious that government agencies should not be pushed down the primrose path or lead the public to believe that adequate crop protection by farmers can be achieved without the continued use of contemporary pesticides, at least until alternate methods are fully developed and tested in the ultimate laboratory—the farmer's fields.

The matter of insects developing resistance to pesticides has been advanced as a reason for moving in other directions to achieve pest control. Lest there be some misunderstanding, it is a biological fact of life that any population, plant or animal, tends to develop resistant characteristics to accommodate the conditions present in its environment, whether man-made or natural. Given the vast pool of genetic material in any single insect population, such resistance occurs in just a matter of time.

Scientifically, it is conceivable that the development of resistance to naturally occurring forces would equal or even exceed that which has been experienced with certain man-made pesticides. This is well understood within the scientific community. But, perhaps the public has been inadvertently misled into believing otherwise. It would seem appropriate to make this and other information known so that the level of expectation might not rise higher than it should be.

What has many in the agricultural community and in the agricultural chemicals industry concerned is that a state of the art is presumed for IPM that does not yet exist. Nonetheless, there are signs that it may be precipitously imposed on agriculture by impatient agency personnel within the government.

Such concern does not stem from idle speculation. Assistant Administrator Jellinek is on record to the effect that EPA will try to use IPM as an alternative to cancellation proceedings against pesticides, feeling that it represents a positive, promising direction in agriculture and pest control. To make the 'promising program grow,' he suggested use of incentives and disincentives, saying that IPM crop insurance was an incentive and pesticide cancellation if IPM was not used was a disincentive.

Responding to such a concept, conferees of the Annual Conference on Cotton Insect Research and Control recently considered a working draft prepared by EPA analysts entitled "National Strategy for Integrated Pest Management." They have objected to the use of IPM as a regulatory mechanism, and pointed out that it is not in accord with the intent of the 1977 Food and Agriculture Act (P.L. 95-113) which states: "The Secretary of Agriculture shall coordinate all agricultural research, extension and teaching activity conducted by the Department of Agriculture, and to the maximum extent possible, by other agencies of the Executive branch of the United States Government." They said further that integrated insect management systems have not been refined to the extent that permit the concept or practices to be included in Federal regulatory programs nor has technology on delivery systems for IPM systems been developed to the point that enables the development of a national information system on IPM.

Use of the word "integrated" was initially inserted for scientific entomological interests, but seems to have taken on an unfortunate and potentially dangerous interpretation. Obviously, it has been construed by some in the government and public interest groups to mean that there is on hand a "grand scheme" of pest suppression that can be applied universally across agriculture. Dr. J. M. Good, Director of Pest Management Programs for the Federal Extension Service, offers further perspective contained in a November, 1977 memo to Mr. Jellinek on IPM implementation. He wrote, "I am assuming that you are thinking of IPM as we do in USDA, and not merely pesticide management or as a regulatory tool. There also are differences between education and voluntary acceptance with those of persuasion and regulation.

"Some points to consider are:

1. IPM, and even monitoring techniques, is not developed for many crop and pest situations.

2. Monitoring and data keeping costs may be prohibitive for some pests.

3. There will not be enough qualified experts to make such regulatory decisions in the foreseeable future.

4. For many years it would not be feasible to use this approach for entire crop areas on more than one or two pest situations per year in most States."

It is unfortunate that some who are involved in the political jockeying to advance the cause of IPM have at times lowered the discussion to attacks on the integrity of those who do not share their views. This has led to the suggestion that industry scientists and fieldmen are lacking in integrity and allegiance to scientific principles because they work for an industry which sells pest control products. In my opinion, based upon intimate contact with workers in industry, government, and institutions of higher learning, the charge is fallacious and must be viewed as a political ploy.

What really bothers me is that such tactics neither contribute to the necessary cooperation which is needed among all agricultural researchers nor does it advance the level of understanding of the scientific method among members of the general public.

Fact of the matter is that all researchers deal in a product; for some it is the data developed and published through government or university programs; in industry the research sometimes leads to a specific pest control product. These products are judged by the farmer customer on merit alone—results he achieves in pest control.

No company or its salesmen could stay in business by giving bad advice. Thus, most salesmen are highly trained and knowledgeable in agricultural production and the use of products which the pesticide industry has developed.

Industry relies upon sale of commercial products to meet its payroll and other financial obligations; university and government research gets public funding, grants, and contracts. Both systems contribute greatly to American agriculture and to society, and, hopefully, all workers receive regular paychecks. Neither group is deserving of the "black hat" categorization. The best effort and cooperation from both will add knowledge from which sound judgments will be made.

One of the basic strengths of American agriculture has evolved from its foundation on science, both basic and applied, coupled with a perhaps imprecise, but nonetheless effective problem-solving technique involving wide-ranging disciplines within the scientific community. Once a problem has been identified each works in his own way to add to the body of knowledge and ultimate solution. There may be and often is a difference of opinion among scientists, but scientific controversy is but another step in the search for truth.

Most of the difficulties arise when science, which in a true sense faces no time constraints, interfaces with the political structure for which time and speed are of the essence. Science moves too slowly for the political structure, and the political structure moves too fast to absorb much of the available scientific data.

When the term "integrated" was added to pest management in the early 1970's I was dismayed to learn that one of the proponents in the USDA had stated that Industry can be expected to oppose it. Why should industry be expected to oppose something it had been involved in for so many years? The answer was not forthcoming. As a matter of record and policy "NACA endorses and urges support of

programs which have as their ultimate objective the achievement of pest suppression based on sound ecological principles which integrate chemical, biological, and cultural methods into a practical program, where necessary and when possible."

In my view there should be common agreement about the desirability of encouraging the development of pest suppression techniques based on sound ecological principles. By any measurement it would seem imprudent to place any great reliance upon an unproven or theoretical system without adequate testing which showed dependable results. And since I know farmers as prudent managers I would be surprised if they accepted IPM at face value. There is too much at stake. By the same token, I would also be surprised if a government program was needed to lead them to a practice which helped them do a better job of producing our food supply. The ultimate test of any new idea or combination of new and old techniques must pass one critical test—its applicability to the special needs found in the farmer's fields. For, in the final analysis, it is these results that count. □

The Future of Integrated Pest Management

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All these circumstances have called for devising a new approach from that of simply applying a pesticide at each instance of a pest occurrence. A national IPM project opening up such new frontiers was sought by the International Biological Program (IBP) in 1969-70, and in 1972 it was supported by NSF, EPA, and in various ways by USDA and 18 universities. I have had the lead responsibility of organizing, developing and coordinating this effort since its origin. This project is an example of what might be done on a much broader scale. The practical gains already achieved suggest the potential of such programs and the justification for re-aligning policies, funding procedures, and laws and regulations in order to make integrated pest management a broadly-based reality. It has engaged some 250 scientists for the past six years. A unifying force has been the gradual shifting of the program toward concentration on the crops themselves and on systems analysis, rather than on the insect pests specifically. The systems chosen for this effort were alfalfa, cotton, soybean, citrus, pome and stone fruits and pine forests.

Just what do we mean by "integrated pest management (IPM)?" The term is becoming almost a household word. The trouble is that everyone seems to have a different idea of what it means. Some consider it a convenient term that embraces the use of just any combination of measures for controlling the pests on a crop—even the isolated use of two or more different pesticides, without analysis of their need or consideration of other possible tactics beforehand. The term, however, means something distinctly different from this. It has evolved from the earlier used term "integrated control" which in general has meant the augmentative integration of a combination of tactics (e.g., cultural, biological, pesticidal, behavior modifying, crop resistance techniques) used in an ecological context and supportive, wherever possible, of existing natural controls to maintain pest populations at non-economic densities.

The above described project and related research have recently made major advances in the degree of sophistication in establishing the real need to take *any* action and in determining *what* actions are best. This involves a more profound determination of the various factors in the growth of the crop, as well as those affecting the destructive potential of the pests. Thus, currently: *"integrated pest management" embraces an analysis of the production system as specifically related to pest impact, and the specific physical, biological, and cultural factors and their interactions that bear upon that impact, and the combining of all appropriate measures to optimize the benefits of pest control in the broadest sense.*

Before a pest control system can claim to fill this ideal definition, much more needs to be learned about the growth of our crops, the pests themselves, and the measures that might best be used to control them. This is what the new technology is all about.

The project particularly emphasized economic injury, and the real need to use insecticides. While the weather cannot be manipulated directly, we can intensify its harmful effects on the pests and lessen those on the natural enemies, or to favor host plant resistance, by various cultural or management practices. The other two major natural control factors, plant resistance and natural enemies, have been taken as the cornerstone of the effort. In addition, efforts have been intensified to find better ways of using chemical pesticides—primarily by using non-selective ones in ecologically selective ways.

I would like to give briefly a few highlights of what the program has accomplished in a practical sense.

For *apples* in affected States there has been an approximate 20-50% or more reduction in use of insecticides and acaricides, in Washington, only slightly due to the effects of this project, but in Michigan and Pennsylvania as a major consequence of it.

For *soybean*, a management system tested for soybean insect control in North Carolina required a single treatment on only 20% of the acreage but no treatments otherwise, whereas adjacent farms averaged one treatment per field. The pest management system devised by the soybean project is being widely used in Louisiana and other States and is credited with preventing escalating insecticide use for soybean insect control. The project is credited with saving the soybean industry from the same catastrophic situation pest control in cotton was in a few years ago.

In *alfalfa*, a simplified management system for alfalfa weevil control, wherein biological control factors and chemical control are integrated, has been tested in Illinois, in which growers cooperated fully and made their treatments only as recommended by program advisers.

In *citrus*, evidence suggests that high quality fruit can be produced using insecticides only minimally, in some seasons or areas none at all. An effective system is ready for adoption on some 76,000 acres of oranges in Southern California. In Florida, the introduction of the parasite *Aphytis lingnanensis* for control of snow scale alone is saving the citrus industry some 8 to 10 million dollars annually, in the amount of insecticides required, thereby imposing no disruption of the existing integrated control system used there, and reducing the adverse environmental and health effects correspondingly.

For *cotton* in Arkansas, in a region of over 100 sq. miles, a pest management system based on a prediction model for *Heliothis* was adopted in 1976 and 1977 by essentially all growers in the area. An average of only two chemical treatments in 1976 and one in 1977 were used.

A most exciting event has been the development in Texas of short-season, dwarf types of determinate fruiting cottons and the development of IPM "packages" for insect pest control on these cottons. The system offers promise in greatly reducing insecticide use, alleviating secondary pest outbreaks, use of less water, less fossil fuel and labor, and less growing time, with the latter point suggesting that some extra crop per year might be grown on the same land and the former that the crop can be grown more cheaply, more profitably, and with less risk, while conserving water and fossil fuels. Tests indicate that some of these cottons grown under more narrow spacing produce even higher yields than conventional varieties and spacing.

For *pine forests*, a much improved understanding of forest stand dynamics, bark beetle behavior, conditions favoring outbreaks and both economic and recreational impact of bark beetle outbreaks have been gained. These findings suggest better possibilities for managing bark beetles, through silvicultural and/or use of behavior modifying chemicals (pheromones).

Development of a project in IPM requires the coordinated effort of scientists from many disciplines, such as agronomy, plant

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physiology, entomology, nematology, plant pathology, weed science, mathematics, ecology, engineering, and computer science, simply to examine the various interacting factors in a crop system. The general analytical methods used in assessing such complex problems and reaching a solution are referred to as "systems analysis".

It is in this coordinative, integrative area that much of our research has failed to meet the full requirements of IPM. This is not to say that our past research has been unproductive. Indeed, IPM requires two major categories of research: (1) that on direct control tactics and (2) that on supportive tactics. The first refers to direct methods of controlling the pests (e.g. chemicals, biological control, cultural methods, resistant varieties etc.), and the second refers to methods which do not control a pest but which furnish the scientific understanding of the problem so that the various possible tactics may be employed optimally.

What has been lacking is the organization and research needed to develop a *comprehensive* understanding of the *whole system as a unit and to put together optimal* solutions for growing the crop (or livestock) and protecting it from all the pests. Our traditional systems of using creative scientific individualism, conducted separately, has indeed led the world in development of various solutions for specific pests. *There can be no lessening of this emphasis* because these fundamental individualist efforts are *absolutely* necessary to give us specific *methods* to control specific pests, because no amount of greater understanding and insight, or systems analysis *ever* controlled *any* pest. These basic experimental studies, pest by pest and crop by crop, will furnish the nuts and bolts needed in the analysis of the systems and synthesis of holistic solutions.

We can hardly be faulted that we have not already done all this (it is an entirely new frontier); we *can* be faulted if we do not rise to the challenge now made so evident. So we may objectively ask just what are the problems that prevent faster development and implementation of IPM? These can be reduced to a few major ones:

1. The first problem is that advice and pest control chemicals are being sold by the same entity. So long as sale of pesticides and sale of advice concerning the need to use them are vested in the same entity—the pesticide company—there will not be a bona fide, large scale implementation of a rational, scientifically based pest control technology. So long as earnings are based on the quantity of pesticides an advisor sells rather than the quality of his advice, the emphasis will be on overselling of insecticides. [See e.g. Glass, E. H. coord. 1975. *Integrated pest management: rationale,* potential, needs, and implementation. Entomol. Soc. Amer. Sp. Publ. 75-2. 141 pp.]

2. The second problem rests on the fact that we know far too little about the dynamic aspects of economic thresholds for most of our major pests, even as single-pest species, and we are even more ill-informed about the combined treatment thresholds where several pests attack the crop concurrently.

3. We need to know far more about how we can encourage and foster better biological control.

4. *Considerable successful research has* been conducted to develop crop varieties having resistance to plant disease pathogens and to an extent against insects. The possibilities in both areas offer major possibilities, and research to find varieties capable of countering the adverse effects of weeds has been *essentially nonexistent.*

5. We know far too little about the selective possibilities for the various pesticides that may be used to control certain pests in a way so as to protect or to foster natural enemy or antagonist action. We know too little about how we may use the broad spectrum materials in selective ways.

6. We do not yet have adequately efficient, yet cheap, methods for assessing natural enemy action, and more significantly the populations of the pests and their expected damage. Monitoring systems must be improved and yet boiled down to their very lowest requirement.

7. There is currently a shortage of specialists concentrating on practical integrated pest management research, and also a shortage of practitioners adequately trained to use the techniques that are being developed.

We are on the verge of transforming insect control from a system of science and half guesses to one based primarily on facts, in which the promotion of insecticides will no longer be a decisive determinant of what is to be done. In doing so we are also entering the era when not only insect control but all pest control, and indeed crop production itself, will be more scientifically based. Priorities will be determined through an orderly process of farm decision making, based on actual results from monitoring the fields for the conditions that affect crop growth and yield.

A corps of highly trained professionals will be needed to monitor the major features required. A weather network designed and computerized to satisfy the needs for modeling events throughout the Nation is needed. We have seen how such a network is effectively used in insect pest management in Michigan. We have seen how a telecommunication network, tied into a data bank of pest incidence, crop conditions, and pest control tactics can be used to update our traditional extension service. Without such updating, the extension service could not begin to cope with future needs. Private consultants, too, will be able to utilize the new pest control guidelines and obtain their own practical monitoring data to put into mini-computers, which will utilize formulae for optimizing decisions on pest control.

Substantial practical benefits have been gained, and others could be gained, without using systems analysis and modeling. Other gains have been made and can only be made by use of systems analysis. The systems approach, is, in fact, almost synonymous with the first dictum of IPM, "consider the (whole) ecosystem". We feel that the tools of systems analysis offer us a path by which we can establish the research needs, explore the biological, physical, economic, and social problems that are suggested, and then assess the results as components of a single interlocked system. Needed are facts and more facts, rather than "educated guesses". It is by developing an understanding in depth that we can confidently settle on the main criteria, neglecting endless details, and simplify the monitoring and delivery systems, as must be done, if we are to establish realistic, implementable IPM programs on a crop-wide national scale.

Finally, I would point to two major factors that have hindered development and achievement of improved pest control. The first is that the chemical industry has for too long dominated the pest control scene, and this has resulted in an almost complete departure from some of the older, more ecologically based methods of pest control. A virtual army of pesticide salesmen have in some parts of the country practically replaced the traditional dependence of the farmer on his university for advice. There must be some way that this can be corrected. We should put a force of independent professional biologist-agriculturists in the field to do the necessary monitoring and assessment of the need for treatment and to ascertain what measures, if any, are best.

Secondly, the method of funding and managing research programs to develop improved pest control, i.e., IPM, must allow for some changes. Existing routes of funding through small individual research grants on small pieces of basic or applied research, or through the USDA have been inadequate. At present, most of the management of pest control research is automatically subject to the cross-currents, opposing viewpoints, and yes, parochialisms or special backgrounds, of the administrators at different levels in the several universities and the Federal Government usually involved in such "coordinated" programs as now exist. A program of appropriate scope and technical depth, centered on use of systems science and modeling, as a means of setting research priorities, guiding research, evaluating results, and optimizing

economic and social benefits to the farmer and society requires a strong *centralized management* largely independent of domination by these administrators, and lacking the dilution of dollars as they are filtered down to various individual scientists. The large IPM program I have coordinated became possible because government realized the need for such a *centrally managed* and *block-funded* effort. The program that various participants have described attests to the success that can be had when such programs are solidly established and strongly supported.

But we have just begun! We need to establish more solidly the insect control programs we envisage for the six crops we have worked with, and develop similar programs for all our crops, and to look at the livestock pest and urban situations. But we need first to bring in the other *kinds* of pests—plant pathogens, nematodes, and weeds (which we have not done), and the whole gamut of crop and livestock production.

A farming operation is a complex system. By using systems science we can serve the farmer better than we have. The farmer deserves more than he has gotten in the past and more than the most dedicated individual scientists or pesticides salesmen can give him. He needs to have his (her) whole farm operation looked at as a unit, the options organized, and the consequences detailed for him. Moreover, if the family farmer is going to be able to meet the competition from the ever-increasing corporation operation, he will need the clear insight and predictive potential for cost/benefit analysis and decision-making that systems science and accurate, detailed information afford. □

Bees

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hobbyists, and the rest are part or full-time professional beekeepers.

All told, their bees produce about $100 million worth of honey annually and around $3.4 million worth of beeswax used in cosmetics, medical ointments, candles, and other products.

But bees fulfill a much more important function. While making their rounds of various plants in search of nectar, they pollinate billions of dollars worth of food crops each year—about a third of all the food that shows up at the dinner table. They also pollinate untold numbers of trees, shrubs, and flowers, including everything from wildflowers to the vegetation used in protecting watersheds. By serving as a link in the reproduction of such plant life, the bee is a vital and even indispensable part of the web of life.

Pollination is the transfer of pollen from stamens to ovules in plants, resulting in fertilization and seed formation. Cross-pollination between two plants, often made possible by insect carriers such as bees, has genetic advantages since this produces more varied progeny with a better chance of survival than self-pollination within a single plant. Entomologists point out that many bee-pollinated plants are unable to reproduce themselves in areas where certain kinds of bees are not present.

Honeybees kept by professional beekeepers are often rented out to farmers for pollination purposes. Without the domestication of honeybees by professionals, many foods could not be produced on a large scale. These include production of cherries, avocados, tangerines, apricots, almonds, apples, several vegetables, and seeds for forage crops such as clover and alfalfa.

Yet every year pesticides destroy an estimated 10 percent of the Nation's honeybee hives and substantially reduce the populations of another 30 percent. The U.S. Department of Agriculture became worried about the problem of bee mortality a decade ago and launched an indemnification program to help beekeepers recover from losses incurred by pesticides. As of this writing USDA has paid out approximately $23.5 million to reimburse apiarists for damage to their bee colonies since 1967. However, bee industry specialists believe that less than a fourth of the losses are being indemnified. They estimate that actual losses are totalling at least $12 million a year or 400,000 hives.

Commenting on the lack of communication between farmers and bee keepers, Roy Barker of the U.S. Department of Agriculture's Bee Research Laboratory in Tucson, Arizona, complains: "There are very few areas where beekeepers and pesticide applicators are seeing each other. Mostly they see each other in court."

The other side of the picture, of course, is that growers often complain of lack of understanding and cooperation by beekeepers when pesticides are being used in fields where bees are not needed for pollination.

"We have programs in many states to notify beekeepers when spraying is scheduled," explains one food industry representative. "But it's difficult at times to get the apiarists to cooperate when we suggest they cover the hives or remove them from nearby fields. For example, the bees will move into sweet corn fields where we are spraying for corn earworm or borer control, and they are killed. Bees are not needed for pollenation in corn or other grain crops. It is not helpful when the beekeepers simply tell us, 'If you kill my bees, you'll be sued.'"

To bring together various organizations concerned with the problem, the Environmental Protection Agency sponsored a conference in November, 1977 in Washington, D.C. with William C. Holmberg, Director, Operations Division, Office of Pesticide Programs, as program chairman.

Attendees included representatives from Federal and State agriculture departments, universities, pesticide manufacturers, and the bee industry.

One of the special problems for beekeepers is a relatively recent development called microencapsulated pesticides. With the banning of DDT, chemical companies have been turning to highly toxic organophosphate insecticides. Although they degrade rapidly and therefore do not present a long term danger to the environment, repeated applications are necessary to protect crops effectively. However, such repetition is costly and time-consuming, and manufacturers are slowing down the degrading process by enclosing fine droplets of liquid pesticide in tiny polymer spheres. This microencapsulation permits the active chemical to be made as a powder with individual grains only 30 to 50 microns wide. (A micron is one thousandth of a millimeter or .000039 of an inch long.)

Microencapsulation permits the pesticide to be applied as a water-based spray with ordinary equipment.

The problem is that the tiny capsules are picked up by bees and carried back to their hives before the insecticide is released. The result: Other bees including hive workers and brood are poisoned. Where most pesticides kill only bees working in a field, this type is hazardous to the entire bee colony. Studies at the University of Oregon and Washington State University entomology departments suggest that extensive bee losses have been caused by misapplication of Penncap—M, a microencapsulated insecticide patented by Pennwalt Corporation of Philadelphia. The company, in an effort to help solve the problem, underwrote the cost of last November's meeting in Washington.

Among other views aired at the Washington conference were the following:

- A principal point of contact within the Federal Government is needed to represent the interests of beekeepers, coordinate bee research efforts, and improve communication between beekeepers and growers.

- Training of growers and spray applicators should focus to some degree on bee protection measures.

- Label precautions must be improved as well as State enforcement of pesticide regulations.

- More grant resources for bee research should be identified and utilized.

- A public relations effort is needed by beekeepers to explain their problems to the public and the significance of bee losses to food production. □

News Briefs

EPA Restricts Sale and Use of 2,000 Pesticide Products

For the first time under authority provided by the 1972 Federal pesticides law, the Environmental Protection Agency has restricted the sale and use of some 2,000 pesticide products.

Only farmers and commercial users who have been certified and shown competent to handle the products safely will be allowed to use them. The products contain 23 potentially hazardous ingredients such as calcium cyanide, endrin, and strychnine. The restricted list includes agricultural insecticides applied to crops such as cotton, wheat, soybeans, and other vegetables and fruit; certain weed-killing compounds, and pesticides for control of rodents such as rats and mice.

The Federal Insecticide, Fungicide and Rodenticide Act as amended in 1972 required EPA to restrict hazardous pesticides to certified users or persons working under their supervision. This mass action by the Agency is the first time it has used this authority, and came after extensive study and analysis of the products.

"These restrictions begin a new chapter in U.S. pesticide use," declared EPA Administrator Douglas M. Costle. "Competent growers and applicators will continue to have the chemical tools they need to raise crops and control pests. The public will be protected from possible illness or environmental contamination resulting from unskilled use of these compounds."

Update

A listing of recent Agency publications and other items of use to people interested in the environment.

General Publications

The following publications are available in limited supply from EPA's Office of Research and Development. To obtain complimentary copies, send a self-addressed adhesive mailing label with the EPA report number, PDS number, and number of copies desired written on the label to Energy Publications, US EPA, (RD-681), Washington, D.C. 20460.

Interagency Energy/Environment Research and Development Program.
March, 1977. EPA-600/7-77-007, PDS #3605.
This 20-page publication by EPA's Office of Energy, Minerals, and Industry presents a general look at the Interagency Energy/Environment R & D Program.

Energy Status Report.
April, 1977. EPA-600/7-77-032, PDS #3579. This 59-page report is a more comprehensive description of all activities of the $330 million Interagency Program through mid-1977. It explains each of the 14 interagency categories and lists major projects.

Who's Who in Energy (Part III).
600/9-77-011, PDS #3868.
This 22-page directory was prepared for EPA to provide a means of access to information on projects funded by the Interagency Energy Program. It lists many key individuals involved in this Federal program with addresses and telephone numbers.

Federal Register Notices

Copies of Federal Register notices are available at a cost of 20 cents per page. Write Office of the Federal Register, National Archives and Records Service, Washington, D.C. 20408.

Toxic Substances
EPA publishes inventory reporting regulations for chemical manufacturers and importers; effective 1-1-78,Pp.64572-596. In the December 23 issue . Toxic Substances Control Act; interim procedures for handling confidential business information. Pp. 1836. Jan 12 issue.

Call for Papers

The first annual Pine Barrens Research Conference presented by the Center for Environmental Research at Stockton State College, Pomona, N.J. has issued a call for papers. The Conference, cosponsored by the Center for Coastal and Environmental Studies at Rutgers University and the New Jersey Department of Environmental Protection, will be held May 22 and 23 at the Resort International Hotel, Atlantic City, N.J.

The purpose of this conference is to bring together the researcher and planner to define and integrate research and priorities into future planning efforts resulting from Federal legislation. Abstracts of pertinent and timely papers on the following topical areas are requested: 1) hydrology, water quality, and water resources management, 2) ecology and ecosystems management, 3) resource, regional, and community planning, and 4) history, culture, and archeology. Literature surveys on these topical areas with specific reference to the Pine Barrens are also requested. Abstracts must be submitted by April 14, 1978 to Mr. Robert Maestro, Center for Environmental Research, Stockton State College, Pomona, New Jersey, 08240. □

The telephone number listed in the January Update for obtaining copies of "Progress in the Prevention and Control of Air Pollution" should have been 202-755-2557 not 755-0890.

Opposite: Cornstalks in a farm field

United States
Environmental Protection
Agency

Office of
Public Awareness (A-107)
Washington DC 20460