

The Scope of Pesticides in Highway Operations

WILLIAM C. GREENE

Engineer of Roadside Development, Connecticut State Highway Department

•PESTICIDES have become important and exceedingly valuable tools in highway operations to control or eliminate the creatures emanating from highway trees. With the application of pesticides in accordance with very carefully developed programs, the heritage of beautiful shade trees and natural flora has been preserved and conserved from the ravages of insects and diseases. The establishment, maintenance, and control of vegetation along roadsides have benefited by pesticide applications. Similarly, as pesticides are essential in the abundant production of food and fiber, so they are important in the development of a safe and healthy environment for the highway user, the abutting property owners, and the highway maintenance employees. Chemical pesticides have also become exceedingly important in the economy of highway operations.

In Connecticut, as in many other state highway departments, the following pesticides have been in use: Insecticides, such as DDT, Dieldrin, Chlordane, Aramite, Lindane, Malathion, Nicotine Sulphate, Toxaphene, and some others; Fungicides, such as Bordeaux Mixture, Ferbam, and Phygon; Herbicides, such as 2, 4-D, 2, 4, 5-T, Dalapon, Simazin, Diuron, Baron and numerous combinations and formulations of these other synthetic chemicals.

In June 1962 three excellent articles, entitled "Silent Spring," by Miss Rachel Carson, appeared in the New Yorker Magazine. In October of the same year, it was the Book-of-the-Month selection. This book served to alert each and every citizen and prompted the late President of the United States to appoint a special committee to investigate what was being done to control the use of chemicals with the so-called wanton destruction of wildlife and its attendant ramifications and effects on humans.

Connecticut had a finger pointed in its direction:

Botanists at the Connecticut Arboretum in New London declare that the elimination of beautiful native shrubs and wild flowers has reached the proportions of a "roadside crisis." Azaleas, mountain laurel, blueberry, huckleberry, viburnum, dogwood, bayberry, sweetfern, low shadbush, winterberry, chokeberry, and wild plum are dying under the chemical barrage. So are the daisies, the black-eyed Susans, the Queen Anne's lace, the goldenrod, and the fall asters. In the spring of 1957, trees within the Connecticut Arboretum Natural Area were seriously injured when the Town of Waterford sprayed the roadsides with chemical weed killers. Even large trees not directly sprayed were affected. The leaves of the oaks began to curl and turn brown, although it was the season for spring growth. Then new shoots appeared, and these grew with abnormal rapidity, giving a "weeping" appearance to the trees. Two seasons later, large branches on some of these trees had died, other branches were without leaves, and the deformed, weeping effect of whole trees persisted.

The author of this paper can attest to the latter part of this statement being true, for it touched off an explosion of criticism of the Department that was anything but pleasant. Did not the Highway Department sponsor and encourage the spraying? Why were town crews allowed, even though they were not under the Department's general

direction, to go out and plaster the countryside with these lethal chemicals?

This unfortunate application was not sponsored by any of the personnel in the Department; and it was not performed in accordance with any directives that were developed by the Department. Upon investigation, including complete testing of the chemicals used, it was found that the spray rig operators had a pressure of 400 lb instead of the desired 40 lb and the nozzle tips were of such a small orifice that the mixture was atomized. Also, one of the operators of the rig, instead of selectively directing the spray to the plants that were supposed to be treated, stood on the running board of the truck, opened the gun, and the driver drove down the road at a rapid speed. The consequence was drift of 2, 4-D solution over the countryside.

Miss Carson's book was critical of the operations in many other states and numerous governmental bodies. And, of course, she took many jabs at the chemical industry and the dedicated scientists that have been alert to develop the materials that afford such healthful comfort and abundance.

Miss Carson made no mention of the potato famine in Ireland when a fungus disease turned the food supply into a stinking black slime and the people perished from starvation; or the abandonment of the French plans for a canal across the Isthmus of Panama because malaria, carried by the mosquito, took such a toll of human life. Nor did she recall the farmer's wheat fields being flattened by stem rust; rows of young corn destroyed by cutworms and wire worms; pigs dead from cholera; the high-pitched buzz of flies that were struggling in the sticky festoons hanging from ceilings and the stealthy patter of cockroaches that darted across floors.

Miss Carson did not mention that before the use of herbicides, dermatitis cases of highway employees from toxic vegetation caused many valuable lost hours of work in addition to the untold suffering of hay fever victims aggravated by the pollen from Ambrosia (Ragweed) that incapacitated many people for long periods or made them asthmatic victims; or the lives that have been lost and the property damage experienced that are the result of inadequate vision at an intersection or a railroad crossing because it had not been sprayed with an herbicide. Miss Carson does not bring out the facts that countless trees have been lost and woodlands depleted because of the ravages of insect pests, disease infestations, and that the consequent wildlife cover and natural habitat for birds have been destroyed.

However, Miss Carson did point out that the use of pesticides and herbicides might be causing a multitude of indirect causes of future troubles. Therefore, in addition to the Federal inquiries, numerous states, through an alarmed citizenry, set up investigating bodies. Connecticut was no exception, and Governor Dempsey was urged to appoint a committee to look into the situation. The author had the privilege to serve on the Connecticut Governor's Pesticide Investigating Committee.

On January 30, 1963, the Governor appointed a Committee to review present State laws and procedures governing the use of chemical pesticides and to render a report by April 15, 1963. This Committee of eight members, comprised primarily of trained and experienced professionals in the field of biology, brought a considerable fund of knowledge to the assigned task. The appointment of a layman to chair the Committee insured concentration on the objective as viewed by the general public.

An exceptionally impartial and expert evaluation of current pesticide practices and their effect on man and wildlife was made before recommendations on legislation could be developed. To supplement the knowledge of the Committee with the views of those citizens having a deep interest in pesticide use, information was sought by mail from 40 groups representing Connecticut agriculture, business, conservation, custom application, garden clubs, industry, naturalists, natural resources, and sportsmen. They were asked to submit pertinent facts concerning misuse of pesticides and recommendations for corrections of inadequacies in laws or practices. Fifteen additional representative groups were invited to appear before the Committee to present their views. Forty-seven people attended these hearings and 23 statements were heard. During the course of the 9 meetings, 62 letters and statements were received and reviewed by the Committee.

The research covered numerous publications of the College of Agriculture of the University of Connecticut, Connecticut Agricultural Experiment Station, State Highway

Department and State Board of Fisheries and Game on the use of pesticides. In addition, 42 news articles, books and other publications concerning pesticides were thoroughly discussed and all the pertinent facts noted.

Many laws and proposed laws were studied by the Committee in light of the testimony received; these laws included Connecticut's legislation, Federal laws, and laws from numerous other states.

The following is the Committee's evaluation of practices and laws:

Chemicals that control our pests are both an amenity and a necessity in our way of life. Their benefits are large and obvious. Our bodies are free from insect-borne diseases. Our food comes abundantly, daily and flawlessly. Our timber, even the green cover of our hills, can be protected from caterpillars. In our fields and along our roads, weeds and brush can be cleared with little money or sweat.

All agree (the Committee) to the necessity of some and most to the convenience of these chemicals. The Committee's task was to determine the cost in side effects and to recommend reasonable and effective means of minimizing or eliminating this cost. The side effects to both man and wildlife were considered....

Synthetic pesticides, especially DDT, have been in use and experiment for a score of years. No evidence of an insidious menace to human health has been obtained. On the other hand, some pesticides, like some of our most valuable drugs, can have a clear, even fatal effect, if misused. There is evidence that a parathion bomb was stolen and ignorantly sprayed on a child's clothing in Connecticut; the child died. The following authenticated accidents have been reported in Connecticut. Two applicators of parathion have been sick and have recovered. Another applicator was affected by a similar experimental material.

Incidentally, this was a Connecticut Highway Department employee and the only known person to be adversely affected in the author's 30 years of experience with the Department, and this despite the tremendous volume of pesticide materials that are used for specific purposes in Connecticut's highway operations.

Among those who bought at retail, one injury is known: a lindane bomb that was misused made a housewife sick. Occasionally, applicators have suffered dermatitis from pesticides.

Here again, dermatitis from toxic vegetation and other causes are not listed for comparative purposes.

The other part of the health problem is pesticide residues in food. Many pesticides have no known toxicity to man. Nevertheless, people are generally uneasy about strange molecules in their food. Thus, both State and Federal inspectors and chemists monitor our food. The effectiveness of these officers is attested both by actual condemnations of food and by the myriad reports of pure samples. Happily, Federal officials judged that local products had less residue than those moving between states. In fact, they have found no excessive residues on any fruits or vegetables grown in Connecticut. Significantly, Connecticut milk is inspected at the farm; thus, milk containing pesticides is eliminated from the market before it can be mixed with pure milk.

Finally, the nuisance of pesticides was considered. Witnesses again and again pointed to Connecticut's aerial spray law and regulations as a model and the strictest known. For example, materials known to be toxic to man are forbidden for general use; only a landowner or his legal representative can obtain a permit; inspectors visit each area before a permit is granted. Nevertheless, during aerial application the drift of harmless dust can be a nuisance to neighbors.

Thus the Committee found farseeing laws and vigilant inspectors combined to prevent any ominous or subtle menace to public health.

It also found potentiality for nuisance to neighbors and for accidents to uninformed applicators. The cost of pesticides in terms of human health is, therefore, not from use, but from ignorant use. Hence, the Committee's recommendations contain means of improving the labeling of materials for the homeowner and the examination of the competence of professional users....

Wildlife has been killed in Connecticut, not en masse, but accidentally in isolated instances. In 1962, there were 7 cases reported among aquatic wildlife: 3 associated with aerial spraying of gypsy moth, 1 with aerial spraying of mosquitos, and 3 with other types of spraying. In addition, aerial spraying of gypsy moth was associated once with the killing of bees and once with the killing of *Cecropia* larvae. Also, one robin was reported killed by unspecified spraying.

Fortunately, none of these episodes related in any manner to highway spraying of pesticides. And during the year 1962 only one slight accident occurred that related to highway operations. A gentleman in an open sports car went through warning signals and both he and his car were inadvertently covered by a fine mist of DDT. This resulted in a small bill for cleaning clothes and washing the vehicle, even though it was not the fault of the highway operators.

The death of any harmless creature is sad. They may, however, be viewed in terms of the creatures that die from other causes or in terms of the numbers that still prosper in our woods. To many people, therefore, these accidents seem no great cost to pay for freeing themselves of woodland pests that invade lawns and homes, or for protecting the trees that clothe the hills. Thus, these known deaths of wildlife are not the major concern.

Rather, the appearance and accumulation of DDT in fish and birds that have not been sprayed is the concern. Whether harmful or not, the persistence of DDT, which has commended it to man in the past, permits it to move about as one creature eats another. Thus DDT is found in wildlife although the massive spraying of all Connecticut woodlands has been prevented; and in spite of the fact that unnecessary spraying has been avoided by accurate scouting and predictions of defoliation; and that when defoliation was imminent, only about one-half the affected towns chose to spray.

The Committee finds, therefore, that Connecticut's regulation of spraying and elimination of spraying where pests are not a menace has prevented catastrophes to wildlife. It also finds that regulation has not prevented the appearance of DDT in wildlife. Thus, regulation seems less important than reducing the total dose of DDT received by our land.

There are few problems more worthy of public concern than that of protecting the individual user of pesticides and all forms of desirable life exposed to his activities. Today, the citizen finds himself swept along the path of rapidly changing technology--both complex and mysterious. Small wonder that public reaction to the use of pesticides varies from unreasonable or misplaced fear at one extreme to reckless indifference at the other.

No matter how vocal some citizens may be about real or imaginary fears of this new world of everyday chemistry, we cannot retreat from it. We must through education and understanding learn to live in this new world safely and wisely.

The intensification of science instruction in our schools is already preparing the younger generation to recognize the opportunities and to cope with the problems more effectively than their elders have done.

We (the Committee) are in accord with sincere naturalists and their love of the outdoors. We believe that minimum harm should befall wildlife and this minimum only when it is found necessary to preserve or protect our citizens' welfare.

During the extensive hearings and study of information submitted to the Committee, no evidence was found to indicate that our food

supply in Connecticut is unsafe because of the use of pesticides. On the contrary, convincing facts were presented to show that pesticide residues in foods produced in the State, and especially milk, were lower than similar products moving legally in interstate commerce. Through the cooperative efforts of Federal and State agencies, continuing food inspection helps provide our citizens with safe food. The need does, however, exist for faster and more intensive inspection in order to increase the number of examinations and thereby provide even greater protection.

In regard to the effect of pesticides upon wildlife in Connecticut, the Committee heard conflicting statements. There was a wide difference of opinion as to the gravity of the situation with some citizens being genuinely concerned about the degree of danger, while others expressed no serious alarm. The only concrete evidence of direct loss of wildlife from use of pesticides in Connecticut during the past year (1962) were the ten cases cited earlier in the report. The problem of persistent DDT has also been cited.

In order to maintain the safety of our food, continue to protect human life and prevent unnecessary loss of wildlife, while still recognizing the essential need and economic benefits derived from the proper use of pesticides, the Committee recommends the following:

1. Connecticut should strengthen its Food and Drug Act to make its standards uniform with Federal regulations concerning pesticide residues and to provide legal authority for the control in intrastate commerce.
2. Connecticut should expand its inspection for pesticide residues on crops. While it has done a reasonably adequate job so far, it is in the public interest to examine more samples of produce for sale in the State.
3. Connecticut should have a pesticide registration law in order to regulate better the distribution, sale and transportation of pesticides within the State. The Committee, therefore, recommends the enactment of "An Act Regulating the Distribution, Sale and Transportation of Insecticides, Herbicides, Fungicides and Rodenticides."
4. Connecticut should create a pesticide control board. Such a board should have the authority to approve pesticide materials to be used in ground or aerial spraying for hire and should also regulate the disposition of pesticide containers. The composition of the board should represent those State interests most directly concerned with the health, wildlife and pesticide use. Funds should be provided for the board to employ competent personnel to carry out its duties. The Committee, therefore, recommends the introduction and enactment of "An Act Concerning Custom Application of Pesticides and Establishing a State Board of Pesticide Control."
5. Connecticut must employ all reasonable means to assure the competence of custom applicators of pesticides. This is especially true with the discovery of new and highly potent chemicals that are invaluable to the control of pests.
6. Connecticut should maintain its leadership in exploring new and better ways of meeting the growing problems that confront its citizens in the field of pest control. To do this, it should support research, especially on new approaches, techniques, and materials that will provide the greatest possible protection to human life, health and to the conservation of our wildlife and natural resources, while meeting the economic criteria.

These recommendations provide broad and flexible authority for dealing with problems that may arise; they do not create a complex mechanism, costly in dollars and harassment beyond the magnitude of the pesticide problem; they attack the tangible problems of accidents, of ignorance, and of the persisting pesticide molecule; and they should reduce the cost in side effects from necessary and convenient use of miraculous modern pesticides.

With this report the Committee presented legislation that was enacted with few, if any changes, during the 1963 Legislative Session. This legislation was effective January 1, 1964, and the machinery for enforcement is in the process of implementation; in fact, the most recent meeting was held January 6, 1964, and the approval of the Board was requested for the Connecticut Highway Department to continue with its program for the use of chemical pesticides.

In this legislation the Highway Commissioner is a member of the Board of Pesticide Control. He, like several others on this Board, may have a voice but no vote. The author of this paper has appeared at the meetings to represent the Commissioner.

But what are the hazards that are evident from the use of pesticides; the previous report reveals the extent that has been evident with the possible side effects. There may be the loss of earthworms in grub-proofing operations; or there may be insects that have been eaten by birds that may cause sterility. There have been times when an inexperienced operator, despite all the precautions required, will hit a desirable plant item and cause a brown-out and injury to the plant.

However, if pesticides are not used valuable trees and vegetation may be lost. (Just the control of the Elm Bark Beetle, the carrier of the Dutch Elm Disease, is responsible for the preservation of stately elms that add such charm and beauty, with attendant functional value, to village roadsides.) With the loss of trees, many unsafe conditions would be evident along the highways, the real estate values would be depreciated, and the consequences would be huge expenses for the cost of removal of dead and dying trees.

It would be difficult to determine what would happen if a pesticide were not used to control insects that damage turf areas, such as the Army Worm, the Japanese Beetle, the Asiatic Beetle, the Sod Web Worm, the Chinch Bug, and numerous other destructive pests or to determine the hazards to the highway user who may be blinded by swarms of insect pests, or the erosion that would take place, with the attendant unsafe conditions, if the functional value of well-developed grass areas were lost.

Criticism has been made and hazards noted because some of the natural habitat along roadsides has been destroyed so that wildlife does not breed abundantly in this environment. But what about the hazards to the highway user who attempts to avoid such wildlife as it scampers across the road? And certainly there is a tremendous loss of wildlife because of contacts made with motor vehicles when there is too much natural environment along highways. Should motor vehicles be labeled a pesticide and their use eliminated because they too are a hazard?

What about the exposure of manpower in highway maintenance operations to high-speed traffic when this work can be easily, expeditiously, economically, and safely performed with pesticides?

What about the hazards created to the millions of highway users with the abandonment of pesticide applications to eliminate toxic vegetation? (Incidentally, it was proposed by an eminent ecologist that is quoted as an authority in Miss Carson's book, that the Connecticut Highway Department plant poison ivy in one of the large picnic areas in order to keep people away from the certain spots where trees might be damaged by constant pedestrian traffic over the root areas.)

What about the rodents, particularly rats, that have infested, on numerous occasions, the homes adjacent to the high fill on the approach to a bridge—should not a rodenticide be used to eliminate these disease carrying creatures? (The fill on this approach was largely made up of rock. The rodents find this a most desirable habitat and move in en masse. And the homes adjacent to this neighborhood are a source of food. Consequently, in the interest of health and to foster good public relations, appropriate rodenticides are used to control the pests.)

What are some of the other hazards that accompany the use of pesticides? It is the uneducated operators that do not take seriously the importance of proved application techniques. This makes the highway administrator's life much too exciting because some employee has sprayed petunias instead of dandelion.

All the legislation in the world will not cope with this problem. Therefore, it is important to educate and to train thoroughly each and every man as to the proper use of each and every pesticide tool. All too often this phase of the work is neglected, and

John Doe employee will inadvertently do something that is entirely wrong because he was not made aware of the consequences.

There are perhaps numerous other hazards that might be listed but the values of pesticides in highway operations are as follows:

1. The conservation of trees and natural flora has already been cited.
2. The health and safety of highway employees is improved.
3. Litter along highways is less evident because of well-maintained roadsides.
4. Insects, diseases, and weed growth harmful to the adjacent farmer's fields are controlled.
5. Safety for the highway user is improved because sight-lines are not impeded, trees are not as hazardous because they are kept in a healthy condition, free from insects and diseases, safety devices are not obscured from vision, and the maintenance employee with his equipment is not as frequently in the travel path.
6. The entire highway environment is better because the aesthetics are given proper consideration.
7. The dollars saved by the use of pesticides can be used for much needed construction to extend, expand, or improve highway facilities.
8. They are valuable in the field of good public relations between the highway department and the public.

Therefore, it seems appropriate to conclude that pesticides are important for a multitude of highway operations in the establishment, maintenance and control of vegetation. There are hazards that are evident if improperly applied and used. There are hazards that are apparent if pesticides are not used. However, the tremendous values that are evident far offset the hazards that may seem evident. Pesticides are valuable tools in the entire scope of highway operations and their use must be continued for the benefit of the safety, health, economy of operations, and beauty of highway systems.