removed at the request of the Conservation Department. A cable was erected across the power house windows to catch misguided sinkers, a street light, trash burners and a sign of welcome put the dam fishermen back in business.

We have recently received a preliminary report of a study made by the U. S. Fish and Wildlife Service on our proposed Weiss impoundment. The report embraces fishing, boating and wildlife on the new 30,600-acre reservoir and indicates most favorable prospects for recreationist. Plans for public access development, waterfowl management and selective timber clearing are recommended for maximum impoundment benefits. Five or six subimpoundments for raising fish will be constructed in selected coves this year. The Company underwrote a substantial expense for this study because it was felt that the Fish and Wildlife Service was equipped to produce the ultimate guide for maximum recreational benefits.

The purpose of the Alabama Power Company's existence is to manufacture, transmit, and sell electricity. But our slogan, "Helping Develop Alabama" implies an interest in many fields, not the least of which is intelligent conservation and utilization of natural resources.

CONSERVATION AGENCIES AND THE CHEMICALS INDUSTRY

By BURTON SEEKER
Agricultural Chemicals, Public Relations
The Dow Chemical Company

The field of wildlife conservation is probably unique in the interested public that follows it. This public is quick to praise good work but equally quick to condemn questionable activities. This interested public must be served. As interested citizens they have a right to know. Also, failure to inform this interested public can give us our "one buck laws" in circumstances where what really is needed is additional gun pressure to balance game productivity with the ecology of the land.

Gaining this understanding would seem to be one of the biggest problems facing informations staffs of the various conservation agencies. And it would constitute one of the biggest services that could be rendered by outdoor writers.

The question of public understanding of the conservationist's methods is not growing simpler. As a matter of fact, it is growing much more complex. This growing complexity follows the increased use of new and—from the layman's viewpoint—rather startling methods of wildlife management.

Actually, "conservation" has become something of a misnomer in describing the work of game and fish departments today. To conserve means to protect or to guard. In many cases game technicians do maintain or protect wild lands in their natural state. But more and more they are called on to build or to create good habitat in circumstances where it does not exist. They are called on to develop habitat for game species that were not indigent to the area. They are called on to reconstruct good habitat after an area has been ruined; either naturally or through human neglect.

In addressing this sort of job the game technician is starting more and more to use tools of industry. And in developing these tools and in explaining their operations to the interested public is an area where industry and wildlife conservation people can and should work closely together to develop the best results.

The Dow Chemical Company is proud to have been a part of this movement developing scientific means of helping wild game. We are perhaps best known for our role in the program of the Fish and Wildlife Service to combat the sea lamprey in the Great Lakes.

The lamprey is an eel-like fish sprung from a family predating the dinosaur. As canals were opened to link the Great Lakes, the lamprey moved in to prey on fish life. Soon the fishermen started beaching their boats and hanging up their nets.

Almost as soon as the problem became noticeable, the U. S. Fish and Wildlife Service, working with conservation departments of the Great Lakes states and Canadian authorities, began a search for control measures.

The lamprey was most vulnerable on his spawning run into the streams so electro-mechanical weirs were set up on stream mouths to block spawning runs. This worked but results would be a long way off since many generations still would develop and prey on fishing before the spawning barrier could take its toll. A chemical method was sought that would do a faster job of cleaning the larvae out of the spawning streams.

Two years and 6,000 chemicals later they came up with the material known as Dowlap which would kill lampreys effectively at a dosage that would not injure game fish or other plant and animal life in the waters. You are doubtless aware of the fact that the control program is progressing so successfully that work is now being started toward restocking the Great Lakes.

We should all realize that a situation such as the lamprey invasion of the Great Lakes is a natural phenomenon. In Nature's scheme, the lamprey might destroy fishing in the Great Lakes but as the game fish disappeared, the lamprey would also disappear for lack of a food supply. In time, fishing would doubtless naturally re-establish in those waters. But we are too impatient for that. We are anxious for good fishing now, in our own time and we insist on the prompt action that will provide it. This is the reason that conservation agencies map out programs as vigorous and with the originality that characterizes the lamprey control program.

There is another interesting factor in this program: if anyone has been critical of the program I have yet to hear of it. I have heard only praise for the actions that have been taken. I would credit this to the fact that the agencies involved first did an adequate job of describing the problem they were addressing. Outdoor writers and sporting magazines did a good job of reporting the situation to the interested public. The public was conditioned to accept the verdicts of the investigating teams.

The solution that was found involved the use of chemicals. This could have been touchy. As a representative of a chemical company I am quite prepared to admit that a lot of questions rest in the public mind concerning chemicals and wildlife.

However, as development of Dowlap continued, a parallel program of explanation to the public was drafted and executed. Dow and the Fish and Wildlife Service worked together on the information program with Fish and Wildlife Service acting as spokesman.

You know the results. The chemical control program was widely accepted by the public—as it should have been. Work moved ahead with full public support and success is now within sight.

The lamprey control program is one of the most dramatic chapters in modern-day conservation work. It is an excellent portrayal of public agencies and industry working together to pool their respective abilities to solve a problem. In addition to pooling technological know how it is a good demonstration of pooling informational know-how.

Another field of work for our company has been in evaluating weed and brush control chemicals as wildlife habitat development tools. The project is quite promising in a number of ways:

Indications are that 2,4-D and 2,4,5-T, two of the common spray materials, can do an excellent job of creating game openings in a dense forest. These clearings offer sunning and dusting areas as well as needed variety of plant types by increasing the amount of forest edge available. These clearings can be made either by spraying out an area of forested land or by holding an opening left by an abandoned farmstead.

Removing the overstory of tall tree foliage allows the low-growing plants to flourish as food and cover plants. This is an example of "selectivity" the characteristic that any chemical has in order to be useful in this sort of circumstance.

Selectivity means that at a given rate of application the chemical will control the undesirable species with little or no harm to other plant or animal life. Dowlap, for example, kills lampreys at a low rate of application without harm to trout. In the same way, 2,4-D can be used to take out tall growth without harming briars, brambles, grasses and other low plants.

The forest openings proposition does offer quite some promise. It promises to be one more tool for the forest manager along with lumbering or the controlled burn as a possible way of opening up densely wooded lands as better game habitat.

There are other ways that these herbicide chemicals show promise. Trials have shown that dalapon, a grass control product that we manufacture, does an excellent job of opening up marshes choked by cattails or reeds. As a rule, the application is made aerially and the resulting clear strips give ducks and geese a landing strip as well as allowing leatherleaf, water smartweed and other food and cover plants to grow free of the competition from the cattail.

Aquatic weed control is an area of real interest. A certain amount of vegetation is valuable in a lake, but when a lake becomes overgrown with aquatic weeds, fishing and other water sports are ruined. Recently we introduced Kuron as an aquatic weed control agent. The development marked a big step forward in the search for effective but safe chemicals for control of aquatic weeds.

Dow has been active in this program of evaluating weed and brush control chemicals for possible usefulness in wildlife habitat work in these and other ways for some eight years now. During this time we have worked with a large number of state and federal conservation agencies. We have been working on the technology of the situation together and now are continuing to work together as we reach the point where we have findings that warrant reporting to the public.

Through the years the results of various projects have been reported in DOWN TO EARTH, a technical journal through which we report our new findings in agricultural science. In some cases Dow employees have been the authors of these articles, but in more cases, the article has been prepared by a member of the public agency we worked with.

It still is far too early to make broad statements about the usefulness of weed killers in the wildlife field; although we do have a substantial body of knowledge showing that it is a promising field. We feel we are ready to report to the public. The public is interested in new methods and should know about progress. To the present, work has been in the form of research on a small scale. If larger scale work is contemplated in the future, it will be most important that sportsmen understand what is being done.

Therefore, we welcome opportunities such as this to join with recognized conservation agencies to explain our work. Earlier this year The Dow Chemical Company and the Michigan Department of Conservation took a group of conservation leaders on a two-day tour of locations around Michigan where projects involving the use of herbicide chemicals have been carried out. The tour group included members of sportsmen's organizations such as National Wildlife Federation and Izaak Walton League. A couple of the major magazines were represented. The work was shown and explained in detail by research personnel of the Michigan Department.

As we expected, the tour did not touch off any barrage of publicity. Rather, the tour group showed a keen appreciation of what they saw and carefully evaluated what they heard. It is obviously good business for The Dow Chemical Company to have them appreciate what we are trying to do. On the other hand, it will prove most helpful for any public conservation agency wishing to pursue this sort of work to have members of the sporting press aware of the work and appreciative of its safety, economy and its effectiveness.

So my message here today is this: because of the nature of many of the wildlife management problems that are being faced today, more and more we find industry and wildlife conservation research teams working together on the solution. As we get our research teams together to work out these problems, let us also make an effort to get our information people together on the job of explaining the significance of the work to the public. The wildlife conserva-

tion field is outstanding in having such an interested public anxious for news of any new development. This interest should be served. Also, these new programs can be far more effective if they meet with public understanding and approval at the time they are executed.

These are the two cases that I would like to bring before the group this afternoon. We feel that they depict the benefits possible in cooperative research between industry and public agencies. We feel they also exhibit the better understanding that can be chieved when the information people of these same groups join forces.

Both of the programs that I have discussed as areas of cooperative action between conservation and industry people have involved the use of chemicals in wildlife habitat situations. I would like to briefly examine this area a little further.

The question of the relationship of chemicals and wildlife has been given a lot of attention lately. There has been a lot of debate on both sides of the matter: some of it valid, some of it highly questionable.

I have cited two programs in which chemicals have been a useful tool to the wildlife conservationist. But at the same time I have no intention of suggesting that chemicals are the panacea for all wildlife management problems. On the other hand, chemicals do not spell doom for wild game animals, birds and fish.

Today's high production in agriculture demands better means of controlling pests such as insects and weeds. These products are here in response to a real need in agriculture. The so-called "mass spraying" programs have been getting the bulk of the attention—in fact, a definite impression has been left that this is the typical way in which agricultural chemical materials are used.

In many cases of serious outbreak of an insect pest, large scale aerial spraying is the only effective method of control. But it needs to be borne in mind that these cases are far more typical than common. The more typical way that agricultural chemicals are used is by a farmer applying them on a rather small scale in his crop field.

Just how dangerous are agricultural chemicals? Of course, they do have to have the power to take out weeds or harmful insects or they would be valueless in pest control. But they do have a substantial margin of safety.

This safety margin stems from three sources:

. *The integrity of manufacturer.* For the most part, the manufacture of agricultural chemicals is in the hands of major companies who try hard to be good corporate citizens of their community and their country. These companies have many millions of dollars invested in production plants, in research laboratories and other facilities. Their success in business rests upon successful operation over a period of many years. They cannot afford to offer questionable materials that would endanger their chances of recouping their investment over long run.

2. *Government regulations.* Few if any businesses are subject to closer government regulation than is the agricultural chemical industry. In addition to various state laws on the matter, federal law states that before any agricultural chemical may be offered for sale it must be thoroughly tested to make sure that it is useful and that it can be used safely. The burden of proof rests on the manufacturer, not the government. It takes two to five years of research at a cost of millions of dollars to put a new agricultural chemical product on the market. As a result, the chemical companies have very complete files on the performance of their products. This data is also filed with regulatory agencies in Washington. All this must be done by the manufacturer before the product can be offered for sale.

3. *Cost.* As a rule, agricultural chemicals are fairly costly items. Users of the products are willing to pay this cost because the product solves a problem for them and saves them far more money than the product originally cost. This situation probably is one of the greatest controls that we have on the promiscuous use of these chemicals. No one would apply a chemical unless he

hoped to realize a monetary return from the application. This certainly limits the use of these materials to their proper places.

Many states as well as the federal government are now seeking appropriations for further research on the relationship of agricultural chemicals to wildlife populations. This, we feel, is a good thing. The use of agricultural chemicals is becoming quite widespread and all the implications should be studied.

Most certainly this is an area where industry and the conservation groups can work together. As I have already indicated, our files contain volumes of data on the toxicity of our products toward various types of plant and animal life. We have data on the rate of disappearance of these chemicals. We have years of experience in working with these materials and in explaining their use to the public. This, certainly, is one of the greatest areas where industry and conservation agencies can and should work together on a point of mutual interest.

TECHNICAL GAME SESSION

A LABORATORY STUDY OF AN ARKANSAS DUCK DIE-OFF [1]

By CALVIN A. PAGE and JOHN J. LYNCH [2]

In January, 1956, a "die-off" of Mallard Ducks (*Anas platyrhynchos*) was reported in the Jonesboro, Arkansas area. Estimations of the number of birds involved have ranged between 15,000 and 20,000 from a flock concentration that varied between 250,000-500,000 birds localized over an area of approximately 700-1,000 acres. Field studies of this "die-off" indicated that the major cause of death was acute lead poisoning as based upon acid scarring of the gizzard, bile excretion and the presence of lead pellets in the gizzard. Just preceding the "die-off," a period of drought coupled with snow coverage forced the birds to dry-feed on soybeans from areas that had been hunted with the ground, therefore, heavily contaminated with lead pellets. In addition to lead poisoning, a great many of the birds showed a condition resembling crop-impaction.[3] A total of thirty specimens showing mixed symptoms of lead poisoning, "crop-impaction," and tissue necrosis were brought into the laboratory for examination.

Preliminary autopsy findings, Table I, indicated the probable causes of death to be lead poisoning and "crop-impaction" as a result of soybean engorgement. Similar impaction "die-offs" in Canadian Geese (*Branta canadensis*) have previously been reported by Hanson and Smith (1950),[2] and it was found by these investigators that dried soybeans would undergo an 85% increase in bulk within three after immersion into water. Durant (1956),[1] studying crop impactions in geese, reported that death would occur between 4-16 hours after drinking water following feedings on dry, hulled soybeans. An extreme shortage of water and other weather conditions in Arkansas just preceding this "die-off" were highly inducive to "crop impaction" and lead poisoning.

TABLE I

AUTOPSY SUMMARY

Findings	*Male**	*Female†*	*Total*
Gross Appearance			
Heavy	5	3	8
Normal	4	9	13
Emaciated	5	4	9
Rectal Staining	12	16	28

1 Financed by the Department of Bacteriology, Southwestern Louisiana Institute, Lafayette and the United States Fish and Wildlife Service, Lafayette.

2 Present address: United States Fish and Wildlife Service, Lafayette, Louisiana.