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PROCEEDINGS

1963

WESTERN WEED CONTROL CONFERENCE

March 20, 21, 22

Portland, Oregon

Western Weed Control Conference

1963 OFFICERS

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ANNOUNCEMENT OF 1965 CONFERENCE

Albuquerque, New Mexico

March 17, 18, 19

HEADQUARTERS—HILTON HOTEL

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PREFACE

This proceedings contains papers and reports presented at the 1963 meeting of the Western Weed Control Conference in Portland, Oregon, on March 20, 21, 22, 1963.

Some papers presented at the Conference are not included in this proceedings because of the author's intent to publish in the Weeds Journal or elsewhere. Abstracts are available for most of these papers either in the Proceedings or the Research Progress Report of the Conference for 1963.

Copies of this proceedings are available from the Business Manager, Edward J. Bowles, 3239 Mayfair Boulevard, Fresno, California. The Research Progress Report for 1963 and for some previous years is also available at the same address.

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Adjournament of Conference

*Trademark

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FARMER ATTITUDES TOWARD WEED CONTROL

E. E. Heikes[1]

Presidential Address

Fellow members and friends of the Western Weed Control Conference:

It is a real pleasure for me to have the opportunity to make a few remarks to you at this opening session of the 20th meeting of the Western Conference. I have enjoyed the privilege of serving as your President this past year and serving in previous offices. I have enjoyed working with the program and local arrangements committee in planning this conference and hope it will be of interest to everyone. I, for one, feel it was an excellent idea to include a program committee to help plan the conference rather than leaving this entirely to the President. Jesse Hodgson and his committee have done an excellent job. Keith Sime has spent much time making local arrangements. Without people of this kind, organizations such as this, cannot be successful. There are many other committee chairmen and members who have helped to organize and make this meeting a success. As far as I know, there was not a single individual who declined when asked or elected to perform certain functions. Committee chairmen are listed in our program. I wish to thank all of them.

It is not necessary for me to review past achievements and events in development of modern day weed control. Progress has been almost unbelievable and I'm sure weed control will always be one of the basic and major practices required in the production of crops. But in many cases, acceptance of new information and new methods of weed control has been slow. Since many of you may not be as closely associated with farm problems and how farmers think, some emphasis on farmer acceptance of weed control research seems worthwhile. To quote from a recent talk I heard, "The immediate problem facing real advancement and progress in weed control at the present time is not further development of new herbicides or new methods of weed control, but greater acceptance and use of information already available." One of our members recently made the following statement in a letter I received, "Judging by some of the problems that we have solutions for, but that still exist, we aren't getting through." There is always need for more and better research, but at the present time, there is a real need—at least in some areas—for getting better acceptance of information already available. This means more extensive education programs.

In some cases, I believe farmers were more weed conscious 20 years ago than they are now. Then they knew good farming was their only means of fighting weeds; they were much concerned about the threat of fanweed or the spread of wild oats. With the development of 2,4-D and other selective herbicides, some farmers have tended to let their guard down; they rely more on chemicals now and less on good farming. As a result, some susceptible annual weeds have been reduced in number while other resistant noxious weeds have greatly increased.

Drill-box surveys of seed grains farmers plant have been made in several states. All have shown that a large percentage of farmers are seeding noxious weeds every year. They still do not realize the necessity of using clean seed. Surveys in Colorado and Montana have shown that over 50 percent of the small grains seeded contain seeds of one or more noxious weeds.

Noxious weeds on low valued lands are a continuous problem. It is hard to convince a farmer he should spend several times the value of the land to control weeds, when he himself, may benefit very little from the expense.

I'm sure we can refer to many statistics to show that the utilization of herbicides has proceeded at a pace equal to or greater than the rate of adaption of most new farm practice. Sales of herbicides have increased steadily over past years and, in general, weed control in crops has been better accepted by farmers than control of noxious weeds. Although specific figures are not available, I'm sure, in many areas, noxious weed acreages are increasing. In some cases, entire farms have been abandoned or left out of production because of noxious weeds. If a sincere effort had been made to eradicate weeds on these farms when infestations were small, the job of eradication would have been quite easy. Now, it is many times greater. These events are hard to explain when we know that research information is available on practical means of controlling all weeds. Our challenge is to show farmers the need for weed control and its economic importance.

Before a farmer accepts any new practice, he first wants to know (1) what will it cost and (2) will it pay on my farm? I think these two factors must be kept in mind when planning or performing all phases of research. Also, I wish more research reports included cost figures and the economic aspects of new methods. Without good cost figures on a new practice, the chances of selling the idea to the farmer is greatly reduced. Also, I think more of our noxious weed control research should be planned to fit into an overall farming program rather than simply testing a group of herbicides on a particular weed and reporting that one chemical will kill a certain percentage. In many cases, this is not practical — it renders the land unproductive for several years; it may be too expensive for the type of land involved and is not something that fits into the farming plan in any way. Instead, I think more noxious weed research should be planned over a period of years to fit into farming rotations, performed with regular farming equipment and done on a large enough scale that farmers can know in advance what to expect when they follow a certain set of recommendations. In some states, entire farms are set aside for this kind of study—land is leased and research projects are conducted over a period of years rather than just one or two. Information obtained this way is much easier to take to farmers and farmers are more acceptable to the information when they can see a way of fitting into their particular farming program.

In a study reported several years ago by our Federal Extension Service, it was pointed out that simply presenting new knowledge or showing new skills will, on an average, be accepted by about 7 percent of the people we work with, but if we change their attitudes first, we have about a 93 percent chance of getting them to adopt new practices. This is particularly true in the field of weed control. Many farmers we work with have their minds made up before they ask for help. Many farmers do not realize that weeds are a serious problem. Many do not realize that weeds seriously reduce crop production. Many times we encounter a rather negative attitude about weed control—that what may work someplace else won't work on my farm, or there's no use me spending money as long as Jones across the road does nothing, or as lon gas seeds are coming down the ditches or from higher watershed areas. Many people have a rather complacent attitude about weeds — they have driven by the same patches for years or they have farmed around or with weeds for years—it is hard for them to get very concerned. Just presenting technical information has little effect unless people realize they have a problem and are receptive to the ideas. Farmers must first be made to realize that weed control is good businss—that it can be done economically and that it will make them money.

Advertising is sometimes misleading and gives farmers wrong ideas. I'm sure you have all seen ads, "use X chemical and have a weed free farm or a weed free crop". Farmers buy and use the material, get less perfect results than expected, and become sour and think nothing will work. If the ads had been less promising and farmers had been told one application would kill a certain percentage—that there would be need for follow-up, that

[1] Extension Weed Specialist, Colorado State University, Fort Collins, Colorado.

seedlings would be a problem for several years or that the material would work only under certain conditions, they would not have expected such perfect results and would have been satisfied with only partial kill. This again emphasizes the need for information, stressing that people read labels and that modern day weed control is beyond the "squirt-and-hope" level.

Maybe we expect faster acceptance of new information than is commonly possible. I have heard that it took about 5 years from the time the average farmer heard of hybrid corn until he tried it and about 13 years before the majority of farmers adopted it. When progress in the field of weed control is compared to the number of workers employed, the record of achievement and acceptance is rather remarkable. A survey by W. C. Shaw, in 1960, showed that in the United States, the equivalent of about 233 full time workers were employed from State and Federal funds in all aspects of regulatory, teaching, extension and research in weed control. This averages out to be about 4.7 workers per state. In 21 states, less than the equivalent of 3 state or federal workers were employed in weed control activities. On the overall basis, lack of Extension Specialists in weed control may be even more serious than lack of research or teaching personnel. The 50 states averaged an equivalent of only 0.4 Extension personnel per state engaged in weed control activities.

The relatively small numbers of persons employed in weed control activities is most apparent when the numbers are compared with those employed in comparable activities with other pests. In the North Central Region in 1960, there were a total of 176 persons employed on State and Federal funds engaged in Entomology. There were 177 persons employed in Plant Pathology. At the same time, there were only 44 persons employed in weed control in this region. Such comparisons make it apparent that the support for this field of effort is much less than that provided for studies on the control of other pests—yet a USDA report entitled, *"Losses to Agriculture—1954"* shows that losses caused by weeds range from two to three times as great as that caused by insects or plant diseases. Weed losses are also estimated to be about twice that caused by livestock diseases.

There is evidence that this deficiency of manpower support is tending to correct itself. There are more State, Federal and Industrial workers devoting full or part time to weed problems each year. The number of state workers employed in weed control activities has increased substantially. There has also been a substantial increase in the number of persons employed by industry devoting time to weed control. This marked increase in numbers of workers engaged in weed control during the past few years is encouraging and we hope this trend continues.

There is a continuous need for more, better and practical research. This must be documented and reported in a manner that farmers can see its value. There are also file cabinets full of weed control data, back several decades, that is still good and would be useful to farmers if brought to their attention.

I'm sure we will all agree that a successful weed control program requires several steps. There is need to learn more about how to control weeds. It is necessary to teach the landowner why weeds should be controlled. It is essential to establish weed control organizations, both on local and state levels. It is mandatory that information on methods of controlling weeds be disseminated. There is need for legislation and regulatory men to enforce the laws on the few people who refuse to control weeds voluntarily. There is need for a completely coordinated program between industry, research, extension and regulatory workers. This coordination of activities and exchange of information is the primary purpose for having conferences of this kind. The Western Weed Control Conference has been, without doubt, very instrumental in hastening such coordination. Although this Conference has performed a very important function and because of it, progress has been made, but we still have much coordination to do. We still have a need for pooling information. I believe that everyone in this audience will learn something during this conference that they can take home and that will help them do a better job.

I believe the Western Weed Control Conference has a very worthy purpose and I believe it is achieving that purpose. It is an excellent means of disseminating information to professional workers, but the final outcome of how valuable this information is depends on how well it is accepted by people outside of our own group.

EXTENSION AND RESEARCH JOB IN PERENNIAL WEED CONTROL

Theodore Fosse[1]

I am glad of the opportunity to appear and take a part in your program today, as I am very much interested in perennial weed control. I have heard about the good work your Association is doing.

Perennial weed control has been the No. 1 agriculture problem in my County since 1940 and in some of the other counties in our state, for many years. We organized our first three weed districts in Cascade County in 1940, 1941, 1942. The entire County was organized into a weed district in 1952. During the years we have made a lot of progress on many fronts, but we have a long ways to go just to keep even on some of our more difficult areas to control.

All we need to do is to travel in our County, State and Nation to realize that perennial weeds are a most serious agriculture problem that deserves much more attention than it has received in the past.

Most of our rivers and small streams, much of the agricultural land and range areas, have become badly infested with such perennials as leafy spurge, Canada thistle, Sow Thistle, Russian Knapweed, bindweed, White top and others.

In the western part of our state goatweed or Klamath weed has infested large areas of rangeland and more recently Dalmation toadflax, has gotten started in a few places in our state.

There is a great need for the general public to become more interested and better informed on the seriousness of the perennial weed problem since in the long run the general public must pay the bill.

To show the seriousness of the perennial weed problem, I want to show a few figures of a weed survey made in Montana in 1960 by Eugene Heikes, your President, who was then Extension Weed Specialist for Montana. This rough survey conducted by the County Extension Agents and Weed Districts throughout the State reported the following acreages:

Canada Thistle	839,066 Acres
Field Bindweed	153,274
Quackgrass	157,000
Perennial Sow Thistle	62,054
Leafy Spurge	41,153
Whitetop	33,514
Russian Knapweed	16,577
Blue Lettuce	13,000

This means—

1 acre in 13 of cropland is infested with perennial weeds.

1 acre in 10 on irrigated land infested.

1 acre in 50 on rangeland infested.

Heikes' report showed that the acreage of Leafy Spurge, Russian Knapweed, and Whitetop had nearly doubled since 1953. In contrast Blue Lettuce has been

[1] Cascade County Extension Agent, Great Falls, Montana.

reduced from 26,000 to the 13,000 acres. With the use of 2,4-D, Blue Lettuce can be controlled, however, some of the other tough perennials mentioned are much more difficult to eradicate and control measures are more expensive.

At this point it might be well to stop and consider some of the major ways that weeds spread:

1. Humans
2. Wind
3. Water
4. Seed Grain
5. Garden Seed
6. Hay, straw and fed
7. Livestock
8. Farm Machinery
9. Road Machinery
10. Combines

Most of our weeds have gotten started in different localities as the result of human carelessness. Many of our most serious weeds trace back to Europe and Asia and have been brought to this country by man in various ways.

Often times people pick wild flowers, carry them in a car for a few miles and then throw them out. Some of these plants are far enough along that they produced seed and a new plant gets started. If this plant is left uncontrolled, it soon spreads to new reas.

Such perennials as Canada Thistle, sow thistle and other weed seeds that are air borne, easily spread to many new areas long distances way from our original areas by the wind.

Many of our perennial weeds get started along our roads from various sources, such as vehicles, hauling grain, feed, hay and straw, that is contaminated. The extra moisture that falls on the road and runs off on the shoulder of the road and into the barrow pit makes a fertile place for these weed seeds to get started. These weed patches, if not controlled early, soon spread to neighboring fields. Many of the seeds are blown and washed down into gullies and streams to infest new areas. Once the stream areas are infested, they are soon spread further by livestock and wild game.

Seeding unclean seed of small grain, grasses and legumes is probably one of our chief ways of contaminating farm land. Once they get started in the farm lands, they are further spread by farm machinery of various kinds but probably mostly by the cultivators, the combine and through our hay and straw.

Many a patch of Morning Glory has gotten started in the garden plot, through contaminated garden seed; and then spread to other areas of the farm by farm machinery.

Highway graders and maintenance equipment can be another important way of spreading weeds along our roads if the weed patches are not controlled in time. County and State weed crews need to work in close cooperation with road building crews to keep the spread of weeds from this source at a minimum.

Timely spraying of our highways, County roads, railroad right-of-ways, irrigation canals and drainage canals, *is a must*, if we are to expect cooperation from our farmers and ranchers and other property owners.

Our greatest spreader of weeds in our agriculture land is the combine. If weed patches are not properly controlled in time, then the combine going through these areas can be a real source of spreading weeds all over the field.

Chemical companies have made a lot of progress in the last 20 years in the discovery of new chemicals that have been a valuable help in weed control. The main problem is that many of these chemicals are expensive and the problem has become so serious in many of our areas that the farmers and rancher can only carry on a maintenance program rather than an eradication program. Many other areas are doing little to check the problem of weed spreading.

There is a real need for Research and Extension to work in close cooperation with our weed districts, agricultural planning groups, chemical companies and other groups interested in helping to solve our weed problems in our various states.

The 1954 USDA Agriculture Research Service report estimates that weeds cost American farmers about 4 billion a year. The following tables may help to emphasize the importance of weeds and some of the losses caused by weeds.

Annual Losses to Agriculture
1954 from U.S.D.A. REPORT

	Billion
Soil Losses	$1,512,000,000
Soil deterioration erosion floodwater and sediment.	
Plant—Insect Losses	$1,065,727,000
To field and forage crops, vegetables, ornamentals and fruits.	
Plant Disease Losses	$2,912,601,000
To field and forage crops, vegetables, ornamentals and fruits.	
Livestock Diseases	$1,847,904,000
Cattle, Sheep, Swine and Poultry.	
Weeds—agricultural lands only	$3,747,036,000

Yet much more emphasis and research is being put on soil losses, insect losses, plant diseases and livestock diseases, than on weed control.

In 1954 the National gross farm income was 34 billion dollars, net income 11.8 billion. In other words the cost of weeds was 11% of the gross income and 31% of the net farm income.

Research Job in Weed Control

1. There is need for more research in weed control. Conditions vary so much between counties and states which makes much more testing necessary. What works out well in one area may not work as well in another area due to different soil, climate and moisture conditions.
2. Research workers need to work in close cooperation with chemical companies in checking on new products that become available to determine their adaptability to various county and state conditions.
3. There is a need for close correlation of weed work between research workers in the various states. New findings must be made available between states as rapidly as possible, so this information can be gotten out to the public.
4. There is a need for close correlation between research workers within a State and the Extension Weed Specialist in getting out new information to County Extension Agents ,weed boards, supervisors and others working with the weed program.
5. There is a need for research workers and Extension weed specialist to carry on more systematic research work in various parts of the state with interested County Extension Agents, weed supervisors, etc. so as to be able to judge the value of various chemicals faster.
6. Research workers must have the opportunity to discuss latest research findings with Extension personnel, County weed supervisors, railroads, highway personnel and other Government and private agencies concerned with weed control.
7. Publish new research findings so this information is made available to the public.
8. There is a great need for more research as to the best methods of controlling our perennial weeds along our rivers and sterams and various waste places grown up by brush.

In most areas very little is being done to control our perennials in these areas due to the difficulty and great expense of control and the fact that many of these areas are subject to reinfestation every year by floods.

As a result these kinds of waste areas become constantly worse and are producing billions of seeds that are being spread downstream by water, wind, livestock, and wild game, to reinfest new areas.

This is an area of weed control that needs the attention of all groups, both Federal, State and County, if we are to start solving this knotty weed problem.

Extension Responsibility on Weed Control

1. State Extension Weed Specialist must keep County Extension Agents, weed supervisors, vocational agriculture instructors, ditch companies, Government agencies, highway supervisors and railroad company officials and other interested groups, informed on the latest weed control information.
2. County Extension Agents, weed specialists and County weed supervisors need to carry on a good many test plots with various kinds of chemicals at different rates on the various perennial weeds within the County. This kind of information is needed to determine the rates and kinds of chemicals to be used in the County weed spraying program.
3. County Extension Agents and County Weed Supervisors need to carry on a good educational program that reaches into every community of the County to inform the public. We must always keep in mind that a well-informed public on weed control is the greatest weapon we have in keeping weeds at a minimum. Some of the methods that are desirable are:
   (a) Educational meetings for the general public. We must have an informed and interested public if we are to make real progress.
   (b) Special meetings with agricultural planning or advisory boards, directors of ditch companies, civic clubs, soil conservation districts, highway, railroad company officials and other Government agencies.
   (c) Demonstration areas are a must in every county.
   (d) Tours are excellent ways of arousing interest.
   (e) Newspaper publicity.
   (f) Circular letters to the growers and those concerned.
   (g) Radio and TV programs.
   (h) Educational exhibits at fairs, window displays, etc.
   (i) Movies on weed control and related practices.
   (j) Colored slides on local situation and results.
   (k) Personal visits with farmers, ranchers and property owners.
4. We must solicit cooperation of all agencies concerned with weed control, such as:
   (a) Board of County Commissioners.
   (b) Agriculture Planning Board and Advisory Committee.
   (c) Government Agencies, such as: Soil Conservation Service, Farmers Home Administration Supervisors, Bureau of Reclamation, Bureau of Land Management, Forest Service, State Commissioner of Agriculture, and State Land Department.
   (d) State Highway
   (e) Railroads
   (f) Irrigation Districts
   (g) County road crews
   (h) Chambers of Commerce and Civic Clubs
   (i) Farm organizations
   (j) Farmers, Ranchers, Individual Property Owners
5. County weed crews must set a good example in their spraying on County roads, highways, railroads and other places. It is the responsibility of the County Extension Agent, Weed Board, and County Weed Supervisors to see that County weed crews are properly trained and are carrying on their work in a thorough and efficient manner using those chemicals and equipment most desirable for the situation concerned.
6. There is a need for the County Extension Agent and County Weed Supervisor to keep a close check on the progress of weed control in the county and report their information to the County Weed Board, Agricultural planning groups and the general public. Weed control is a year around program.
7. Seeding of Roadsides to Grass
   One of the best ways of reducing the infestation of weeds along our county roads and state highways is to see that the borrow pits and shoulders of all new road construction is seeded to adaptable perennial grasses. Care must be taken that only good pure seed of high germination content is used and that the work is carried on in the most efficient and practical manner. Cooperation must be solicited from County road crews to see that these borrow pits and shoulders of the road are left in such a condition that grass seeding may be carried on in a practical manner.
8. 4-H Weed Project
   I believe this is an excellent 4-H project to interest our young people to know more about our various kinds of weeds. At the same time, it will help carry on an educational program for our adults and stimulate greater interest in weed control.
9. Organization of Weed Districts
   It is the County Extension Agent and Weed Specialist's responsibility to help organize weed control districts in the counties where there is much of a weed problem. A weed district organized under the State Law is a must in order for a County to carry on a real effective weed control program.
   I realize there are many obstacles to be overcome in the orgainzation of these weed districts. But the sooner, weed district can be organized in every County and a good weed control program carried on, the faster we will make a real progress in our perennial weed work throughout our State and Nation. This needs the cooperation of all of us to help bring this about if we are to make the most progress.
   Furthermore, we need to employ competent weed supervisors in charge of the district program on a year around basis so that they may plan and carry out an effective weed control program.
10. Extension and Research workers have a responsibility to work in close cooperation with the weed districts and other interested groups in maintaining a *strong state weed control association.* Such an organization can offer a real opportunity for bringing the latest up-to-date information to all groups who are working with the weed program at a minimum of time and expense.
    The *regional weed conference such as you are holding this week* can act as a real stimulant and aid to workers who are helping to furnish the information for state programs.
11. Agriculture Conservation Programs
    The Agriculture Conservation Program offers an excellent opportunity for growers who have a real serious weed problem and are in an organized weed district to obtain some helpful financial assistance in carrying on an effective weed control program. In our County the County Weed Supervisor checks with all these growers and helps determine compliance with the program in cooperation with the County ACP committee.
12. We need to strengthen and improve our seed and weed laws at least in Montana. Montana is the only state of 11 western states that does not prohibit sale

of crop seed containing certain noxious weed seeds. Montana's law merely limits the number of noxious weed seeds per pound of seed that may be sold in seed. Our neighboring states prohibit the sale of crop seed containing certain noxious weeds. It seems rather obvious that if a crop seed can not be cleaned up and made legal in any of the areas surrounding Montana, the logical solution is send it to Montana.

Some of our seed laws are not strict enough and need to have closer enforcement by our State Department of Agriculture to see that our agriculture and garden seeds meet the required standards.

We need to improve our seed law—

(1) We should strengthen the list of prohibited weed seeds which should include any weed that is a serious threat to our agricultural economy.

(2) Provide for more inspectors. We already have horticultural inspectors and a feed inspector. We need to do some combining and do a more thorough job. In some cases weed district supervisors might also serve as weed and seed inspectors.

(3) We need to enforce the laws that we now have and to strengthen any weakness that now exists. This is going to take more inspectors but will be far cheaper in the progress that can be made.

We need to have more inspections of agricultural products coming into our State and even between counties so as to reduce the spread of weed seeds.

Extension and Research must work close together with our Weed Districts our farm organizations and other interested groups in bringing about some of these desired changes in our present weed laws.

These are a few of the things as I view the job of Research and Extension's part in this big job of perennial weed control working with our weed districts.

The control of perennial weeds is not an easy one since they are like a thief in the night, constantly working and spreading while we are sleeping.

Through constant research, good educational programs to keep our people informed and through proper applied action programs, we can keep our perennials down to the point where we can live with them.

I am sure that the information and inspiration we receive at this conference will help each of us in doing a better job for the future.

EDUCATIONAL REQUIREMENTS FOR CAREERS IN WEED CONTROL

Chester L. Foy[1]

When the title of this address "Educational Requirements for Careers in Weed Control" was first suggested to me, I was immediately reluctant to accept the assignment. This was chiefly because I visualized it as a philosophical discourse on education, i.e. somewhat along the lines of the much publicized "What Can't Johnny Read?"

This aspect of "what is right" and "what is wrong" with our present educational systems may truly be a part of the present subject but, unfortunately, not a part that I feel best qualified to speak about. I am sure these aspects could be most capably discussed by others of broader experience and insight in the fields of weed research and education. I refer to such men in our own state of California as Prof. A. S. Crafts (representing research and university teaching), W. A. Harvey (Agricultural Extension) and yes—our Thursday evening toastmaster Walter S. Ball who has been so active in the regulatory field. Each has made valuable contributions toward furthering the discipline of weed control. Each has been well educated in his own school(s) and more importantly, has educated many others in his own way in connection with his particular chosen line of endeavor.

Many others could be named, of course, but these three examples were selected purposely to illustrate the breadth of the topic of education in weed control. Each of these three and many others unnamed have contacted and served a different audience, yet all have broadened understanding and benefited humanity in general through their sustained interest in weed control. So it is with each of us here today. Our own individual contacts and spheres of influence will sample different segments of the general public. Just as no one individual crusader for any cause could hope to evangelize the world alone, so none of us can accomplish alone what we all can do together under WSA.

This brings me o the point of why now, on reconsideration, I feel happy about accepting this assignment. According to the theme of the California Weed Conference, two or three years in the past, "Weeds are Truly Everybody's Business." Growing recognition of this fact, that weeds profoundly influence the affairs of human beings in all walks of life, suggested to me that (for purposes of discussion) there are two general groups who stand in need of education on the subject of weeds, weed losses, and weed control.

The first is the serious student of cacophytology* (if you will pardon the expression) and he is the one who is trained in the conventional academic manner at an institution of higher learning. The second, the general public, is more difficult to reach and represents generally a more disinterested group.

The first must be taught in order to provide a continuing supply of highly (and more specifically) trained personnel who will enter the various aspects of the weed control field as a profession or as an important adjunct to his career or business.

Concurrently, I believe, it is important that we who are in the field make a determined effort to inform the second group, the general public, of the importance of weed control. We may call this "public relations," "putting our best foot forward," or in current filmdom and political parlance "improving our public image." Admittedly, most of the latter group will not be informed about weeds in the classroom and, certainly, the requirements for this group differ markedly from that of the first, but they also must be educated nevertheless. Why? Because the "general public" is ulimately the group who uses and benefits by improved weed control practices. (The research scientists does not use very many pounds of herbicides and rarely pays for what he does use.) The general public also must recognize and accept or reject the efforts and importance of the discipline. Similarly, it is also the public (through legislators, etc.) who will provide the necessary appropriation of funds for expanding weed research, teaching extension, regulatory activities, etc. on a national ,regional, state, county and local level. Ultimately, of course, it is from the general public that the potential students who will take up careers in weed control must come. Thus we in the weed control field should never sell short the importance of our public image.

Despite the phenomenal record of achievement in weed control in the past it is my belief that we need, individually and collectively, to launch a more concentrated effort toward reaching both groups more effectively in the future.

Therefore, it is for this reason that I welcome the opportunity to "beat the drums," as it were, before a large group, for a cause I happen to feel rather strongly about and one in which we are all here interested. This manifold cause includes bringing about general public recognition of the following:

[1] Assistant Botanist, University of California, Davis. Chairman, Education Committee, WSA.

*Study or science of undesirable plants.

(a) That the WSA (of which WWCC is a member conference) is a reputable and top notch professional society (and if it is not top notch by all standards, we should each strive to make it so);

(b) that weed control should be and is becoming an important applied scientific discipline comparable in many respects to the sciences of plant pathology, entomology and nematology;

(c) that weed control is just as deserving and (despite recent large federal appropriations for weed work) actually more in need of legislative financing to provide the necessary workers than are the other fields mentioned; (Parenthetically, I might say we could well work a little toward removing some of the stigma associated with the word "applied." The term applied means "put into actual practice" or "used toward the solution of a practical problem." We need feel no guilt in the admission that this is the primary goal of weed work as is true of all agricultural disciplines, no matter how fundamental or abstract the research methods employed);

(d) that improved academic curricula, of both greater depth and breadth must be designed to provide adequate preparation for careers in weed control (Just as botany is a branch of biology and plant physiology emerged out of botany, so chemical weed control may be considered a branch of applied plant physiology and biochemistry.);

(e) that the losses due to weeds are tremendous, the problems are worthy of our best efforts, and that adequate legislation and financing are essential to provide the needed weed research, teaching, extension and regulatory staff, etc., and finally,

(f) that weed work in its many and various aspects is a dignified and honorable profession, wherein all participating may take pride in both their individual professional accomplshments and their contributons toward benefting mankind.

This presentation has two main purposes then: (a) to stimulate us and similar groups like us (i.e. the apostles of the discipline) to a greater need for educating the public concerning weeds and in the process to do a little educating of the layman, should any be present; and (b) to consider, as more or less a family matter, specific recommendations for improving academic curricula in weed control and related subjects.

Before considering specific course requirements (which will appear in the proceedings), I should like to comment briefly on the status of weed control as a discipline. I shall mention briefly only a few facts which should serve to dramatize both the remarkable progress of the recent past and the almost unlimited potential for the future.

Both Prof. K. P. Buchholtz in his WSA presidential address, 1961 (1) and Dr. O. A. Leonard in his California Weed Conference presidential address, (5) correctly described weed control as a "record of achievement." Prof. Buchholtz pointed out the magnitude of the weed control problem which is much larger than is often realized (Table 1).

Table 1. Areas on which weed control is required each year in the United States.

Type of area	Acreages (000,000)
Row crops (intensive control)	141
Drilled crops (moderate control)	227
Hay, pasture and range (limited control)	1020
Railroads and highways	31
Single family homes—No	33,000,000

* Study or science of undesirable plants.

As pointed out by Dr. W. C. Shaw, current President of WSA (9), chemical weed control is being accepted at a phenomenal rate. Several measures of this acceptance by (mostly) satisfied users of chemical herbicides are shown in Table 2 (compiled from Dr. Shaw's address).

Table 2. MEASURES OF HERBICIDE ACCEPTANCE, 1962.

Pounds Herbicide Used	200 million
Acres Treated	85 million
Amount Paid by Farmers and Consumers	$200 million
U.S. Ave. increase in use of Herbicides Past 5 Years	6%

(From: Shaw, 1963)

It may also be pointed out that more acres in the United States are treated today for weed control than for the control of insects or plant diseases, despite the great disparity in personnel engaged. Table 3 from Prof. Buchholtz (1) illustrates this disparity in the North Central Region; a similar situation likely exists in other regions.

Table 3. Research, teaching and extension workers in the North Central region in three aras of pest control.

	Weed control	Entomology	Plant pathology
Total no	44	176	177
Avg/state	3.7	14.7	14.8

(From: Buchholtz, 1962.)

A survey by Shaw in 1960 (7) shows that in the United States the equivalent of about 233 full-time weed workers were employed by state and federal funds in all aspects of regulatory, teaching, extension and research in weed control. This averages out to be about 4.7 workers per state. In 21 states less than the equivalent of three state or federal workers were employed in weed control activities (Table 4).

Table 4. States having various numbers of research, regulatory, teaching, and extension workers in weed control.

Workers per state	Number of states
Less than 1	7
1-2	14
3-4	12
5-6	7
7 or more	10

(From: Buchholtz, 1962.)

Happily, the situation with respect to numbers of personnel involved in weed control has improved somewhat since Prof. Buchholtz report. There are more state, federal and industrial workers devoting full time to weed control problems each year (8). In January, 1962, for example, there were 11.2 persons or the equivalent of 5.4 full-time state and federal research, teaching and extension weed workers alone per state.

Table 5. State and federal personnel engaged in research, teaching and extension work in field of weed control.

No. workers per state	No. states
1-5	7
6-10	19
11-15	14
16-20	6
21-25	2
Over 25	2
Total 560 (1 to 100% time)	Total 50
Average=**11.2** Persons per State	

(Compiled from: Shaw, 1962.)

Table 6. State and federal weed workers (FTE's) engaged in research, teaching and extension.

FTE's	No. states
Less than 1	7
1-3	8
3-5	14
5-7	10
7-10	5
10-15	4
15-20	2
a Total 269.86	Total 50
Average=5.4 FTE per STATE	

(Compiled from: Shaw, 1962.)

Expansion of some programs and the development of new ones was made possible by the recent increase in Hatch funds for weed control approved in 1961. Funds from state sources have also been increased and may be expected to increase further, but it should be re-emphasized that such increase will not be automatic. In the words of Prof. Buchholtz (1) "it will require renewed and continual activity by those of us now engaged in weed control work so that farm organizations, administrators, commodity groups and the public at large will become aware of the magnitude of the weed problem facing the farmer, the industrialist and the home owner. They will need to be reminded that weeds can be controlled more efficiently, more conveniently and more completely today using modern methods than has been the case in the past. We should point out how additional study of weeds and weed problems will lead to still further improvements in the methods we may use to control these pests." This all involves education of the public of which I spoke earlier. This will not be done in the classroom to any degree but individually by our daily contacts and communications, and collectively through the medium and influence of county, state, regional and national weed conferences. The "educational requirements" for this group (the nonspecialists in scientific weed control) are relatively simple and have already been stated. Thus full awareness of the importance of weeds and their control and our willingness and yes—zeal—to so inform them are absolute educational requirements, however.

We are indeed fortunate in having such an organization as the Weed Society of America which not only serves the needs of weed workers directly but also represents the discipline of weed control to the public.

Scientists, engineers, educators and others in the United States from federal, state, industrial and private institutions, and similar personnel from more than 30 foreign countries are united in the WSA to promote the development of knowledge concerning weeds and their control and to foster unity in research legislation; regulation and terminology; to encourage higher standards in weed control education; to stimulate meritorious research and to facilitate its publication; and to encourage the development of the science of weed control (4).

The objectives of the Education Commitee of WSA, one of the standing committees of which I happen to be chairman, are basically those of the society. The Education Committee and the society believe that one of the soundest ways to advance the science of weed control is through (a) improved academic training of those preparing for careers in the field and (b) by creating a better awareness, in the minds of both professional men and the general public of the educational and career opportunities in the field.

Toward that end, during the past few years, we have engaged in several activities that should be of interest to this group. I shall discuss briefly only two or three of these activities; others either engaged in or presently under consideration by the Education Committee will be discussed in the Education and Regulatory Session tomorrow afternoon.

Another item in which we have had some interest will be introduced to you during tomorrow's meeting in the form of a WWCC resolution, i.e., that of urging the publication of a Yearbook of Agriculture on the subject of weed control.

Our principal efforts during 1962 were devoted to revising and completing a small career leaflet entitled "Your Future in Weed Control." According to WSA Executive Committee authorization on December 10, 1961, 20,000 copies were prepared initially. A limited number of copies will be sent free to appropriate persons and agencies; each WSA member will receive one copy. These are now being distributed. Volume quantities for distribution at high schools, institutions of higher learning, career days and fairs, conferences, and any other group who might find them useful may be obtained at about cost (4 cents per copy) from Dr. Fred Slife, Treasurer-Business Manager, Weed Society of America, Department of Agronomy, University of Illinois, Urbana, Illinois. Some of today's address is contained in that leaflet and its contents will be discussed more fully tomorrow.

Among other features, the leaflet stresses the need for more well-trained young weed specialists. This automatically poses the questions "Well trained how?", "For what?" and "How well do present course offerings satisfy the need?"

Table 7 summarizes the course offerings in weed control at the Land Grant Colleges and Universities in the United States in 1961. Limited copies of the complete report (3) were supplied to persons engaged in academic activities in each state. Additional copies (now slightly out of date, of course) may be obtained on request from the Treasurer-Business Manager of WSA, by those who may be especially interested.

Table 7. Wed control course offerings.

	CONTACTS		
72	Institutions		
50	States and Puerto Rico		
1 to 4	Individuals per institution		
	RESPONSES		
1	Institution	4	Courses
6	Institutions	3	Courses
18	Institutions	2	Courses
25	Institutions	1	Course
14	Institutions	0	Courses
8	Institutions	No Answer (probably no courses)	

This survey answered the question "What courses are now being offered?" and the general conclusion, in 1961, was—not enough. The next logical question is "What courses should be offered?" and this should be determined largely by the career opportunities now available or soon to become available for University-trained specialists.

The Division of Agricultural Sciences of any Land Grant College or University has three mandatory functions: resident instruction in agriculture, agricultural research and agricultural extension. Each function is separate in a sense, but with respect to weed control, for example, they are all interrelated. In the first, the matriculated academic student is taught; in the second farmers and the general public receive the instruction; in the third case, research not only provides the information which can be taught in the classroom and extended to the public for use, but also it often provides a key part of the advanced weed students' academic training. Moreover, many of the ultimate users of herbicides, eg. small and large farmers, gardeners, urban land owners, fruit growers, turf specialists, golf course superintendents, live-

stock ranchers, irrigation specialists, seedsmen, chemical industry representatives', public health officials, military officials, housewives and hosts of others may actually be former students who have had some familiarity with weed control principles and who now come back to Experiment Station and Agricultural Extension staff for further information. Their "educational requirements" in weed control will necessarily vary widely both as to depth and quantity depending upon the individual.

Thus two more important items in the leaflet are perhaps appropriate for our consideration at this time. These are career opportunities available and the types of training involved in adequate preparation for such careers.

The career opportunities available for well trained weed specialists include the following (4):

AGRICULTURAL ENTERPRISES
(Research, development, promotion, sales, field men)
- Chemical manufacturing and marketing companies
- Farm corporations
- Seed processing and marketing firms
- Agricultural supply houses
- Agricultural chemicals associations
- Crop commodity groups (profit and nonprofit)

FEDERAL AND STATE GOVERNMENT AGENCIES
- U. S. Department of Agriculture
- U. S. Department of Interior
- State Departments of Agriculture
- Colleges and universities
- Crop improvement associations
- Departments of highways, parks, and recreation
- Military reservations

RESEARCH
- U. S. Department of Agriculture
- State Agricultural Experiment Stations
- Chemical industries
- Research institutes

EDUCATION
- County Agricultural Agents (Farm Advisors)
- Extension Weed Specialists
- Public relations
- College and university teaching

SELF-EMPLOYMENT
- Farm owner-operators
- Farm managers
- Custom pesticide applicators
- Consultants

OTHERS
- Railroad corporations
- Various large industries

Normal adequate training involves such fundamental and applied sciences as:

Agricultural engineering	Organic chemistry
Agronomy	Physics
Biometry	Plant anatomy
General botany	Plant biochemistry
Horticulture	Plant physiology
Inorganic chemistry	Systematic botany
Mathematics	Weed control

Agriculturalists and research scientists in particular have learned that knowledge not only of the applied but also of the fundamental sciences is essential in modern agricultural education. Well balanced training in the fundamental and applied sciences is stressed for those planning careers in weed control.

In research, especially, it is clear that fundamental and practical aspects of weed control are interdependent (6). Even if they could be successfully visualized as two separate domains, they are connected by two-way bridges and thus sustain one another. The obvious implication is that the same organization must be involved in both fundamental and practical research insofar as possible, so that easy, natural interplay of ideas can develop. Furthermore, unless "weed-minded" men are involved in practical matters, much that can be learned about weed control is unlikely to be observed.

The best qualified weed researcher or other weed worker, in my opinion, will be the one who has been exposed to laboratory ,greenhouse and field situations and is able by benefit of his training to bridge, correlate and integrate the three.

Contrary to the views of some, field and laboratory research are not opposed, but complement each other. According to Dr. O. A. Leonard (5) either type of research (or other activity) will eventually die on the vine without the other. Quoting from Dr. Leonard, "ideas gained in the field can be taken to the laboratory for study; further, ideas gained in the laboratory can be studied in the field. Basic laboratory research is necessary after the direction for such research has been pointed out. But field research is never ending and must continually feed problems into the laboratory. Successful weed control in one crop does not automatically mean success will be achieved in another crop. Nor does success in one part of the United States mean that the same methods will be successful in other parts of the country. A great deal of field work must be done to discover the chemicals and methods of application that will be successful. Starting with laboratory research alone is likely to lead down blind alleys and end up nowhere, contributing little." Routine never ending application of field plots without the knowledge of underlying principles that can guide in the correct interpretation of results may be equally unrewarding and a lot more back-breaking.

Thus the best trained individual, in my opinion, neither has a hoe or "Knapsack sprayer welded to his person" nor was he "born and bred in a test tube." Again, I say, well balanced training in both the fundamental and applied sciences should be stressed for those planning careers in weed control.

Finally, to insure such preparation, what specific courses should be taken? In 1961, the Education Committee of WSA also prepared a report (2) entitled "Courses Proposed for Inclusion in the Academic Study Programs of Students Preparing for Careers in Weed Control." It was intended primarily (as a matter of general information) to offer suggestions or guide lines which we hoped would be useful to those in the academic areas of weed control in assessing, evaluating and improving their present curricula.

Since the report is still being requested and the supply of copies is low, the main body of the report is reproduced in this proceedings. The list may appear formidable and not all courses would necessarily be taken by any one student. In fact, there may not be a single person who has had all of these listed in a given study curriculum. The contents will be discussed only briefly with the use of slides.

Courses Proposed for Inclusion in the Academic Study Programs of Students Preparing for Careers in Weed Control

A. B.S. Degree, Applied Course

Recommended	Suggested
General Chemistry	Crop Ecology
Advanced General Chemistry	Field Machinery
General Botany	Seed Analysis
Plant Physiology	Taxonomy
Microbiology	Soil Fertility
Entomology	Organic Chemistry
Plant Pathology	Geology
Soils	
Soil Management	
Field Crops	
Horticultural Crops	
Forage Crops	

Range Management
Genetics
Weeds and Their Control
Animal Husbandry
Grain Crops
Algebra

B. B.S. Degree, Technical Course

Recommended	Suggested
General Chemistry	Quantitative Chemistry
Advanced General Chemistry	Plant Ecology
Organic Chemistry	Statistics
General Biochemistry	Entomology
General Botany	Plant Pathology
Plant Physiology	Geology
Genetics	Soil Management
Microbiology	Range Management
Plane and Solid Geometry	Soil Fertility
Physics (1 semester)	Seed Analysis
Soils	
Field Crops	
Horticultural Crops	
Weeds and Their Control	
Taxonomy	
Zoology	
Algebra	

C. M.S. Degree, Course

Recommended	Suggested
General Chemistry	(Select from the following
Advanced General Chemistry	according to interest)
Organic Chemistry	Quantitative Chemistry
General Biochemistry	Taxonomy
General Botany	Zoology
Plant Physiology	Plant Ecology
Advanced Plant Physiology	Geology
Genetics	Plant Growth Regulators
Statistics	Experimental Design
Entomology	Seed Analysis
Plant Pathology	Soil Management
Microbiology	Soil Chemistry
Algebra	Soil Physics
Plane and Solid Geometry	Soil Microbiology
Physics (one semester)	Plant Breeding
Soils	Range Management
Field Crops	Forage Crops
Horticultural Crops	Grain Crops
Weeds and Their Control	Vegetable Crops
Special Problems in Weed Control (Field Research)	Fruit Crops
	Agricultural Economics
	Agricultural Machinery
	Business and Accounting

D. Advanced Degree Course (Ph.D.)

Recommended	Suggested
General Chemistry	Advanced Organic Chemistry
Advanced General Chemistry	Physiological Chemistry
Organic Chemistry	Organic Analysis
Quantitative Chemistry	Isotope Chemistry
General Biochemistry	Aquatic Botany
Plant Biochemistry	Microtechnique
Advanced Biochemistry	Entomology
Algebra	Plant Pathology
Plane and Solid Geometry	Biophysics
Calculus	Experimental Design
Physics (2 semesters)	Soil Microbiology
Zoology	Soil Physics
General Botany	Forage Crops
Plant Ecology	Grain Crops
Taxonomy	Vegetable Crops
Morphology or Anatomy	Fruit Crops
Plant Physiology	Range Management
Advanced course in Plant Physiology	
Microbiology	
Genetics	
Plant Growth Regulators	
Statistics	
Field Crops	
Horticultural Crops	
Weeds and Their Control	
Soils	
Soil Management	

Although not specifically mentioned as formal course requirements, students (especially those pursuing advanced degrees) should develop reasonable competence in the areas of public speaking, technical and/or journalistic writing, and public relations.

EXPLANATORY NOTES

It must be recognized that subject matter offerings, accreditation, scheduling, catalogue descriptions, facilities available, etc. vary widely among colleges and universities throughout the United States. The relative economic importance of weeds, therefore the amount of emphasis justified, also differs from region to region.

The above listings are presented as general working guides to assist those who are now or soon expect to be in the position of instructing or directing students in weed control and related areas.

Sound courses in each area listed as "recommended" and "suggested" at each level are considered "adequate" academic training for careers in weed control, without particular regard to where the studies were followed or what the area of specialization for the degree is called.

Category (A) is intended for those students whose primary interests in weed control are applied. Thus, it could serve as a terminal degree program, or in some instances, as preparation for M.S. degree work also with applied emphasis.

Category (B) is designed with more technical emphasis to provide the basis for advanced degree work or alternatively, to serve as a terminal degree for those entering technical phases of weed control at the B.S. level.

Category (C) provides breadth and some additional depth of training for those who look upon the M.S. as a final degree. Added emphasis beyond the B.S., Technical Course level would be mostly along applied lines. Considerable latitude is also permitted, however, in the selection of additional technical courses. Although perhaps less likely, a somewhat similar curriculum for "M.S. Degree, Technical" would be possible by appropriate choice of courses from among those listed in category (C, "suggested") and category (D).

Category (D) is presented as the desired training for the Ph.D. degree.

The Education Committee believes that one of the soundest ways to advance the science of weed control is through improved academic training of those personnel preparing for careers in the field. It further believes that a determined effort should be made to inform the public of the importance of weed control and of the educational and career opportunities available in the field .

Although these were meant primarily as suggestions, to stimulate thinking, at least one institution, Mississippi State University, has by a realignment of activities organized a Department of Plant Pathology and Weed Control in the Agricultural Experiment Station and has included in its curricula practically all of the courses proposed by the Education Committee of WSA in this report.

Two undergraduate curricula, one technical and one applied, have been worked out for students specializing jointly in Plant Pathology and Weed Control. Specialized graduate training leading to the M.S. degree in Weed Control is also offered. Perhaps other institutions could profitably consider similar realignments giving increased emphasis to weed control. Dr. W. C. Shaw (personal communication) commented "I believe this is the first

administrative department in the land-grant institution which has as a part of its name "Weed Control." I hope the organization of the Department of Plant Pathology and Weed Control will establish a precedent in land-grant colleges and that Departments of Weed Control will be organized by other institutions in the future."

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ARE HERBICIDES HERE TO STAY?

R. D. Eichman[1]

When Jesse Hodgson asked if I would speak to the Western Weed Conference from the agricultural chemical industry viewpoint we considered several possible titles and approaches, mostly centered on a rebuttal to Rachel Carson's "Silent Spring". However, I am sure that everyone in this room has read and/or heard many of these from far better informants than I. As a matter of fact, for the most part, we have simply been reminding each other with a lot of statistics how valuable pesticides are to agriculture, forestry, preventive medicine, households and so to the populace as a whole, without stopping to realize that our message through our trade and association journals and meetings was circulating in our own mutual admiration society, rather than reaching the general public who look askance at all use of pesticides, because the true facts are unknown to them.

So when Jesse came up with the title "Are herbicides here to stay", I agreed to develop my theme around it. This title is appropriate before the Western Weed Conference but immediately I want to expand my subject to include pesticides as a whole.

In industry, particularly sales, we seldom think in terms of weed killers, insecticides, fungicides or whatever, because when our research people build a new chemical, which is found to be biologically active, it can turn out to be any one. Hence we find ourselves engaged in all fields whether we want to be or not. So gents, I am going to talk about pesticides, not just herbicides, but my remarks apply to the herbicide specialist as well as to the general practitioner in the field of agricultural chemicals.

Attacks like Miss Carson's are not new. They have been occurring since chemicals were first used in pest control. I well remember one that was popular when I was a student, entitled "100,000,000 Guinea Pigs". Perhaps some of you do too. Why do these things keep recurring? Sure, the writers do these things for personal gain, but why do they sell? In my opinion, it is because the public likes to be scared. How better can you scare people than to write about something unknown—at least unknown to the reader. Authors, sometimes of dubious reputation, write these things and people read these things for the same reason that the cienma industry keeps producing horror films; because, people like to spend money to be scared. There is an excitement in seeing, reading or hearing of things that frighten.

Now there is our cue on how we can offset this unfavorable publicity. We must bring the science of pest control with chemicals out of the limbo of the unknown and make the knowledge so general that John Q. Public finds it as commonplace as the automobile. After all, everyone knows all about automobiles and what havoc they cause when improperly used (a record far worse than pesticides), and yet, who is afraid of an automobile?

Science has not yet learned how to synthesize food. We must grow it and everyone is directly dependent on food. Therefore we have a natural approach. We are not producing, selling and suggesting the use of pesticides just to kill pests, but rather to protect food crops, fiber crops and health. Actually it would probably be better to refer to our chemicals as crop, food and health protectants rather than as pesticides. The very thought of killers makes our products suspicious. "Agricultural chemicals" is not satisfactory terminology either, for many are used to control pests which affect forests, health and the household. Further ,agriculture is foreign to the general public, but food is not.

Man has been struggling with nature for food right from the beginning. Man has constantly been improving his means of combatting the other elements of nature to his advantage in the struggle for existence. Man unbalanced nature to his benefit a long time ago in order to survive. As man has prospered and increased in numbers, because he unbalanced nature in his favor, it has become constantly necessary to come up with better and more effective tools. Herbicides and pesticides in general are certainly among the best tools ever devised ,and I am sure all in this group will concur with me that herbicides are here to stay.

Chemical pesticides have earned their place in our economy as the best means of pest control. Farmers know this and we who work in the field know it, but we must get the word to the public and our approach must be through the most common thing to everyone—food.

Our nation is great as an industrial power, a military power, the leader in atomic energy, but more important than all else, as the greatest producer of food the world has ever known. Our true strength lies in our capacity to produce food. Yet, what is the use of growing food in abundance through crop genetics, fertilizers, mechanization and so many other modern improvements in farming only to lose out to weeds, insects, fungi and so on. Our chemicals are indispensible in the modern philosophy of farming.

How can we get this knowledge to the general public and dispel the fear of the unknown? The National Agricultural Chemicals Association has launched a public relations program aimed at thought influencing individuals, groups, and organizations; but our industry and its trade association are pitifully small when it comes to influencing public opinion favorably simply by telling the truth to such a limited group of 25,000 mailings.

We must enlist every possible means of carrying our message to every home, every individual. We who earn our living through the use of agricultural chemicals, whether we sell them or not, are the ones who must spread the truth. All institutional workers, farmers, food processors and distributors of food products are in this

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category. We in the pesticide selling, research and extension fields are the nucleus. We must utilize every opportunity to tell the truth. We can't afford to sit back and wait for N.A.C. to do the public relations job. We are all members of the public relations committee. We can do this job as individuals and through groups of which we are members; social groups, service clubs, church groups and so on. In each there are many who know little or nothing of our business and its products.

The agricultural extension service is one of the best media for bringing the truth about pesticides to the attention of the public. Our various trade associations and professional groups must organize to press our public relations job. All should follow the lead of N.A.C. As for as industry is concerned ,our best medium is through our resellers who are a part of every agricultural community. They need to be thoroughly educated, completely familiarized with not only the good, but also the risks of our products; they in turn to instruct growers with the proper use of pesticides, most important of which is *read the label.*

Most everyone in this room is familiar with what goes into the making of the label on a package of any agricultural chemical commodity, but this is not true generally. I have in mind a grower I knew years ago, who said he doubled recommended dosages because he conisdered the label claims were kept on the minimal side in order to hold down the cost and insure the sale. In the same vein, in the past there has been a tendency on the part of growers, to which we all subscribed, to keep a secret the fact that pesticides had been used in the production of any crop.

There is nothing to hide or to be ashamed of in any of our products or their labels. Actually the labels are documents of truth. To begin with, research develops a new chemical molecule. Screening, which is a very elaborate process, develops the fact that it has biological activity. Following this ensues an arduous regimen to prove: that it is of value for its particular job, not least of which is that it can be economically useful; that no residue remains at harvest, or if residue does persist to harvest that it is within the safe tolerance level that has been established by prolonged feeding tests on two species of mammals, and finally, development of a method of analysis that will detect minute amounts.

All of the above requirements are subject to federal approval if the product is intended to move in interstate commerce. The U. S. Department of Agriculture certifies the usefulness and registers the label, including directions for use and precautions as far as crops and personnel are concerned. The U. S. Food & Drug Administration passes on the feeding tests (any product showing carcinomic effect is dead), and establishes a safe residue tolerance if one is needed, and accepts or rejects the method of analysis.

If a product is formulated for sale within the boundaries of a given state and federal jurisdiction therefore does not apply, over 40 of the 50 states have comparable laws that provide similar controls. In fact, state regulations apply on all products whether they have or have not won federal approval. The net result is that our industry is the most regulated and carefully controlled of all industries in the country, probably in the world. The pesticide industry has worked with government in establishing these controls.

After pesticides are applied by growers, the F.D.A. still retains jurisdiction to insure that no excessive residues (in excess of tolerance) remain on the raw agricultural product. This is accomplished by sampling agricultural produce moving to market. This final safeguard gives America the very best and safest food supply in the world.

No agricultural chemical sales person, be he employed by manufacturer or reseller, can make any representations other than what conforms with the label. All literature and advertisements are considered to be part of the label registration and so must conform with the text of the label. Even the extension service through cooperative effort with industry is making recommendations which conform with labels. We are all promoting the same program which simply means, if label directions and cautions are followed we gain the desired pest control and crop protection with no risk to the personnel handling the pesticide and crop residues, if any, are within safe tolerance levels.

The old concept of drummers does not apply to pesticide salespeople. We are not selling a product, we are selling a service—crop protection. Our salesmen and resellers know their growers' problems, analyze the situations and suggest controls based on label claims. The result may be measured in terms of increased yield, better quality, or reduced farming costs. The latter applies particularly to selective weed control. A good farmer controls weeds with whatever means available to him. This may sometimes be very costly cultivation, as with weeding sugar beets with a hoe. Chemical weed control saves him money which is the same as putting money in his pocket through increased yield. Proof again that herbicides are here to stay.

Progressive growers, those who will succeed in the survival of the fittest, are disciples of pest control with chemicals. They know the value of pesticides in producing profitable crops and certainly do everything possible to handle and use them correctly according to the label so there will be no accidents in storage, in use in the field, or in excessive residue on the harvested crop. These progressive growers constitute another large and widespread segment of the food industry to help carry the message of truth concerning the use of pesticides. Through our personal contacts with individual growers and farmer groups we must prevail upon them to use every opportunity to dispel the fear of the unknown regarding pesticides from the minds' of consumers they know personally or come in contact with in groups.

Food processors and distributors of raw agricultural products are well aware of the value of chemical pest control and we must enlist their aid in carrying our message through their distributors and retailers to the consuming public. This network reaches everyone.

By the same token, if these retailers are incorrectly aware of the true situation, they may add fuel to the fire of suspicion regarding unknown poisons. I have in mind an airport in a Pacific Northwest fruit area where crisp cold apples are retailed. Recently our local representative had chauffered me there and while we awaited my plane departure we decided to enjoy delicious apples. Upon completing our purchase the woman attendant warned, "You better wipe them, they have spray on them". Naturally this did not please us for we knew the truth and took her to task for her misleading comment, learning that she even owned an orchard and knew better than to be scaring people. But think of the impact of that remark on the uninitiated public buying apples in that airport. We trust we straightened her out.

Another area in which we can solicit and develop aid in spreading the truth about pesticides is through the forestry and forest products industry. Foresters have been blamed for wholesale poisonings of wildlife. There is no desire to debate the relative values of timber resources and wildlife in this presentation. Suffice to say that the total area of forest and uncultivated range areas ever treated with pesticides is an infinitesimal part of the total of such lands in the U.S. and yet some individuals earning their livings in the forest products industry are passing out misinformation regarding the use of chemicals for forest protection simply because they have not been properly indoctrinated.

Public health people, mosquito abatement district personnel and the medical profession constitute another ally. The story of disease control through the control of mosquitoes and other arthropod carriers of disease with chemicals is a well known worldwide activity. We must

urge these people to help spread the truth about pesticides.

One area where we can expect little or no help is through the mass media. Newspapers publish accounts of accidental poisonings with chemicals as they do auto accidents and violent crimes because the public likes to read such stuff, and it sells newspapers. At one time our Pacific Northwest public relations committee solicited the help of newspapers in spreading the word on safe use of pesticides. They frankly told us "no", because it wouldn't help sell newspapers. They further said education was our job.

Gents, with that thought I will wind up my ramblings. Basically, it is up to us who earn our livings directly from agricultural chemicals whether we sell them, research them or whatever, to carry the load in spreading the truth about crop protection with chemicals. We have been content to sit back and believe that our contributions toward helping the United States produce the world's biggest, best and safest food supply would be recognized in proper perspective. Obviously this is not so, we are accused of practically everything short of felony. It is high time we quit hiding our light under a bushel. Surely herbicides are here to stay. So are all chemical crop protectants—they are practically indispensable. We have but one more goal to attain and that is to dispel the unknown and win favorable public opinion. All of you should be sure to hear Dr. Robert White-Stevens of American Cyanamid on CBS Report 7:30 p.m., Wednesday, April 3. He presents our side of the story in rebuttal to Rachel Carson. You will gain inspiration for the task I have outlined. He is a dynamic speaker. This is part of N.A.C.'s program.

SYMPOSIUM: DEPOSIT AND ENTRY OF SPRAYED HERBICIDES INTO FOLIAGE

1. APPLICATION TECHNIQUES FOR IMPROVING DEPOSITS AND MINIMIZING DRIFT

C. R. Kaupke—No Paper Available

2. PLANT SURFACES AND HERBICIDE PENETRATION

Chester L. Foy[1]

ABSTRACT AND SUMMARY. The known bases of herbicidal selectivity are enumerated and those relatnig to foliar penetration are emphasized. The process of penetration (stomatal and/or cuticular, then cellular) is described; since substances that enter the sub-stomatal chambers by mass movement must still cross a lipoidal barrier, the internal cuticle, entry via the cuticle is stressed. The physical and chemical nature of plant surfaces is discussed in relation to the penetration of herbicides via polar, apolar or combination routes through the cuticle. The individual properties of (1) cutin, (2) waxes, (3) pectin, and (4) cellulose, the four major components of cutinized cell walls, are reviewed in relation to their contributing influences on cuticular penetration. Ontogenetic changes in plant surfaces, environmentally induced and otherwise, are also pointed out.

3. SURFACTANT ENHANCEMENT OF HERBICIDE ENTRY

L. L. Jansen[1]

ABSTRACT

A review of surfactant influences on herbicide sprays emphasized that phytotoxicity of several herbicides to corn and soybean was enhanced by surfactants at concentrations much higher than those needed to provide maximum wetting, spreading, and sticking of sprays. At least a portion of the enhancement was associated with increased rates and amounts of uptake of herbicides. Cuticle composition and structure were considered in the development of theoretical proposals to explain a number of surfactant phenomena. Hypotheses included surfactant promotion of cuticle hydration, surfactant sorption in the cuticle to increase the swelling of hydrophilic and lipophilic transport channels, and possible partial solubilization by surfactants of components of cuticle and subjacent plasma membranes. These proposals provided plausible explanations for excess surfactant concentration requirements and surfactant phytotoxic effects. Chemical structure of the hydrophilic and lipophilic moieties of nonionic surfactants was shown to influence markedly the entry and activity of DNBP and illustrated interrelations among herbicides, surfactants, and plant species. Results obtained with oil and water sprays of two forms of 2,4-D also emphasized the necessity for considering the spray carrier and form of the herbicide in the total complex of variables which regulate the entry and activity of herbicides.

4. PHYSIOLOGY OF HERBICIDE TRANSPORT IN PLANTS

A. S. Crafts[1]

ABSTRACT. The distribution of systemic herbicides in plants is a result of those physiological processes that are designated by the term translocation. By means of autoradiography, much new information concerning the movement of herbicides has been obtained.

It has been shown that herbicides may penetrate the cuticle of leaves, migrate to the veins, and move rapidly in the two transport systems, the phloem and xylem. Transport from leaves to roots or shoot tips is via the phloem in the assimilate stream; transport of soil borne herbicides from roots to tops is via the xylem in the transpiration stream.

5. INFLUENCE OF TEMPERATURE ON THE RESPONSE OF PLANTS TO CERTAIN HERBICIDES

T. J. Muzik and W. G. Mauldin[1]

SUMMARY. It is obvious from the data assembled by numerous workers that the influence of temperature on plant growth is very complex. Small differences in either light or temperature may lead to some rather large differences in final growth. Much of these effects of light and temperature are exerted on absorption and translocation, yet it appears that some effects of light and temperature can be separated from these. It is also apparent that species differences must be considered when working with different plants. A tomato under 10°C temperature is clearly under more stress than winter wheat or a winter annual weed at the same temperature. Absorption and translocation in leaves and roots is less under low temperatures.

Stage of growth is important in determining response to a chemical. In our experiments, most of the work was done with a plant (*Amsinckia intermedia*) which shows a marked reduction in response to 2,4-D when it begins to flower. In the rosette stage, it is much more sensitive, even when the plants were of the same chronological age. Thus, physiological condition is more important than age.

Plants grown at temperatures cool enough to reduce their growth rate failed to respond to 2,4-D or responded to a much lesser degree than plants grown at higher temperatures. However, when these plants were sprayed with a solution containing a metabolite which would increase growth at this temperature, the response to 2,4-D was increased. The most active of these compounds was thiamin. It is of particular interest to note that the concentration of the material applied is apparently quite im-

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portant, both in increasing the rate of growth of the plant and its response to 2,4-D. The mechanism of this action is not yet clear, although it may be due to an interference with the plant's metabolism. Further experiments are underway to investigate this possibility.

It seems unlikely that the slower entry and translocation at low temperatures alone is sufficient to account for the failure of *Amsinckia* to respond to 2,4-D treatments at the low temperatures. These results suggest a detoxifying mechanism by which plants are able to resist the smaller amount of 2,4-D translocated at low temperatures.

EXPERIMENTAL CHEMICAL CONTROL OF AQUATIC VEGETATION IN NEW MEXICO

Douglas B. Jester[1]

ABSTRACT

Control of aquatic vegetation with chemical herbicides was tested in New Mexico during 1960, 61 and 62. Purpose of testing was to determine controls for various species for fish management purposes.

Techniques of selecting test waters and herbicides are described along with chemical water analysis methods, techniques of herbicide application, and evaluation of results.

Ten lakes and ponds were used to represent all major geographic areas of the state. 2,4-D, granular arsenicals, silvex, endothal, tricholorobenzoic acid, silvex-endothal mixture, neburon, amino triazole, telvar, dalapon, kloben, TCA, algicides, and copper sulfate were tested on various numbers of 24 species of submerged, emergent, and marginal plants. Controls were found for the 11 most problematical species and most others. A synergistic effect was noted. A brief outline of management is included.

EVALUATION OF HERBICIDES FOR WEED CONTROL IN SHELTERBELTS

by H. R. Guenthner and L. O. Baker*

Shelterbelts or windbreaks are trees or shrubs planted to act as barriers against strong winds and drifting snow. Certainly there is a need for shelterbelts in Montana since most of the farms and ranches generally do not have sufficient protection for their livestock, crops, farm buildings and homes.

In general, shelterbelts slow down speed of the wind, absorb some of the force and divert the wind upward. The effect of diverting the wind upward is to create an area of calm air near the ground on the downward or leeward side of the shelterbelt. This results in: 1). improved living and working conditions, 2). better winter protection for livestock and 3). improved growing conditions for the orchard, garden, and flowers. Trees or shrubs planted as a field shelterbelt (single or multiple row planted in fields to protect crops and soil) provide the following benefits: 1). Reduce wind velocity, 2). protect crops from hot, drying winds during growing season, 3). reduce crops damage from high winds and storms, and 4). add soil moisture from snow trapped on cropland.

Since climatic conditions in Montana does not favor tree growth in some areas due to low rainfall, frequent droughts and extremes of heat and cold, considerable planning is necessary in order to establish a shelterbelt. In order to be successful in establishing a shelterbelt, it is necessary to: 1). have a site which has sufficient moisture and is definitely free of all perennial weeds; 2). select the most suitable trees and shrubs; 3). plant them in the right manner for the purpose intended, and 4). cultivate and maintain the shelterbelt properly.

A contribution of Fisheries Federal Aid Project F-22-R.

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* Montana Agricultural Experiment Station, Moccasin and Bozeman, Mont.

Weed Problem

Presently Montana is only planting approximately two million trees annually. The primary reason this number has not increased as rapidly as it perhaps should have has been the problem of controlling weeds. This problem undoubtedly has accounted for most of the failures in establishing a shelterbelt.

Mechanical Weed Control

One method of shelterbelt weed control is between-the-row cultivation with regular farm implements such as the disk, duckfoot, or rodweeder. When planning the shelterbelt, sufficient distance should be allowed between the rows so that the shelterbelt may be cultivated by this method for a number of years. This method controls only the weeds which are growing between the tree rows.

Five of the most common farm implements which will do a good job of weed control in the row are:

1. Harrow weeder with 12-16 inch teeth.
2. Dump rake equipped with mower wheels.
3. Side delivery rake.
4. Spring tooth drag harrow with 11-inch control shoes to regulate the depth.
5. Flexible toothed field harrow.

The following factors should be considered in using cultivation for weed control in shelterbelts.

1. Cultivate every 10 days to control weeds when they are small.
2. Over-the-row cultivation is limited usually to the first year or two after planting.
3. Over-the-row cultivation should be done at speeds of 4 to 5 miles per hour.
4. Cultivation between the row can be continued only as long as the implement does not cause damage to the trees or shrubs.
5. Late cultivation should be limited since this tends to stimulate late fall growth at a time when the trees should be hardening.

Chemical Weed Control

The primary objectives of chemical weed control investigations in shelterbelts are: 1). to find herbicides for effective weed control; and 2). to determine the effect of the herbicides on the recommended tree species.

1. **Evaluation Herbicides for Effective Weed Control**

The first investigations were initiated in 1956 at the Central Montana Branch Station. Dalapon, Dow Premerge, Amino Triazole, 2,4-D, Baron and Diuron were applied at various rates on established Caragana. Three years after application, Diuron at 4 lbs./a was the most effective treatment.

In 1959, Simazine, Prometone, and Diuron were applied at the 5 lbs./a and 10 lbs./a rate on the established Russian Olive and Green Ash. During 1962, Simazine was the most effective treatment, particularly on the perennial grasses. Prometone caused considerable tree injury to the Russian Olive.

A new planting was established in 1961 at the Central Montana Branch Station on a clay loam soil series. The species planted were Caragana, Russian Olive, Green Ash, Siberian Elm, Ponderosa Pine, and Douglas Fir. Ten treatments were applied immediately after planting, eight treatments were applied in the Fall-1961 and nine treatments were applied in the Spring-1962.

Of the treatments applied immediately after planting, Amiben at 5 lbs./a was the most effective treatment.

During 1961, a very dry season was encountered and as a result the soil sterilant herbicides were not very effective. Very little precipitation occurred after application.

Data obtained prior to 1962, indicated that both Diuron and Simazine would provide satisfactory weed control. Results obtained in 1962 again indicated that these two herbicides were effective.

The Simazine treatment of 2½ lbs./a applied in the Spring-1961, provided satisfactory control of all weed species, except Rough pigweed and Russian thistle. The 5 lbs./a Spring-1961 application of Simazine provided 60 percent control of Russian thistle and Rough pigweed and 90 percent control of all other weed species. A 5 lbs./a Fall-1961 application of Simazine provided the most satisfactory control of all weed species. Weed control of 50-90 percent was obtained from the Spring-1962 application of Simazine.

Diuron applied at 5 lbs./a in the Spring-1962 provided 80-100 percent control of all weed species. The 2½ lbs./a Spring-1961 application did not provide any control of Russian thistle and Rough pigweed. In general, the Diuron treatments were not as effective on the grassy species as the respective Simazine treatments.

Prometone applied at 2½ lbs./a and Banvel-D at 1 lb./a provided excellent weed control but did cause considerable tree injury. Amiben which was effective in 1961 was not effective due to the abundant precipitation which occurred in 1962.

The following herbicides were evaluated during 1962 but did not provide the desired weed control: Amiben at 2½ lbs./a and 5 lbs./a; Premerge at 1½ lbs./a plus Simazine at 2½ lbs./a; Premerge at 1½ lbs./a plus Dalapon at 3 lbs./a; Dinitro at 1.87 lbs./a plus Simazine at 2½ lbs./a; p,4-D amine at 2 lbs./a and Shell 7961 at 10 lbs./a.

During 1961, a trial was established at the Forestry Nursery in Missoula, Montana. Fourteen treatments were applied on eleven species. Treatments which were effective in 1962 were Diuron, Atrazine, Simazine and Amizine at the 5 lbs./a rates.

A new shelterbelt consisting of 13 species was established in 1962 at Montana State College in Bozeman specifically for evaluation of herbicides for chemical weed control in shelterbelts. Of the treatments applied in 1962, Simazine at 5 lbs./a and Diuron at 2½ lbs./a and 5 lbs./a resulted in 75% control of the weed species present. The following herbicides were also evaluated at Bozeman but did not provide the desired weed control (Diquat or Paraquat was applied to control the weeds which were not controlled by the original treatment): Amizine at 5 lbs./a plus Paraquat at 2 lbs./a; Amizine at 2½ lbs./a plus Diquat at 2 lbs./a; Casoron at 4 lbs./a plus Diquat at 2 lbs./a; Falone at 5 lbs./a plus Diquat at 1 lb./a plus Paraquat at 1 lb./a, Sesone at 3 lbs./a plus Dinitro at 1½ lbs./a and Shell-7961 at 5 lbs./a.

During 1962, a number of applications of Diuron, Simazine, and Simazine granules were made on an old shelterbelt at the Central Montana Branch Station to determine the effectiveness of these herbicides in removing the perennial grasses present. The Simazine wetable powder at 10 lbs./a appeared to be the most effective the first season.

Since herbicides respond somewhat differently under various soil and climatic conditions, nineteen trials were established throughout Montana in 1962 by the Extension Weed Specialist. Diuron, Simazine and other more promising herbicides were applied. In most instances if sufficient precptation occurred after application, good weed control was obtained.

2. **Effect of Herbicides on Tree Vigor**

This area is perhaps the most important aspect of the evaluation of herbicides for chemical weed control in shelterbelts. Certainly a herbicide which will provide satisfactory weed control should not produce any injurious effect on the trees. A considerable amount of information was obtained in 1962 at the Central Montana Branch on the effect of the herbicides on tree vigor. Since there was no noticeable effect on tree vigor at Bozeman, no data was obtained.

The data presented at this meeting are from the August-1962 determination. Since Simazine and Diuron have appeared to be the most promising herbicides, only data from these treatments will be discussed.

All treatments of Simazine which were evaluated had some effect on the tree vigor of the broadleaved tree species; Caragana, Russian Olive, Green Ash, and Siberian Elm. Table 1 presents the data obtained from the August determination of the Simazine Treatments.

Table 1. Effect of Various Rates and Dates of Application of Simazine on Tree Vigor*

Rate #/a.(Active)	Date of Application	Tree Species: Caragana	Green Ash	Russian Olive	Siberian Elm	Ponderosa Pine	Douglas Fir
2½	Spring-1961	3	3	3	2	2	1
5	Spring-1961	4	4	5	3	2	2
5	Fall-1961	4	3	3	3	3	2
10	Fall-1961	4	4	5	2	3	3
5	Spring-1961	3	2	2	1	3	1
Cultivated	Check	2	1	1	1	1	1

* Tree vigor is based on a rating of 1 to 5 with 1 representing normal development and 5 as death.

Simazine applied at 10 lbs./a in the Fall-1961 caused considerable injury and in some instances death. The 2½ lbs./a and 5 lbs./a rates all had adverse effects on tree vigor in relation to the check determination. Comparison of the 5 lbs./a rates of Simazine which were applied in the Spring-1961, Fall-1961, and Spring-1962 indicates that the earlier the application the more serious the tree injury. This data does indicate that the 5 lbs./a rate of Simazine did cause a reduction in tree vigor and growth. This rate is perhaps the rate which will be required to provide the desired weed control under conditions similar to those of the Central Montana Branch Station.

Of the Diuron treatments applied in 1961 and 1962, only light injury occurred to the Russian Olive at the 10 lbs./a rate. Table 2 presents the data obtained.

Table 2, The Effect of Various Rates and Dates of Application of Simazine on Tree Vigor*

Rate #/a.(Active)	Date of Application	Tree Species: Caragana	Green Ash	Russian Olive	Siberian Elm	Ponderosa Pine	Douglas Fir
2½	Spring-1961	2	1	2	1	2	1
5	Spring-1961	2	1	2	1	2	1
5	Fall-1961	2	1	2	1	2	2
10	Fall-1961	2	1	3	1	2	1
5	Spring-1961	2	1	1	1	3	1
Cultivated	Check	2	1	1	1	1	1

* Tree vigor is based on a rating of 1 to 5 with 1 representing normal development and 5 as death.

Conclusions

Evaluation of Diuron and Simazine and their effect on tree vigor does indicate that applications of Simazine will cause tree injury to the broadleaved tree species. If additional tree vigor data can be obtained from the trials which have been established, some conclusions should be able to be made concerning the effect of these herbicides

on tree vigor. Other herbicides which show some promise for chemical weed control—in shelterbelts are Shell-7961, and Casoron.

Due to considerable interest by the farmers and ranchers in the state in chemical weed control in shelterbelts, the following herbicides are being suggested:

In newly established shelterbelts

1. *Diuron* at 2½ lbs./a on light textured soils and 5 lbs./a on heavy-textured soils. Diuron should provide two seasons weed control if properly applied. Application should be made after the first growing season (late fall or early spring) and on a trash-free surface if possible. Do not apply Diuron on Lilac ,Honey Suckle or Chokecherry.
2. *Amiben* at 4 lbs./a will provide weed control for a single season. Application should be made early in the spring before weeds emerge.
3. *Sesone* applied at 3 lbs./a when ample soil moisture is present and prior to weed emergence will provide effective weed control for one growing season.
4. *Eptam* applied at 3 lbs./a with a light incorporation is an effective treatment for a single growing season. Eptam should be applied before weeds emerge.

In established shelterbelts

1. *Diuron* applied at 5 lbs./a will control all annual weeds and many of the perennial grasses. Application should be made late in the fall or early spring. No control of perennial broadleaved weeds can be expected.
2. *Dinitro General, 2,4-D Amine, Diquat,* and *Paraquat* applied as recommended on the label (1 to 3 pounds) will kill the top growth. The spray should not contact the tree leaves or tree.

In conifers

1. *Simazine* applied at 2½ lbs./a on light-textured soils and 5 lbs./a on heavy-textured soils should provide two seasons weed control. Application should not be made until after the first year of establishment. A late fall or early spring application is the best.
2. *Amizine* applied the same as Simazine. Amizine will control weeds that have emerged at the time of application.
3. *Sesone* and *2,4-D* applied in the manner as previously indicated.

If these herbicides are used as suggested they should provide satisfactory weed control. The herbicides suggested have not caused any tree injury and therefore can be safely used.

A considerable number of herbicides have been evaluated since the first trial was initiated. Primary interest has been placed on herbicides which would provide at least two seasons weed control. Perhaps more attention should be given to the evaluation of herbicides which would provide only a single season's weed control.

SYNERGISM, ANTAGONISM AND COMPATIBILITY BETWEEN PRE-EMERGENCE GRASS HERBICIDES

Jess Fults, Jack May, and Alta Moser[1]

February 8, 1963

The technique used in these tests was the plastic box technique. Hairy crabgrass (*Digitaria sanguinalis*) was used as the test plant and the quantitative data obtained was based on the growth of the primary roots during a 6-day test period. Tests were made in a Stultz germinator. Alternating temperatures of 8 hours/day at 35° C temperature period and darkness during the 20° C period.

In making these tests the first step was to determine for each chemical the dosage necessary to cause primary root inhibition equivalent to one-half the growth of untreated controls. The end result was the establishment of equal phytotoxic levels for all chemicals in the test. Equal phytotoxic levels for Chlordane, Bandane, Zytron, Dacthal, Trifluralin, Banvel-D, 2,4-D acid, MCPA, 2,4,5-T, and Amino triazole were established as shown in Table 1.

The second step was to combine these chemicals two at a time.[2]. This was done by combining the paired chemicals (X and Y) at equal phytotoxic levels in proportions of:

0 parts X,	5 parts X,	10 parts X,	15 parts X	and 20 parts X
20 parts Y	15 parts Y	10 parts Y	5 parts Y	0 parts Y

and measuring inhibition of the growth of the primary roots of hairy crabgrass. The synergism tests were made under conditions where the paired chemicals were available in: 1) both the liquid and vapor form, 2) in the vapor form alone, and 3) in the liquid form alone. Determination of equivalent phytotoxic levels were made only in the system where the chemicals were available in both the liquid and vapor form in the same test. The results of these studies are summarized in Table 2. These data are not to be interpreted as what might be expected to happen in a soil system but are indicative of what the basic interactions are between chemicals and crabgrass seedlings in a tightly controlled environment.

The next step in the use of this general technique will be to develop it for use in a system that involves interactions with different types of soil.

Tables on Page 16

[1] Botanist and research assistants respectively, Botany and Plant Pathology Department, Colorado Agricultural Experiment Station and Colorado State University Research Foundation, Colorado State University, Fort Collins, Colorado.

[2] This technique is similar to that described by Dr. Neely Turner in: Shepard, H. H. 1958. Methods of Testing Chemicals on Insects. Vol. 1: 314-324. Burgess Publishing Co. and to that described by J. G. Horsfall in Fungicides and Their Action. Chronica Botanica, Waltham, Massachusetts, 1945, and in Crafts, A. S. The chemistry and Mode of Action of Herbicides. pp. 2362-43. Interscience Publishers, Inc., New York. 1961.

THERMAL DEATH POINT OF WEED AND CROP SEEDS

Lambert C. Erickson

(AN ABSTRACT)

This paper reviews pertinent work to date and then evaluates several factors that influence the tolerance of seeds to infrared irradiation. Comparisons are made on the effects of radiated and convected heat. Lastly, the study shows that the results obtained by irradiation are influenced by nature of the heat energy employed and the composition of the irradiated body. Similarity in results obtained by several past workers should not be expected.

The results revealed that grasses had the greatest heat tolerance followed closely by the legumes. The effects of seed moisture content, seed morphology, seed color and size, and physiological factors are discussed.

THE EFFECT OF SILVEX AND 2,4,5-T ON THE ALKALOID CONTENT OF DELPHINIUM BARBEYI HUTH

M. Coburn Williams and Eugene H. Cronin[1]

ABSTRACT. Tall Larkspur, *Delphinium barbeyi* Huth. was treated with amine salts of 2,4,5-trichlorophenoxypropionic acid (silvex) and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) at 2, 4, and 8 lbs./A on three dates. The alkaloid concentration in treated leaves and stems was significantly greater than that found in the controls. Plants treated with silvex contained greater concentra-

[1] Plant physiologists, Crops Research Division, ARS, USDA, Beltsville, Maryland.

Table 1. Equal phytotoxic levels of 10 pre-emergence grass herbicides necessary to inhibit the growth of hairy crabgrass primary roots equivalent to one-half of untreated controls. Chemicals available in both liquid and vapor phase.

Common Name & Company	Chemical Technical Name	Equal Phytotoxic Levels at One-half Controls
1. Chlordane (Velsicol Corp.)	1,2,4,5,6,7,8,8-octochloro-4-7-methano-3a,4,7a-tetrahydro-indane	1000 ppm
2. Bandane (Velsicol Corp.)	polychlordicyclopentadiene (isomers)	150 ppm
3. Zytron (Dow Chemical Co.)	0-2(2,4-dichlorophenyl) 0-methyl isopropylphosphor-amidothioate	13 ppm
4. Dacthal (Diamond Alkali Corp.)	dimethyl ester of tetrachloro-terephthalic acid	12 ppm
5. Trifluralin (Eli Lilly & Co.)	2,6-dinitro-N-di n-propyl-x, x,x-trifluro-p-toludine	2 ppm
6. Banvel-D (Velsicol Corp.)	2,methoxy,3,6 dichlorobenzoic acid	50 ppm
7. 2,4-D acid (Dow Chemical)	2,4 dichlorophenoxyacetic acid	4 ppm
8. MCPA (Ordered, Will Co., Eastman Kodak)	2 methyl^4,chlorophenoxyacetic acid	10 ppm
9. 2,4,5-T (Ordered, Will Co., Eastman Kodak, 2/6/63)	2,4,5-trichlorophenoxyacetic acid	48 ppm
10. Amitrol or ATA (K & K Laboratories 177-10 93rd Ave. Jamaica 33, N. Y.)	amino triazole	600 ppm

Table 2. Synergism, compatibility and interference interactions between 15 pairs of pre-emergence grass herbicides using hairy crabgrass (DIGITARIA SANGUINALIS) as the test plant.

Paired Chemicals	Equal Phytotoxic Levels	Results
1. Bandane-Chlordane	150 ppm 1000 ppm	No synergism, slight antagonism at 1:1 ratio, otherwise compatible.
2. Bandane-Zytron	150 ppm 11 ppm	Antagonism at a ratio of 1:3; and 3:1, but synergism at ratio of 1:1.
3. Bandane-Dacthal	150 ppm 12 ppm	Synergism at ratio of 1:3; antagonism at ratios of 1:1 and 3:1.
4. Bandane-Trifluralin	150 ppm 2 ppm	No synergism at ratio of 1:1 and 3:1; slight antagonism at 1:3.
5. Chlordane-Zytron	800 ppm 11 ppm	No synergism, no antagonism, compatible.
6. Zytron-Dacthal	11 ppm 15 ppm	No synergism, antagonism at a ratio of 1:3; compatible at ratios of 1:1 and 3:1.
7. Zytron-Trifluralin	11 ppm 2 ppm	No synergism; antagonism at ratios of 1:3 and 3:1; compatible at ratio of 1:1.
8. Chlordane-Dacthal	800 ppm 15 ppm	Synergism at ratios of 1:3; 1:1 and 3.1
9. Dacthal-Trifluralin	15 ppm 2 ppm	Synergism at ratios of 1:1 and 3:1; slight antagonism at ratio of 1:3.
10. Chlordane-Trifluralin	1000 ppm 2 ppm	Synergism at ratio of 1:3; no synergism or antagonism at 1:1 and 3:1 ratios; compatible.
11. Banvel-D-Bandane	50 ppm 150 ppm	No synergism. Antagonism at ratios of 1:3; 1:1 and 3:1.
12. Banvel-D-Chlordane	50 ppm 1000 ppm	No synergism, slight antagonism at 1:1 ratio, otherwise compatible.
13. Banvel-D-Zytron	50 ppm 11 ppm	Synergism at ratios of 1:3 and 3:1. Equal at ratio of 1:1 in July '62; antagonism at ratios of 1:3; 1:1 and 3:1 Sept. 1962.
14. Banvel-D-Dacthal	50 ppm 16 ppm	Synergism at ratios of 1:3 and 1:1; slight antagonism at ratio of 3:1 in 1st test. Synergism at ratio of 1:3 but antagonism at 1:1 and 3:1 in November test.
15. Banvel-D-Trifluralin	50 ppm 2 ppm	No syngerism; not compatible; antagonism at ratios of 1:3; 1:1 and 3:1 in 1st test; no synergism; slight antagonism at ratios of 1:3 and 1:1 in November 1962.

tions of alkaloids than did plants treated with 2,4,5-T. Alkaloid content of the leaves varied directly with the rate of application of the herbicides following the first treatment in mid-July.

EFFECT OF EPTC ON BARNYARDGRASS SEEDS

J. H. Dawson[1]

ABSTRACT. Barnyardgrass (*Echinochloa crusgalli* (L.) Beauv.) is an extremely troublesome weed which can be controlled selectively in several crops with ethyl *N*,N-di-*n*-propylthiolcarbamate (EPTC). In spite of the relatively short soil life of EPTC, season-long control of barnyardgrass and other weeds commonly results when EPTC is used in crops such as beans or potatoes. Field observations have suggested that weed control extending beyond the soil life of EPTC was due to competition from the crop plants. On the other hand, it has been suggested that EPTC is a seedicide, and extended periods of weed control result from the death of weed seeds.

Previous research using non-dormant seeds under conditions favorable for germination indicated that EPTC killed barnyardgrass by injuring the seedlings after germination. In no case was seed germination affected by EPTC.

Further research was conducted to determine whether barnyardgrass seeds would be injured by exposure to EPTC for extended periods when they did not germinate because of (1) low temperatures, (2) insufficient moisture, or (3) seed dormancy.

For low temperature exposure, highly germinable seeds were mixed in moist soil containing EPTC and with untreated soil. The soils were kept in a refrigerator at 3 to 7 degrees C, which is too cold for barnyardgrass germination. At weekly intervals for 18 weeks, seeds were recovered from both soils and planted in untreated soil under favorable germinating conditions.

To stimulate exposure under conditions too dry for germination, barnyardgrass seeds were stored at room temperature in sealed containers with concentrated EPTC vapors. Seeds were removed at bi-weekly intervals for 10 weeks and planted in untreated soil under favorable germinating conditions.

A high percentage of newly harvested barnyardgrass seeds are dormant. Such dormant barnyardgrass seeds were mixed with moist soil containing EPTC and with untreated soil. The soils were placed in a greenhouse under favorable conditions for germination. At biweekly intervals until the EPTC had dissipated (10 weeks) seeds were recovered from both soils and placed in an unheated building over winter. After dormancy was broken, they were planted in untreated soil under favorable conditions for germination.

Barnyardgrass seed germination was not reduced by exposure to EPTC under any of the three conditions. A low percentage of seedlings from seeds exposed to EPTC under cold conditions showed very slight and temporary symptoms of EPTC injury. It was concluded that selective rates of EPTC do not kill barnyardgrass seeds. Therefore, barnyardgrass control in the field from EPTC can be expected only during the time when EPTC is actually present in lethal concentrations.

The author wishes to acknowledge the cooperation of the Stauffer Chemical Company in supplying experimental chemicals for these investigations.

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STATE GUIDANCE AND RESPONSIBILITY IN WEED CONTROL DISTRICTS

Bert Bohmont[1]

We would not have weed laws if the State Legislature did not think that weeds hurt the entire agricultural community, and perhaps the entire state as well. Weed Control Laws to be successful must be tailored to the weed problem. One group of laws tries to keep weeds from spreading by controlling weed seed. This discussion will not be directly concerned with such "seed" laws, although I do not mean to slight their importance. The other type of law deals with the weeds once they get started. These "weed" laws aim for treatment of the weeds on the ground, first to control them, and second to eradicate them.

The legislatures recognize that weeds hit most directly at the farmer who has infested land and most weed laws use farmers' self-interest as its main motivation for weed control.

Wyoming's Weed & Pest Control Laws were first passed in 1923, amended a number of times through the years, and then rewritten and brought up-to-date in 1961. The first Weed and Pest Control Districts were formed in 1935, others added a few years later and the newest district was formed in 1956. We presently have 10 organized districts.

The law provides that whenever the majority of the *resident* landowners, who represent at least seventy-five per cent of the *resident*-owned land within a contiguous territory comprising not less than 24 square miles of land, desire to form a district, they may file a petition with the county clerk. The petition is addressed to the county commissioners and contains the boundaries of the proposed district, a description of the land of each person signing the petition ,and stating the weeds or pests to be controlled and the proposed name of the district. In the event that the original district does not comprise the entire county, additional contiguous or non-contiguous lands may be made a part of the original district through the same procedure as just outlined.

After the petition is filed and the proper publications of notice have been made, the county commissioners, by order entered upon their minutes, form and create the district. The district continues as such until dissolved by the same procedure as required to create a district. The district is a public corporation, with the rght to sue and be sued.

After the district has been formed the State Department of Agriculture calls a meeting of all landowners within the district for the purpose of nominating board members. The district has a governing board of at least 3 and not more than 7 board members.

When a board has been elected they organize and elect a chairman, vice chairman and appoint a secretary and treasurer. The board serves without pay except for expenses and mileage as paid other county officers.

The board then appoints an inspector with the approval of the county commissioners and the Department of Agriculture.

The duties of the board are many and varied; such as —the purchase of chemicals and equipment (which is authorized by law); the matter of seeking cooperation with other groups; the policy of handling enforcement cases; the provision of leadership in the control activities; to strive for good public relations; to conduct meetings; to provide publicity which will be of credit to the program; to meet regularly; to council with the county extension agent; and many other policies which must be established at the local level.

The law states that the Board of Directors will make at least one annual inspection of lands within their district for the purpose of determining the progress of the Weed & Pest Control Program.

The present Weed & Pest Control Laws authorize

[1] State Agronomist, Wyoming Department of Agriculture.

State participation in the cost-share program. The law says that the State's share cannot exceed 1/3 of the total cost. The State Legislature allocated $90,000 to be used for the State's share during the present biennium. This amount does not permit us to pay 1/3 of the districts' total cost. The total budgets of the 10 districts for the present biennium is $731,764.00. The $90,000 allocated allows the State to pay about 14% of the weed districts' actual expenditures. The remainder of the cost is shared by the farmers and ranchers who pay ½ the chemical cost, and by the districts who derive their finances through a tax levy, not to exceed one mill, on all the properyt in the district, as provided for in the State Weed and Pest Control Laws.

Most of the districts purchase weed chemicals on bids and, in turn, sell the chemicals to the farmer at ½ price. The farmer applies the chemical with his own equipment. The Weed & Pest Control Districts do not engage in commercial application of chemicals. Prior to 1957 the districts were applying chemicals for farmers. It was becoming apparent that the districts could not own enough equipment or hire enough men to do the job, hence the 1957 ruling which prohibits the districts from engaging in this type of work. It was also apparent that farmers and ranchers were relying on the district to do the work for them and they were not taking enough personal interest in solving their individual weed problems.

The inspector is the main "cog" in a successful Weed & Pest Control Program. For this reason we feel that an inspector should have a degree in agriculture or a high school education and at least five years' experience in a related field. Inspectors must:

1. Have pleasant personalities and be able to meet and work with the general public.
2. Be good public relations men.
3. Have a good command of mathematics in order to advise persons in regards to rates of application of different chemicals, per acre costs, sprayer calibration, and many other problems.
4. Be able to keep a good set of records and make timely, accurate reports.
5. Keep up-to-date on the latest information in the Weed & Pest Control field.
6. Keep a well-organized program in operation.
7. Be a good public speaker.
8. Conduct inspections and surveys to determine infestations and follow up on enforcement cases.
9. Prepare and provide interesting educational information for radio, television, newspapers, fairs, and demonstrations.
10. Work in cooperation with County Extension Agents and other agencies concerned with Weed & Pest Control.

Inspectors are the main deterrent to introduction of new weeds and pests into a community and they provide the necessary supervision which is essential in a good control program. The inspector is the key man who is in an excellent position to aid landowners and others in realizing a greater net return from the land through a good Weed & Pest Control Program. Inspectors are the regulatory personnel who help to administer the laws and regulations and maintain the proper aims and objectives.

The Wyoming law provides for enforcement in cases where a landowner fails to control or eradicate his weeds or pests. There are three remedies which may be used:

1. Control or eradication of the weeds or pests and the full cost charged to the landowner, occupant or person in charge.
2. Causing action to be brought against the landowner ,occupant or person in charge, subjecting him to certain penalties as provided by law.
3. Or both the above-mentioned remedies.

Enforcement procedures are used only as a last resort. It costs the farmer less to do his own work under the cost-sharing program than to have it done by the district and the full cost assessed to him. Since a Weed & Pest Control District can be formed only when a majority of the landowners desire it, a farmer within a district is pressured not only by the law, but also by his neighbors' desires to have a weed-free area. Compulsory features of a weed law act as a backstop to the educational activity and are typically used partly as a threat underlying what the weed officials say, and partly as evidence that the community feels that failure to comply with weed laws is a serious business.

Last year there were 47 legal notices issued. Twenty-four of these notices were not complied with and required force control. 410 acres were treated.

Enforcement probably contributes little to the success of a Weed & Pest Control Program. Control or eradication of weeds and pests often requires action at strategic times. By the time a complaint may be filed, inspections made, notification given to the landowner, and time allowed for his compliance, the proper time for taking action may have passed. Obviously, in such cases the real purpose of the law has not been served and the action has only antagonized someone.

The Weed & Pest Control Districts in Wyoming work on the assumption that education and cooperation, rather than enforcement, are the keys to success. We are interested in compliance, not court convictions.

In Wyoming we also have quarantines which supplement the weed law as aids in preventing the further spread of our present weeds or the introduction of any other unwanted weeds. We have a state quarantine which prohibits the importation of hay, straw, fodder and all grains or seeds containing mature noxious-weed seeds into the state. Two counties, Park and Big Horn, have county quarantines that prohibit the movement of certain farm products off the individual farms in the county and prohibit the movement of certain farm products from all states and the other Wyoming counties into the county. The farm products subject to this quarantine can be moved only after a permit to do so has been granted by the Department of Agriculture or the County Weed & Pest Inspector.

For he last 2 years drought feed has come into the state in large quantities. We have worked in cooperation with the Division of Markets and their grain graders and have checked every sample for noxious-weed seeds. We found a few samples with viable seeds and proper corrective action was taken.

The following weeds and pests have been designated under the Weed & Pest Control Laws:

Weeds	**Weeds (cont.)**
horsenettle	Russian knapweed
white horsenettle	barberry
Austrian field cress	yellow toadflax
camelthorn	
field bindweed	
Canada thistle	
leafy spurge	
perennial sow thistle	**Pests**
quackgrass	grasshoppers
St. Johnswort	Mormon crickets
white-top	prairie dogs
ox-eye daisy	ground squirrels
white-leaved franseria	
perennial nutgrass	
yellow nutgrass	

At present there are 10 of these weeds found in Wyoming. Ox-eye daisy is found only in Teton County within the boundaries of Teton National Park. The Park Service has started a control program on this weed.

The other 9 weeds are found in most of the weed districts and the following acreages were reported in 1962:

Canada thistle	43,000	acres
field bindweed	23,332	acres
white-top	15,514	acres
quackgrass	13,450	acres
Russian knapweed	11,205	acres
leafy spurge	7,686	acres
white-leaved franseria	4,206	acres
perennial sow thistle	3,324	acres
yellow toad flax	460	acres
Total	122,178	acres

This total acreage might be compared to the acreage reported in 1936. The 1936 acreage was 9100 acres.

Under the cost-share program, there were approximately 55,000 acres controlled. This is 45% of the total acreage.

3,285 farmers and ranchers used the following chemicals in 1962:

2,4-D	38,544	gallons
soil sterilants	100,345	pounds
amino triazole	5,928	pounds

Last year's report shows that the farmers owned 2,359 pieces of spray equipment. The districts owned 21 spray rigs. The districts, in most cases, are responsible for the control of weeds along county roads. Last year the districts used 2,131 gallons of 2,4-D and 3,460 pounds of soil sterilants for this purpose.

The Department of Agriculture has a contract with the State Highway Department whereby we are responsible for the control of noxious-weeds along the highway rights-of-way. We have 3 spray rigs that we use in the control work. Last year we used 1,610 gallons of 2,4-D and 2,106 pounds of soil sterilants on the 5,255 miles of highway at an over-all cost of $13,958.52. We are proud of the job that has been done on the highways. Although we do have scattered patches of weeds along the highways we do not have solid infestations such as have been observed along highways in some of the surrounding states.

The Department of Agriculture is responsible to determine whether the districts are functioning within the meaning of the laws and regulations. This responsibility falls within the Division of Plant Industry with Mr. Everett W. Spackman as Director and myself as State Agronomist. My position was created in 1956 when it was evident that the supervision and coordination of the weed districts' activities required the services of a full-time man.

Although the board in each district has the responsibility for the operation of their individual district, it is felt that over-all coordnation and supervision of the districts is necessary to keep the Weed & Pest Control Program operating smoothly and heading in the same direction under a standardized procedure.

The Department of Agriculture supplies most of the forms used in the administration of the districts. Some of my responsibilities are to attend board meetings, assist with any problems that may arise, administer examinations to prospective inspectors, disseminate technical and educational information ,and prepare an annual summary.

Mr. Spackman and I have prepared a handbook for use by the districts which outlines the general duties of the boards and inspectors, the objectives of the districts and explains the use and proper execution of the various administrative forms.

Each inspector is asked to submit a weekly work report. From this we are able to keep better informed and up-to-date on the events and problems of all the districts. Two years ago I started a monthly newsletter for June, July, August and September. This newsletter is a summation of the weekly reports along with general comments on other items of interest. The districts have expressed a desire for the continuation of this newsletter since it helps to keep them informed of the events in other districts as well as comparing their own activities with those of other districts.

We feel that education and public relations are the main points to be stressed in our over-all program. The public generally asks three questions: (1) What are they getting for their money? (2) What are the final accomplishments? And, (3) Are we gaining or losing ground?

In order to best answer these questions we feel that personal contacts are the best method of informing the individual farmer or rancher of the seriousness of noxious-weeds, helping him in the identification of them, and advising him of hs responsbilties and obligations to himself, his neighbors, and to the district. Personal contacts have increased from 9,576 in 1960 to 13,789 in 1961 and 16,714 contacts in 1962.

The districts also keep in close contact with Government agencies, county agents, railroads, county commissioners and State agencies. Local business and social and educational groups are not overlooked. Most of the inspectors have spoken before Lions Clubs, Rotary, Chamber of Commerce, Farm Bureau, Grange, Farmers Union and FFA classes. The weekly reports indicate that last year the inspectors attended 126 educational meetings, 37 tours, made 102 demonstrations, released 229 newspaper articles and participated on 47 radio programs as well as making 8,229 weed survey stops. All of this information is compiled in the annual summary which I mentioned earlier.

Every two years we hold an inspectors' school at the University to help the inspectors keep up-to-date on the latest methods and procedures. This is a two-day school and is appreciated by the inspectors.

Most of the districts have a display at the county fair. This is always of interest to the public and gives the inspector an opportunity to visit with many people in a short period of time.

The Department generally has a display at the State Fair.

A recent bulletin was published by the University in which I collaborated with several other authors. The bulletin could not have been possible without the cooperation of the Weed & Pest Control Districts, county agents and especially the inspectors.

The Annual Wyoming Weed & Pest Control Conference to be held at Riverton, Wyoming in November is a culmination of the efforts of all the weed districts.

The board members, inspectors and others have an opportunity to get together and talk over their prolbems and advance new ideas and suggestions. This further unifies the districts in their common battle against plant and animal pests and especially the ever present "cancer of the soil"—noxious-weeds.

I now have some slides which I would like to show, after which I will entertain any questions that you may have.

1. Map showing Weed & Pest Control Districts in Wyoming
2. Eden-Farson Weed & Pest District warehouse
3. Big Horn County Weed & Pest District warehouse
4. Platte County Weed & Pest District warehouse
5. Park County Weed & Pest District warehouse
6. Park County spray truck
7. Hot Springs County spray truck
8. Hot Springs County river raft and spray rig
9. Fremont County spray rig
10. Lincoln County spray truck
11. Crook County spray truck
12. Hot Springs County weed tour
13. Goshen County weed tour
14. Spray rig demonstration

15. Demonstration of soil sterilant spreader
16. Goshen County weed tour picnic
17. Goshen County weed booth at county fair
18. Platte County weed booth at county fair
19. Platte County weed booth at county fair
20. Wyoming Department of Agriculture big spray truck
21. Wyoming Department of Agriculture medium spray truck
22. Wyoming Department of Agriculture jeep spray truck
23. Wyoming Department of Agriculture jeep spray truck
24. Bindweed along Montana highway
25. Wyoming Department of Agriculture quarantine sign
26. Picture of money

REGULATORY WEED CONTROL MANAGEMENT

James W. Koehler[1]

We, in the California Department of Agriculture, strive for effective regulatory weed control. This includes quarantine measures, or preventative weed control and, by voluntary or involuntary action, control or eradication of noxious weeds.

When I was invited to speak on the subject of regulatory weed control management, I realized that in some respects other states were not as fortunate as California. At Las Vegas last year, a representative of a neighboring state remarked that "some states would enjoy the resources of finance and personnel that California is able to put into its pest control efforts". Our weed programs are far from perfect—in fact we are really just beginning to approach some of our problems with an organized effort.

I recall hearing comments that interest is lacking in the regulatory section of this conference. This trend, also apparent in the Weed Society of America, was discussed by the regulatory section of the Weed Society at their December, 1961 meeting. As nearly as I can determine, the regulatory people agreed in general, that the four regional groups of weed conferences should work to bring about uniformity in weed control laws on a regional basis. They also agreed to investigate forming a separate organization of regulatory officials. We, in the California Department of Agriculture, feel that divorcing regulatory weed control from the Western Weed Control Conference, or any other weed conference, is extremely undesirable. In regulatory weed control we need extension, research, and industry, and they need us.

Right now we need them to help develop effective regulatory programs. We should begin with specific proposals for local, state, regional, and national legislation. Someone must sell these proposals and one way to sell something is to prove the need for it! We need evidence to back up proposals for weed laws and means of enforcing these laws in each of our states. The only way that we can sell these proposals is to work together. As the results of research mount, we are going to need ways and means to put them to work, for without these, some of our research results may be lost and much of our educational effort wasted.

Weed control is basically an educational effort. In fact, education in some areas has been so effective in telling the farmer all about weed control that he sometimes gets confused over the complexity of methods and materials. If he ever overcomes this confusion, he then may look around and see the complex weed control problems surrounding him: the problem involving his neighbor's place and on other nearby farms.

The help that is offered him fails because with it he is not offered a coordinated plan for weed control. The best farmer in the world can't solve his own problem if his neighbor persists in raising a crop of noxious weeds. This is where we need management and by management I mean weed control laws, and ways to put them into effect, combined with education and research programs.

We need improved and uniform quarantine laws in the Western states to prevent the introduction and establishment of noxious weeds. Too often, our regulatory people in the various states consider quarantines as primarily a measure to prevent the introduction of diseases and insect pests. Not enough consideration is given to the prevention of the dissemination of weed seeds, intra-state and inter-state.

Quarantines are not complete in themselves as an answer to weed control. At best, they are delaying actions and to be effective, they must be supported by continuous control effort. A considerable amount of time has been spent at regulatory meetings discussing methods of preventing weed seed dissemination and perhaps not enough time has been spent on determined means to write effective weed *control* laws.

Weed control laws should contain authority for enforcement, but this does not mean that authority has to be constantly exercised. Here is an example of how this is working in some fairly new weed control programs in California. Some of these programs are in effect on an old widely established weed pest, Johnson grass. The impetus for these programs has been furnished by the development of new herbicides, by educational programs and especially by federal aid to weed control through the agricultural conservation program. The ACP, a national conservation service of the United States Department of Agriculture, shares with farmers and ranchers the cost of practices needed for conserving crop, range, orchard, and forest lands and agricultural water. ACP program funds authorized by Congress encourage farmers to invest in new and purposeful conservation work that is in the public interest.

The first steps in developing an ACP weed program in California usually are taken by alert farmers who recognize that they have a weed problem. The proposed program is reviewed by the local Agricultural Stabilization Conservation Committee to determine if it meets national policy requirements. The county committee determines local farmer interest, the extent of control work in the community ,and the program activity of local public agencies.

The weed practice wording and cost share rates are developed and submitted to the state ASC office. Through a gentleman's agreement, the state office forwards the proposed practice to our office for technical review. The University of California also participates in giving technical program assistance. Recommendations are made as to the probable success of the program. The proposed practice is returned, along with supporting material and recommendations, to the state group for consideration and, if approved, the material is forwarded to Washington for further or final disposition. Success of ACP programs hinges upon voluntary grower participation.

Experience indicates that the most effective weed control programs are those carried out in conjunction with voluntary weed control districts. Therefore, the state ASC looks at this provision closely when the practice is submitted. To supplement voluntary programs, a county board of supervisors may either adopt a weed ordinance or an approved written weed policy. The adoption of county weed ordinances are provided for in the California government code. A county weed policy may prescribe certain discretionary action that the county agricultural commissioner may take. For one thing, it

[1] Chief, Weed and Vertebrate Pest Control, Division of Plant Industry, California DeparCmtent of Agriculture.

authorizes the expenditure of money on private and public property for weed control.

Our weed control or eradication projects under these voluntary programs are not always on a county-wide basis, but are sometimes confined to certain geographical areas in the county. The local county agricultural commissioner advises farmers in control measures. He also controls weeds on roadsides and other public areas in the voluntary district. Most of these districts are formed with the assistance of the agricultural commissioner. Farmers are told that the best district is the voluntary one. The agricultural commissioner also informs them that unless growers representing at least ninety percent of the land in the area agree to the proposed district, he will not entertain regulatory action or launch abatement proceedings. Abatement proceedings are brought about under provisions of the agricultural code. If the county agricultural commissioner is forced to treat the weeds of a non-complying property owner, the entire cost of treatment then becomes a lien upon the property. So-called voluntary programs, of course, cannot be completely "voluntary", human nature being what it is.

We have many successful state and local regulatory weed control programs being conducted through the use of applicable state laws. Through these laws, weeds of limited distribution in the state may be controlled by three methods: they are, (1) cooperative county-state programs, where the state agrees to bear one-third of the expense of eradication. The remaining expense is shared by the county and the landowner; (2) weed-free areas where an area may be designated as free of certain weeds and action is taken to keep it that way; (3) the formation of weed abatement districts to control serious pests within a designated area.

A recent important development in regulatory weed control was the implementation of California Agricultural Code, Section 154.8. This section, enacted by the 1959 Legislature, defines noxious weeds and authorizes the director of agriculture, after investigation and hearing, to determine additional species of weeds as noxious.

In 1961 hearings relative to this act were held and as a result California Administrative Code Section 4500 (Title 3) became effective July 9. The section names 36 species in addition to the 32 noxious species included in Section 154.8 and also named in the California Seed Law. For the first time, the new regulation establishes in California a definite noxious weed list for weed control by the California Department of Agriculture and the county agricultural commissioners.

In addition to the regulation, we have designated the pest status of the noxious weeds by rating them as A, B, or C pests.

An "A" pest is a noxious weed subject to current eradication, quarantine, or other holding action at the state-county level. "B" pests are weeds of limited distribution and are subject to extensive control or eradication, where feasible, at the county level. "C" pests include weeds of general distribution in the state. They are subject to control, extensive control, or eradication as local conditions warrant, at the county level.

A practical eradication or control program for a widespread weed pest is much cheaper than living with the pest year after year. An eradication program for a weed pest of limited distribution will be much cheaper than the losses that will be suffered when the pest invades free areas. To have these programs and to make them effective, we must have regulatory weed control. For effective management, each state must have a well-defined weed law and policy. Then we can strive for uniformity in our laws on a regional basis. This is a challenge that faces the entire conference—not just the regulatory people.

RESIDUES, REGULATIONS, AND AN EXTENSION PROGRAM

W. A. Harvey[1]

As a prelude to the remarks I ultimately want to make, let me refer to a book which has produced a certain furor in the pest control field and suggest that there are certain lessons which we might learn from this episode. The fact that a book such as "Silent Spring" can be written and can become a best seller is evidence of our failure to do an adequate job of education. Somewhere we have failed in presenting the story of pesticides as protectants in assuring an adequate, economical, safe food supply. We should be presenting the positive aspects of pest control rather than fighting the negative. We should not be on the defensive. As others have pointed out, an equally glamorous story of the good that pesticides have done could have been written.

Perhaps we have been so busy making new recommendations and testing new herbicides that we haven't taken the time to see what is happening after we make a recommendation—to tell of the good that is accruing and to correct any bad that may be developing. We get the baby born and then rush off to another confinement without carefully rearing the first infant in the way of the righteous. We occupy the role of midwife rather than the role of parent in the development of pesticides.

The second lesson we might learn has to do with the type of campaign we wage. The book created a huge furor on publication. It was news. But since that time there have been other books published—Liz Taylor went to the hospital with a bad knee, Cuba is a hot spot on the political stove, attention has drifted elsewhere. Some aspects of the controversy still exist, of course; and some politicians still hope to use it for personal glory. But by and large, it isn't the force it was a few months ago. To me this suggests that we need to be developing a *continuing* educational program of information on pesticides. We should never let up in presenting the positive side of advantages and savings and safety from the use of herbicides. And this needs to be presented not only to the farmer but to the American public. I stress again the necessity of a *continuing* program as against one big blast. To quote an old Chinese proverb, that I just invented, "The sound of even the largest cannon soon dies away." We must keep everlastingly at the job and encompass an everwidening audience.

Now, with that off my chest, let's spend a few moments viewing the impact of regulations and residues on our extension program. Where are we now, where are we going, and how do we get there? This will be a very rough map, and we may have to build new roads.

In the University of California we are now operating under directives that tell us we can make recommendations for use of pesticides only when the chemical fulfills the requirements:

1. It is properly registered and labeled for use by the USDA.
2. It is properly registered and labeled for use by the California State Department of Agriculture.
3. We have research data on its effectiveness under California conditions.
4. We have research data indicating that the residue remaining following our recommendation for use will not exceed the established tolerence; or, if the chemical has been registered on a "no residue" basis, that our recommended use will not result in a residue on the crop at harvest.

A series of committees has been appointed and made responsible for published recommendations involving the use of pesticidal chemicals. One of these is on weed control and includes the statewide weed control special-

[1] Extension Weed Control Specialist, University of California, Davis, California.

ists and technologists as well as the research staff. This committee develops and reviews the recommendations from the standpoint of performance and residue data and submits the completed programs to a member of the Directors Staff for review. This staff member who spends full-time on this job critically reviews the recommendations for compliance with University directives and, on approval, submits them for publication.

A further interpretation of policy tells us that we must be certain that no crops treated experimentally enter channels for food or feed if they have an illegal pesticide residue. This means that we must make provision for destruction or disposal of crop whenever we put out plots with untested or unregistered chemicals in commercial producing fields.

I realize that most of you are not at present bound by such restrictive directives, but I do know that other Experiment Station Directors are seriously considering what might be done to tighten the procedures for making recommendations. All of us can expect greater restrictions in the making of recommendations restrictions on the side of safety.

One alternative is to accept Federal Registration and label claims as proof of safety. Actually these are only limits within which we can operate. We don't accept performance data this way; we always want to check it under our own conditions; we never have recommended every use that every manufacturer has put on the label of every herbicide. We need the same data on *residues* from use under our own conditions.

Another out is to leave the whole thing up to the research people, wait until they make a recommendation, then carry it out to the farmers as something for which we accept no responsibility. If we take this approach there is really not much need for Extension at all. Any good office girl can mimeograph recommendations and mail them out. We cannot ignore our responsibility to the users of the recommendations we make. Our problem lies in the development of the recommendations and we in Extension are going to share a larger part of this activity.

The development of state recommendations should be a cooperative endeavor of the Experiment Station, the Extension Service, and industry. Residue data can be developed along with performance data. Many of our residue samples are analyzed by the company concerned. Coded samples are sent in from our plots, the analyses returned, and the code revealed. This information is of value to the company as well and has been used for obtaining registration.

This does mean that we must be more accurate in our field work. It does mean that industry must participate more actively in the field testing program. Just sending a five gallon bucket of the chemical isn't enough. Arrangements for residue analyses must be made and in some cases provision for payments for the crop treated is necessary.

All of this also means slower acceptance of new herbicides. We need a complete story ,and a good story before we go to the farmer with a recommendation. This is not necessarily bad. We have spent too much time jumping to something new and promising each new season and not enough plain hard work developing the herbicides we have now. It takes time to get new practices into field and farm programs—and we haven't been spending that time. We, and I mean all of us, industry, research, and Extension, must spend more time in the field with our herbicides—testing, evaluating, fitting into production patterns, and teaching safety of use. We need to know more about residues in the crops treated, in the soil, and in succeeding crops.

In summary, I feel that our Extension program will become more research oriented as a necessary step in the development of the recommendations we are to bring to the users. Our program will include more information on safety of use and safety to the consumer of the treated crops. And I hope we can aid in a public relations program by telling the story of successful, safe, and economical pest control.

REPORT OF THE ACTIVITIES AND PROJECTS OF THE EDUCATION COMMITTEE OF THE WEED SOCIETY OF AMERICA

Chester L. Foy[1]

The Education Committee of WSA is one of the standing committees of the society and as such shares the societies objectives, and attempts to carry on activities that are for the betterment of the society and for the advancement of the discipline of weed control. In view of the tremendous losses caused by weeds and suffered by man in practically all walks of life, we feel this is a worthy undertaking. Therefore, we feel we have a worthwhile product to sell to the general public as well as to the student enrolled in academic weed control curricula. We are also convinced that each of us can and should do a better job of selling, both individually and collectively.

The objectives of the Education Committee include the following in particular: promoting the advencement of the science of weed control through improved academic training and by creating a greater awareness in the minds of both professional men and the general public, of the educational and career opportunities available in the field.

The objectives and some of the Education Committee's activities have been presented at the last WSA meeting, published as committee reports in WEEDS and mentioned briefly during an earlier general session of the present conference. Perhaps it is also appropriate to render an up-to-date, if "thumb-nail," progress report of our activities before the Education and Regulatory Session at this time. At any rate, this is what I have been requested to do.

But first a few introductory remarks. At the risk of being repetitious, I should like to say that weed control is rapidly becoming a separately recognizable scientific discipline. Although it is analogous in many respects to the applied fields of entomology and plant pathology, far less is available to interested persons in the way of formal college course offerings in weed control. Most land grant institutions offer one course (most commonly) to four courses (rarely) dealing in some way with the subject of weeds and their control; many states offer no such courses. Few higher educational institutions have organized programs or curricula designed to give broad academic training in preparation for a career in weed control.

Also lacking, in contrast to the field of entomology, for example, is adequate provocative literature and other publicity which would attract high school and lower division college students of higher caliber into this field. We who are active weed workers and know how dynamic is the subject and how great the need often, I think, fail to consider that we must generate some of the enthusiasm we share to others, if additional well-trained weed specialists are to be provided. We simply cannot divorce academic training of the serious students of weed control from public relations, or good continuing communications with the general public.

The Education Committee of WSA has been, understandably, concerned with such matters and has (in the past few years that I have been associated with the committee) undertaken several projects of activity along these lines. The committee usually meets as a group only once every two years in connection with the national

[1] Assistant Botanist, University of California, Davis. Chairman, Education Committee. WSA.

conference. Thus most activities must be carried out largely by correspondence which often involves greater delay than we would sometimes wish. Some of the projects recently completed or currently under consideration are listed below and will be discussed briefly:

During 1961, two reports pertaining to academic training in weed control and related areas of instruction were compiled (1,2).

1. The first listed "Courses Proposed for Inclusion in the Academic Study Programs of Students Preparing for Careers in Weed Control."

2. The second itemized the "Courses in Weed Control and Related Areas Now Offered in Land-Grant Colleges and Universities."

3. The committee also developed a small folder or career leaflet (3) entitled, "Your Future in Weed Control" which describes the activities and opportunities in the field of weed control. The leaflet is now being distributed by the Treasurer-Business Manager, WSA. Each WSA member will receive a copy; selected persons or agencies will receive more than one. The leaflet is intended for distribution to students or would-be students at institutions of higher learning and all other interested persons, so that they may be aware of the possibilities for service in this field.

One of the purposes of a University is to explore the world of men and things and ideas; and to encourage constructive thought and individualism. There is no reason why this should not also be the case with respect to the subject of weed control and academic instructions. I hope some of you may find this leaflet helpful in your own state.

Volume quantities of the career leaflet for regional, state, local high school or university distribution, etc. will be supplied at cost (approximately 4 cents per copy). About 20,000 copies were printed initially; additional printings will be made if necessary.

The Education Committee attempts to function truly as a national committee although this is sometimes difficult.

4. Attempts are being made to promote liaison among the member conferences of WSA. Each of the four regional conferences in USA and the Eastern and Western sections of the National Weed Committee of Canada now have either an appointed Education Committee or a designated representative to maintain active liaison in that capacity.

5. Promotion of a Yearbook of Agriculture entitled, "Weeds and/or Weed Control." Considerable interest is being generated in several quarters for this publication devoted entirely to the subject of weeds. We are currently considering the best means of proceeding. The Education Committee(s), representatives of the weed conferences and the Executive Committee of WSA could write the Secretary of Agriculture forceful letters suggesting the yearbook topic of "Weeds", "Weed Control" or "Weeds and Weed Control." Although the most influential letters might come from the President (for the Executive Committee) of WSA, from USDA representatives at Beltsville (eg. Dr. W. B. Ennis or W. C. Shaw), etc., other letters from member conferences, standing committees ,etc. sent either directly or through WSA and urging the publication will add coal to the fire. For example, the Western Weed Conference is considering a resolution favoring such a yearbook. Barring unforeseen circumstances, the resolution will be introduced in tomorrow's business meeting.

6. Establishment of Scholarships Awards for graduate study in weed control (WSA and regional). The Southern Weed Conference already has such a program. Although there was no response the first year, several participants were reported for the 1962 conference year. The matter is being explored on a national level in connection with the Awards Committee of WSA.

7. In connection with the above, encouragement awards and sponsorship programs including the development of a scholarship, sponsoring travel to weed meetings, prizes and awards to students with the best oral presentation, best published research paper, best review of a topic, most outstanding original work, etc.

Both items 6 and 7 are considered worthwhile proposals, however they may be most appropriately implemented by suggestions and encouragement to separate Scholarships and Awards committees.

8. Investigation of ways and means of further stimulating student participation in WSA and in appropriate academic training leading them to such interests. The idea of establishing some approaches or "guide lines" as suggestions for regional, state and perhaps local use is seriously being considered. These approaches might be used to instigate weed activities such as the following:

(a) forming noon hour journal clubs, discussion groups, informal seminars or forums on weed control;

(b) interesting existing clubs and fraternities such as Alpha Zeta, Alpha Gamma Rho, etc.;

(c) publicizing the importance of weed control and educational and career opportunities to high schools (perhaps by distributing and discussing the prepared career leaflet), via college entrance advisors, etc.

(d) advertising at every opportunity on campus, eg. at "Picnic Day," "Preview Day" and other "opportunity" days;

(e) making separate appeals to national youth organizations related to nature and agriculture, eg.— Boy Scouts of America 4-H, Future Farmers of America, etc. This might best be accomplished through county and state extension personnel;

(f) encouraging and participating in personal appearances nad lectures before civic groups, school organizations, etc.

(g) encouraging those in education at various institutions to examine current offerings in relation to weeds and with an eye toward improvement. Consideration of "pest control" curricula for B.S. and possibly M.S. candidates (Reports I and II, cited may prove useful in reappraising the situation at a particular institution). Letters from the president of WSA to Deans of Agriculture of State universities might be sent pointing out the needs of industry and agriculture for persons trained in pest control. In these, we might propose the establishment of such curricula as a means of supplying a great need to agriculture and industry.

9. Increasing the awareness of the public (now students, primarily) of the importance of weed control. This can partially be accomplished by implementing the following activities:

(a) encouraging more widespread distribution of information on weed losses and the importance of weeds by newspapers, commercial organs, scientific publications, radio, television, etc. (Perhaps this is most properly a function of an advertising or Public Relations Committee but perhaps we may work jointly and supply fuel);

(b) producing (by professionals) some high grade, documentary type color movies on the subject of weed control as has been done by entomology, for example, and when produced, then seeing that they are shown not only at weed meetings but before nonprofessionals as well;

(c) 8 d, above;

(d) 8 f, above. Mechanisms of encouraging and facilitating interchange of information via available speakers on international, national ,regional, state and inter-society levels are being investigated.

Perhaps we could supply a list of various speakers and those operating or holding meetings could do their own inviting. WSA members who belong to Lions Club, Rotary, Kiwanis, etc. should be encouraged to invite scientists to speak to their clubs on weed control subjects.

10. Promoting the status of weed control and herbicide physiology at learned society meetings. For example, we might suggest to the program committees of AIBS, ACS, etc. that symposia on herbicide physiology be held.

11. Encouraging the accumulation of more accurate and complete data on weed losses in all agricultural, recreational and industrial activities where growth of weeds is significant. Perhaps we or a Weed Losses Committee of WSA could lend some inducement to this effort. Granting agencies might be appealed to for sponsorship of such an undertaking. Perhaps we could cooperate with or interest agricultural economists in the problem.

12. Exploring the possibility of setting up an employment bureau in connection with the national (WSA) meetings, similar to that of AIBS. Form letters, questionnaires, booths for interviews between prospective employers and employees could be provided.

Other activities are under consideration but these are sufficient to indicate the scope and interests of the Education Committee and what it hopes to achieve.

The present Education Committee, W.S.A. consists of J. B. Baker, L. A. Derscheid, H. A. Nation, T. J. Sheets and C. L. Foy (chairman). Education Committee Chairman for the Western Weed Conference is Louis Jensen, Extension Agronomist, Utah State University, Logan, Utah There are many educational possibilities that should be explored at all levels. We, (the above named in particular) would appreciate your comments and suggestions as to how the Education Committees, both national and regional, may serve you and the discipline of weed control more effectively.

REFERENCES

1. Education Committee, Weed Society of America. I. Courses proposed for inclusion in the academic study programs of students preparing for careers in weed control. Mimeo. pp. 1-4. 1961.
2. Education Committee, Weed Society of America. II. Courses in weed control and related areas offered in land-grant colleges of the United States. Mimeo. pp. 1-15. 1961.
3. _____. Your future in weed control. Career leaflet. 1962.

STATE WEED PROBLEMS AND PROGRAMS

Louis A. Jensen[1]

This discussion was started by the leader proposing three questions:

1. What is good about our weed program?
2. What should be done in the near future to improve our weed program?
3. What are your specific suggestions to the Education Committee of the Western Weed Conference and the Weed Society of America?

Those present in this session were divided into groups of three persons. Each group was to discuss each of the above questions within their group, making a list of their answers. After the discussion periods, each small group reported to the over-all group. Following are the items reported.

What Is Good About Our Weed Program?

1. We are making definite progress on the control of noxious weeds.
2. The educational phase of the program has been improved.
3. Well-established weed laws to require the control of certain weeds.
4. Well-trained men working in the weed program.
5. Holding weed conferences and schools often.
6. The saving of water through controlling weeds in canals and ditches.
7. Holding joint meetings of Regulatory, Research, Extension, and Industry and cooperating on programs.
8. Exposing young people to the science of weed control through summer employment in this field.
9. Good Research and Extension programs have provided weed workers with the information they need to do an effective job.
10. The extensive use of test demonstrations as a teaching device.
11. Where the weed control program involves many people the results have been good.
12. New information takes drudgery out of weed control.
13. Aiming weed control at more efficiency in food and fiber production has shown the opportunity for all people to benefit.

What Should Be Done in the Near Future to Improve Our Weed Program?

1. Develop weed chemicals that are more effective and lower in price.
2. States should establish noxious weed lists and push a vigorous program for their control.
3. Get control information down to the farmers' and consumers' level to improve attitudes and use of the information.
4. More effective education programs with information to show the dollar value of controlling weeds.
5. More uniformity in weed laws and regulations to improve general acceptance.
6. More opportunity for exchange of ideas between groups.
7. More demonstrations of applied research on county and community level.
8. Learn more about how chemicals kill weeds.
9. Improve the efficiency of control of aquatic weeds, especially the equipment used.
10. Increase the effort to obtain residue information on more herbicides in more crops and soils.
11. At weed schools and conferences, simplify the technical papers so farmers can understand them and distribute to those interested.
12. Do more educational work with youth and involve them at an earlier age.
13. Work more with newspaper editors to stress the need for weed control.
14. Keep emphasizing the fact that weeds can be controlled and continue to use the effective control methods we now have.
15. Improve our public relations.
16. Try to attract more bright, eager young people into weed control work.
17. Develop an enlarged biological weed control program.

What Are Your Specific Suggestions to the Education Committee of the Western Weed Conference and the Weed Society of America?

1. Produce movie films on the story of weed control, stressing health, the well-being of people, and the importance of weed control in the production of an abundant supply of nutritious food.
2. Make better use of mass media such as TV programs.
3. Ask that studies on the economic aspects of weeds be included in federal and state research projects.

[1] Extension Agronomist, Utah State University, Logan, Utah.

4. Have a committee work on a model weed law which the various states could pattern after.
5. Support Vo-Ag and 4-H programs in weed control.
6. Help train teachers and develop teaching aids to make weed control more interesting to high school students.
7. Have one session of the Western Weed Conference devoted entirely to regulatory work.
8. Alternate the order and time of research project meetings in the Western Weed Conference to better enable each person to attend the ones of his choice.
9. Western Weed Conference Committee to help speakers be better prepared and make top quality presentation of papers with visuals *LARGE* enough for the entire audience to see.

REPORT OF THE RESOLUTIONS COMMITTEE

David E. Bayer, Chairman Resolutions Committee

The Committee moves the adoption of the following resolutions and further moves that the Conference Secretary be instructed to send copies of each to the appropriate agencies and/or individuals concerned.

Resolutions #1

WHEREAS, our officers during the past year, President, Eugene Heikes; Vice President, J. M. Hodgson; Secretary, Keith Sime; Executive Secretary-Treasurer, E. J. Bowles; have spent much time and effort in connection with the conference,

Now, therefore be it resolved that we express to them our appreciation and thanks for their services.

Resolutions #2

WHEREAS, the Western Weed Control Conference assembled in Portland, Oregon, on March 22, 1963, appreciates the opportunity to meet in Portland, and

WHEREAS, the local arrangements committee under the chairmanship of Keith Sime has done an outstanding job,

Now, therefore be it resolved that we express to them our appreciation and thanks for their services.

Resolutions #3

WHEREAS, the Education Committee of the Weed Society of America under the Chairmanship of Chester L. Foy has done an outstanding job in compiling the career leaflet, Your Future in Weed Control,

Now, therefore be it resolved that the Western Weed Control Conference continue encouragement of their aims and express appreciation for their services.

Resolutions #4

WHEREAS, weeds cause extensive reduction in quantity and quality of farm crops and grazing lands, reduce the efficiency of producing, harvesting, marketing, and processing agricultural products, and interfere with the effective operation of irrigation and drainage systems and utilization of farm ponds, and

WHEREAS, weed control practices are extensively used on farms and are a major direct cost of agricultural production, and

WHEREAS, the results of research on practices to control specific weeds, either in general or in specific environmental situations, tends to be reported in terms of the experimental situation, and

WHEREAS, the value of such research results could be greatly enhanced if related to the extent of the occurrence of the particular weed or weed environment situation under study, or to the economic loss incurred by the prevalence of such weed infestations.

Now, therefore be it resolved that research agencies engaged in evaluating, reporting, and recommending weed control practices, conduct surveys of weed infestations to determine the extent of particular weed or weed environment situations under study and provide physical and economic measures of losses attributable to them, and

BE it further resolved these research agencies with the aid of Agricultural Economists be encouraged to analyze costs and returns from improved weed control practices in terms of economic gains accruing from such treatment.

Resolutions #5

WHEREAS, many states have weed laws all being different in mode of action but all having the same aims, and

WHEREAS, the weed control problems are similar in all states,

Now, therefore be it resolved that the Western Weed Control Conference request the Weed Society of America to make a study of the possibility of a uniform model weed law for weed control which the various state legislatures can draw upon as a pattern.

Resolutions #6

WHEREAS, there is now extensive information on weeds and weed control, and

WHEREAS, the value of a semipopular review of weed literature would further the understanding of the field of weed control,

Now, therefore be it resolved that the Western Weed Control Conference request the Weed Society of America to encourage the appropriate agencies of the United States Department of Agriculture to publish a Yearbook of Agriculture on Weeds and Weed Control.

Resolutions #7

WHEREAS, the Western Weed Control Conference assembled in Portland, Oregon, on March 22, 1963, recognizes the long and distinguished services of Walter S. Ball in the development of weed control, and

WHEREAS, his pioneering role in founding the Western Weed Control Conference, June 16, 1958, is unprecedented, and

WHEREAS, his tireless energy and enthusiasm was an important factor in the founding of other regional weed control conferences, and

WHEREAS, his experience and advice provided important guide lines in the formation of the Association of Regional Weed Control Conferences and ultimately the Weed Society of America,

Now, therefore be it resolved the Western Weed Control Conference in recognition of these services bestow on Walter S. Ball an honorary life membership.

The foregoing seven resolutions were approved and adopted by the conference members present.

BRIEF MINUTES OF BUSINESS MEETING

Prepared by Kieth Sime—Acting Secretary

Minutes of Executive Committee meeting held March 19, 1963 at Portland, Oregon were read.

Treasurer's report by Ed Bowles.

Auditing Committee report was given by L. O. Baker certifying that the status of the funds appeared proper and in order.

Report from Research and Committee—Herb Hull, chairman. The new chairman is Virgil Freed .

Report from Education Committee by Chairman Louis Jensen.

Report from Regulatory and Public Health Committee by Phil Martinelli.

President Heikes asked for a discussion of the next meeting place. J. M. Hodgson explained the invitation that had been extended by E. E. Hughes to meet in Albuquerque in 1965. No other invitations were extended and it was moved and approved by those present that the next Western Weed Control Conference, March 1965 would be held in Albuquerque, New Mexico.

The report from the nominating committee was made by Rex Warren as follows:

Jesse M. Hodgson for President
Millard Swingle for Vice President
Louis Jensen for Secretary
Ed Bowles for Treasurer and Business Manager

A motion was made and passed unanimously that these nominations be accepted as the new officers of the Western Weed Control Conference.

Conference was adjourned.

Western Weed Control Conference

Registration Roster — Portland, Oregon
March 20 - 22, 1963

Dr. Walter W. Abramitis
Armour Ind. Chem.
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Oregon State University
Corvallis, Oregon

Dave Bayer
Botany Dept.
University of California
Davis, California

T. L. Blanchard
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L. L. Danielson
CRD-USDA
Beltsville, Md.

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