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Minutes of the Fifth Annual Western Weed Control Conference

State House, Salem, Oregon

Friday Morning, June 26, 1942

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Dr. Robbins of California presided as Chairman.

Chairman: We want this meeting to be a friendly and open discussion. We want everyone to feel free to ask questions and to discuss the topic before the house. The first item on the program as arranged for us is roll call and introduction of guests. There are no guests here as we all know each other; therefore, we shall have roll call.

Mr. Ball: I sent out a number of invitations to those who have been with us in the past, but due to lack of transportation, or for other reasons, they could not be here. Among those, of course, were our federal people, Dr. Salmon and Mr. Kephart.

Roll Call.

Official State Representatives present:

- Arizona - absent
- California - present - Walter S. Ball
- Colorado - absent
- Idaho - present - Harry L. Spence, Jr.
- Montana - present - H. Elwood Morris
- Nevada - present - George Schweis
- New Mexico - absent
- Oregon - present - Prof. G. R. Hyslop
- Utah - present - Earl Hutchings
- Washington - present - Chas. D. Gaines
- Wyoming - absent

The representative from Wyoming submitted a report, and Colorado wrote regretting inability to attend. Total attendance was 32.

Chairman: We shall have the Secretary's report and the Minutes of the last meeting.

Mr. Hutchings: I move that we dispense with the reading of the Minutes.

Motion was seconded and carried.

Mr. Ball: The financial report is as follows:

1940 - 1941 Balance Forward	\$292.95	
1941 - 1942 Amount received	60.00	
Expended for Postage	\$ 9.00	
Balance on hand	343.95	
	<u>\$352.95</u>	<u>\$352.95</u>

It was moved, seconded and carried that the Secretary's report be accepted.

Chairman Robbins called for State Reports.

Arizona was not represented.

California. Mr. Ball: I shall try to bring out those things which are considered as new and of interest to the group. So far as California is concerned, we have been carrying on research along with our field work, and inasmuch as we requested Mr. Raynor to give us some information on the progress of weed research, and Dr. Robbins will read the paper, I shall refrain from further repetition.

The war has brought about conditions that have made weed control, we think, more important than it has been in the past. My reason for making this statement is that the Chairman of the War Board met with our county agricultural group last December and stated that he felt that weed control should be continued as it definitely has a place in the program of food for victory; therefore, we felt that we should do all we could to carry on. The results have been that our County Agricultural Commissioners, who are responsible for most of the work in the State, along with our Experiment Station, have continued putting in full effort on the weed control program. One of the problems we had was due to the evacuation of the Japanese, which naturally turned over large acreages of land to individuals who were not wholly familiar with farming. Some of them knew farming; however, others have taken over just to make what they could out of it. The results are that there are now individuals in the farming game on these thousands of acres of Japanese areas who do not understand weed control, and who are buying seed as cheaply as possible to make as much out of the farming as possible, which, as you know, presents a problem. These people need help. We are trying to be of service and, also, to handle the regulatory phases of this particular situation. In some cases we have had very good cooperation. In other places, we still have a problem.

Our Camel Thorn program, which I have reported on in the past, has been one of our most extensive projects. Landowners have entered into a 3-way agreement which has resulted in a cleanup in eleven counties. There are only three counties left; one county with a new infestation which is less than one acre and which is being handled quite satisfactorily, the others completing an extensive program.

The Artichoke Thistle-infested land which was ^{partly} taken care of by state appropriations, has been turned back to the landowners. So far as we are concerned that project has been completed. Some 17,000 acres have been cleaned up, primarily through cultivation.

The Austrian Field Cress infestation in Modoc County--2500 acres involved--is now reduced to 700 or 800 acres. The rest has been put under cultural practices, plus drainage, which have proved to be very satisfactory.

So far as new developments are concerned, we have a rather interesting set-up so far as oil sprays are concerned. About four or five months ago I had letters from the East on the subject of carrots which seemed to be impregnated with oil of some type. We immediately looked into the matter and found thousands of acres had been sprayed with oil, but it was only in those cases where oil had been misused that they had the ill effects. The story of a selective spray in carrots involves a labor problem. To weed carrots under our conditions, according to the growers, costs around \$50.00 to \$75.00 an acre. The application is a light fuel oil, sprayed at the rate of 60 to 70 gallons per acre in a 50% emulsion with water, finely atomized at about 400 pounds pressure. This proves very satisfactory. This pressure will drive dew or other water particles off the plant and gets the material where it does the work. The principle seems to be that the weeds which are sprayed are annual weeds, usually succulent, and are in the two- or three-leaf stage. To be effectively handled the carrots should not be over the two- or three-leaf stage and under 2 inches in height. The foliage of the carrot leaf will be killed back slightly, but the weeds are effectively killed. The cost by commercial operators is \$8.00 per acre as against some \$70.00 for hand weeding. With the labor situation as it is the growers of carrots are going for this type of weed control. The trouble came when growers attempted to spray for second weedings, or attempted to put on too much oil. The carrots were too large and the residual oil was retained in the crown of the carrots. I have been working on the last crop of carrots, and only three weeks ago they were harvested. Samples taken and cooked showed no ill effects. These carrots were sprayed according to recommendations at the rate of about 60 gallons of oil per acre, the carrots being in the two- or three-leaf stage, and only sprayed once. These carrots were checked three or four times during the growing season and oil could be detected until three weeks prior to harvest. Selective spraying of this type is going to come into our weed picture more and more. Under California conditions we find that people are attempting to spray peas and beans and everything that involves weeds in order to curtail the labor expense. X

Another point I wish to mention is that of ammonium sulfamate, the promotion of which is built up by commercial salesmen. We have checked the work and found this material is effective under certain conditions, and, no doubt, has a place in our weed control program, but at the present time it is not working out as set forth by the salesmen, for we are unable to obtain the results they claim can be attained. On Johnson grass it was effective; in fact, this was one of the best controls I have seen for Johnson grass. We had to use as much as 4 pounds per square rod, however, which is twice the recommended dosage. At around 24¢ per pound, the price is high. It is definitely in competition with carbon bisulphide in the control of deep-rooted perennials.

Much money is being expended on Klamath Weed control. We now find that we can continue our work throughout the summer months. Borax may be applied through the summer months in the dry form at 8 to 10 pounds per square rod and, apparently, does not lose its effectiveness, and thus gives us early fall results. Under our conditions we usually have light rains in October and November. The plant starts its growth early in the fall and with these light rains the roots pick up the material quite readily, thus giving very good kills. Formerly we confined our Borax work to a definite period of three or four months during our rainy season, depending on the rain to carry it into the soil. We have gained a great deal and covered thousands of acres through summer applications on our range program.

An AAA program has given us a great deal of help. The AAA has gone into the program extensively. They ordered some 800 tons of Borax to be used by the landowners, applied in most cases under the supervision of the County Agricultural Commissioner. The farmer received 3¢ per pound of borax applied.

In closing I should like to mention seed. I think the sooner we get into the seed end of this weed program, the planting of clean seed and the harvesting of clean seed, or seed from clean fields, the sooner we are going to handle one of our most important problems.

Mr. Hutchings: I should like to ask about morning glory and hoary cress.

Mr. Ball: Cultural practices have been very effective. Without the use of sodium chlorate, which had proved effective when properly applied, we have encouraged cultural methods wherever possible. Carbon bisulphide has played an important part in our morning glory control program. We have some large areas where the growers are continuing to use carbon bisulphide to get rid of small infestations, and in some cases quite extensive infestations. This can be used only for crops that will eventually pay for this eradication. We are fortunate in a way in having our morning glory confined to such areas as the Sacramento Valley where large acreages are confined primarily to the growing of grain, which is a dry land crop--or winter crop with us. This really encourages morning glory and is our major problem.

A new project gaining much interest now is the guayule planting. They are planning on planting 50,000 acres. Guayule, as I understand it, is a plant that will grow with less than 15 inches of rainfall, which is about what we have in the Sacramento Valley. I was talking with the federal field man in charge of the planting operations, and he is much concerned as to how to eradicate morning glory on these 50,000 acres. My answer was to pick out areas that were not infested with morning glory. So far as this federal program is concerned the morning glory is playing an important part in this rubber emergency, which brings our weed control picture right up to date. Another procedure is to get irrigated land where they can get enough moisture to supply both plants.

So far as Hoary cress is concerned, we have continued to treat scattered areas with carbon bisulphide; other chemicals have not been wholly effective. We have found that one of our most heavily infested areas has been quite successfully handled with the planting of oats and vetch as a winter crop and plowing during the summer. The 160 acres were practically solidly infested. A year ago the field was inspected and it was difficult to find a plant. _____

Chairman Robbins: Mr. Ball mentioned guayule. I think you will be interested in a very brief statement regarding the guayule nursery at Salinas, which was recently established. This is a 600-acre nursery. The beds are four feet wide and on each side of the bed are boards upon which the tractor wheels run. The seeds are essentially pre-germinated and set out in a well prepared seed bed. The irrigation is all overhead and automatic. At the present time they are spending \$6,000 per day weeding those beds, using 3,000 employees-- approximately \$450 per acre. The weeds that infest these beds are the ordinary annuals.

Of course, one of their first considerations was how to cut the weed costs in those guayule beds. They have tried Sinox, and we found in checking over their work they were not having much success. They were also killing the guayule. Sinox, however, was not given a fair trial. I am sure it was made too strong. We tried Sinox at Davis on one-year plants and there was no injury. Lately, at this nursery, they have used the oil that has been so successful on carrots, and it seems that the oil is doing a fairly good job. The latest report I had on that a few days ago was that they were cutting the cost of weeding by about one-half by using the oil.

Report for Colorado. Not represented.

Idaho. Mr. Kahout: Our program is essentially a program built on labor. We have not changed the program a great deal in the last six years. This year we are faced with the same problem that all States are faced with, that is, the loss of labor. At the present time our labor load is about one-fourth of what it was last year. We have not had any chlorates for about 18 months until a few weeks ago. Following the suggestions that were made at the Seattle meeting and last year at Salt Lake, we went into a rather extensive burning program, and have built 60 or 70 power burners and feel that, in a way, that is taking the place of the chlorate and is also solving some of our labor problem. We are quite encouraged with our burning program. Some good results, some bad results and some indifferent results have been experienced. In some parts of the State good results have been noted on Canada thistle. In our upper Snake Valley, on an area that is irrigated, there has been considerable difficulty from willow growth along the ditches and spread out in the fields. We have had some good results with willows by burning them in September. Apparently they can be cleaned out in one year.

We are continuing our cultivation program and to date we have not had to stop any of our work in any of the counties. This year we had more land under cultivation than last year, and we are now refusing to take on any more acreage. I think we reported last

year our average cultivation with the publicly owned equipment was about two acres to the hour. Now, with the labor changing so fast, I am afraid that that return is going down to about one acre an hour. Our cultivation program has been encouraging.

We have one area that we are particularly interested in that is infested with morning glory. It lies across state lines, but at this time it is planted to guayule. We have been doing some work with carbon bisulphide in dry areas. Northern Idaho, which is a green country, has gone into a cultivation program and we find our eradication is much easier in that section than it is in the south. We have continued our work on goat weed with good results in the north.

We have tried Borax as a substitute for chlorate, but I am afraid we are going to have to look for some other chemical for our results have been nil. Mr. Spence is going to talk to you about the future of weed control work in Idaho. I think we are going to be able to continue with our work, especially with our cultivation work. The farmers in the State have shown an interest in the work, but where in the past we have been able to furnish labor for the application of chemicals, this year our labor is so short that it is almost impossible to do a great deal of chemical work. The farmers now are buying small amounts of chemicals and applying them themselves. We feel the program will continue, and we hope that when we emerge from this thing we shall be able to take up from the point where we left off. We are, of course, interested in new crops, and I think we should go home and get busy. I mention guayule.

Mr. Ball: What acreage do you have under cultivation?

Mr. Kahout: We are cultivating about 15,000 acres with about four units.

Question: I should like to have the gentleman describe the power weed burner.

Mr. Kahout: There is none on the market. We now have 25 or 30 types. We find it necessary to build 150 to 200 pounds pressure which can handle two hose. In Madison County we had a very interesting outfit. The ditchbanks are infested with Canada Thistle and burning seems to be the only solution. A man there built a small outfit that is completely portable. He has a four wheel trailer, and sets this unit in the center with two drums at each end. As he goes down the roadway he cleans everything along the road.

Mr. Ball: Have you made any recent studies as to the time it may take to deplete the root under certain conditions?

Mr. Kahout: No, we have not. We have gone ahead with our program hoping to stumble onto some results.

Question: How much fuel do you use per acre?

Mr. Kahout: One gallon to 3 square rods. We use an oil mixed by the Husky Refining Co. of Cody, Wyoming. It is heavier than Diesel or stove oil and burns easier. The price in Eastern Idaho is \$5.75 per hundred and in Western Idaho \$6.25.

Question: Can we get enough oil in the future?

Mr. Kahout: Apparently the oil companies need to find a market for this particular type of oil. They are making aviation gasoline so fast that they have to find an outlet for this type. Apparently there will be plenty.

Mr. Ball: We have been following some work where crude and Diesel oil have been mixed, 18 to 20 inches of penetration have been noted on White top. We are getting absorption up to 24 inches in some cases that we have not obtained with straight crude or with Diesel. This mixture has been sprayed under many conditions with the same result. It appears that one application would control White top for the year. A repeated application should have some effect on the root reserve.

Question: How much do you put on?

Mr. Ball: It is just a matter of complete coverage.

Question: Does it eventually kill it out?

Mr. Ball: To date we cannot say. However, definitely we are getting a thinning.

Montana. Mr. Morris: Montana had no representative at the Salt Lake meeting last year, therefore it will be necessary to give two years' report. The program in Montana is quite different from some of the programs in the other States. There is no state-wide program and the control work in Montana is done under a county program. Most of the research work is done at the Experiment Station under the direction of the Agronomy Department, and practically all of the control work is under a legal district set-up in the county, which makes a different proposition than exists in most of the States. As reported two years ago, the beginning of control work in Montana was in its infancy. Since that time considerable progress has been made. There have been about three factors which have helped materially in the Montana weed program. The first is the A.C.P. program, in which a good many farmers have taken part and this has made these farmers and their neighbors conscious of the weed program. The second factor is that the weed program has been presented to every county planning board, and while some of them have ignored the facts, others have considered them and given the weed program a definite place in the county plan. The third, and perhaps the most important factor, was that in 1939 Montana passed a weed law; provisions were made for setting up legal weed control districts. With these three factors considerable progress has been made.

About 325 farms, comprising 12,500 acres, have taken advantage of the A.C.P. program. Most counties have agreed to consider a weed

program in the county planning board. This was especially true in counties having a considerable amount of irrigated land. The weed program has received a lot of publicity and many people are conscious of the increasing damage caused by weeds. The 1939 weed law was amended so that the counties could levy a tax of 2 mills to be used in weed eradication. It was amended so that in a legal district the State paid all of the expenses of weed control on the state and federal highways. This relieved the county of that expense. This resulted in that more money could be used for individual farm control work, as many serious infestations of weeds were on the right-of-ways of the state and federal roads.

Two years ago it was reported that under the weed law only six districts were organized in the State. There are now twenty-seven districts covering an area of $3\frac{1}{2}$ million acres in thirteen out of fifty-six counties. This area includes a good many acres of dry land, but most all of the irrigated land is included in the control districts. There is one county which has organized into a county-wide district; in another county there are six districts which include all of the irrigated land, three counties have four districts, two counties have two districts and there are four counties that have one district each.

To show the extent of the program, the county appropriations for 1941 were almost \$126,000.00, and that is a substantial increase from that of two years ago. During 1941 Montana used about 700,000 pounds of chlorate on 765 acres, about 1,500 gallons of carbon bisulphide, almost 2,000 pounds of arsenic and 100,000 gallons of fuel oil. The searing or burning program has a real place in weed eradication, especially in weed seed control. Very good success by burning was secured on willows and a good many ditch banks have been cleared with one or sometimes two burnings.

The results with White top and Leafy spurge have not been so encouraging. Speaking of Canada Thistle, in many places in Montana it is not considered to be in the same class with White top, Leafy spurge or Knapweed, because Canada Thistle can be commercially controlled with cultivation at a reasonable price, and it is so widely distributed in the State that it is now a proposition of living with it and not attempting to eradicate it.

It is recognized that cultivation, if it is possible, is the most economical and best method of weed control. In the control program it has been possible to turn back a few acreages for cropping during the four years of operating. This has made a very good impression with the County Commissioners, who have direct charge of the weed control program. The program in Montana is not as extensive as in some other States, but progress has been made and the most encouraging thing is that the County Commissioners are fully cooperating with the program with the idea of continuing it.

Chairman Robbins: Any questions you would like to ask?

Question: About these districts, do you operate them as quarantine areas or how?

Mr. Morris: They are organized by the landowners themselves, creating a weed district, and after a weed district is created all land in that district is subject to weed control. This provision is to take care of tenant farms and also non-resident farms. In case that the tenant farms or non-resident farms are not taken care of county can go in and take care of these special places and the charges become a lien upon the land. Within a district an individual can take care of his own weeds or make arrangements with the county to do the work for him. The cost is as follows: The owner pays 1/3, the county pays 1/3 and the State pays 1/3.

Nevada. Mr. Schweis: The report for Nevada is going to be very brief as anything said will be only a repetition of reports given at former meetings. However, I will state that weed control is now receiving greater attention and support than ever before. This condition has come about slowly, but a larger percentage of our farmers now realize that the presence of noxious weeds on their land reduces their crops materially and also reduces land values.

There is a greater acreage of weed infested land under control programs at the present time than ever before and I believe this acreage will be increased another year. Where conditions are favorable we are depending largely on flooding as the most feasible control method for perennial noxious weeds. In other areas where soil conditions are not favorable for flooding, or where water for this purpose is not available, cultivation is practiced. Chemicals are now used only for spot control or in places where flooding or cultivation is not practical.

Question: How long do you keep the water on a piece of ground?

Mr. Schweis: We find the hot summer months are necessary for adequate weed control. Turn the water in by the first of June and take it off in September.

Question: What is the depth of the water?

Mr. Schweis: We attempt to keep all the plants covered.

New Mexico. Not represented.

Oregon. Mr. Harris: I am not going to spend a lot of time on the state report. One thing in the educational field, we have completed another group of bulletins which, I take it, most of you have received, making a total of 39 leaflets instead of one large booklet. We felt we could keep the information up to date better in this way.

We have organized some new weed councils which will be discussed more fully later. As far as the cultivation work is concerned, we have been increasing that. As far as any definite cutting down of the large acreage of weeds, it is necessary to use cultivation methods. We have six counties operating cooperative cultivation programs. The type that works the best is where the county operates the equipment and buys the materials. This program started

first in Malheur County. As far as the county appropriations have been concerned, they have been increasing a little all along. In 1936 we had 11 counties, at the present time there are 22 counties making direct appropriations. Several others have various budgets that they draw from. The Highway Commission is becoming interested in the problem of weeds along the highways. In Canada thistle control in some of our Western Oregon counties we are in the same condition as in Montana. We believe that cropping methods are going to be the best. For the most part that has been the main control that has been used in Western Oregon.

With St. Johnswort we have not done as much. We are starting to do a little work on the range. The total acreage that is being controlled is about 15,500 acres. Most of it has been carried along under the Triple A program. They have helped tremendously. In 1937 we had about 8,000 acres in a control program. It is not a program that is ideal as the Triple A can only work on a year to year program. Chlorates. Last year we had to cut down on their use materially. We have felt that weed control demonstrations through the County Agent, the Grange and other organizations will help materially in getting certain practices as information to farmers. While they are not experimental plots, we do feel that we get distribution to have them in as many places as possible in the counties. Last year we had over 600 weed control demonstrations established by the County Agents primarily.

For the annual weeds, which we are recognizing more and more, I think we have made some marked progress. It is marked to the extent that the farmers are taking it up and use it on certain crops.

Approximately 4,000 acres of fibre flax and 800 acres of grasses were sprayed last year. A total of about 3,000 acres of grains was treated for weed control. Our Yellow Star Thistle program is rather extensive in the southwestern part of the State. We have obtained good results with a combination of Diesel oil and water. Use 25% oil and 75% water. They use an activating agent with it and are getting good results. It is a method of holding the weeds in check and an economical method of control.

As far as the arsenicals are concerned, we have not used many. Have stayed away from them in many locations on account of their extremely poisonous nature.

Utah. Mr. Hutchings: Our noxious weed organization consists of a State Weed Eradication Committee and county committees in each of the 29 counties, with county supervisors in all except Utah and Salt Lake. Each of these counties has two supervisors.

In 1941 we cultivated 7,324 contracted acres including 1,560 acres supervised by county supervisors and cultivated by individual landowners. It appears that the 1942 acreage will be slightly less due to farm commodity prices, war production goals and labor shortage. All twenty-nine counties of the State are participating as in 1941.

Land is being returned to the owner much earlier than in the past, due to close supervision, better knowledge of control methods,

more and better equipment, and additional moisture conditions. All have been contributing factors.

Fall plowing has proven much more satisfactory than spring plowing. It has been necessary this year, however, to do considerable spring plowing because of the unusual amount of moisture packing the soil solidly, preventing the cultivator from working well. By fall plowing, spring growth is very much retarded, allowing the early showers to pass before cultivation is necessary.

Duck foot cultivators still are the best implements for all around purposes and especially the tractor attached weeder, hydraulically controlled, with sweeps 14 to 16 inches wide constructed to run perfectly flat, eliminating furrowing as much as possible. If, however, furrowing does occur, we use a heavy timber or light iron rail to smooth out the corrugations. This is attached to the weeder with extension chains on each end.

Many other kinds of cultivators are used and most of them give very excellent results especially when the land is favorably prepared. We are using mostly tractors with pneumatic tires. The tractor has quite universally replaced team power.

One of the serious mistakes counties have made in the past is the purchase of tractor equipment that is too light, and best results cannot be obtained with it, especially when it is necessary to cultivate 4 or 5 inches deep and cover sufficiently large acreage. Our good tractors cultivate 150 acres twice each month and do a very satisfactory job.

Good cooperation is obtained from farmers in cutting the hay crop early before noxious weed seeds have ripened. Much progress has been made in convincing landowners to plant seed free from noxious weeds. However, we have a long way yet to go in this respect.

I think we should take the lead in finding an economical method of devitalization of noxious weed seeds. Possibly on a community basis and by a method by which the producer can receive a fair salvage value inducing better cooperation in this important problem. It might be accomplished by steam or dry heat on a large scale and induce the policy of cleaning grain at harvest time so that the movement of such a commodity in commercial avenues would not be such a temptation to farmers to purchase and plant. Our present method of devitalization is by the hammer mill process which has proved none too satisfactory.

We are getting much better results from the use of chemicals, both Atlacide and Carbon Bisulphide. This is due to a large extent to our farmers and supervisors having a better knowledge of how best to apply it. We believe that there is no good reason why we should fail in its results. When we do fail there is always a discernible reason why. Most failures come because of the lack of study of the problems involved in the location. Naturally there is no reason why we should have much failure after 4 or 5 years of experiment in its use. In most cases Atlacide is applied by the

dusting method with two light applications and some follow-up work. This method is very economical and satisfactory except on large areas. In such cases the application is made by power spray chemical machines.

In Davis County a light solution is used in a power spray machine covering a large area with a weak solution, sufficient to burn the plants down. This method has been used over a period of 4 years on the same area with very excellent results. It has proven a very economical control policy, and much of the infestation has been eradicated.

Since labor has been scarce farmers are responding very satisfactorily in the application of chemical to their own land. Excellent control work is accomplished by inducing landowners to keep a supply of chemical on hand. When infestation appears on their farms they apply the chemical at once avoiding the usual method of waiting for the supervisor and men to make the application, avoiding the dangerous practice of spreading over large areas before anything is done about it.

The general attitude of the farm people has changed much in the last two years. Instead of soliciting the landowners, we usually have a waiting list.

At the last Legislature a law was enacted authorizing county commissioners to levy for weed eradication and control purposes. This act has greatly increased county participation and contribution, and enabled counties to supply themselves with better equipment.

The labor problem has become one of much concern. None of the northern counties has received W.P.A. help. The southern counties have received a limited amount because they are quite far removed from defense areas.

Washington. Mr. Gaines: Weed control work in Washington can be divided into three divisions: First, Experimental work; second, General Extension work; and third, actual control projects. The following is a brief summary of experimental work:

Experiments on White Top have shown that complete eradication of the weed may be effected in two seasons by cultivation with duck-foot blades at intervals of three weeks, from May 1 to November 1. A study of the effect of cultivation on root reserves indicates that the first effect is a marked reduction in root quantity with but little change in reserve composition. Further cultivation results in further reduction with a decrease in the starch-dextrin fraction but an increase in per cent of sugars. Just before death occurs, the quantity of roots in the soil is very low with most of the reserves in the form of sugars. Two years' cultivation may result in a soil with poor physical characteristics and low organic matter. This reduces crop yields on the area the following year, but the effect can be mitigated by seeding rye the fall of the second season of cultivation, then plowing it under the next spring before cropping.

On none of the cropping plots has the White top been completely eradicated, although there has been a marked reduction in stand of the weed. The experiments do indicate that profitable crops of corn, potatoes, beets, millet, Sudan grass, alfalfa, and sweet clover may be grown on land heavily infested with White top if proper methods are used.

Chemicals have not proven too successful on White top. Experiments with sodium chlorate indicate that a divided application (an original light treatment followed by a heavier one) is more effective than a single heavy one. Our plots show differences in reaction to chlorate due to a spotted alkali condition on the area.

Flooding experiments show a kill of approximately 97% of the White top when flooded for 98 days during the summer. Shorter intervals of flooding were less effective. On Russian Knapweed, flooding for 2½ months was sufficient to give a complete kill. Shorter periods gave marked reduction of the stand of the weed. The flooded plots which were on saline or alkaline ground were much improved following the flooding and raised good crops the next year.

Cultivation experiments on Russian Knapweed indicate that the best frequency for cultivation is every three or four weeks, although the experiments are not yet completed.

Diesel oil spray has been used successfully for control of weeds along ditch banks. The number of applications required depends upon the weeds that are present. A combination of the spray with burning shows promise.

The Extension work may be briefly summarized as follows:

Days devoted to this type of work by County Agents...	356
Communities in which work has been done.....	193
Result demonstrations conducted on weed control.....	92
Farm visits in weed control work.....	1094
Office calls received by the Service.....	4640
Farmers reported following the recommendations.....	3124
Pounds of chemicals used.....	1530
Number of acres treated.....	18608
Total estimated savings to the farmers in the State -	
	\$34,795.

The actual field work is largely confined to four counties; three of these entire counties have been declared Weed Districts, and the fourth county has two relatively small controlled districts in operation. Four additional counties are cooperating with AAA.

The principal weeds that have been attacked are Canada Thistle, the White Tops and Russian Knapweed. The materials used in control work are Sinox, sodium chlorate, ammonium sulphate, borax and carbon disulphide. The chemical control work has been supplemented by the use of burners, mowing to prevent seeding, spraying with dilute solutions to kill vegetative growth, and cultivation. The seeding of highway rights of way and power line rights of way has been engaged in by counties concerned, to prevent the establishment of noxious weeds in what would otherwise be waste areas.

In some instances the county has purchased equipment for cultivation to be rented to individual farmers as a supplement to those who can afford to own their own equipment. In one county, a full time specialist is employed to organize weed control work.

In general we feel very much encouraged over the progress of weed control in Washington during the past year. It is our hope that we can at least hold the weeds in check that have been controlled up to date, during the period of our present emergency.

The Wyoming report, submitted by Mr. B. Thomas Snipes, was read by Mr. Ball and further summarized for the Minutes:

Perennial Noxious Weed Control Summary

Wyoming -- 1941

Of twenty-three counties in the State, 10 participated in the organized subsidized weed control program in 1941, including the formation of noxious weed control districts, employment of full time County Pest Inspectors and assistants for the administration of control activities and the appropriation of county funds to finance all expenditures accruing to weed control. Field control operations were directed against the following plant pests. White top, Canadian thistle, field bindweed, Russian knapweed, White leaved franseria and Leafy Spurge.

EXPENDITURES OF FUNDS*

County	Subsidized Control Program				Subtotal	Quarantine	Total
	County	State	Landowner			Enforcem't & Seed Insp	
Big Horn	\$ 2,810.93	\$ 2,728.34	\$ 2,728.34	\$ 8,267.61	\$ 1,000.00	9,267.61	
Fremont	7,000.00	4,000.00	4,000.00	15,000.00	4,612.96	19,612.06	
Goshen	1,638.14	3,014.04	2,425.54	7,077.72	2,195.47	9,273.19	
Hot Springs	1,777.54	1,018.74	758.80	3,555.08	--	3,555.08	
Lincoln	1,812.50	1,812.50	1,812.50	5,437.50	--	5,437.50	
Park	4,447.60	4,434.52	4,405.82	13,287.94	4,138.88	17,426.82	
Platte	2,128.92	2,128.93	2,128.92	6,386.77	--	6,386.77	
Sheridan	1,713.77	1,625.93	1,561.60	4,901.30	2,798.05	7,699.35	
Uinta	2,204.00	2,000.00	2,000.00	6,204.00	718.06	6,922.06	
Washakie	1,235.82	420.37	420.37	2,076.56	--	2,076.56	
Total	\$26,769.22	23,183.37	22,241.89	72,194.48	15,462.52	87,657.00	

*Does not include expenditures for weed control by private individuals, Agricultural Adjustment Administration, Bureau of Reclamation, Indian Service, Canal companies, etc.

A summary of the field control program is as follows:

Clean Cultivation

Areas returned to crop in 1941.	
Counties participating	9
Total acreage	781
Average plowings per year.	1.4
Average cultivations per year	6.7
Average cost per acre for eradication.	\$29.93
<u>1941 cultivation program</u>	
Counties participating	9
Total acreage	2453
Average plowings per year.	1.6
Average cultivations per year	4.9
Average total cost per treatment	\$ 1.75
Average total cost per acre	\$11.53

Continuous Light Burning

Counties participating	9
Total square rods burned.	59,142
Average number of burnings	2.4
Average gallons of oil per square rod	1.1
Average cost per treatment per square rod.	0.17
Average total cost per treatment per square rod	0.37

Heavy Chlorate Treatment (Sodium chlorate or Atlacide)

<u>1939-1941 eradication program</u>	
Counties participating	8
Total square rods eradicated	5,950
Average total cost per square rod for eradication.	\$2.88
<u>1941 program</u>	
Counties participating	8
Total square rods treated	4,881
Average pounds per square rod.	9.2
Total average cost per square rod	\$1.65

This work was greatly curtailed by the chemical shortage and the continuous light searing method was substituted.

Carbon bisulphide Treatment

<u>1940 results</u>	
Counties participating	6
Total number of square rods treated	442
Total number of square rods eradicated	397
Total number of square rods eradicated 1941	45
Total average cost per square rod for eradication	\$2.63
<u>1941 program</u>	
Counties participating	5
Total number of square rods treated	361
Total gallons used	802
Average gallons per square rod	2.1
Average total cost per square rod.	\$3.55

The greater portion of the CS₂ used in the State was furnished to individual farmers and ranchers at one-third the cost and applied by them.

QUARANTINE ENFORCEMENT

Noxious weed quarantine orders Nos. 1, 2 and 3 were enforced throughout the State in 1941 through the State Entomologist's office and County Pest Inspectors. The State Seed Law became effective in February, 1941, and was administered cooperatively by the Commissioner of Agriculture, State Entomologist, State Seed Analyst and County Pest Inspectors.

A brief report from Kansas by Mr. T. F. Yost, State Weed Supervisor, was read by Mr. Ball:

The weed work in Kansas is rolling along in good shape. We can see no slack due to the war effort. One of the biggest changes in our program this year is the fact that twenty-eight additional counties have purchased county-owned cultivation equipment. During this year we are operating forty tractor-duckfoot outfits owned by counties. We also have several cities that are using small outfits for eradicating bindweed on larger areas, such as vacant lots.

Our latest figures show 195,885 acres of bindweed on 43,634 farms in the State, not including bindweed on public property. During 1941, 8,618 farmers in Kansas were properly cultivating 54,186 acres. Our latest records show that 5,172 farmers in the State have completed eradication by cultivation on 33,412 acres. 7,369 farms have eradicated 18,535 patches of bindweed, aggregating 2,413 acres by the use of sodium chlorate. This does not include 1,125 patches on 621 farms that were eradicated by special methods. Our latest figures also show that 9,043 farms in the State have eradicated all of the bindweed on their premises. Of the 43,000 farms in the State with bindweed, they are all in the program excepting 16,000 that are classed as non-cooperators.

We used a total of 1,617,000 pounds of sodium chlorate during 1941, and also 680 carloads or about 30 million pounds of salt on highways and other non-agricultural land. This will give you a short report of the work in the State during the past year.

Prof. G. R. Hyslop: We are getting some vegetable seeds that contain noxious weeds which are in violation of our law. I am not going to mention what State they come from, but I do think that this western weed control group should go on record in favor of bringing vegetable seeds into the law. There are so many state laws that pay no attention to more than the germination of the vegetable seeds. I think the noxious weed phase of it should be given careful thought. We had some low germinating onion seeds, and they were turned over to the federal authorities. They delivered a small slap on the wrist to the company and told them not to do it again. Under present conditions, when normal seed sources are closed, we are likely to get more seeds from the middle west. Certain seeds are coming to the far west from the central west, and we have found several lots of orchard grass seed containing wild garlic. It is a particularly dangerous weed for this western section, where we have quite an extensive dairy and poultry industry. We should be considering the possibility of wide-spread introduction of that very dangerous weed into our Western States.

At this time I should like to introduce Mr. Morton Tompkins, who is the Master of the State Grange, and who has been active in our weed control program.

~~Mr. Tompkins~~ Tompkins: I just want to say that I am glad to be here. We have worked on this weed control through our subordinate granges, the State Grange and the State Department of Agriculture. We try to keep our farmers weed conscious. We try to support weed legislation in our Legislature. I am glad to have the opportunity of being with you today, and shall be glad to take back with me a report of the progress you have been making.

At this time Mr. Harry L. Spence, Jr., Extension Agronomist, Boise, Idaho, was called upon to talk on the subject "Weed Control under War Conditions." Mr. Spence did not submit a paper and up to this time it has not been received. Therefore the Minutes are being submitted without this paper. We are sorry we did not receive this talk, since Mr. Spence brought up some very interesting and timely points relative to the present situation.

Professor Hyslop: Seed law enforcement should be strengthened. Mr. McKennon's department has put on a more strenuous campaign and has not met any particular resistance. We have to protect our growers. In connection with their production and weed program there are quite a lot of places where we can re-direct our effort. A lot of stress is given to certain crops as being strategic, and if we center our attention on some of the crops that are minor it will be helpful. The work that Mr. Harris has done on flax has been very well received and is very popular. Then those folks who have engaged in the perennial weed eradication program should have brought to their attention what they are going to lose if they drop out of the program, or if they slow up for a time. This suggestion of Mr. Spence about being set when the war is over is going to mean a great deal. When it is over there is going to be need for finding something to do for a lot of people, and there are a lot of agencies in the federal government itself that have a lot of plans in that connection. The weed interests better be prepared to utilize some of that post-war help, and also there undoubtedly will be vast quantities of material that can be used when the war is over.

The meeting ajourned for luncheon.

Friday Afternoon, June 26, 1942.

The meeting was called to order by Chairman Robbins.

Chairman Robbins: The next item is "Weed Control on Bureau of Reclamation Projects" by Mr. R. B. Balcom, Assistant Plant Control Supervisor of the U. S. Reclamation Bureau at Denver, Colorado.

WEED CONTROL ON BUREAU OF RECLAMATION PROJECTS

R. B. Balcom, Assistant Plant Control Supervisor
U. S. Bureau of Reclamation

Mr. Chairman, Gentlemen of the Western Weed Control Conference:

The Bureau of Reclamation is pleased to be represented at a meeting where a vital problem which so directly affects the welfare of western agriculture is studied and discussed. Each meeting of this kind develops a better understanding of the complex weed problem and brings it nearer to its solution. The Bureau is vitally interested in weed control, not only as it affects its own irrigation projects, but also as it affects agriculture as a whole. Since the passage of the Reclamation Act on June 17, 1902 (just 40 years ago), there have been 81 projects or divisions of projects completed, under construction, or authorized. In 1940, on operating projects, areas supplied with supplemental water, and on projects furnished supplemental storage, there were nearly 3½ million acres irrigated. When all authorized projects are completed they will provide water for approximately 12 million acres.

At the present time there are more than 20 million acres of land irrigated in the 17 western states on private and Federal irrigation projects. This represents about 3.5% of all land or 11% of land from which crops are harvested. In comparison with the value of all crops harvested, 98% of the total comes from irrigated land in Nevada, and 96% in Arizona. In Wyoming, Utah, New Mexico, Idaho, Colorado and California the proportion is over 50%. The investment in irrigation enterprises on these lands in 1939 was more than one billion dollars, and nearly 600 million more is invested in land now being prepared for irrigation. It is no wonder then that the Bureau of Reclamation is interested in the pest problem that causes more farm losses than animal diseases, plant diseases, insects and rodents combined.

Perhaps this paper will not add much to the knowledge already gained in methods of weed control; however, I can give a few results of the work undertaken, describe the program, and assure you that every effort is made to cooperate with other weed control activities.

The methods used on Bureau projects, for the greater part, have been borrowed from research work conducted by other agencies and adapted to irrigation farming. For this reason our most important function in weed control is education. Unless the research findings, regardless of their importance, are transmitted to the farmers and a practical application made on their farms, no good is derived from them. Information obtained from experimental weed control is handed

down to our project farmers in various ways. Visual education is used where possible by means of slide lectures, motion pictures, weed control demonstrations, tours in cooperation with the county agents, and potted and mounted weed specimen displays. This work is augmented by local news items, weed handbooks, and articles in the Reclamation Era, the official publication of the Bureau. Reprints of the Era articles are distributed to irrigation projects and weed leaders. Methods of eradication and the necessity and advantages of a systematic weed control program are stressed. Our ditch-riders and other project employees are taught weed identification and to be on the alert for new weeds and new weed infestations. Occasionally questionnaires are submitted to farmers on some of the projects to determine what they know, think, and are doing about weeds. The answers recently received from one Colorado project showed that over 82% of the farmers were in favor of some form of organized weed control. Nearly 72% were in favor of a weed district. These facts are encouraging as they indicate that farmers are becoming more weed conscious.

Weed surveys, which will be discussed in detail later, can be considered as a part of the educational work and the first step of an efficient weed control program.

No actual weed eradication is performed by the Bureau on private crop land. Here the cooperation must begin and end with education. On large infestations in fields, shoot-cutting or a combination of the shoot-cutting and cropping methods are advocated. Often a farmer cannot afford to take his entire infestation out of production all at once as he would not have sufficient land left from which to obtain a living. In this case, he is advised to begin a systematic plan of removing a portion from production each year until his farm has been cleared of weeds; or, in some cases it is suggested to alternate summer shoot-cutting with a winter grain crop. Often it is desirable to precede this method with the raising, for a year or two, of a heavy smother crop.

Most chemicals that are applied by the farmer himself have generally given disappointing results because of existing soil and moisture conditions, lack of information in applying the chemicals, or some other factor or combination of circumstances adversely influencing the results. Unless it is quite certain that chemicals will give the desired results and that they can be applied under the supervision of a skilled weed leader or weed-trained County Agricultural Agent, they are not as apt to be recommended as heretofore. It would perhaps be better for the farmer to use carbohydrate starvation, by hoeing or searing, than to lose faith in existing chemical control methods. Until a more satisfactory and cheaper herbicide is developed, carbon bisulphide is suggested -- and then only if the value of the land and crop returns warrant its use. Chlorates are probably the biggest offenders in producing spotty and unpredictable results and, now that they are difficult to obtain, we hope that the search for other chemicals to take their place will result in the finding of more suitable herbicides.

Arsenicals have their place in weed control, but because of their poisonous nature to man and livestock and of the exacting

circumstances under which arsenicals must be applied, to get the desired translocation, it is suggested that their use be left to those who are familiar with their application. They appear to be particularly adapted to the jar method in killing camel thorn and for spraying weeds in orchards and vineyards, but livestock must be excluded from the areas.

The only actual eradication work which we do is on land withdrawn for Reclamation purposes which comprises mainly the right-of-way needed for the water distribution and drainage systems. The three general methods used to kill weeds on the ditch banks are shoot-cutting or clean cultivation, chemical eradication, and searing or burning. Shoot-cutting on ditches must be done largely by hand tools such as spades. During the period when the Bureau was assigned CCC camps on operating projects, most of the work was done by camp enrollees. This method was successful but required a great amount of hand labor. Chemicals have been used to some extent, but on most ditch banks it has been found that the ideal conditions needed in effective chemical control are not encountered. The tops and back slopes of ditches are too dry and heavy rains carry the chemicals off, rather than into the sloping banks. Often the soil is saturated at the water line where usually the greatest density of weed growth occurs. Perhaps enough chemical could be used to sterilize the soil, but by experience it has been found necessary on most soil types to have some kind of vegetation present to prevent wind and water erosion and to stabilize the banks. For these reasons burning equipment is now being used to a greater extent. Even though the existing method of burning or searing some weeds has proven so far to be only another means of carbohydrate starvation, it is better adapted to ditchbank conditions than either shoot-cutting or chemicals.

There is some evidence that a light sear on certain weeds seems to produce a toxic substance which is translocated to the roots and helps in killing the plant. On at least two species of plants, Canada thistle and water hemlock, our tests have shown that three or four light sears will kill the weeds in one season where twice as many tight burns, causing the circulation to be cut off, have been required to produce the same results.

Most irrigation projects have one other serious weed problem, incidental to water channels, which has not been given much study -- the water weed problem. These weeds range all the way from the lower types of vegetation, the algae, to trees such as willows. The cost of controlling water weeds in irrigation channels is borne by the landowner, just as if these weeds were infestations on his own farm. Some plants, like the arundo species or so-called bamboo canes, grow rank at the water's edge and create a maintenance problem because they must be mowed to prevent their falling into the water and reducing the carrying capacity of the canal. Others, such as willows, prevent proper operation of the system and act as pumps, using water which should be going to a farm to irrigate crops. Still others, of the cattail and tule class, growing in the bottom of canals, laterals, and drains, act as desilters and tend to fill the waterway with silt or catch floating debris which further incapacitate the ditch. The so-called mosses grow either entirely or

nearly submerged and choke the water passage so completely that the water is raised above the normal flow line. This may cause seepage in the less compacted bank section and often contributes to excessive alkalinity in crop land. Eventually the mosses grow so thick that mechanical means of eradication must be resorted to, in order to allow sufficient water to reach crops at the lower ends of the ditches. These weeds are referred to locally as moss, pondweeds, horsetail, seaweed, eelgrass, or feather moss. The ones causing the most trouble are, in reality species of alga, pondweed, horned pondweed, hornwort, milfoil, cress, and polygonum, with probably the largest group made up of pondweeds or potamogeton species.

A recent questionnaire sent to all Reclamation and many private projects shows that about 85% of all projects so circulated have a water-weed problem. From the answers it was determined that over 4000 miles of canals, laterals and drains are infested with moss, and a much greater number of miles with tules, cattails and willows.

There are four general methods used in controlling aquatic and semi-aquatic plants: mechanical means such as dragging chains, or the use of discs, harrows, dredgers, submarine saws, draglines, and hand scythes; chemicals, usually copper sulphate, for algae; draining the ditch and allowing the plants to dry; and shading the plants by introducing silt into the water (the submerged plants cannot grow where sunshine does not reach them). Most of these methods have been used to some extent for at least thirty years but, at best, they merely control the growth. Perhaps the reason why eradication methods have not been developed is because very little study has been made of the problem, including the growing habits of the submerged plants. Also, it has been considered a special problem of the irrigation district itself, and possibly it has not been taken into consideration that the irrigation district is comprised of the same group of farmers for whom we have all strived to solve land weed problems. The need for a comprehensive study of water weeds and their control has been discussed with the Bureau of Plant Industry, several colleges, and experimental stations, and it is sincerely hoped that some time and effort may be given to the problem.

Another phase of our educational program deals with weed prevention. On operating projects an effort is made to prevent established infestations spreading, by wind, animals, birds and water, and new infestations being brought about by man-made methods. While natural causes are likely to spread weeds, man has no doubt been the greatest factor in their dissemination. For this reason every occasion is taken to advise our farmers to plant only certified, weed-free seed. In a recent survey of crop seeds in Colorado, made by Bruce J. Thornton, some surprising facts were disclosed. The average quality of crop seed sampled showed that 84.95% contained noxious weed seeds. The average number of noxious weed seeds per pound was 233, which would be 2.7 seeds per square yard. The poorest quality of seeds sampled averaged 2,084 noxious and 17,760 common weed seeds per acre, or 206 weed seeds per square yard. One farmer planted $4\frac{1}{2}$ pounds of bindweed seed on one 60-acre field. A particular effort is made to show our farmers that the few extra cents spent for weed-free seed pay big dividends.

Under irrigation conditions, the water itself is another means of spreading weed seeds which, of course, is why we are anxious to eradicate noxious weeds from our ditch banks. Many weed seeds maturing on canals and laterals, and along streams and rivers which furnish the irrigation water, eventually find their way to crop land or start new infestations along the channels. Some of these seeds, such as the light chaffy type of the grass weeds and those of water plants like poison hemlock, will float great distances; others are heavy and sink immediately or shortly after falling into the water. It is possible that some of the seeds which sink may be rolled along the bottom of the channel, especially where the water velocity is high, and also reach irrigated fields. Perhaps not as many infestations have actually been started in this way as has been contributed to it, but as long as it remains a potential source of spread, it merits consideration. The question of how long these seeds will remain alive during water transportation is now being answered, at least in part, through the research work of Wm. H. Mercer, our CCC plant control foreman at Montrose, Colorado. The question as to the effect of submergence on the viability of weed seed has not, so far as we know, been answered by any carefully planned experimental work. It therefore presents a comparatively new and unexplored field for research in weed control investigations. However, Mr. Mercer's preliminary work has shown that weed seeds do retain their viability after long periods of submergence. Seeds were placed in water and at definite intervals removed and placed in sand pan and blotter tests. Bindweed continued to germinate after 180 days submergence; whorled milkweed after 130 days; white top after 30 days; water hemlock after 240 days; and burdock after 210 days. These were the extremes and usually only a 2% to 4% germination resulted after these periods, but a much higher germination occurred during the first 30 day period. Most floating seeds will have lodged along the canal or found their way to crop land before 30 days.

Inasmuch as it is known that ditch banks are liable to reinfestation by water or other means, methods have been studied to prevent weeds starting again after patches have been eradicated. It has been found that grasses or other weed-competing plants growing on the banks will cut the chances of reinfestation to a minimum, and that by pasturing these areas the grasses will spread into the desired dense sod much faster and, at the same time, furnish pasture for the farmer's livestock. Ditchbank roads are being built which will give better circulation to mowers and other weed equipment. Some study has been given to weed seed sources in watersheds which supply irrigation water. It may be found advisable to eradicate the weeds at their source or devise some means of keeping the seeds from entering the irrigation system, in order to further prevent ditchbank and crop land infestations.

Reference was made earlier that the making and recording of weed surveys would be discussed in detail -- there was a special reason for this. In any undertaking where it is desired to plan an efficient program, it is necessary to obtain all the pertinent facts. An effective weed campaign should be preceded by a comprehensive weed survey in order that a systematic and economical plan of eradication may be developed. It gives the knowledge as to extent of infestation on the project, kinds of weeds, location of each patch, its size, and

the degree of infestation. This survey eliminates the possibility of omitting any weed areas from the program and helps plan weed crew maneuvers. It also creates interest in weed eradication among the farmers because, until a weed survey is made and the results published, most of the residents of a community do not realize the seriousness of the weed situation. While, as stated before, the Bureau of Reclamation does not eradicate weeds on private land, the ditchriders on many projects are trained to make weed surveys on all land in the district. By making a weed survey every year the records will indicate whether the weeds are decreasing or increasing on a project. Where it is learned that weeds are increasing, plans can be made to devote more time in helping that district get its weeds under control.

In some areas, particularly where weed districts are functioning, other agencies make the crop land weed survey. It has been noted that every group charged with making these surveys uses a different form. In order not to duplicate work, we have endeavored to use information given us by weed district, county agent, and other surveys, but have experienced difficulty in compiling the results and making them conform to our records. Likewise, our survey reports do not contain all the information required by other agencies. If a standard weed survey form could be adopted it would be an easy matter for all organizations interested in weed control to use the information interchangeably.

One function of the Western Weed Control Conference is to analyze methods, procedures and equipment and to standardize these where possible. The complex nature of the weed problem necessitates variation in some practices, but it is believed that a standard weed survey form can be adopted that is simple and practical, yet contains all the information needed in planning a systematic weed campaign. It is hoped that if time allows some discussion may be had on this question. Our system of recording surveys includes a card on which all pertinent data are recorded in the field. It shows a quarter section plat where the infestation is sketched for location. It has space to record landowner or tenant's name, kinds of weeds, size of patches and degree of infestation. The data are compiled on recapitulation sheets, and a summary sheet is made from the latter. The form which we call our plus and minus sheet shows whether weeds are increasing or decreasing on each project. This plan is offered only for your information and not because it is believed to be the best that can be devised.

In conclusion I wish to emphasize that my superiors are anxious to cooperate with other organizations which are conducting weed control programs on Federal irrigation projects.

Chairman Robbins: Next is a paper by Richard N. Raynor, Associate, Agricultural Experiment Station, University of California, at Davis, which I shall read, since Mr. Raynor could not be present.

RECENT DEVELOPMENTS IN WEED RESEARCH

By Richard N. Raynor

Sodium Pentachlorophenate as Herbicide and Activator

The use of sodium pentachlorophenate as an herbicide and as an activator for other herbicides has been proposed in several papers

in recent literature. Charles Chabrolin, working in Tunisia, found it the most toxic of a long list of organic chemicals tested, and proposed its use as a selective spray in grain fields at a dosage of 17 pounds per acre. Although young plants of wheat and oats were severely burned, they soon recovered and made normal growth. The writer (Raynor) found similar dosages of 14 to 17 pounds per acre effective in controlling fiddleneck (Amsinckia sp.), but the injury to the grain plants was much more severe than that caused by Sinox and other dinitro compounds. Furthermore, the per acre costs were higher than for selective sprays now in use. These facts were reported at the Salt Lake meeting last year. The possibility of controlling water hyacinth by treating the water in streams in which the pest is growing was recently suggested by A. A. Hirsch of Louisiana. He found 5 ppm of the chemical retarded growth, and 80 ppm gave complete control.

Sodium pentachlorophenate also has algaecidal and fungicidal properties. It is used as an algaecide in industrial cooling systems, and as a fungicide for treating lumber. It has also been used experimentally for dormant sprays for fruit trees.

Of most interest, however, is the activation of sodium chlorate and sodium arsenite sprays by sodium pentachlorophenate, observed by Francis E. Hance, chemist for the Hawaiian Sugar Planters Association Experiment Station. He reports that the addition of 2 to 4 pounds of the phenate per hundred gallons of spray has the following effects.

1. Reduces the amount of chlorate or arsenite required to kill weeds.
2. Increases the rate of penetration and killing.
3. Makes addition of wetting agents unnecessary in sodium chlorate sprays.
4. A small amount of oxidizing agent (sodium chlorate) enhances the activating properties.

Examples of spray formulas recommended by Hance are:

Sodium chlorate spray for mixed annual weeds --

Sodium chlorate - 15 pounds
Sodium pentachlorophenate - 3 pounds
Water to make 100 gallons.

Sodium arsenite spray --

As₂O₃ as sodium meta arsenite - 5 pounds
Sodium pentachlorophenate - 2 pounds
Sodium chlorate - 2 pounds
Watsol CT 85% - 2 pints of 10% solution
Water to make 100 gallons.

These and similar activated formulas are said to be commonly used in cane plantations in the Hawaiian Islands.

In order to test the value of sodium pentachlorophenate as an

activator under California conditions, a series of plots was treated at Davis in February and March of this year. Our results do not agree with those reported by Hance in regard to any of the points mentioned except the increased rate of penetration and killing. This, however, is perhaps sufficient to justify its use under rainy conditions. We did not find that the final degree of control was significantly different whether the activator was added or not, provided weather conditions were favorable.

The addition of small amounts of sodium chlorate did not appear to change the final degree of control achieved with activated sodium arsenite spray. The activator did not appear to entirely eliminate the necessity for a wetting agent in sodium chlorate sprays.

In other tests, sodium pentachlorophenate had no activating effect on Sinox, but did on ammonium sulfamate. However, an undesirable precipitate was formed in the ammonium sulfamate solutions.

Tests of Ammonium Sulfamate and Sulfamic Acid on Morning-glory

Plot tests were begun in August, 1941, to study the mode of action of sulfamic acid and ammonium sulfamate, and to determine the dosage required to kill wild morning-glory when treated at different seasons. At concentrations up to $1\frac{1}{4}$ pounds per gallon neither of these chemicals caused any root killing by translocation. An acid arsenical spray applied under the same conditions killed roots to a depth of 24 to 30 inches, with only 10 per cent of regrowth on the plot to date. When applied to the foliage, or to the bare soil after hoeing off the foliage, and then irrigated in to a depth of 24 to 30 inches by sprinkling 5 to 10 days later, 6 pounds of ammonium sulfamate gave only 65 per cent control and sulfamic acid at the same rate only 50 per cent control. Soil treatments in November and January were even less effective. Wild morning-glory on plots treated in August and November remained dormant for nearly a month after the spring emergence of untreated plants, whereas plants on January-treated plots were delayed not more than a few days.

Our general conclusions are that ammonium sulfamate is less than half as toxic as sodium chlorate to wild morning-glory; that sulfamic acid is slightly less toxic than ammonium sulfamate, and that unless further tests show them more effective under other conditions than those already tried, we cannot recommend ammonium sulfamate and sulfamic acid for controlling this particular weed.

Progress on Hoary Cress Project

A cultivation experiment begun in May, 1941, is still in progress. Intervals of 1, 2, 3 and 4 weeks between cultivation are being run on duplicated 50 x 50 foot plots. In addition, variable interval plots are cultivated according to the rate of emergence. Although all plots showed abundant growth at the beginning of the present season, weakening of the plants is evident on plots cultivated at all intervals and emergence is very slow.

Since experience elsewhere also indicates that 4 weeks is not the upper limit for eventual control, a pair of plots cultivated at

5-week intervals was started this spring. Control methods applicable to ditch banks and other areas not susceptible of cultivation are also being tested. They include searing, spraying with oil, Sinox, and ammonium sulfamate.

The vaporizing type burner is being compared with the smoky flame type used in Wyoming, and each type is used at four different intervals. These intervals are based on growth stage but average about every 2, 3, 4, and 8 weeks.

The oil spray plots are also resprayed at four growth stages, using four mixtures of oil at each stage. The oils used are Diesel fuel, and 3 mixtures of Diesel with U.S.No.1 light industrial fuel oil

The Sinox spray plots are retreated at the same 4 growth stages as the searing and the oil spray plots.

Hoary Cress Control with Oil Sprays

Last year I reported to the Weed Conference some observations I had made on the results of spraying hoary cress with a mixture of 3 parts diesel oil and 1 part U.S.No.1 light industrial fuel oil. The work had been done by men working under the Yolo County Agricultural Commissioner. In some cases roots were penetrated and killed to a depth of 18 inches. The penetration of oils into the root system of hoary cress had been previously observed by weed control authorities in Oregon. Extension Bulletin 510, Control of Weeds in Oregon, states that in Klamath County, diesel oil applied at the rate of 6 gallons per square rod at blooming time with a high pressure sprayer may kill the roots to a depth of 2 feet. This bulletin implies that Russian knapweed and other perennial weeds are controlled to the same degree as hoary cress. Later reports from Oregon have not been so encouraging. Mr. Lawrence Jenkins, in his Weeders Readers, No. 5, of June 5, 1941, states that 63 gallons of oil to the square rod gave only 50 per cent kill of whitetop in Klamath County trials, and that 80 gallons of crankcase oil to the square rod did not eradicate whitetop in Wheeler County.

I recently had the opportunity through the courtesy of Mr. Fix, Deputy Commissioner, to review the results secured by the Yolo County Commissioner's Office in their operations last year. The points of principal interest are as follows:

1. Four sprayings gave up to 90 per cent control of both lens-podded and globe-podded hoary cress, but 50 to 60 per cent control was more usual. In one case that number of sprayings gave only 20 per cent kill.

2. Slender perennial peppergrass (Lepidium latifolium) responds to the same extent as hoary cress, four sprayings giving 90 per cent control in two cases.

3. Oil penetrated the roots of young willow canes to a depth of 6 inches.

4. Russian knapweed was not greatly reduced by four sprayings. In one case where the infestation originally consisted of about 10 per cent knapweed and 90 per cent hoary cress, the knapweed has now taken the plot, having increased while the hoary cress was killed out.

5. No penetration has been observed into the roots of wild morning-glory, alkali mallow, or alkali heliotrope.

6. Although 25 per cent by volume of the industrial fuel oil was used in most cases, 15 per cent appeared to give similar results.

7. The addition to the oil mixture of 1% by volume of an 8-pound sodium arsenite solution apparently retarded growth for a longer period than did the oil mixture alone.

8. The amount of foliage present at the time of spraying is probably more important than the growth stage. As deep a penetration occurred in plants in the rosette stage, with many large leaves, as in plants in full bloom. Little penetration occurs in plants with small rosettes.

9. Penetration is deeper at summer temperatures than during cold weather in early spring.

10. High pressure spraying is not necessary for root penetration. Around 75 pounds was used throughout this work.

11. Crown growth on hoary cress areas treated with carbon disulfide was eliminated by one or two sprayings.

Weeds in Guayule Nurseries

Three nurseries totaling 600 acres were established at Salinas this spring for the purpose of growing guayule seedlings. These nurseries are under the supervision of Forest Service officials, working under the Department of Agriculture's Emergency Rubber Project. It is expected that the present crop of seedlings will be sufficient to establish 40 to 50 thousand acres of field plantation when transplanted next winter.

Weeds, principally annual species, have been abundant and expensive to control this spring. As many as 1,700 people have been employed in hand weeding and, in heavily infested areas, the cost of the first weeding is computed to run around \$450 per acre.

Two factors apparently are responsible for the heavy weed growth. First, the land on which the nurseries are located had previously been cropped mainly to grain and to beans, and was therefore fouler with weeds than the sugar beet and lettuce land also available, but which was avoided because of possible infection with soil-borne diseases. The second factor is the frequent watering required to get the guayule seedlings established. The seeds are pregerminated before planting, then mixed with sawdust and planted by special machines which scatter the seed directly on the soil surface and cover it with a layer of sand one-eighth inch thick. This method of planting requires that the beds be watered at least once a day at first to prevent the seed drying out. Seedlings 6 to 8 weeks old are watered about every third day.

The seedlings are in rows 6 inches apart in beds four feet wide and 400 feet long, with 7 rows to the bed. Beds are separated by 1 x 8 inch boards laid flat on the ground. These are called "duck boards," and are for the planting and cultivating machines to run on. The beds constitute a block, and the blocks are separated by a snow-fence windbreak nailed to posts which support the overhead sprinklers. Although cultivators of special design have been built, it was impossible to use them at first because of the fre-

quent watering, and later the weed growth obscured the rows to such an extent that they could not be safely used. Consequently, the first weeding has been almost exclusively by hand pulling. Larger weeds, especially those in the rows, are cut below the crown with a pocket knife instead of being pulled. This is to avoid loss of guayule seedlings from excessive disturbance of the soil. Even with this extreme care, around 3 plants per square foot are lost in weeding out of an original population of 27 to 30 plants per square foot.

To avoid trampling of the seedlings as much as possible, the weeders sit on low carts provided with small wooden wheels which run on the duck boards at each side of the bed. Two weeders sit on one cart, each working on one-half the width of the bed. As the weeds are cut or pulled they are placed in cans or boxes on the weeding cart, and later dumped in piles in the cross drives at the ends of the blocks. The piles of weeds are then removed from the nurseries in trucks.

Unofficial figures show from 70 to 130 lineal feet of bed weeded per man day of 10 hours. On the basis of 100 feet per man day, it would take one man 4 days to weed a bed 400 feet long. Since there are 22 beds to the acre - including, however, space taken up by duck boards and sprinkler systems - it would take 4 x 22 or 88 man-days to weed an acre. Weeding labor is figured at \$5.45 per man-day, so 88 days at \$5.45 per day gives a figure of \$479.60 per acre. This, remember, is for the first weeding only.

For the second weeding, unofficial figures show from 400 to 600 lineal feet of bed per man-day, or around 4 times as much as on the first weeding.

Spraying tests conducted during the last few weeks indicate that stove-top emulsions may be safely used on even small seedlings, and if the weeds are small enough a high degree of control can be expected. In these tests, emulsions containing 20 and 25 per cent of the oil were applied at rates between 120 and 150 gallons per acre. These tests were mainly on heavy weed growth, consisting of lambsquarters, tall pigweed, and others about six inches tall. Although the larger weeds were not killed, the leaves were burnt off. The rows of guayule were much easier to see, and subsequent hand weeding was facilitated to the extent that weeders covered about 50 per cent more area per day than on similar unsprayed beds. The net saving in weeding costs resulting from spraying was computed to be \$132 per acre in one block.

Spray tests with Sinox were less promising. The guayule seedlings were killed at the lowest dosage tried of about 1 gallon per acre. However, plants one year old were not affected by that dosage. It is possible that lower dosages of Sinox might kill the weeds without excessive injury to seedling guayule if the optimum amount of activator were incorporated in the spray.

Chairman Robbins: Next is a paper entitled "Cropping Methods for Weed Control" by Dr. W. A. Harvey, Assistant Agronomist, State College of Washington, Toppenish, Washington.

Dr. Harvey: Most of us consider three general solutions to our weed problems. If the infested area is small or inaccessible we think first of chemicals; the particular chemical to use depends upon the weed we are trying to kill and many other factors of soil type and moisture. The size of the area that can be eradicated by chemicals without too much cash outlay depends upon the value of the land, the type of crops grown and the nature of the infestation - whether it is one patch of a weed menacing the whole farm or a common weed in that section.

The second solution to our weed problem is cultivation, which is usual for areas that are somewhat too large for chemicals. Cultivation requires no cash outlay if the farmer does it himself, but does require labor and the use of equipment. In addition, the land brings in no returns to the farmer during the period of cultivation.

The third general solution to our weed problem is the use of cropping methods. I realize that there are numerous other methods of controlling or eradicating weeds than these three that I mention - such as burning which may be a substitute for cultivation, flooding, mowing, etc. Cropping methods, of which there are many, aim primarily at keeping the weeds under control with an ultimate goal of eradication. It is seldom that the cropping itself entirely eradicates any of our serious perennial weeds, but the use of proper crops and methods does hold them in check, prevents further spreading, perhaps weakens them and gives a return on the land until such time as eradication by chemicals or cultivation is feasible. Cropping methods ordinarily require no cash outlay and probably no great change in farming methods other than what would be good farming practices even without the weeds.

In planning a cropping program for a weed infested area it is important to know as much as possible about the life cycle and habits of the weed before choosing a crop. We would like to know when the weed makes its most rapid growth, when is it dormant, does it thrive best on moist or dry soils, is it tolerant to shading. All such information we can get will help in choosing a crop or rotation with a better than average chance of success. If possible, disrupt the life cycle of the weed so it cannot seed or go dormant when it normally would. The choice of crop or method will, of course, depend also on what crops can be grown in the area. One of the general axioms in the use of cropping methods is to keep something happening to the weed at all times. When there is no crop growing, cultivate. After the crop is harvested, plow, don't let the weeds have any opportunity to build back reserves. Another requisite to success in cropping is the use of good seed in the best possible seed bed. It isn't always possible to get a first class seed bed on weedy land, but every effort should be made to give the crop all possible chances of success.

There are three types of crops we can use on weed infested land. One possibility is a crop which receives extensive cultivation and the weed is held in check primarily by the cultivation given to the crop. Another possibility is a crop that will actually compete with the weed for light, nutrients, or water. Then there are certain crops in which the weeds are held down by cultivation while the crop

is young, but which compete with the weeds when the crop is nearer maturity; sugar beets are an example of this type of crop.

Of the purely competitive crops, alfalfa is probably the most commonly used. It is particularly valuable on irrigated land or in regions of high rain fall where three or more cuttings may be made. Fall seeding is preferable in some localities in order that the alfalfa may start faster in the spring and be ahead of the weeds. Spring seeding may be necessary in some places. The time to seed is the time when there is the best chance of getting a good stand and of competing with the weed. Work in California, at Davis, has shown the alfalfa is an excellent competitor with morning glory. Not only does the alfalfa shade the morning glory, but also uses up the available soil nitrogen early in the spring and then utilizes nitrogen fixed by the bacteria in the root nodules. The morning glory is forced to survive in a soil low in nitrates, while the alfalfa thrives. The continued cutting of the alfalfa further reduces the morning glory and the frequent irrigations tend to keep it in a vegetative stage and thus disrupts its life cycle. White top behaves similarly with alfalfa in the Yakima Valley. Seed formation is not complete at first cutting and subsequent cuttings and irrigations keep it from its normal summer dormancy. The vegetative growth is hindered by the light competition; leaves and stems are pale and weak. We have used Ladak alfalfa because of its longer life. It competes well in the spring with a heavy first cutting, but does not offer as much competition to the fall growth of the white top. Alfalfa has been used with success on most of the perennial weeds. Canada thistle is one of the crops that handles particularly well in alfalfa. The frequent cuttings, plus the irrigation and competition, often reduce the thistle to the point of eradication.

Frequently, in the Yakima Valley, we hear that alfalfa is not a good crop on white top infested land because white top comes in in the alfalfa. The usual story there is that the white top was present all along and began to become prominent as the alfalfa died out. Improper handling and the use of poor grades or unadapted seed are the usual reasons for alfalfa thinning out after two or three years. It is not unusual to find farmers selling their alfalfa land for sheep pasture late in the fall after the third cutting. Such a practice takes the alfalfa into the winter with low reserves resulting in some winter killing and a slow spring start. These conditions favor the growth of the white top, which may soon take the upper hand.

There are a number of other legumes which also compete well with certain weeds under some conditions. We have used sweet clover in a short rotation but find it inferior to alfalfa for controlling white top, both from its effect on the weed and from the value of the crop. In California, Ladino Clover has been used with success in some areas. There are reports in Washington of Strawberry clover being of value in controlling some weeds on low, subirrigated pasture lands. Another legume which may be of value on white top is winter vetch. When seeded in the fall this crop makes a good fall growth and then resumes growth early in the spring, thus competing with the white top during the cooler season when the weed is most active. The vetch may be plowed under in the spring and corn or potatoes planted. Such an annual rotation is looked on with favor on farms subject to short term lease and it does hold the white top in check.

In addition to the legumes there are a number of other competitive crops which are of value on weed infested land. Most of these are grasses which are either fall seeded or are strong summer competitors. Of the fall seeded group, winter rye, wheat and barley are the most commonly used. They are valuable both on irrigated and dry land and have been most used on morning glory. In our dry land wheat region, fall seeded wheat alternated with heavy summer fallow has proven very useful, and is but little different than the normal cropping system. The summer fallow must be kept with a blade type weeder at intervals of about two weeks whenever the morning glory is growing. In the fall the fallow is plowed and seeded to winter wheat at a heavier rate than usual, if the normal rainfall justifies such increase. This alternate fallow and winter wheat may be used successfully over a period of years, holding the morning glory in check and actually reducing it to the point where eradication is possible. The use of nitrogenous fertilizers on continuous winter wheat or alternate winter wheat and summer fallow has been of value in the dry land wheat region. On irrigated land a common practice is fall seeded rye plowed under in the spring and potatoes planted. This not only holds the weeds in check but is reported to be of benefit on wire worm infested areas. It is successful on morning glory and white top, but not particularly so on Russian knapweed.

Strong summer competitors such as millet and Sudan grass are of value in irrigated regions. Our practice on white top has been to plow early, cultivate as needed until middle or late May, then seed the grass crop. The cultivation keeps down the weed until seeding and the rapid growing crop soon shades out the slower growing white top. The grass may be cut for hay or grown for seed and the area plowed immediately after harvest. Cultivation is resumed and continued until about the first of November if the weed resumes growth, as it usually does under our conditions. Under some conditions other smother crops, such as cane, hemp, etc., have been successfully used. In general, all these annual smother crops do better under warm conditions. In the Pacific Northwest, our relatively low night temperatures, which prevent rapid growth, cause them to be less valuable than they are in the mid-west.

Pasture grasses or mixtures have also given favorable results in some cases on white top infestations, particularly if preceded by a season of cultivation. The sod thus established has been successful in holding the white top in check and providing returns to the farmer in the form of pasture. Dr. Rosenfels, who has used this system in Nevada, emphasizes the necessity of using competing species which are best suited to the local conditions. Most successful under his conditions were meadow fescue, Ladino clever, brome grass, alsike clover, and strawberry clover.

Cultivated crops of many kinds have been used with more or less success on the different weeds. Intensive truck crops with the resultant close cultivation as well as normal field crops have been of value. Lettuce culture in the Salinas Valley in California is reported to have been quite successful in checking morning glory. Various truck crops in the Yakima Valley have held the weeds in check, particularly where intensive hand hoeing and fertilizers have been used.

Corn has been perhaps the most successful cultivated crop on white top in our experiments. Potatoes have yielded well, but have not held the weed in check as well as corn. It is best to check-row the corn if possible, although that is not common on irrigated land. Our practice has been to plow early in the spring, cultivate until mid-May, then plant. Cultivation should be continued in the growing corn as long as possible. It may be necessary to hand hoe the corn in the heavier infestations after the cultivations have been discontinued. With such a system the white top develops rosettes in the late summer, but the corn yield is little if any reduced. Harvesting should be done as early as feasible in the fall and the field plowed. Early plantings of corn or potatoes without cultivation between plowing and seeding have not been so successful. Complete failures of early sweet corn seedings because of Russian knapweed have been observed. It would seem that any adaptable late seeded cultivated crop might have possibilities.

Sugar beets, although early seeded, have been quite successful on white top under our conditions. This may be due to the intensive early hand operations of thinning, blocking and weeding, which tend to delay the weed at the start, and then the frequent machine cultivations until the beets are sufficiently heavy to compete with the weeds for light. The frequent irrigations which keep the white top vegetative and prevent normal seeding and dormancy also aid in the competition. Observations indicate that Russian knapweed is not so successfully handled in sugar beets.

One of the important considerations in choosing a crop is the presence of alkali or of salinity in the soil. Much of our weed infested irrigated land is more or less alkaline and if such conditions prevail it is necessary to adapt a cropping system to the alkali as well as to the weed. Fall plowing has proven superior to spring plowing under such conditions and fall or early spring seeded crops have proven better than later seedings. The fall plowing allows some leaching of the salts down out of the planting zone and gives the seeding a chance to start. With fall or early spring seeding the crop has a better chance of establishment due to better soil physical characteristics than a later seeding when the soil is more apt to crust or bake in the windy, drier weather. Many of our poor stands of alfalfa are due to alkali.

Sugar beets have again proven of value on such soils if properly handled. If they are planted early on fall plowed land the chance for good emergence is increased. Then the application of heavy irrigations to further leach the alkali and prevent the soil from baking promotes establishment. It will be necessary to irrigate often even though the soil isn't too dry because of the physiological drouth due to high salt concentration. This system would not be adaptable under all alkali conditions, of course, but it does have a valuable place on certain soils. Strawberry clover is also a possible crop on somewhat alkaline soils, although it isn't as alkali-resistant as has been popularly supposed. It can, however, stand very wet conditions and thus could be heavily irrigated, which would aid in leaching out the alkali.

Another application of cropping methods to weed control could be mentioned, and that is the use of special methods for eradicating

serious annual weeds in grain. These weeds, such as wild oats, tar weed, fan weed, and other mustards may sometimes be handled by certain changes in farming practices. The shifting of seeding time from spring to fall or vice versa is an aid in controlling certain weeds. Likewise the development of new crops for the grain growing regions with the resultant change in rotations may offer promise in combating certain typical grain region weeds. Whenever one particular rotation such as wheat and summer fallow persists for a relatively long period, certain weeds which favor this particular system will thrive and become serious. With new crops and a shift in rotation these weeds may find conditions unfavorable and thus be more easily checked. With such diversification the chance for new weeds increases, but likewise the possibilities for controlling them.

In brief review, choose a crop or rotation that has every possibility of success considering both the growth characteristics of the crop and of the weed. Upset the normal life cycle of the weed as much as possible. Give the crop every chance of success through use of good seed and the best care in establishing and handling. In heavy stands of some weeds it may be advisable to precede the crop with a season or part of a season of cultivation. Above all do not let the area lie idle either before or after harvest if the weed makes any growth. Plow, cultivate, or keep a competitive crop on the area whenever possible.

Finally, in choosing a crop or system of farming, the ultimate aim of eradication should be kept in mind. If the farmer can't afford to eradicate all of his weeds by chemicals or cultivation at any one time, then eradicate whatever is possible and crop the rest in such a manner as to hold the weed in check and provide some income. As the eradication is completed on part of the weeds, put this area back into crops and take another portion out for eradication. The combination of alfalfa and cultivation works well for such an eradication program. It may also be that with the reduction in stand of the weed through cropping, chemicals may be economically used to finish up the job. In the various state, county or district weed control organizations there is a definite place for cropping programs in holding the weeds in check until they can be eradicated and in actually reducing the stand or reserves of the weed so that eradication is facilitated.

Speaker: Alfalfa seems to be one of the worst ways of spreading white top in our area. Matures about the same time the first hay is cut. Spreads as much as any other way.

Dr. Harvey: Are your seeds viable at that time of the year? We ran some experiments on viability of seeds and found on repens no viable seeds until a month after it was cut,

Professor Hyslop: One fact that might enter into this for some of you folks who live in the warmer districts is that the government may want hemp grown in this district, which will compete with it.

Chairman Robbins appointed the following members on the Nominating Committee and asked that they report tomorrow morning: Mr. Schweis, Chairman, Mr. Spence and Professor Hyslop.

Chairman Robbins: Mr. L. E. Harris, Associate Agronomist, Oregon State College, Corvallis, submitted the following paper entitled "A Selective Spray as a Means of Weed Control":

The recent development of a new chemical for selective sprays during the past years has stimulated the use of this method a great deal. I think that most of us are familiar with it or have heard a lot about it; that is, the use of Sinox. Dr. Robbins and Walter Ball have stressed the desirability of using pictures or slides, so I took the liberty of bringing them to you. Do not believe I shall be able to use them until later in the afternoon.

It has been definitely established in our work that ammonium sulphate, that is in small quantities, combined with Sinox, will increase the effect from the weed control standpoint and when using large quantities a fertilizer can be included and two operations can be taken care of at once. Different ones of us have been discussing the idea of using combinations of other chemicals with Sinox. We have come to the conclusion from experimental evidence and actual practice in the field that ammonium sulphate combined with Sinox will decrease the amount of Sinox required to approximately one-half when Sinox is used alone. One-half gallon of Sinox with 8 pounds of ammonium sulphate is practically equal to one gallon of Sinox so far as weed control is concerned. The cost of the application is less and we do have a fertilizer effect. We are continuing experimental work with other combinations and have used 32 chemicals alone and in various combinations. In our work to date we have used a number of ammonium salts and sulphate salts, primarily combined with Sinox. A high percentage of the ammonium salts that we have used have been very active when combined with Sinox and used as a selective spray. Of 11 used everyone gave good control on mustard and fire weed or tarweed. The average per cent of plants killed was from 90 to 100. The sulphate salts were very variable. In some trials there would be one that was very effective, but they seem to be affected more by weather and other environmental factors than is true for the ammonium salts.

The past year we have gone into the use of waste products, such as sulfite liquor from paper mills. Some of the mills dump four to six million gallons into the river every 24 hours. In the further development of selective sprays we thought there may be some value in combining this waste material with Sinox. If it proves effective it will be of particular value due to the possibilities that commercial ammonium sulphate will become scarce because of the war and the sulfite liquor is actually a drug on the market.

The value of ammonium sulphate with Sinox has been well demonstrated and may be summarized as follows: The cost of a spray program is less, it is affected less by adverse weather conditions, and a greater range of weed species can be controlled. All crops cannot be treated. It is necessary to take advantage of the differences of growth habits of plants. The grains, grasses, fibre flax and peas are the most important crops we are now spraying. These crops are receiving the most attention, but there are many other crops where more research should be done. In the eastern part of the State where they produce grass seed, they have been able during the past

two or three years to increase their plantings about four times on the average because they could take care of an acreage so much faster. Right now when shortage of labor is becoming acute, this factor is important. In Union County, for instance, they are spraying their grass crop two or three times, if necessary, during the first year, and they are eliminating a lot of seedling weeds that would become perennials. In some of the old bent grass stands successful sprayings have been accomplished. They have been able to decrease the weed infestation and increase seed yields.

Perhaps the best treatment on grasses is the use of sodium arsenite as a spray, particularly on such weeds as false dandelion or cat's ear, used when the grass is dormant. In many trials this treatment has eliminated 95% of the weeds. Twelve to fifteen pounds of dry sodium arsenite in 100 gallons of water per acre, on the average, has been the best dosage. The field should not be used for grazing immediately after spraying however, because of the poisonous properties of the spray.

Fiber flax is probably our most important crop from the standpoint of a selective spray program, because of its high value per acre. This year a good many spray rigs were constructed to eradicate weeds from fiber flax fields. Flax does not have a tolerance for the chemicals that the grasses have. It is therefore very important to have the proper dosage and not to go over the desired amount, which on the average is 5 to 6 pounds of Sinox and 8 pounds of ammonium sulphate in 100 gallons of water per acre. Adverse weather conditions during time of spraying operations will limit the success of the treatment to a greater degree on a crop of flax than for a crop of grain or grasses. Because of this it is necessary to use reasonable care and judgment when spraying this crop. Field peas and canning peas have been successfully treated with Sinox and ammonium sulphate.

Mr. Spence: What stage of growth do you get the best results on peas?

Mr. Harris: Peas should be approximately 4 to 6 inches in height and of course can go somewhat higher, up to 8 or 10 inches.

Mr. Spence: Have you done anything with onions?

Mr. Harris: On seedling onions we have had limited experience. We had very poor results. It killed the onions.

Chairman Robbins: Mr. Raynor has submitted the following report, which I shall read:

TOXICITY OF SINOX TO SHEEP
By Richard N. Raynor

Sinox spraying on ranges and pastures offers a relatively economical means of controlling unpalatable broad leaved annual weeds, such as star thistles, milk thistle and Italian thistle, but weed control authorities have hesitated to recommend the spraying of large areas in the presence of grazing animals because the danger of

poisoning was not known with certainty. Reports in the medical literature showed that dinitro-cresol, of which Sinox is the sodium salt, when administered in small daily doses as a specific for reducing weight, is likely to cause grave disturbances in susceptible persons, and that deaths have occurred from overdoses taken by persons using the remedy without a physician's advice. Furthermore, there have been cases ^{where} spray-rig operators applying Sinox have become ill after inhaling the drifting mist from the spray nozzles over a period of several days.

On the other hand it has been observed that cattle and sheep avoid vegetation recently sprayed with Sinox, provided untreated vegetation also was available to them.

In order to determine the minimum lethal dose for sheep, and the likelihood of sheep consuming injurious or fatal doses when confined to recently sprayed vegetation, experiments on these points were carried out with the cooperation of the Veterinary Science Division at Davis. When given as a drench in water, the fatal dose for a sheep was found to lie between 5 and 10 cc. of the Sinox concentrate as packaged by the manufacturers. Doses between 1 and 5 cc. increased the temperature several degrees, but the animals recovered in a few days. Now, since there are 3,785 cc. in a gallon, spraying with Sinox at the rate of 1 gallon per acre should give 378 lethal doses per acre, if 10 cc. is taken as a lethal dose. This is over 2 lethal doses per square rod, an area which a sheep would certainly graze down in the course of a day even on fairly heavy vegetation.

It therefore at first appeared that the probability of poisoning in the field would be high. Nevertheless, field tests were begun; the first one designed to determine the degree of repellency of sprayed vegetation on this test, 2 animals were confined in a 45x85 foot fenced enclosure, having an area of 14 square rods, immediately after two diagonal quarters had been sprayed with a solution containing 1 gallon of Sinox and 3 pounds of ammonium sulfate per 100 gallons. This solution was applied to mixed annual vegetation, about half grasses and half broad-leaved weeds, at the rate of 375 gallons per acre. During the first four days the animals did not graze on the sprayed areas, although they walked over them and trampled down the vegetation to a considerable extent. On the fifth and sixth days they began eating the dried leaves at the top of the killed fiddleneck (Amsinckia) plants, but still avoided the grasses which, although burned ^{at} the tips of the blades, had not been greatly affected by the spray. Rain fell on the night of the seventh day, and the animals immediately began to take grass from the sprayed areas. More rain fell the night of the eighth days, and the animals eventually grazed sprayed and unsprayed areas down to the same extent, but without any increase of body temperature or other symptoms of injury to themselves.

The same two animals were then moved to another fenced plot of the same size and composition of vegetation which had been sprayed in its entirety with the same strength solution as in the first test, but at the rate of 390 gallons per acre. Although they were evidently reluctant to eat the sprayed vegetation, they began to do so after ascertaining that there were no unsprayed areas. Their temperatures

were up 4 degrees three hours after turning into the plot, but by the next morning, 18 hours later, were down to normal again. Rain fell that day, so the test was repeated again on a new plot, sprayed at the rate of 320 gallons per acre. Although they remained on the plot until they cleaned off the vegetation completely, and without any rain having fallen in the meantime, they remained in good health and condition.

To determine whether they might have developed a tolerance, one animal was given 10 cc. of concentrate as a drench and died immediately. The other was penned and fed a quantity of alfalfa hay on which 10 cc. of concentrate had been sprayed after dilution with water. The treated hay was repellent, but the animal consumed it all in about 24 hours, without any symptoms of poisoning.

It therefore appears that although Sinox is dangerous when taken as a drench, some reaction occurs when sprayed on vegetation, which eliminates the danger.

Chairman Robbins: While I am on my feet I shall also read: "SUMMARY OF PROGRESS DURING 1941 OF THE FALLON, NEVADA, COOPERATIVE PROJECT ON CONTROL OF WHITETOP." (A condensation prepared by R. S. Rosenfels for the use of Dr. W. W. Robbins, Chairman, at the Fifth Annual Western Weed Control Conference Meeting at Salem, Oregon, June 26 and 27, 1942.)

Frequency and Total Period of Cultivation

All work is being done on irrigated land. A bladed implement is used which undercuts the soil at a depth of 3" or 4". Whitetop has been killed by cultivating every 2, 3 or 4 weeks. Approximately 2 seasons are required in the Fallon region, regardless of interval. This is true of both Hymenophyssa pubescens and Lepidium Draba var. repens, although the latter appears to require a slightly longer total period than the former.

Thus far the plots used have been small, and the whitetop infestation not as uniform as desired. Before definite recommendations can be made, it is necessary to re-try the longer intervals using larger plots which include the center portions of old, well-established infestations. Such trials are now in progress using plots approximately 75' x 100', species Hymenophyssa pubescens.

Tests are in progress comparing straight cultivation with the alternating of cultivation and winter-grain growing. On one plot a grain crop is grown every other year, and on another, every year. Although still unfinished, these tests show that a good winter-grain crop can be grown on white-top infested land after one season of cultivation. It is not yet known how seriously the growing of the crop will delay final eradication.

Flooding

Nothing new has been learned about flooding during the past year. A successful practice in the Fallon region has been to apply the water in May or June and maintain a depth of several inches until about September 1st.

Chemicals

Nothing has been done with chemicals during the past year except for some further trials of carbon bisulfide on an infestation of Lepidium Draba var. repens in sandy soil. Complete success was obtained with 18" spacing and both 15 and 20 pounds per square rod, and 24-3/4" spacing and 20 pounds per square rod.

Competitive Crops

Work on competitive crops was first started in 1939, and several trials have been made. The following general observations apply to the use of grasses and clovers. (1) The crop or crop mixture must be one that produces heavy growth under the particular local conditions existing. This can only be determined by trial. Meadow fescue and brome grass have, for example, done very well in certain plots, and have failed in other trials 5 miles away with conditions apparently similar. (2) The length of the necessary period of preliminary cultivation must be considered. A year usually is sufficient in the Fallon region, but in one case it was impossible to establish any of the grasses and clovers tried after one year of such treatment. When it is remembered that complete eradication can usually be obtained in two years, it may sometimes be more advantageous to continue cultivating than to stop and seed to a perennial competitor which at best will control but not eradicate the whitetop for several years. The choice depends basically on what use the landowner wishes to make of the land. If pasture or grass and clover hay can be used to advantage, whitetop-infested land can be reclaimed for this usage at the expense of one or one and a half seasons of preliminary cultivation. If it is desired, however, to get the land into a crop such as alfalfa, then continued cultivation, or flooding if permissible, or chemicals if the infestation is small, would be preferred.

Progress during the past year consisted in maintaining the set of plots started in the spring of 1941 after preliminary cultivation during 1940. Each plot is approximately 26' x 42'. The following crops are seeded: Reed canary grass, English rye grass, both white and yellow blossom sweet clover, meadow fescue, crested wheat grass, Western wheat grass, brome grass, strawberry clover, alsike clover, and Ladino clover. On June 5, 1942 the yellow blossom sweet clover was itself in bloom and was the only crop which had completely prevented the whitetop (mostly Hymenophyssa pubescens) from blooming. The stand was thick, and whitetop was almost impossible to find. The alsike clover had also severely smothered the whitetop and prevented it from blooming over much of the plot area. The Ladino and strawberry clover were equally effective where the stand was heavy, but good stands of these crops had not been uniformly obtained. The meadow fescue, although thick, was permitting considerable blooming of the whitetop, and did not look quite as promising as it had the year before. There was practically no whitetop in bloom in the brome grass plot, although there were many bare spaces between clumps of the grass. All other plots contained considerable whitetop in bloom. Experiments with summer annual competitors are also in progress.

Searing

Trials of the method of searing for killing whitetop on ditch-

banks and similar situations were started in June and July, 1940, on infestations of Lepidium Draba var. repens. Searing is being done every 10 days to 2 weeks, every 3 weeks, every 4 weeks, and every 8 weeks, or at full bloom, whichever gives the shorter interval. A hot flame coil type of burner is being used. Whitetop is still appearing on most of these plots. It is evident that the destruction of the top several inches of root after the first few searing operations, described in the early publications on searing, has not occurred on these plots.

Chairman Robbins: A paper entitled "THE IMPORTANCE OF THE EXTENSION SERVICE IN ORGANIZED WEED CONTROL" will now be presented by Mr. Lawrence Jenkins, Assistant Extension Specialist in Farm Crops Oregon State College, Corvallis.

Mr. Jenkins: Weed control, to be most effective, should be carried on through a well-organized and thought out plan. This problem is not one for the farmers to be expected to fight alone. Neither should the railroads, reclamation districts, the irrigation districts, the Forest Service, or any other one group be expected to carry out an effective program unless all parties concerned are working together toward a common objective.

It appears to me that an organized weed control program logically breaks itself down into three phases. First, all parties and agencies concerned must be convinced that weed control is important and necessary and that it is a mutual problem of all. Second, all these parties must be brought together to understand the problems of each other, and, thirdly, an organized plan of attack, as developed by all these agencies and individuals, must be developed and kept operating.

The Extension Service in Oregon has been the logical organization to bring about this unification of purpose. I realize that in some states weed commissioners, through the State Department of Agriculture, are the ones who carry on this organization. The Extension Service can educate the local people on weeds and their control. Here in Oregon, we have used four principal methods of acquainting the people with the different weeds. Weed mounts have been used very extensively for exhibiting of the individual specimens. These mounts, such as are exhibited around the wall today, are made with corrugated cardboard for the support; and on top of this cardboard is a layer of cotton, which is glued to the cardboard, and then the specimen is laid on top of the cotton, after which a seed ring is assembled on the back of the celluloid cover, so that the seed of the weed can be seen along with the specimen. This celluloid cover is attached to the cardboard by the use of either black cellulose tape or transparent tape. The cost of these mounts will vary from about 25 cents to 35 cents each. If any of you are particularly interested in this type of an exhibit, we have prepared a mimeograph on the details of the system. This mimeograph is available from the Oregon State College Extension Service.

Growing specimens have been used. Here we either collect the roots of some of the weeds and transplant them into flower pots a couple of months before the exhibit is desired, or plant the seed. These specimens are excellent for their purpose, but do not lend

themselves to being transported to meetings. And, of course, they are not available for very long during the year. Colored slides have been used to acquaint the people with the worst perennial weeds. Another system which we use, and I know is used in most of the States, is to have exhibits at the local and state fairs.

Weed councils and weed control districts have been effective means of organizing all of the agencies in weed control and directing the efforts. These councils are organized on a county basis and are made up from representatives of the county court, highway, irrigation districts, Granges, large land-holding companies, state highway, and any others who are owners or holders of land within the area.

Under the 1937 Revised Weed Control Law, it is possible to organize two types of weed control districts. One is a county-wide district which is declared by the county court covering specific weeds and specifying the control. The second type of district is that organized by the people concerned, within a specific district within the county. This special weed control district is created as a result of a petition of landowners within the district. The petition can specify the weed to be controlled, the method of control, and the area to be included. After this petition is signed by at least seven landowners in a district constituting a majority, the county court is obligated to declare it a weed control district.

The Extension Service can help in coordinating the activities of the various agencies throughout the county and the State. We have found it desirable to have a man on the Central Staff who is responsible for keeping the county agents informed on the best methods of control and the findings of the experiment stations, not only in Oregon, but in other states. This individual on the Central Extension Staff helps organize weed control demonstrations, interprets the results obtained, and greatly reduces unnecessary duplication of proved methods in the counties.

The Central Staff representative should keep the Field Staff informed on the latest information on weed control. Here in Oregon, we attempt to do this through the issuing, from time to time throughout the year, of a mimeograph entitled, "Weeders Readers." In this mimeograph all the latest information on weed control is sent out along with the summary of what is being done by other counties throughout the state. It is desirable that weed control bulletins be kept up to date as much as possible. With this as an objective, we changed our system from issuing one large weed bulletin dealing with the control of many different weeds and have issued one large bulletin dealing with general control methods; then we have written individual 2- to 4-page bulletins dealing with specific weeds and the best recommendations on their control. These 2- to 4-page bulletins are inexpensive to publish and so can be revised from time to time as new information becomes available.

The Extension Service can be helpful in the organized weed control program in keeping up the activity in this field. Radio programs, written in a popular style, either for state-wide or county use, are helpful. Weed control plays, colored slides, identification contests, and weed control demonstrations through Granges and other

farm organizations are all effective means of carrying the message and helping to keep the people interested in this activity.

Weed control should not be carried on through an inflation-deflation attack, but rather through a continuous, organized effort carried out on a systematic plan with all parties concerned cooperating.

Chairman Robbins: We are testing the effect of passage of weeds through the digestive tracts of a sheep on the germination qualities of the seed. We call this sheep Herman. Two thousand seeds are fed to Herman, later the seeds are washed out of the droppings and put in the germinator. Percentage of recovery of seeds:

Morning-glory	38.4
Klamath weed	36
Russian knapweed	81
Yellow star thistle	35
Canada thistle	2.9
Camel thorn	82
Purple star	58

Percentage of total number of weed seeds which were recovered and found to be viable:

Morning glory	32%
Klamath weed	22%
Yellow star thistle	8%
Russian knapweed	72%
Canada thistle	.45%
Camel thorn	64%
Purple star	4.3%

These seeds came through for as long as ten days, and some of the seeds were still viable. So the practice of keeping them up for 48 hours is no assurance that the animal will not disseminate weed seed following this period.

Chairman Robbins: Tomorrow morning we meet at 9 o'clock, or as soon thereafter as possible. We came to the conclusion last year that we do not need a Resolutions Committee. Do you want a committee of that sort this year? (A Resolutions Committee was not appointed.)

The following telegram, which had just been received from the War Production Board, was read:

"PRH80 39 GOVT DLG - TDC WASHINGTON D.C. 26 3:27P

1942 June 26 P.M. 1:07

"WALTER S. BALL, WESTERN WEED CONTROL CONFERENCE, MARION HOTEL
"ACCOUNT CHLORATE AND ARSENIC SITUATION REQUEST OPINION YOUR CONFERENCE EXTENT TO WHICH BORON COMPOUNDS CAN BE SUBSTITUTED FOR THESE ON
"PACIFIC COAST. ALSO YOUR OPINION IRREDUCIBLE QUANTITY CHLORATE
"NECESSARY TO MAINTAIN PRIMARY WEED PROJECTS IN EACH OF YOUR STATES.

"VICTOR BOUTIN WAR PRODUCTION BOARD."

Saturday Morning, June 27, 1942.

The meeting was called to order by Chairman Robbins.

Discussion on the telegram from the War Production Board about the amount of chlorate needed for the coming year was called for. The following estimates were given:

For Idaho	- 500 tons
Nevada	- 50 tons
Montana	- 300 to 350 tons
Washington	- 200 tons
Oregon	- 200 to 225 tons
California	- 400 tons
Utah	- 100 tons

Mr. Schweis: I move that the Secretary be asked to contact the other States and find out the necessary amount of chlorates needed so that he can wire the War Production Board relative to the amount needed. Motion seconded and carried.

Chairman Robbins: I should like to have a motion that expresses the view of this group relative to the substitution of borax for chlorates:

Mr. Spence: From the discussion I think it can be stated this way: "The Western States Weed Conference with California, Nevada, Idaho, Oregon, Washington and Montana represented does not approve substitution of Boron compounds for chlorates for control and eradication of deep-rooted perennials."

Chairman Robbins: Shall we say that Boron compounds are limited to temporary sterilization and contact sprays, but cannot be substituted for the control of deep-rooted perennials at least at this time?

Mr. Spence: I so move. Motion seconded and carried.

Chairman Robbins: Let us take up this matter of weed surveys. I will ask Mr. Balcom to lead the discussion on this subject.

Mr. Balcom: I should like to give our reasons for asking for a more or less standard form of weed survey. Often we have tried not to duplicate work where county agents and other agencies, weed districts, etc., have made weed surveys. It has been hard for us because we have been unable to use the information they got. The districts would be making surveys and our riders would be making surveys also. They would find that certain weeds were left from that survey that were needed in their work. The matter resolved into more or less cooperation where we might go into an area and ask that particular district if they would take the information that we would need, and ask them what information they wanted when we would make the survey so that it would be complete. I do not know whether under the conditions a standard weed survey form can be evolved.

Mr. Schweis: Did you send information to all the weed agencies in the various States at the time you contacted Nevada?

Mr. Balcom: No, we did not. In that case we had no other agency to act.

Chairman Robbins: What use have you made of the surveys?

Mr. Balcom: We find that a survey does several things. In the first place, if the survey was made only for the publicity we get on a project, that is, showing the residents of that particular irrigation district the extent of the weed infestation, I think that alone would be valuable because we find that in a good many places until we made a survey we did not get much interest. You would talk to the farmers and they would say they didn't have much of a weed problem. After the survey they became alarmed and could see the danger of spread to their farms. It also gives us an opportunity to plan a long-time program. It gives us the names of those weeds we have, of the extent, and what it will cost us. It helps us in our crew maneuvers. The whole thing makes for efficiency in a well-planned weed program.

Chairman Robbins: How many States are carrying on weed surveys in some definite form? What is the nature of yours, Mr. Hutchings?

Mr. Hutchings: We have been listing the acreage, and most counties have a map which shows definite locations of various types of weeds. They spot them with different colored crayon.

Mr. Morris: When a legal district is set up under the state law the first job is to make a survey, which would follow very much the form that you suggested, giving the exact location of the various weed patches and identification of the weed. Then, of course, data are assembled by the Weed Commissioner and held as a county record. They are not transferred to any central office at all, but held in the county in which the district is formed. It is a detailed survey of that district. Mr. Jenkins: We have used very much the same card as that used by the Reclamation District. From the small cards we then transfer the information to a large map. The whole State has not been surveyed. We started a survey in 1936; we found that the one thing valuable about it was the publicity. We also found it was not accurate enough in most instances. The time that is required for making the survey does not make it up to date enough.

Mr. Ball: In California we have a survey giving general information for the known infestations, and we know approximately the sizes of the infestations. The thing that we find of value is the kind of weed present in the county, and the approximate extent of that infestation.

Chairman Robbins: How about Washington?

Mr. Gaines: The only surveys we have made are in the counties where they have weed projects. These cover only those weeds under control.

Chairman Robbins: We know that in Kansas there are very accurate surveys so far as morning glory is concerned. Doesn't it boil down to this that all states are doing survey work and that it is being worked out to meet their conditions?

Mr. Balcom: I wonder if it would be unreasonable to ask the States to use our forms on the ditchbanks? The thing we are particularly interested in is the survey of the ditchbanks, but if a district is going to make a survey on a ditchbank, there is no need for us to make a like survey. So I wonder if the States would like to use our form in making a survey of the ditchbanks. The thing is that we should like to have certain definite information that we show on a sheet here. It is a record of the district, and in the first half we show the actual survey record and in the second part we show actual increase or decrease.

Mr. Schweis: I have a suggestion in which some of the responsibility could be eliminated. Couldn't your ditch-rider make the survey and give us the information?

Mr. Balcom: We are working toward this cooperation that you mention. If we can get together and get the information then we are going to be all right.

Chairman Robbins: These gentlemen all understand what you are driving at now, Mr. Balcom. Isn't it true that you can expect cooperation from them? In turn, I think the States can expect cooperation from you.

Mr. Balcom: 100%.

Chairman Robbins: Then at the present time doesn't it appear that this uniform card system would not be necessary?

Mr. Balcom: When I get back to Denver I shall send a complete set of the information on surveys to each of the States represented.

Discussion on the Extension Program.

Chairman Robbins: Mr. Jenkins, will you please lead the discussion on extension work?

Mr. Jenkins: What is the best method of getting something done on weed control? We have a lot of people who can talk weeds and then after the meeting they go home and forget all about it. I want to know what we can do to maintain interest and get something done.

Mr. Ball: I think I mentioned a year ago the importance of working with the younger people. I think the best reaction I have had is from my talks to vocational and agricultural youngsters in high school and 4-H clubs. I have attended numbers of Farm Bureau and Grange meetings, and as Mr. Jenkins says they will talk to you and become enthused, but at many of those meetings I attended they were talking about other subjects as well and did not go home with a lot on the weed problems. I have had letters and requests from the parents of those youngsters who attended weed meetings, many more than from the old people with whom I have talked. Our most effective work is through the Ag classes at the high school.

Mr. Jenkins: It is easier to get activity from the younger folks. They seem to realize the problems.

Chairman Robbins: One of the most successful pieces of extension work in California has been weed schools; these weed schools in counties were worked up around a few key men. We encouraged the attendance of irrigation engineers, of road maintenance engineers, of commercial companies, implement companies, Farm Bureau leaders, Ag teachers, County Agents and County Agricultural Commissioners, the men that have these things under their control. Weed schools extending over one or two days were very successful. We worked it out through the Commissioners and the County Agents. The meetings were not open to farmers generally. What have you done along this line, Benson?

Mr. Benson: We have had all the problems that have been brought up here, of course. Our 4-H Club activities have not produced results, but we have had these weed schools, with the railroads being represented, county engineers, etc., down the line. We agree that this Grange and Farm Bureau system is not satisfactory. They are glad you came, but promptly forget all that you tell them.

Chairman Robbins: An educational program on anything is a long process. What we are interested in here now particularly is methods.

Mr. Martineau: I have worked 20 to 22 years in the same county. We went through a good many years of just what Mr. Jenkins said. We had lots of meetings about weeds when the problem was not nearly as bad as it is now, and with all those meetings and the work that was done there actually were not over 5 or 10 acres of weeds controlled in the county until we started a definite weed cultivation program. We first started with the WPA workers and teams, and then we got equipped with better equipment and then when the State Department of Agriculture undertook the state-wide program we got some financial backing. We went ahead and during the last four years we have had from 150 to 250 properties under cultivation control in practically every part of the county. My observation is that these actual demonstrations are a big help. I have not even had to go out and solicit people to sign up the three-year agreement under the program. It has really got beyond the demonstration stage in our area. The people have seen it so much. They know all about the county program and what they can do under it. We have not yet been able to get farmers, even when they own a tractor, to do it themselves. That is probably because the county agreement charges them \$8.00 a year for three years, and it really costs around \$14.00. We have probably been cultivating too many times--all the way from 13 to 17 cultivations during the season. It may be that is just twice as many as we need according to the discussion we have heard here. I really question in my mind that you can kill with cultivations every three weeks. The best way is to get the work under way, even if in only one-half dozen places.

Another thing that is important there is that when a man, for example, has 10 acres of weeds and is signed up for \$68.00 a year, or \$80.00 a year, he is interested because of the investment involved

Mr. Ball: I was wondering if there is not a new phase of this whole thing that we should take into consideration. I think we all attempt some type of education, but are we doing the type of education that we should? Are we not overlooking some phases, as talking

with the wrong persons? What I mean is to get the individual interested who is paying the bill. We tried to get bankers interested. We cannot overlook the problem, especially in California, of tenant-owned farms which is the greatest problem we have. Another thing we are a little bit one-sided on in our educational work is that we are stressing weed control from the hoe up to the tractor, and are forgetting education on the buying of good seed. Many farmers plant weed seeds back into the area that they have cleaned up. We need to put across the importance of planters buying and planting the proper seed. We are going ahead with that phase of our educational work in California.

Mr. Hutchings: Some six or eight years ago in Utah we found that we had been asleep at the switch. The distribution of weeds through our seed is extensive. It was brought to our attention by the fact that the canneries were beginning to have trouble with nightshade in their canning peas. We began to go out to our pea and sugar factories and make an inspection of those seeds. We went to one sugar factory and found 700 bags of beet seed heavily infested with morning glory--about 3% infestation. We found every cannery had for distribution in his cannery pea seed which was infested with nightshade. Then we began to recognize that we should go into our small packet seeds, and we found the same condition there. We revised our seed regulations to require a certificate of inspection to be attached to each lot of seed, whether it was shipped into the State or sold within the State. Our big problem is in enforcing this regulation and the trading of seed between our growers. Many growers realize the necessity of pure seed, but there are always a few that try to violate the law and who have this non-cooperative spirit, and those are the men we are having trouble with - the bootleggers. We have carried on our educational work with 4-H Clubs, scout groups, growers and grower organizations, and we have received practically 100% cooperation from our seed dealers. We prosecuted one last year, or the year before, and that one example of failure to comply with the labeling regulations brought everyone in line. It is with the small dealer we have our troubles.

Our importations through the United States mails give us much concern. We can make our seed inspection of all importations, with the exception of the U. S. mail, and we find a lot of seed coming in in this way. I think this Board could take up this problem with our postal officials and perhaps we can get inspection of seed as well as nursery stock. In the small packet seeds it is essential to go in and make an inspection of hold-over seed and clear that up first. As the seed begins to come into the warehouse, make your inspections before it goes into the packets. This will clear up the situation in your own city, of course.

Question: How do you handle your package garden-seed--these eastern and middlewestern houses that ship in with these displays?

Mr. Hutchings: The majority of our stores are giving us cooperation in that. We open the packets and seal them up with Scotch tape and write on it that it has been opened for inspection by the State Department of Agriculture, and we give the date and the initials of the inspector. We have very little trouble with that. We leave a lot of that up to our regular district men. A lot of them are not

fully qualified. We send considerable samples to our seed laboratory and the actual analysis is made there. We also send our seed analyst into the warehouses, and we ask that our district men go along with her to assist in making the selections. I feel that we are getting quite a way in the seed work. Every season we find a few lots held over. In one warehouse we found approximately 150 small bags of different varieties of seed that we had to destroy. We require that all seed entering the State of Utah must be accompanied by a tag showing the variety of seed. We have not gone so far as to require the exact germination. We do require that it shows it is free from noxious weed seeds and shall not contain more than 1% of the other weed seeds, with the exception of the grasses. We will allow up to 5% in the grasses. If we all fell in line with that requirement we would be able to make quite a few strides in the distribution of our seed. We are weak in our enforcement relative to feed grains.

Professor Hyslop: The sugar beet people have managed to keep sugar beets out of the federal seed act. I think it would be a very desirable thing to get sugar beet seed under the federal seed act. I am not so sure that they are careful to have their seed grown on land free from morning glory. As far as we are concerned it is an agricultural seed in this State.

There probably should be something done with reference to a lot of the seeds that are distributed under contract. At present there is quite an increased acreage in several of the Western States, and a good deal of seed that is being distributed for seed production purposes is not of good quality. There is a need for closer supervision on checking of seed that is distributed to growers for seeding under contract. A lot of it is of definitely inferior quality. In connection with that program I am inclined to think that we have been taken in a little bit by the so-called uniform seed law. That seed law has been to a considerable extent developed by the American Grass Seed Association, and I think it is probably to our interest to get away from it to some extent and develop a uniform law. I think we had better have one for the Western States and tighten up on some of those factors. It is just a labeling law and does not place any limitations. I think we should place more definite limitations on the noxious weed content that is permissible for sale in our respective states. The seed companies do not like limitations. I think we need more actual prohibitions so far as the sale of noxious weed seed is concerned. We are getting seed growers organized, and they are likely to take the position of going in for prohibition of some weeds that are now salable.

Mr. Ball: What in your State, Mr. Hyslop, has your seed certification done to educate people relative to clean seed?

Professor Hyslop: It has helped a good deal. We have a very hard job in the matter of the regulatory work in the seed business here in the State, but we are bringing quite a number of the trade into line. We hope through some of these organizations that are now functioning to have a little bit more authority, so that we can actually start in on prosecutions instead of having to do too much warning. You would really be interested in some of the stuff we have picked up this year. One outfit which has its headquarters in another State shipped a lot of seed mixed up and it became a federal

seed law violation. It looked like they mixed up some seed and used the first label that they could reach.

Mr. Hutchings: I should like to know if there has been found any way through these Western States of controlling the movement of seed screenings, not only within the State but from grower to grower and from cleaning plant back to grower, and to other individuals. That seems to be one of our big problems in Utah - the destruction of viability of seeds in screenings.

Mr. Ball: We were able to get our law amended - possibly for more control over the screenings. One thing that bothered us was the ownership of the screenings following cleaning. The law now allows the cleaning establishment to take possession of the seed in 30 days. In most cases the cleaning establishment is quite willing and ready to follow instructions that the inspectors give. We have carried on experiments in hammer mills and studied the different kinds of mesh toward the destruction of viability. One individual in the alfalfa seed growing area put a lot of screenings in with his ensilage. Burning has been quite successful. Where grinding or burning is not feasible, a dumping ground has been designated and inspected regularly. We are getting a little more cooperation, but it is one of the toughest problems we have to handle. It is hard to tell a farmer that he cannot do a certain thing with his property. Some orchardists will buy screenings for a cover crop, and that makes a real weed problem.

Mr. Spence: We, of course, produce a large amount of various crop seeds and we have this problem of transportation and sale of weed seeds. Anything that has noxious weed seeds in it is condemned. We do not tell them how they are to be treated. We inspect again after treatment and if satisfactory, they will be released.

We have attempted to carry out all pure seed work on an educational basis. We have advanced more in seed work in the last six or seven years than we have in any similar 10-year period, and I think it is due to the fact that we have had an active weed control program. That is reflected in the laboratory tests. Since 1938 we have run from 2500 to 3000 farmer samples. Prior to that time it was around 500 per year. We still have some trouble with these truckers that come in. They are hard to catch and usually they come in and sell to the farm direct, or stop in some little country store and leave a sack or two on consignment.

Then, I think, the most effective meetings we have had are field tours. Those, of course, are now going to be pretty largely out. The next effective are weed and seed schools which were held in the winter time after releasing a concerted publicity campaign in the area requesting farmers to think about their seed requirements. We exhibited weed mounts and from the laboratory brought different classes of seed that had been picked up by our inspectors. We take along an analyst and invite folks to bring in samples of seed which they contemplate purchasing. That has been extremely effective. We are now faced with the rubber situation and probably will not be able to hold such meetings during the coming year. We shall have to depend on illustrated material, the radio, the press, etc. The whole problem of seed production, tied in with your weed problem,

certainly is going to have to be given attention.

We used as a part of our advertising an incident that happened in one of our counties where a man in Boise who owns several ranches spent \$600.00 on cleaning up white top. The following spring he seeded it down with alfalfa. He did not get a good stand so the tenant went down and bought seed containing 2200 whitetop per pound, which he planted.

Chairman Robbins: We wish to express our appreciation to the men who have come here and put up this exhibit material. We have been glad to have you gentlemen here. Would any of you like to talk, or have you any questions?

Mr. Carmichael, a representative of a Borax Company, said there was no shortage of Borax with them or their competitors.

Mr. Westgate, representative of the Sinox Company, also said there was no shortage of that product.

Mr. Keith Sime, representative of the Chipman Chemical Company, said there is definitely a shortage of sodium chlorate. The Chipman Chemical Company would like to have the same information that the War Production Board requested today.

Mr. Diamond of the DuPont Experimental Station was introduced.

Chairman Robbins: We will have a report of the Nominations Committee. (This was temporarily postponed.)

Mr. Ball: Mr. Spence presents the following wire for your consideration, and possibly we can get it on its way. The wire in answer to the one we received is as follows:

"The Western Weed Conference with Idaho, Montana, Utah, California, Nevada, Oregon and Washington represented cannot approve substitution of Boron compounds for chlorates in treating deeprooted perennials."

It was suggested that wires also be sent to Wyoming and Colorado.

Chairman Robbins: What will you do with this?

Moved, seconded and carried that the telegram be approved.

Mr. Schweis: I am in a very embarrassing position. When you appointed me as Chairman of this committee, I did not realize the responsibility that was going to rest on me. I called a meeting of the committee and we discussed the probable officers for next year, and we had no difficulty in arriving at one we thought should be Chairman, or the one we thought should be Vice-Chairman, but when it came to a Secretary there was a wide divergence of opinion.

It was moved, seconded and carried that the following officers be elected for the coming year:

Mr. Earl Hutchings, Chairman
Mr. Gaines, Vice-Chairman
Mr. Walter S. Ball, Secretary-Treasurer.

Mr. Ball: I have attempted for the last three years to get cooperation from these state officials to this effect. I am wondering if you as representatives would prefer that I attempt to invite the members of your State and get information to them, or that I continue as I have, thinking that you as representatives were responsible for the invitations in your various States. I surely need to apologize to some folks that did not get invitations. I should like to continue as I have, but I should also like to emphasize the importance of a little more cooperation on your part.

The one other thing that was mentioned last night was: "Where are all the farmers?" Possibly some are too busy to come in, but I am wondering about that. Of course, I could not invite those people from Sacramento.

I should like to have any suggestions in regard to our next year's meeting in order to obtain the best results.

Mr. Schweis: I think you have handled it pretty well. The state men should know better who should be invited.

Mr. Spence: I think there is another matter that should be presented to the conference. The Plant Board has decided to hold its 25th annual meeting at Riverside next year. By precedent we have been holding our meetings in conjunction with them, but in case they meet in October, which may not be a satisfactory date, perhaps we ought to be thinking about changing to Reno or some other centrally located spot as an alternative, in case it is necessary. I think that a year from today this transportation problem is going to be a lot more serious. Possibly there may be rationing of rail transportation. Then it may be necessary to select some alternative.

Mr. Schweis: The Plant Board will hold its 25th meeting at Riverside next year. It is an anniversary meeting, so to speak. Mr. Mackie, who has been Secretary, has never occupied the position as Chairman of the Board, and since this would be the 25th anniversary we thought it would be a significant thing to elect him as Chairman and hold our next meeting at Riverside. The dates of October were suggested as that is the time the National Plant Board holds its annual meeting.

Mr. Hutchings: I feel that we should at this time give a vote of thanks to our good Chairman, Mr. Robbins, for his very efficient work during the past year, as well as our real entertainment last night.

Meeting adjourned.