Wisconsin State Cranberry Growers' Association.

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WISCONSIN STATE CRANBERRY GROWERS' ASSOCIATION

Fifty-second Summer Meeting — Wisconsin Rapids, Wis. — Aug. 12, 1938

Fifty-second Annual Meeting — Wisconsin Rapids, Wis. — Dec. 15, 1938

Fifty-third Summer Meeting — Wisconsin Rapids, Wis. — Aug. 15, 1939

Fifty-third Annual Meeting — Wisconsin Rapids, Wis. — Dec. 19, 1939

Fifty-fourth Summer Meeting — Wisconsin Rapids, Wis. — Aug. 9, 1940

Fifty-fourth Annual Meeting — Wisconsin Rapids, Wis. — Dec. 18, 1940

Fifty-fifth Summer Meeting — Wisconsin Rapids, Wis. — Aug. 14, 1941

Fifty-fifth Winter Meeting — Wisconsin Rapids, Wis. — Dec. 8, 1941

Fifty-sixth Summer Meeting — Wisconsin Rapids, Wis. — Aug. 12, 1942

Fifty-sixth Annual Meeting — Wisconsin Rapids, Wis. — Dec. 16, 1942

Fifty-seventh Summer Meeting — Wisconsin Rapids, Wis. — Aug. 11, 1943

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MINUTES OF THE FIFTY-SECOND SUMMER MEETING

Meeting called to order by President E. E. Bennett at 1:45, August 12, 1938 in the Rose Room of the Witter Hotel, Wisconsin Rapids, Wisconsin.

Minutes were read and approved.

President Bennett gave the opening address. Other speakers were Mr. E. L. Chambers, Entomologist, Dr. Neil E. Stevens, Mr. A. U. Chaney, Mr. C. M. Chaney, Mr. J. R. Lloyd, Mr. Rex Ebert, and Mr. H. R. Lathrope.

Motion made and seconded to adopt Council of Agriculture resolutions to improve the rights of employers. Motion made to have standing vote on the motion. Motion carried.

Motion made and carried to suspend with minutes and financial report.

Committees appointed to draft resolutions of regret on the passing of the following persons were: C. R. Treat and Oscar Potter for Miss Anne Gebhardt; George Bennett and Richard Rezin for F. R. Barber; B. R. Mitchell and Alex Grimshaw for Betty Hoffman.

Motion was made to ask Mr. Knudsen in charge of Rehabilitation Affairs at Black River Falls to change work period of his men the first 15 days of September and last 15 days of October.

A vote of thanks was extended to Mr. Daniels for the use of the Rose Room.

Date and place of next meeting was left to President and Secretary.

Motion made to adjourn. Motion carried.

CLARE S. SMITH, *Secretary*.

ADDRESS

E. E. BENNETT, *President*

I am very glad to see so many growers here today and certainly appreciate the honor of being here. I feel that there are a lot of people here who could make a much better speech than I can.

Our crop prospects are not as large this year as they have been, but Massachusetts and New Jersey are situated about the same, so we should get a pretty good price. I have heard several reasons for our not getting a large crop this year. One reason was that there was too much rain, which washed the pollen off the blossoms that fertilize cranberries. Too cloudy weather, or lack of sunshine. In some places there is too much vine growth. I think that all these ideas are partly right, and have something to do regarding our small crop. There is a lot of blight this year. We used to blame our blight on too hot weather, but this year we got blight without hot weather.

Our fireworm is pretty much under control, but can still stand watching. We have been trying to control the leaf hoppers by dusting, spraying and water curing, and I think we obtained some very good results this year. Within the last two years, there has been about 200 acres of new marsh planted.

There are new warehouses at the Central Cranberry Company, Dempze Cranberry marsh at Biron, Wuersch & Guttley at City Point, and the Mid-West Cranberry Company. Better ideas for handling and sorting berries at the Central Cranberry Company are being put into effect in their one-story building that is somewhat different from anything we have had in Wisconsin.

The weather conditions vary each year. So far, frost conditions haven't been bad this year. The average temperature variations between Mr. Hedler's marsh and Cranmoor for the month of May — 1° colder at Hedler's than Cranmoor. Mr. Lewis's marsh varied about 3° in June and July. Mather was 2° colder in July than Cranmoor, or Mr. Lewis. Mr. Lewis had the heaviest rainfall with almost 27 inches in May. Mr. Hedler had the most cloudy weather and rain in June with a record of 8.37 inches of rainfall in month of June. July records showed only a slight variation between the four recording stations.

1938 CROP CONDITIONS

A. U. CHANEY

They have always had me start off with the meeting. I am not going to say very much about the crop conditions. The weather conditions have been very similar in all three states. In Massachusetts they had the largest bloom they ever saw. It looked as though they were going to have their largest crop in July, but it is dwindling fast. The last report from the East is that the Cape Cod crop will be about 350,000 barrels. I think New Jersey will have about one-third of last year's crop, but it is very hard to guess their crop. Now, it looks as though they may have 75,00 barrels. Wisconsin will have about 60,000 barrels, which is about one-half of last year's crop. It is generally quite hard to estimate the crop prospects for the three states very accurately. We usually under-estimate a large crop, just as we over-estimate a small crop. It is awfully hard to estimate a large crop, as there is generally a tendency on the grower's part to be a little conservative in their estimates.

We know that there is a lot of last year's crop still on hand, but I think it will be handled all right and will be well taken care of. Last year's crop came pretty close to 1,000,000 barrels. I think we should begin to prepare ourselves for just such crops as these, as our next crop can very easily surpass 1,000,000 barrels. We should sell the crop in America. It can be done. It is up to the Cranberry Growers to educate people to eating cranberries. The price is governed entirely by demand and supply. If you are going to have supply, you have to have demand. If the demand is 10% above the supply, the price is high. If the demand is 10% below the supply, you have a much lower price. 10% either way affetcs the price very much.

C. M. CHANEY

For the benefit of those who were not at the meeting this morning, I wlll give the government report of the conditions of the apple crop as of August 1st, which showed a decrease of 35% under last year, or 11% below the past 10 year average. I have just come from the Apple Shipper's Convention this week, but they would not give out their estimate, which is supposed to be very accurate for both the United States and Canada. They do not give out this information until they can give it to everycne at the same time, so I asked the Secretary to wire me here. I am sorry to say this information does'nt agree with the government report.

I think that while the cranberry crop in all three states will be much shorter than last year, this will really be of benefit to the entire cranberry industry, because it will enable the canners to clean up their large surplus in the freezer, and still mean good prices for the fresh fruit. I am looking for a profitable year in the cranberry industry as a whole.

INSECT CONTROL

E. L. CHAMBERS, *State Entomologist*

I have been here so many times I feel like a pest myself. I was very much impressed with the remarks of Mr. Chaney with reference to advertising, and if I may digress a moment, I would like to say a little bit about it. From my observations, I have noted that when the orangegrowers in California, who are well known for their cooperation and leadership in advertising, have a large crop, they increase their advertising in order to increase the consumption. They stress, rather than minimize the fact that there is a large crop, so that people think that oranges are cheap, even though that may not necessarily be so, and will buy oranges in preference to some other fruit. This is purely a psychology factor, or course, but one which has been used by the orange growers very successfully. It is important at times of large crops I believe, to increase the advertising because if the advertising is reduced because a grower feels that his income is going to be small, such a move will reduce the sales and still further reduce the grower's income.

Another organization that does a lot of advertising is the Coca Cola people. They do a lot of advertising by the use of billboards and magazines. I have been particularily impressed by their advertising on billboards, and I believe such advertising would show very great value for each dollar spent. I would like to see cranberry cocktail advertised in the same manner, and I believe it is better to drink and more healthful than Coca Cola. I believe there is a great future for cranberry cocktail, and with proper advertising and improvement of methods to make the cocktail more palatable, I believe there is a wonderful future.

I am going to pass out an insect to you now that you have not seen before. It is called the white fringed beetle. It has just been added to our list of injurious insect pests. It is especially worthwhile to bring it up now, not only because it is a new insect, recently come in from South America, but because of its economic importance. We have found it is a very serious pest, and that you either have to get rid of it, even though the costs of control are almost prohibitive, or else suffer the consequences of its spreading throughout the various parts of the United States. Right now, this insect is located in Alabama, Mississippi, Florida, Tennessee and Missouri, and chances are, it will spread to other states unless it is curbed.

Many new and old pests move about the country by various means. Of course, one of the chief ways pests move is by means of nursery stock being shipped from one part of the country to the other. There are many cases on record where insect pests have been introduced into new areas hundreds, and even thousands of miles miles away, by being transported on nursery stock. In fact, we have a good example of the transmission of insects and plant diseases on nursery stock right in the cranberry industry. The cranberry false blossom as you undoubtedly know, was introduced into New Jersey and Massachusetts from Wisconsin, as this disease had never been known in the East until false blossom vines were sent out East and

were planted. At first, of course, it was not recognized as a disease, by any of the states where cranberries were grown, and in fact so little was known about it that partly infested vines were reshipped from New Jersey back to Wisconsin and planted at the Biron Cranberry Company marsh.

The Japanese beetle is a good deal like any other insect pest. It was introduced into New Jersey in 1925 on Iris and then spread rapidly to Chicago, St. Louis, Detroit, and even Wisconsin. This pest is transmitted pretty much through the dirt around any potted plants, and there are very stringent rules now with reference to moving any potted plants, or plants from which any dirt may be clinging from any infested area to a non-infested area. In fact you may recall that on any cranberry vines recently sent to Wisconsin for any experimental purposes, it was necessary to see that all the soil had been washed from the roots, and in fact a government inspector supervises all such operations when there is a removal of any such nursery stock from an infested area to one that is non-infested.

In order to better stop the spread of the Japanese beetles, traps have been erected through various parts of the country, as beetles come freely to light. Often when the government erects such traps on privately owned property, often without people knowing about them, there is considerable speculation aroused as to what the traps are, and frequently in cities like Racine and Chicago, people thought the traps were some sort of bombs. The government, of course, can go out and do many things such as putting up traps of this kind without giving the people any advance information, but when the state does anything of this kind is has to get permission from the property owners. Many people think it is better to handle the matter as the state does, and inform the people of just what is going on, because then if there is any danger, of children and others, it can be guarded against accidents.

I am not going to go very deeply into the cranberry insect problems as we have a specialist here, Dr. Stevens, to discuss that subject with you, who knows more about it than I do. I have some moving pictures here that were taken during the summer showing many developments on the cranberry bog during the summer. This is a colorful film which replaces our old films, and is much more advanced over the old films, and much more interesting. When we get the film complete, it will be available to any organization in the state free of charge, other than transportation. These movie shots we have taken have been taken throughout various places in the state and show the cranberry industry from beginning to end. The cranberry equipment, such as conveyors was taken at the Cranberry Lake Development Company, as was some of the spraying and dusting pictures, and some of the other pictures such as sanding were taken at the Biron Cranberry Company, and at other marshes around Cranmoor and Warrens.

BACK OF THE WEATHER FORECAST

(Lecture given by J. R. Lloyd, Forecaster, U. S. Weather Bureau, Chicago, Ill., before Wisconsin Cranberry Growers' Association, Wisconsin Rapids, Wisconsin, August 12, 1938)

The field of meteorology, of which weather forecasting is one of its branches, is one of the most interesting of the physical sciences. It is perhaps the one thing that is of interest to all people. From the dawn of history until the present day, man has been influenced by weather changes, and to a great degree has modeled his existence according to its whims. Mark Twain is credited with the remark that, "Everybody talks about the weather, but nobody does anything about it." Many things have changed since the day of Mark Twain, and one of those things is man's attitude in regard to the weather. Great meteorological services have been built up in the last 70 years for the purpose of observing the weather, forecasting its changes, studying its causes and its composition, and computing its averages, which make climate. Of these national services the United States Weather Bureau is the greatest.

Before launching upon a discussion of the work of the Weather Bureau and what stands back of the daily weather forecast, we must first consider the primary causes of weather changes. In the first place, weather changes on the earth have their origin in the heat radiated from the sun. Although astronomers tell us that the earth receives only about one two-billionth of the total amount of heat radiated

from the sun, that comparatively small amount of the sun's heat is sufficient to cause great thermal changes in the atmosphere of the earth, which absorbs only part of the radiation received from the sun, the remainder being radiated back into space. Our atmosphere is divided into two parts, the troposphere, that portion contacting the surface of the earth and extending upward for several thousand feet, and in which most temperature changes take place, and the stratosphere, the portion lying above the troposphere and extending out into space, in which thermal changes do not occur to any marked degree. The imaginary line dividing the troposphere and the stratosphere is called the tropopause, and it is found at much higher elevations at the equator than at the poles. At Batavia, Java, 6° south latitude the tropopause is found in February at an elevation of about 58,000 feet with a temperature of about 120° below zero, Fahrenheit, while at Ellendale, N. Dakota, the tropopause in February is found at about 29,500 feet with an average temperature of about 67° below zero, Fahrenheit. Why is it so much colder at the tropopause in the tropics than in the higher latitudes? It is because of thermal convection. When a particle of air is heated to a higher temperature than the particles of air that surround it, it will, due to its lesser density, rise until its density becomes the same as that of the air through which it is rising, and as it rises it cools, due to certain physical laws, at the rate of 1° Centigrade for each 100 meters increase in elevation until it becomes saturated with water vapor. It then cools with increased elevation at a somewhat slower rate until rather high levels are reached, after which the rate of cooling becomes about the same as at first.

Since so much more radiation is received from the sun in the tropics than in the high latitudes, it is only natural that thermal convection should be carried up to much higher levels in the tropics than in the high latitudes, and therefore, since the air cools at a more or less constant rate with increase in elevation it is easy to understand why the temperature of the tropopause in the tropics is so much lower than in the high latitudes, which is just the opposite of temperature conditions at the surface of the earth. One must marvel at the fact also, that the amount of heat that is absorbed by the earth's atmosphere — solar radiation — is exactly balanced by the amount of heat radiated from the earth into space. If that were not true, the surface of the earth would become progressively warmer or colder, and no life could exist. The amount of solar radiation received by the earth is, of course, much less in the high latitudes than in the tropics, but, on the other hand, the amount of heat radiated by the earth into space is much more in the higher latitudes than in the tropics. The principal cause of this is, obviously, due to the inclination of the earth's axis, which also give us our seasons.

Another factor of great importance in the earth's weather is the rotation of the earth, which sets up the primary wind system on the globe, causing the winds in the higher latitudes to blow prevailingly from westerly to easterly, and deflecting them to the right in the northern hemisphere, and to the left in the southern hemisphere, which in turn makes cyclonic and anti-cyclonic movement of air possible. Then there is the great influence of the vast oceans and the great land masses. About 7/10th of the earth's surface is covered with water, which absorbs heat very readily and gives it up very slowly. On the other hand the land masses absorb heat slowly and give it up by radiation very readily. The oceans also furnish the principal supply of water vapor to the air, without which no precipitation could occur. Other important factors in the making of weather are great mountain chains and plateaus, deserts, large bodies of inland water, and vast forests. Latitude, as previously indicated, is a matter of great importance. Therefore, it may be seen, that the basic factors influencing our weather are many and complex, and the more that we delve into the physical and dynamical changes that take place in our atmosphere, the more we stand in awe of the mighty atmospheric engine that creates our weather changes from day to day, from month to month, and from year to year.

In order to forecast weather it is first necessary to observe its manifestations over a large area. To accomplish this the Weather Bureau has established some 300 weather observing stations in the United States and Alaska. These stations are equipped with weather instruments of every description, and are manned by trained personnel. The Canadian and Mexican governments also have meteorological services, which are modeled along much the same lines as our own. Meteorology and weather know no National boundaries, therefore, there must necessarily be an exchange of weather information between the various governments, which is true in other parts of the world as well as in North America. Weather observations at all stations

in the United States, Canada, and Mexico, are taken at about 7:15 a. m. and 7:15 p. m. Eastern Standard Time the year round, except that the observations taken at some of the outlying Canadian stations are taken a little earlier in order to permit of transmission of reports in time for use at the central forecasting offices. The observations from the Alaskan stations are also taken a little earlier, since the observers have to radio their reports to Seattle, where they are placed on the telegraph lines. In addition to the continental stations, many ships at sea take regular weather observations at about the same time that they are taken on land, and reports are received via radio on the mainland from ships in the eastern part of the Pacific Ocean, the western part of the Atlantic Ocean, the Gulf of Mexico, and the Caribbean Sea. There are also a large number of weather reporting stations in the West Indies from which reports are received based on observations taken simultaneously with the continental stations. In addition to the regular morning and evening observations, most of the stations in the United States and Canada take observations regularly at 1:15 a. m., and 1:15 p. m., E. S. T., so that at the principal forecasting offices it is possible to make four weather maps a day at regular six-hourly intervals.

The weather reports from the field stations are telegraphed in code, which saves much money, facilitates transmission, and eliminates many errors in transmission. There are two central collecting points in the United States for these telegraphic reports — Chicago and New York, and one in Canada — Toronto. From these points the reports are distributed to all of the various stations in the United States and Canada, each regular Weather Bureau station in the country receiving enough reports to make at least one weather map a day. For forecasting purposes, the United States is divided into six forecast districts, where all of the State forecasts are made, and where all storm, small craft, and hurricane warnings are issued for the sea coasts and waters contiguous thereto, and for the Great Lakes. The headquarters of these forecast districts are at Washington, Chicago, Denver, San Francisco, New Orleans, and Jacksonville. At each of these district forecast centers there is a District Forecaster in charge, and an Associate District Forecaster, who alternate by months in making the forecasts in their respective districts. Forecasts are issued regularly twice daily, following the morning and evening observations, upon which the forecasts are based. Local forecasts are also issued from many of the local Weather Bureau offices, such as St. Louis, Kansas City, Cincinnati, Detroit, Cleveland, Minneapolis, and Buffalo. However, these local officials issue their local forecasts only after they have consulted the State forecasts applicable to their own areas. The telegraphic reports are distributed very rapidly. At Chicago, the Western Union Telegraph Company has a pneumatic tube connecting their main office with the Weather Bureau Office, making it possible to deliver a message from the Western Union office to the Weather Bureau Office in about two minutes. The reports come in a page at a time with several tissue copies in duplicate. As these come in they are distributed to four mapmen and a printer. These mapmen decode the reports very rapidly and enter certain data on their maps, each man starting with a blank base map. One man makes what is known as Map AA on which he enters the temperature, pressure reduced to sea level, wind direction, wind velocity, kind and direction of movement of clouds, and state of weather prevailing at the time of observation; also the amount of precipitation that has occured during the 12-hour period preceding the observation, with the time of beginning and ending. Thunderstorms and their length of duration are also entered on this chart. This map when completed gives a bird's-eye view of general weather conditions prevailing over the entire United States, Canada, and Alaska, at the time the observations were made. A second mapman makes a pressure change chart, showing changes in pressure that have occured during the 12-hour period previous to the current observations, and also the 3-hour pressure changes and their characteristics immediately preceding the observations. A third mapman makes a temperature chart showing the 24-hour change in temperature at each station and the departure of the prevaliling temperature from the normal. At an earlier hour, two other charts have been completed, based on data from observations taken about 5:00 a. m., E. S. T. One is called Upper Air Map A and shows wind directions and velocities at 2,000 ft. intervals from the surface up to 14,000 ft. above sea level. These data are obtained by filling a small pilot baloon with a measured amount of hydrogen, releasing it, and taking angular measurements of the progress of its flight through the atmosphere with a theodolite at one-minute intervals. Such observations are made at about 70 stations in the United States four times daily at regular 6-hourly

intervals. The other chart is called Upper Air Map B, and shows temperature in degrees Centigrade plotted against pressure in millibars, which is about the same as plotting temperature against elevation in feet or meters. These graphs, which are obtained from about 30 stations, weather permitting, also show the relative humidity and the specific humidity at significant levels aloft up to about 18,000 feet above sea level. Perhaps these two terms should be explained by saying that the relative humidity is the relative amount of water that the air contains at a given temperature compared with the amount of water that it is possible for the air to hold at that temperature. The moisture holding capacity of the air is much greater at high than at low temperatures. The relative humidity is expressed, therefore, in per cent, 100% meaning complete saturation. The specific humidity expresses the actual amount of water present in the air in grams per thousand grams of air. These data are obtained by the use of a self-recording instrument called a meteorograph, which is carried up by airplane. This instrument shows the pressure, temperature, and relative humidity of the air through which it passes.

In the last three years there has been perfected a similar instrument called the radio-meteorograph. This instrument is attached to a small free baloon and carries with it a miniature radio broadcasting set which radios back to the sending station the pressure, temperature and relative humidity in the course of its flight. These instruments rise to great heights, often penetrating thousands of feet into the stratosphere before the baloon to which they are attached bursts. When that occurs and the instrument starts to fall, a small red silk parachute, which is attached to the instrument opens and permits it to float down gently to the surface. A large number of these instruments are therefore recovered. While not yet in general use, the radio-meteorograph will probably eventually supplant the ordinary meteorograph carried up by plane, because it can be manufactured cheaply, and has the great advantage of being able to be sent up in any kind of weather.

With this vast amount of information at his disposal, the forecaster is now ready to examine and analyze the various maps and make his forecasts. This is done with the utmost care. First, lines are drawn on Map AA, The general weather chart and the principal one, connecting points of equal pressure. These lines are called isobars and are drawn for each one-tenth of an inch variation in the pressure. After these isobars are drawn it is found that there are areas of high and low pressure enclosed by them. The areas of low pressure are marked "LOW," and are technically known as cyclones. The winds blow spirally into the center of the cyclone in a counter-clockwise direction. The areas of high pressure are marked "HIGH," and the winds blow spirally outward from their centers in a clockwise direction. Highs are technically known as anti-cyclones. In making the pressure readings in the field, the barometers are read to the one-thousandth part of an inch of mercury, and the readings reduced to a common plane, sea level, at the common temperature of 32° F. Therefore, the pressure data entered on the weather map are all comparable, making it possible to find the "Lows" and the "Highs." HIGHS consist essentially of cold, dense, and relatively dry masses of air, while LOWS consist essentially of warm, moist, and relatively light masses of air. The LOWS of the temperate zones must not be confused with the cyclones of the tropics. The former are called extra-tropical cyclones, while the latter are called tropical cyclones, hurricanes, or typhoons. The former are seldom very destructive. They, with the attendent anti-cyclones, give us our day to day weather changes. On the other hand, the latter are almost always destructive in nature. They are born in the warm and humid doldrums and are a phenomenon of the tropical and semi-tropical regions. Furthermore, the cyclones of the temperate zones must not be confused with tornadoes. The tornado is the small but extremely destructive whirl-wind that usually occurs in the southeastern quadrant of a cyclone, and is confined principally to the great central valleys of the United States. It occurs in spring and summer.

Now we come to the question of the origin of HIGHS and LOWS. Why and how do they form, where do they come from, and where do they go? To answer these questions in a satisfactory manner, involves discussion of a very complicated subject in a technical phraseology. However, I shall attempt to explain it briefly and as clearly as possible. Most LOWS originate in areas of direct temperature contrast, where the air is moving in opposite directions alongside a line of discontinuity. Such discontinuities are found along the boundary between a mass of cold, dense and dry air, and a mass of warm, moist, and less dense air. Such masses of air do not mix readily, but tend to maintain their characteristics as they move

along for considerable periods of time, undergoing change slowly as the nature of their environment changes. Given currents of air contrasting considerably in temperature, moisture content, and density, flowing alongside of each other, in opposite directions, and it will usually not be long until a LOW will begin to develop somewhere along the line of discontinuity. As viewed in the horizontal plane at the surface of the earth, the first indication of such development is a bulge to the northward (in the northern hemisphere) in the line of discontinuity, or front, between the two air masses. This is assuming of course that the warm air is moving to the eastward and the cold air to the westward. The warm, moist air from the west and southwest then begins to curve to the northward and it pushes the bulge in the front farther and farther to the northward at the surface, while aloft, due to its lesser density, it flows up over the cold, dense air mass, which hugs the surface. In turn as the warm, moist air begins to turn to the northward, the cold, dense air to the northward of the line of discontinuity, or front, curves to the southward on the western or hind side of the warm air mass, setting up a spiral, counter-clockwise circulation. As the development progresses, the cold winds in the rear of the warm air mass tend to twist more and more to the left, becoming northwest to west, and sometimes southwest, and the pressure falls. A distinct circulatory motion of the air around the neucleus of the development is set up and a new low pressure system, or LOW, has been born. The LOW will gradually develop and become deeper and deeper as long as sufficient warm, moist air is supplied to it. However, due to the circulatory motion of the air that is set up around the center of the LOW, the wedge of cold, dense air that is brought in from the rear of the LOW gradually encroaches on the current of warm air, moves in to the southward of the center of the LOW, lifts the warm current of air off the ground, or surface, and finally cuts off most of the supply of warm, moist air feeding the LOW. As soon as this occurs the LOW is said to be occluded, and it begins to die, and unless it moves into an area where it can draw upon a fresh supply of warm, moist air, it rapidly loses force, dies out, and disappears altogether. Lows do not originate in just any old place on the globe. They are confined largely to the middle and higher latitudes, between the Tropical and Polar Zones. In this breeding ground of LOWS in the northern hemisphere there are two great areas of semi-permanent low pressure. One of these is found in the north Pacific Ocean in the region of the Aleutian Islands. The other is found in the north Atlantic Ocean, extending from Greenland to Spitzbergen and Norway. It is in these great centers of action that most of the LOWS that traverse the northern hemisphere originate. In Nort America their most frequented path is from the northern portions of British Columbia and Alberta southeastward to the Great Lakes Region and thence eastward and northeastward via the St. Lawrence Valley or New England to the North Atlantic. There are also semi-permanent areas of high pressure. In the northern hemisphere one of these lies in the north Pacific Ocean to the southward of the semi-permanent LOW, and another lies in the north Atlantic Ocean to the southward of the semi-permanent LOW there.

It may now be asked, why and how do these cold and warm air masses that generate LOWS and HIGHS form? If a warm mass of air moves northward from the region of its environment it is cooled at its surface due to contact with colder and colder surfaces as it moves farther and farther northward. If it is winter, it finally moves over snow covered surfaces, where during the long, clear winter nights radiation of heat from the surface is very intense. This cooling is gradually conducted upward until and air mass that may have been very warm at first, may finally become very cold up to 25,000 or 30,000 feet. Such changes happen to air blown northward over the Atlantic Ocean in winter, and then carried eastward over Russia and Siberia. Such air may have left the Gulf of Mexico with a temperature of 70° F. at the surface. By the time it has reached the coast of Norway, its surface temperature may have dropped to 32° F. As it moves eastward over Russia it becomes colder and colder, and after remaining over Siberia for a couple of weeks its temperature at the surface may have dropped to 75° below zero, Fahrenheit. Where it was very warm and very moist when it left the Gulf of Mexico, it has now become very cold and dry over Siberia. It has changed from a warm air mass to a cold air mass, due largely to radiation of heat from the surface of the earth. Due to the excessive radiation of heat from the earth's surface in Siberia in winter, a semi-permanent HIGH builds up there during that season of the year, and northeastern Siberia becomes the coldest area on the face of the earth. A temperature of 90° below zero Fahrenheit has been observed there,

which is the lowest free air temperature ever recorded. As cyclonic storms form over the north Pacific Ocean and move eastward in winter, it frequently happens that great portions of polar air are torn away from the parent polar air mass over Siberia, and follow the North Pacific LOW into North America. In such cases the polar air mass may move through Alaska to the Upper Mackenzie River Valley, then southward and southeastward up the Mackenzie Valley to the western Canadian Provinces, and thence into the Missouri and Mississippi Valleys and southward to the Gulf of Mexico, completing a circuit. As this cold air mass moves southward from Canada it moves into warmer and warmer regions. By the time it reaches North Dakota it has warmed to perhaps —50° F. at the surface; by the time it reaches Kansas City it may have warmed to —10° F. at the surface; at Oklahoma City it will probably be about 10° F. above zero; and on reaching the eastern Texas coast it may have a surface temperature of perhaps 32°. Whereas it was very dry over northern North America, it has picked up considerable moisture in the southern part of the United States, and after coming to rest over the Gulf of Mexico and the Carribean Sea for a couple of weeks it will again become very warm and moist. This is the way in which the great polar and tropical air masses that have such very different characteristics are formed, the former largely by radiation of heat from the surface, and the latter largely by thermal convection in the lower latitudes which carries heat and moisture upward into the air.

And now a word as to what causes precipitation to occur. As I have already indicated LOWS and HIGHS move from a westerly to an easterly direction. Now these HIGHS are really great masses of cold, dense air that assume the shape of a dome, being thick in the center and sloping off in the front and rear much as a wedge, with the slope in front about twice as steep as the slope in the rear. The LOW, which is really a mass of relatively warm, moist air, rests on the shoulders of two, or more, HIGHS, for the most part, except that it usually rests on the surface of the ground or water in its southeastern or southwestern quadrant. The forward edge of the cold air mass is called a cold front, while the rear edge of the wedge of cold air ahead of the LOW is called a warm front. Both intersect with the surface of the earth. Now air carries along with it water in an invisible, gaseous state, called water vapor, and if the air in the LOW has recently passed over a large body of warm water, it will not only be warm, but moist. Therefore, according to the physical laws of gases, if a mass of air is lifted, either by mechanical processes or of its own accord by convectional processes, it will, due to the decrease in pressure, expand, and when it expands it is cooled, and if the amount of lifting of the air is sufficient to cool it enough, the water vapor will condense and become visible in the form of clouds. If further lifting then takes place, precipitation will fall from the clouds in the form of rain or snow, and sometimes hail or sleet. When a mass of cold, dense air, therefore, moves along on the surface as a wedge, it may run under a mass of warm, moist air, and since the two unlike air masses do not mix to any degree, the warm air is lifted, and if the wedge of cold air is thick enough to produce sufficient lifting of the warm air, precipitation will result. Such precipitation is called cold front precipitation. It is often heavy in rate of fall, but is usually of rather short duration. On the other hand, when the warm moist air in a LOW if forced to ascend the rear slope of the wedge of cold air in front of the LOW, it too is lifted, and precipitation occurs. Such precipitation is called warm front precipitation. It is usually of considerably longer duration than cold front precipitation, but the rate of fall is usually not as great, although the total amount of warm front precipitation in connection with a LOW is usually more than the total of cold front precipitation. It occasionally happens that the warm air in a LOW is so dry that sufficient cold front and warm front lifting does not occur to produce any precipitation, or if any, only light, so it may be seen that the business of predicting precipitation is really a very difficult business at times.

In addition to the warm front and cold front types of precipitation, there is a third type called convectional. This convectional process is responsible for much of the rainfall that occurs in the temperate zones during the summer season, while it causes most of the rain that occurs in the tropics. The principle of thermal convection in the atmosphere has already been discussed. Therefore it is sufficient to say that when air is carried upward by thermal convection it is expanded and cooled, due to lowering of the pressure, just as it would be if forced upward by frontal action. However, in thermal convection, the vertical action is so much more rapid than in frontal action, that great cumulus clouds are formed when the water vapor is condensed, instead of the higher types of clouds that gradually become

lower and more dense, finally becoming the nimbus, or precipitation cloud, as is the case with frontal action. Everyone is familiar with the quick development of cumulus clouds in unstable air in summer, and how thundershowers often develop in mid-afternoon from a perfectly clear sky in mid-forenoon, as the cumulus clouds become heavier and merge into great towering cumulo-nimbus, which in turn become nimbo-stratus. Warm front, cold front, and convectional action are responsible for by far the most of the precipitation that falls out of our atmosphere, in fact almost all of it, there being only a trifling amount caused by mixing.

The foregoing, while only a brief sketch, or outline, of the more important factors that in the sum total affect our weather from day to day, will give some idea of the tremendous scope of modern meteorology and the problems involved in the scientific forecasting of the weather as practiced by the meteorologists of the U. S. Weather Bureau. Weather forecasting is not an exact science, however. Although it is treated as scientific as possible, yet weather forecasts cannot, due to the great complexity of the problem, be made by mathematical or physical formula alone, and it is seriously doubted that they ever will be. The weather forecaster must depend to a large degree on an intimate knowledge of weather maps, gained by day to day experience with them for a number of years. Weather forecasting requires a good memory for weather maps, a high degree of skill on the part of the forecaster in analyzing maps rapidly and correctly, and applying to them certain well tried rules and methods that are the result of years of study and research. A forecaster must have a good working knowledge of the practical application of the fundamental laws of meteorology and physics. District forecasters are selected by a process of elimination. Before a man can become a district forecaster in the Weather Bureau, he must demonstrate by practice forecast work over a period of years in competition with many other men, that he is well qualified to make forecasts. Men who aspire to become forecasters are assigned to make practice forecasts for various groups of states. These practice forecasts are verified, or graded, in exactly the same manner as are the official forecasts. If in a reasonable time a man does not demonstrate that he has ability in forecasting, he is dropped from the list of practice forecasters, and another man is given a chance to show what he can do. It is a case of survival of the fittest. Weather maps are much like people, in that no two are ever found that are exactly alike. Maps are often found that bear a marked similarity to each other, but a close examination will disclose differences that may be quite marked, in one or more respects. This is one reason why weather forecasting is so difficult. Making a weather forecast might be likened to a doctor examining a patient and prescribing for him. A forecaster examines his charts and prescribes a weather forecast, while the doctor examines his patient and prescribes a remedy. But there is sometimes a marked difference in the results. For instance, if the doctor makes the wrong diagnosis, and prescribes the wrong remedy, he can always bury his patient, but if the weather forecaster makes a wrong diagnosis and prescribes the wrong forecast, his forecast lives to haunt him.

ORGANIZED LABOR POLICY

REX EBERT, *Wisconsin Council of Agriculture*

I feel very fortunate that I could attend a program of this kind today and I know that I have derived a great deal of benefit from the attendance, not only at this meeting today, but other meetings of your Association, which I attended in the past. I think, however, and I am sure you will agree with me, that it is unfortunate that Mr. Milo Swanton, who was scheduled to speak in my place and for whom I am substituting, could not be here to address you as he is a more capable speaker than I am and has several problems confronting agriculture which he would like to have presented to you. However, as executive secretary of the Wisconsin Council of Agriculture which is meeting today, he was unable to attend.

The Wisconsin Council of Agriculture as I am sure most of you know, is an organization of cooperatives throughout the state of Wisconsin to promote the interest of farm cooperatives and developing in general the agricultural situation. The Wisconsin Council of Agriculture feels today that perhaps one of the most

important problems which we face is the gradual influx of organized labor in some of the agricultural fields. While perhaps you may not have had to deal with organized labor to date in the field of cranberries, we have had to meet this problem in some of our dairy cooperatives. I think that most of we farmers feel that the labor laws of both the Federal and State Government can be improved, in order to insure a more harmonious cooperation between agriculture and labor. I sincerely believe that if we study both sides of the question, that if we can get together at a conference table, that we can iron out many of our problems as some of them are due to the fact that labor and agriculture do not have an intimate knowledge and understanding of each others problems.

The Wisconsin Council of Agriculture has appointed a committee to study the existing labor laws, both Federal and State, with particular emphasis on the state laws regarding labor in order to see if some changes could not have been made which would be in the interest of agriculture and yet not put labor to any disadvantage. After a large amount of study and consultation with both members of the union organization as well as farm cooperatives, the committee recommended to the directors of the Wisconsin Council of Agriculture which was passed by all of the directors and which I want to bring to your attention today the following amendment:

RESOLVED, By the Directors of the Wisconsin Council of Agriculture in session at Madison, Wisconsin, August 6, 1938.,

1. That the farmers of the State of Wisconsin demand the right to produce and to market their products free from unlawful interference;

2. That in determining wages and hours, the ability and situation of the industries concerned shall be taken into consideration;

3. That the rights of the employer shall be equal to those of the employee in demanding and receiving the arbitration services of the State Labor Board;

4. That we demand the unquestioned and the unobstructed right, at all times, to the use of the public roads, streets, and highways in the movement of articles of commerce;

5. That we vehemently object to the non-enforcement of existing laws designed to protect the individual in the use of his own private property, and that the Wisconsin Council of Agriculture demands that the legislature take such steps as are necessary to insure the enforcement of these laws by responsible officials;

6. That we demand security of our persons and property from all acts of violence and intimidation. Such security requires vigorous and prompt prosecution of those violating these rights to persons and property guaranteed to us by the accepted laws of the land;

7. That upon demand by either party to a labor dispute, the Labor Board shall hold an impartial election in order to determine the extent of the bargaining rights of the specifc organization of labor purporting to represent a majority of workers involved in the dispute working for a specific employer;

8. That the organizations of labor be held responsible under the law for their acts. The legal right to bargain should be based upon the prior fulfillment of this responsibility;

9. That the parties to a labor agreement shall post surety bonds in the like amounts, with the State of Wisconsin, sufficient for the fulfillment of labor argeements and for the purpose of reimbursing either party for the overt acts of the members of the other;

10. That it shall be an unlawful labor practice for employees, individually or collectively, or their organizations, representatives, or agents, to coerce or intimidate any employee in the exercise of his rights.

What we would like to have your cooperative do here today if you feel so inclined, would be to pass a motion either in favor or against the proposed

amendment. Among some labor leaders, there is a good deal of opposition to this amendment and these leaders state that the proposed amendment did not come from agriculture at all but represents the ideas of only a few leaders and that is why we would like you people here as well as other farm organizations which we have contacted and will contact in the very near future, to substantiate this amendment. Our committee feels that we can go directly to labor with our problems, and not to someone who is capitalizing upon labor as frequently has been done in the past. We sincerely believe that the laboring man wants to be honest and sincere in his dealings not only with agriculture, but also with industry, and that many of the unfortunate situations that have arisen are not due directly to the initiative of the laboring man, but rather to some racketeer or insincere and unresponsible group at its head who are not really interested in labor's cause, but have only their own selfish interests at heart.

Motion made, seconded and carried to adopt the above resolution.

GRASSHOPPER CONTROL

H. R. LATHROPE, *County Agent*

I am not going to take a great deal of your time and plan to take only a few minutes, as I know you are anxious to hear Dr. Stevens, who has a very interesting talk. As a County Agent, I am particularly interested in your cranberry problems, but inasmuch as many of your problems are very specialized, it is difficult for me to give you the sound advice which you could obtain from someone like Dr. Stevens or Mr. Chambers. I do not pretend to be an expert on cranberries and the more I learn about the industry, the more I realize the problems you have to confront you, and of a specialized nature.

There are some things, however, which we can do to help the cranberry growers. One of the things our office has done the past year which has benefitted the growers, is in the matter of grasshopper and cutworm control. Cutworms are not particularly serious on the cranberry bogs except in rare instances, but I know and I am sure you will agree with me, the grasshoppers frequently do considerable injury on the cranberry bog, not only by eating, or partly eating the small berries. but by cutting many of the stems off so that the berries in all stages and degrees of maturity fall to the bog floor, and so are of no value to the growers. Many tons of poison bait was used throughout by the farmers of Wood County in the control of grasshoppers in a very successful manner the past year, and I am glad to say that many of your cranberry growers received some of this poison bait and used it with considerable success on their roads and dikes to reduce the grasshopper population to a very marked extent.

Another way which our office has cooperated with the cranberry growers is in the matter of securing Soil Conservations benefit payments for the sanding of the cranberry marshes. The amount of benefit varies of course to the amount of sand applied and the maximum benefit can be obtained as much by the depth of sanding as it could if the whole marsh was sanded. In fact it is not necessary to sand your whole marsh in order to gain the maximum benefits. I will not go into the matter now of how the payments are made inasmuch as most of you are familiar with it, but in case any of you have any questions to ask, I will be glad to answer them after the meeting or you may take them up directly with your Soil Conservation head in your particular town.

Another problem in Wood County which does not affect cranberry growers as much as it does farmers, is the matter of sleeping sickness in horses. Of course, I realize that most of the cranberry growers do not have horses, but a few of them do, and for those who are here today that have horses on their marsh I would like to say that we think that the best way to control this is by keeping the horses in at night, rather than to leave them out in the pastures as most people do. As soon as the first symptoms of the sickness is noted, it is well to get the veterinary as soon as possible. The first symptom is the loss of the control of the muscles, making it difficult for the horses to walk properly and if not taken care of adequately by a veterinary, it results in the loss of the animal.

I want to thank you again for the time and assure you I appreciate the contacts I have with the cranberry growers throughout the year, even though it is not as extensive as I wish it could be.

FIFTEEN YEARS OF COOPERATION IN CRANBERRY WORK

NEIL E. STEVENS

The Situation in 1930

In looking over the report of the Wisconsin State Cranberry work for the years 1927 and 1928, I came across the following paragraph which seems to me well worth repeating here:

> "Cranberry production in the United States is localized in comparatively few sections, chief among which are Massachusetts, New Jersey, Wisconsin, and the coast regions of Washington and Oregon, near the Columbia River. Except for Wisconsin, each of these sections maintains a Cranberry Experiment Station, actively engaged in investigating current practices of culture and in improving methods of overcoming the various adverse factors encountered.
>
> The Federal Government also has an active group of workers engaged in the study of cranberry diseases. While many important differences exist between local production methods in the four cranberry districts, the general problems are, broadly speaking, the same in each, and, consequently, there is exceptional opportunity for constructive cooperation between the agencies interested in this crop. The whole plan of work has therefore been built around the idea that the Wisconsin cranberry industry is an integral part of the industry as a whole. We have attempted to bring into the State the promising methods developed elsewhere, while at the same time we have cooperated in the solution of problems which could best be undertaken in Wisconsin."

This is, I think, a very clear and accurate statement of the situation and after reading it I spent some time in reviewing our work for the last fifteen years to see just how our cooperation had been. It seems possible that the results of this "historical review" may interest you. My introduction to cranberry work was on Cape Cod. Cooperative work had already been initiated there by Dr. Shear and Dr. Franklin, and we merely continued along the lines they laid down. The first problem attacked was a study of the means of reducing the rots in storage and transit. In this we have had the active cooperation of Dr. Franklin and the American Cranberry Exchange and its constituent sales companies.

Next came our attempts at forecasting keeping quality, in which we depended on the reports of the New England Cranberry Sales Company for the records as to keeping quality and Dr. Franklin for weather data. Our incubator tests were started as a result of attempts in the same direction by Dr. Franklin and Mr. H. S. Griffith, chairman of the Board of Inspectors of the New England Cranberry Sales Company. For the studies in storage rots in which Mr. Bain and I are engaged, Dr. Franklin furnishes the berries from Massachusetts and the American Cranberry Exchange, the storage space in Chicago.

Dr. Bergman's outstanding work on injury due to flooding water is now being prosecuted in a laboratory furnished him by the Massachusetts Agricultural Experiment Station.

While working on cranberries in Oregon, Mr. Bain even drew on the State Experiment Station there for the culture media he used.

In New Jersey, Mr. Wilcox is glad to make use of the State Experiment Station Laboratory there, just as Mr. Bain uses your laboratory here in the summer.

False blossom, now that its importance is generally recognized, is being studied by state workers in Massachusetts, New Jersey, and Wisconsin, as well as by members of the Bureau of Plant Industry; also, investigations by the workers at the Boyce Thompson Institute have been very valuable.

I do not wish to be understood as claiming any credit for this long and successful cooperating. It was well underway when I had the good fortune to start work in 1916. I suspect a very large part of the credit should go to the cranberry growers themselves. Their keen appreciation of the investigations and their own readiness to help in any way possible has set an example which it would have been hard not to follow.

Your close contact with sales agents and market conditions has made you fully aware that some problems cannot be worked out within State lines. The Wisconsin cranberry crop is grown right here and the problems relating to growing must be worked out here, but the final battle — the one which determines how great shall be the profit — is fought in the markets of Chicago, Kansas City, and points still more distant. In the same way, while the closest work on any field problem, and the solution of any difficulty must be on the ground and in the immediate locality, there are frequently broader phases which must be studied on a national basis. These national problems on the other hand, can be studied most effectively with the cooperation of the various local units, just as your frost predictions would be much more difficult without the general information furnished by the Weather Bureau. You have, however, all learned not to depend absolutely on the forecasts by the Weather Bureau, but in addition, to make your own forecasts and conversely, the Weather Bureau depends on many of you as cooperative observers to furnish the weather data on which its studies are based.

The Situation in 1938

The above was written in 1930 just before I quit work on cranberries, as I then thought for good, and was filed away in a folder. The other day I dug it out and re-read it. I couldn't see that the situation had changed much or that the manuscript needed revising, even from my present point of view.

No doubt, most of you know that I am keenly aware of the limitations under which I am attempting to carry on temporarily the work so ably handled over a period of years by Mr. Rogers, Mr. Bain, and those who from time to time assisted them. That anything at all is accomplished is due to the helpful cooperation on the part of a number of people. As you know, I plan a trip East each summer with the frank purpose of learning all I can from the growers and investigators there. Without this I would soon be hopelessly behind the times, especially in matters dealing with insect control. Here in Wisconsin, Mr. Goldsworthy, who does so much field work himself, is very helpful to me in many ways. I feel that I am personally, as well as professionally, indebted to Mr. Goldsworthy and to Miss Anita Berard, who handles all my correspondence and other clerical work.

MINUTES OF THE FIFTY-SECOND ANNUAL MEETING

Meeting called to order at 2 p. m. in the Rose Room of the Witter Hotel, Wisconsin Rapids, Wisconsin, on Thursday, December 15, 1938, by President Ermon Bennett.

The minutes were read and approved. The financial report was read and audited by an appointed committee, C. A. Searls, J. J. Emmerick and L. Rezin, who reported the same to be correct.

Speakers on the program were A. U Chaney, Vincent Skilling, Milo Swanton, Lester Haines, and Professor Musbach. Entomologist E. L. Chambers spoke on the value of Quarantine, and showed an interesting moving picture on false blossom. Mr. Skilling explained the trapping permit extended to growers. Resolution was passed expressing appreciation of the privilege to trap and pledging cooperation in giving trappers permit cards and tagging rats caught.

Mr. G. O. Babcock and Mr. Guy Nash were appointed to draft resolutions of regret on the passing of Mrs. Pauline Smith.

Moved and seconded to renew subscriptions to Wisconsin Horticulture.

It was moved and seconded to instruct the secretary to cast a unanimous ballot for the same officers for the ensuing year.

Secretary Clare Smith asked to be released on account of other duties. The request was accepted.

Mrs. C. A. Jasperson was nominated to the office of secretary. Moved that the nomination be accepted and closed. Rules were suspended and unanimous ballot was cast for Mrs. Jasperson.

Moved and seconded to re-elect all other officers for ensuing year. Carried.

Moved and seconded that the secretary send a bill for dues along with notice of the meeting.

A rising vote of thanks was given to the retiring secretary for the many years of efficient service.

Motion made to adjourn.

The annual banquet was held at the Witter Hotel at 6:30 with Mr. G. O. Babcock presiding. One hundred and twenty-nine growers and their friends were present. Music was furnished by courtesy of L. P. Daniels.

CLARE S. SMITH, *Secretary.*

VALUE OF QUARANTINE

E. L. CHAMBERS, *State Entomologist*

I will try not to take up too much of your time today as I know you have a long program. Then too, I have some pictures I would like to show you later if you will bear with me for a few minutes.

First, I would like to discuss the matter of false blossoms, as it pertains to us insofar as nursery inspection is concerned. First you want to remember that for thirty years the government had no regulations in preventing the distribution of insects and plant diseases from one part of the country to another. Finally the situation became so bad that it was necessary for the Federal Government to take some measure in the control of the spread of insects and plant diseases from infested areas in different parts of the country to non-infested areas.

In 1912, the Federal Legislation and Quarantine Act became a law. This act provided for the inspection of nursery stock which would be transported between the states and also regulate importation of nursery stock in foreign countries. The State and Federal government both feel that the regulation with reference to the movement of nursery stock inter-state and intra-state should be controlled by regulations and that it is unwise to move nursery stock before it is inspected, and due to this both the State and Federal nursery inspectors cooperate with the result that the spread of many insects and diseases have been curtailed, and in a few cases new pests have been completely wiped out before they get a chance to get any start.

Chestnut Blight is a good example of the importance of nursery inspection. As most of you know, Chestnut Blight came from China in 1904 and at first its true seriousness was not recognized. In fact when money was first appropriated by the Federal Government in order to deal with this serious pest, the general public thought it was just another scheme for getting a big appropriation and putting people to work on the government payroll. However, it didn't take long before the disease had spread rapidly, and today most of you know that the Chestnut Blight has killed practically all of the beautiful vegetation in the East,

and even with all of our control methods today, is still living on the few chestnut trees that remain in isolated areas.

Another good example is the San Jose scale which came from the West Coast and spread to the East Coast. It does not trouble apples or other deciduous shrubs, and the winters are probably too cold for its survival, but in the southern part of Wisconsin, it has been necessary to carry on a stringent spraying program for its control. The spray that is applied is a dormant spray and is applied early in the spring before the buds on the apple or other trees have swelled to any extent. We have found this spraying program to be very effective in the control, but this pest has threatened to cause considerable damage in apple orchards and various kinds of ornamental shrubs grown in many parts of the state, particularly in southern Wisconsin.

The Mediterranean Fruit Fly caused a good deal of excitement a short time ago, particularly in Florida, and I know that many of you have read about the program used in controlling this pest, and so I will not go into it in detail here. Needless to say, in those areas where it was found it caused heavy losses to the growers because the fruit was all quarantined and could not be shipped and had to be destroyed. However, the results that came from this method of control more than justified the expense, as there has been no trace of the Mediterranean Fruit Fly now for some time. If such a situation is watched closely, I am quite sure we will not have any great amount of trouble with this pest, because we can prevent its spread and eradicate it before it gets a good start.

Other insect pests which have caused us considerable trouble and which our government is very interested in controlling, are the Corn-Borer and Japanese Beetle. Cultural methods have been worked out for the control of the Corn-Borer, but it is spreading a little each year, and probably will do so for some time, but we feel that we can check it so that it will not be a serious pest. The general public, however, does not always realize what we are up against in trying to control certain pests, with the result that adequate appropriations are not granted, and desirable effects are not obtained.

Now I want to get back to cranberry false blossom for just a moment. As I have told you in the past, false blossom was originated in Wisconsin and was taken to the East, where it spread very rapidly. We know that practically no marshes in Wisconsin are free from this disease and if the opinion of our cranberry specialists can be relied upon, cranberry false blossom can be found on every marsh in the state, as each marsh is gone over in detail at the time that false blossom is most pronounced. We know too, that it is much more serious on certain marshes and certain varieties than on other marshes and other varieties. What the state is interested in doing, is to see that on the new plantings that the vines are as free from false blossom as possible, and that the reason that we insist that all growers who sell vines under any circumstances, or move them for any reason from one marsh to the other, even though they may give them away, have the vines inspected by our cranberry specialist. We are fortunate in knowing as much as we do about cranberry false blossom and its control, so that on many marshes where it is present in quantities where it is serious, we can carry on proper control methods to check its spread. I am glad to report to you, that we now have definite means of checking the spread of false blossom that have worked out very satisfactory, and with the control of false blossom, production in the state will rise.

I think another thing you should bear in mind is the matter of using arsenate in some of your late spraying, particularly when you are spraying the fruit. There are certain government regulations which regulates the amount of arsenate on fruit that is sold and if you are over this tolerance, the cranberries so affected would have to be dumped if they got out on the trade, as they could not be sold. I realize of course, that you don't do a great deal of spraying with arsenate, but I hope you keep this in mind in the future in case it is necessary for you to do any such spraying. If it is necessary to do any such spraying, you can reduce the arsenate contents on the outside of the berry, merely by flooding, which you should by all means do before your harvest.

In my rambling way, I tried to give you some idea of our problems so that you will better understand our position and see how necessary it is that we all work together as we are trying to help you all rather than impose any penalties upon you that are not for your own benefit.

Thank you.

Letter from Dean Christensen to President Ermon Bennett:

UNIVERSITY OF WISCONSIN
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
MADISON, WISCONSIN
Office of Dean and Director

December 10, 1938

Mr. Ermon Bennett, President,
Wisconsin Cranberry Growers' Ass'n,
Wood County National Bank Building,
Wisconsin Rapids, Wisconsin.

My dear Mr. Bennett:

This will acknowledge receipt of your letter under date of November 29, wherein you set forth some of the problems of the Wisconsin cranberry growers and express the desire that the College of Agriculture undertake some research work with the hope that solutions might be found to some of these difficulties.

I assure you that the members of our staff will be glad to render assistance to the cranberry industry to the extent that we can provide the necessary funds. In our recommendations to the Board of Regents for the budget of the College of Agriculture for the 1939-41 biennium, we asked for an increase in our 1A-Operation fund. It is our understanding that the Board of Regents has accepted our recommendation, and has transmitted it unchanged to the State Budget Director and to the new Governor.

It has been our intention to use a part of this additional 1A-Operation money, provided it is made available to us, to take care of urgent new research projects such as the work in cranberries.

I was particularly interested in reading that portion of your letter in which you itemized the different cranberry problems which you think are most urgently in need of study. You appreciate, of coure, that some of these are disease problems and would involve the employment of plant pathologists; whereas others deal with insects, which would require study by entomologists; while others deal with plant growth, which involves plant nutrition; and hence cut across such specialties as soils and horticulture. It is probable that no single specialist from the Agricultural Experiment Station would be in a position to supervise research in all of the problems which you have outlined, but instead the participation of several persons from our staff would be required.

I again want to thank you for your letter, and wish to assure you that the College of Agriculture and the Agricultural Experiment Station are eager to render every possible assistance to the cranberry growers of the state.

Sincerely yours,

(Signed) Chris L. Christensen,

Dean and Director.

The secretary has just read you a letter from Dean Christensen of the University of Wisconsin. I am sure that we all greatly appreciate the interest which the Dean of the College of Agriculture has in our problems, and I assure you that we are very anxious to work with him to the utmost of our resources. I know that we are going to derive a great deal of benefit in cooperating with the scientists at the College, and I hope as time goes on, we might work more closely together.

REPORT ON 1938 CROP

A. U. CHANEY

First I want to bring you greetings from my brother whom most of you know has been ill with pneumonia. I am glad to report, however, that he is recovering as well as could be expected, and will soon be back on the job. This is the first time that he has missed a meeting for a number of years, and he wants the Wisconsin members to know that he keenly regrets his inability to attend at this time.

We have had a very successful season as you all know. The berries perhaps did not keep as well as they have other years when the weather was more favorable, but all in all considering everything, we have had a successful year. I know that you will all be interested to know that the demand for Wisconsin berries is increasing. This is due to the fact that your Badgers keep well, and you have put up such a fine pack that buyers want your berries. In some of the southern markets in particular, your berries are replacing many of the New Jersey berries. As most of you know, we have had more trouble with the Eastern berries this year than we have with the Wisconsin berries, probably due to the fact that Wisconsin berries were shipped out early and consumed by Thanksgiving time. Many of the Eastern berries, particularly the late Howes, had to be held later and these late kept berries do not hold up particularly well. Mr. Haines, who is here today and is one of our inspectors, has seen some pretty bad cases of Eastern berries which were held late, and perhaps he will speak to you about it later.

All in all, the markets throughout the United States have cleaned up well and I think that all the people who have handled many berries this past year have made money. This leaves a good effect on the market for next year's crop, if the buyer has had good success one season, he will naturally look forward to handling the same commodity again another season. Insofar as the American Cranberry Exchange is concerned, we are practically cleaned up and I doubt if we will have any berries after the first of January, even for the New York and Philadelphia markets. The New York market was strong yesterday, with the berries selling at $4.50 a box F. O. B.

We are holding off on our advertising now as the berries are all gone on most of the markets, and there is no need to advertise when there aren't any more berries to be sold, and we may as well save the money until next year when we can use it to better advantage.

In closing I wish to thank you all for your fine cooperation and sincerely hope that we can all meet here again next year after a successful season.

EXCHANGE INSPECTOR

LESTER HAINES — *New Jersey*

I am glad to be able to be at your meeting today and I have enjoyed talking with the various members of the Wisconsin Cranberry Sales Company and also hearing the talks and discussions of this afternoon. As you know, I am from New Jersey and have been primarily interested in the growing of cranberries until I started to work for the Exchange as an inspector. This work in the Exchange has made me realize that there is more to the cranberry business than merely raising the berries and that the marketing is a very important part of the business. If it weren't for the very close cooperation, in which manner the cranberry growers have always worked, I know that we would have a very demoralized situation such as they have in many of the other fruit situations. I have not had the opportunity to see you harvest you crop on water which is entirely different than the way they harvest it in either Massachusetts or New Jersey, but I hope sometime to have that privilege. Thank you.

MUSKRAT TRAPPING

VINCENT SKILLING

I haven't been in Wood County very long, but have been here long enough to know a little bit about some of your problems, particularly in the matter of muskrats. As you all know, the conservation department is very anxious to help you with any of your problems, but in turn, we would like to have you cooperate with us as much

as possible. One of the problems which I had noted in my travels around the various marshes, is that there are many men trapping on the marshes for muskrats, who apparently have no right to be there. In order to overcome this difficulty, I would like to ask each grower to be sure that anybody who does trapping on his place, have an identification card, which will be furnished free of charge by the Wisconsin Cranberry Sales Company. If each trapper has such a card, then as we see the trappers from time to time, on the cranberry marshes, it will not be difficult for us to ascertain whether or not such a trapper has a right to be doing such work.

Another thing the trappers should not do is to trap in muskrat houses, because often you may get part of the rats in one house and they then desert the house and go into the dikes. They would not go into the dikes and do the damage they do if it were not for the fact that their houses had been molested. Therefore, you should have your trappers stop trapping muskrat houses, particularly after they are frozen, and only trap when the rats come out. If you follow this plan, I am sure that you will find that the rats will not bother your dikes and dams so much.

Another thing that I want to bring out is the fact that the Conservation Commission furnishes free of charge, tags which must be attached to every hide that is sold. It is necessary that these tags be on each hide in order for the sale to be legal, and if such a tag is attached to a hide by a cranberry grower, and a muskrat is taken lawfully on cranberry property, such a muskrat hide may be sold to any buyer. We would like to request that the growers be very careful in the dispensation or handing out of these tags so they do not get into the wrong hands and be used for unlawful purposes. It is quite possible if the tags are not handled carefully, that they will get into the hands of the individuals who could or would use them for illegally trapping muskrats.

In closing, I wish to emphasize once more that all your trappers carry trapping permit cards from the owner of the marsh, and that each marsh owner also closely supervise the tagging of the hides and we will try to cooperate with you in the control of your muskrats 100% to be of what service we can to to every grower.

Mr. Lewis: "I think we ought to pass a resolution that each grower take particular pains as outlined by Mr. Skilling." Motion made, seconded, and carried, that the growers follow the instructions of Warden Skilling, as brought out in his talk.

Mr. Skilling: "I wish to thank you for your cooperation."

Mr. Calway: "I would like to ask Mr. Skilling how to get rid of Beavers. At the present time the growers have no authority to take them out."

Mr. Skilling: "For your information, we have state trappers hired for that purpose who will take care of all beavers, where they are doing damage. If you will contact me, or the State Conservation Department, we will be glad to help you with your beaver problems. Of course, we only have two beaver trappers in the State, so sometimes there is a delay in getting around, but if you will let us know soon, we will try to get around to those growers who are having trouble with beavers, take care of them for you. Also, one other thing I wish to state, with reference to the muskrat trapping, that the Conservation Commission insists upon a report on the number of rats caught and sold, on the first of July. This is for their records, and is very essential."

IN MEMORIAM

An all wise Providence has removed from our midst, our esteemed friend and member of this Association, Mrs. Pauline Smith, who has been a friend and co-worker of the cranberry industry for many years.

The members of this Association in common with the whole community deeply deplore her loss and join with profund respect and regret in placing on record our estimate of her worth.

Guy Babcock.
Guy Nash.

MINUTES OF THE FIFTY-THIRD SUMMER MEETING

Meeting called to order by President E. E. Bennett at 2:00 p. m., August 15, 1939, in the Rose Room of the Witter Hotel, Wisconsin Rapids, Wisconsin.

Minutes were read and approved.

Nominations were in order to elect Secretary and Treasurer to fill vacancy of Miss Clare Smith. Miss Anita Berard was nominated to the office of secretary. Moved that the nomination be accepted and closed. Rules were suspended and unanimous ballot was cast for Miss Berard.

Mr. George Berntsen spoke on appropriation for cranberry harvest festival to be held September 1, 1939. Roy Potter, Clarence Searles and Mr. George Hill were appointed on committee to select trip for cranberry queen.

Committees were appointed to draft resolutions on passing of Mrs. Clark Treat, Mrs. Guy Potter, and J. J. Emmerick.

Speakers on the program were Dr. Neil E. Stevens, A. U. Chaney, Clyde McGrew, E. L. Chambers, State Entomologist, Mr. Henry Lunz, of the Weed and Seed Department, and Mr. Alvin Schwendiman, also of the Weed and Seed Department.

Those appointed on the committee for checking the books when they were turned over to the new secretary were Rollie Potter, Guy Nash and Charles Dempze.

A vote of thanks was extended to Mr. Daniels for the use of the Rose Room.

Motion made, seconded and carried to adjourn.

ANITA BERARD, *Secretary.*

REPORT OF CRANBERRY WORK FOR 1939 — NEIL E. STEVENS

FRUIT WORM CONTROL

The growing season for cranberries is short. The portion of it which I am able to spend with you is shorter. Consequently, if I am to get anything done it is necessary to concentrate on one or two things. This year seemed a good time to concentrate on the fruit worm.

The fruit worm is not generally considered to be of major importance in Wisconsin, though some of your very good growers have suffered severely at times and I have heard the opinion expressed that the losses in Wisconsin are greater than is realized because the worms finish their work before the berries are packed for shipment. As far back as I can remember, however, the fruit worm was regarded of first importance and very hard to control on Cape Cod, and I notice in his bulletin of Cranberry Insects, published in 1928, that Dr. Franklin says (page 54) "This worm has been more destructive on the Cape than any other cranberry pest, sometimes taking nearly half the crop." In Mr. Rogers' report for 1934, he refers to "Black-heads, next to fruit worm, our hardest enemy to fight . . . "

You can readily understand my interest then, when in 1936 Dr. Franklin told me he believed that after 30 years he had at last found a control for the fruit worm. You all remember that before this, we had been dependent on either fall or spring flooding, neither of which was very dependable, although sometimes one or the other worked out very well indeed. The possibility of control by the new method rests on a curious habit of the insect which is evidenced as soon as it hatches. The eggs are laid usually but not always in the blossom end of the berry. The newly hatched larvae almost always crawl over the surface of the cranberry and enter close to the stem. It is during this journey that there is the best chance for attack and this is what makes accurate timing of the spraying or dusting so necessary. Accurate timing is best done by identifying and counting the eggs, though something may be accomplished by observing the stage of development of the berries.

Because of the heavy losses during recent years, three growers in the northern part of the state prepared for control work this year, one for spraying and two for dusting with Rotenone, this being the insecticide which Dr. Franklin has found most effective. On one of these marshes a heavy infestation was apparently almost wiped out by a four day flood in September, due to the heavy rains which also spoiled part of the crop. On a second, there did not appear to be enough eggs to pay for spraying. On the third marsh, however, located near Strickland there were eggs enough and more than enough for a very good test. On this marsh there had been heavy losses from fruit worm for several years, amounting to over one-fourth

of the crop *last year*, with the heaviest losses in three-year-old Searls, about half their crop; and in a small patch of Natives where more than 90% of the crop was lost in 1938.

We found the first fruit worm eggs on June 28th, at which time there were only a very few small berries. On July 4th when the berries were abundant and the bloom was nearing its peak, we found fruit worm eggs on 36% of the berries examined in a small "nursery plot," 24% of the berries examined in the "Natives" which bloomed early, and 8% and 16% respectively on the two sections of Searls.

Since each worm which hatches and survives is good for four or five berries, here were enough eggs, if they all hatched, to account for all the berries set at the time.

By this time it was evident that the bloom was to be very uneven and the owners adopted the policy of dusting with a hand duster those parts of the marsh which were sufficiently advanced to provide berries for the fruit worm millers. In all, the natives were dusted five or six times, the ditch rows three or four times, and the rest of the marsh once or twice. Part of these applications were necessitated by frequent rains. On the little nursery which was left undusted as a check, the peak of the egg laying was reached in the period from July 6 to 16, at which latter date not over half the bloom had fallen. During this period we found from 40% to 60% of the berries bearing fruit worm eggs. On the marsh itself during this period, we found from 12% to 28% of the berries bearing fruit worm eggs. Fortunately for us a considerable proportion of the eggs were parasited, but enough were left to have inflicted serious damage but for the dust. As it is, very few berries indeed will be lost this year.

In the future we will have no hesitance in recommending Rotenone bearing dusts or sprays to a grower having serious losses from fruit worm. But it will be almost imperative for the interested grower to get a hand lens and learn to recognize the fruit worm eggs. This year most of the eggs were laid by the time the marsh was a little past full bloom, which is earlier than usual in Massachusetts, but they might not act that way another year.

A. U. CHANEY

American Cranberry Exchange, New York City

I didn't come prepared to say anything.

Wisconsin certainly has a crop of berries this year. This seems to be a Wisconsin year. Cape Cod had a wonderful bloom, but it did not set. According to the bloom, it looked as though they would have at least 450,000 barrels, but because of the hot, dry weather a good many of the berries did not set. Some of the bogs that didn't have anything on them last year looked like they would have a lot, but they won't put a scoop in them. We are finding it this way on a good many marshes. On some bogs where they have had big crops there are very few berries. It is a very hard crop to estimate. I made the statement at this morning's meeting that whatever estimate is made by the Government, the crop will be short of the estimate.

The same is true of New Jersey. New Jersey will probably have around 75,000 barrels and the Cape about 400,000 barrels. It is awfully easy to make a wrong estimate and is hard now to say what the crop is going to be. We didn't think it will exceed 500,000 barrels, against 700,000 barrels for 1937. We have an estimate for about 105,000 barrels for Wisconsin, which is probably under-estimated.

The berries are larger than usual but not matured and are going to grow a lot yet in my opinion. Don't make the mistake of picking them too soon. Let them come of age and get ripe and get a good color. Do not jump in to pick them while they are not yet matured. There is a lack of demand for immatured berries. The canners do not like this kind of berry, nor does the broker. Frost berries won't do so much damage if you have to can them. Don't go by the size of the berries, but by the maturity of the berries.

People are becoming more cranberry minded than ever. If we hadn't had the sudden depression in November of 1937, we would have been short of berries in that year. It wasn't the big crop that caused it, it was the sudden shut-off of demand. There were unexpected and unusual conditions. Last year there were not enough berries to carry through. The berries retailed at 25c a pound, against canned berries at 10c a can. When there was no fresh goods, the canned goods sold well, so I think people are more cranberry minded. We are going to give them a strong advertising and pub-

licity program this year. The more we spend the more demand we get. We think we have planned the best publicity program we have had and it is well distributed. It will tend to make the people more cranberry minded. We have to prepare ourselves for the time when we will have to sell a million barrel crop. You are much better situated for it here than they are in the East. The people stick together better than they do in the East. If it had not been for the canners, they would have all been in the dog house. Some of them would have been better satisfied if they had dumped them than if they had put them in the freezers. Only about 60% of the two Eastern states belong to the organization, while about 90% belong in Wisconsin. The 60%, however, are standing together good. They are standing together with you. You are building an organization that is going to help the industry in the future.

I am glad you have a good crop. It would have been unfortunate if you had had a short crop this year when we have so many people cranberry minded and it would have been bad if they had to cut off. I believe the entire crop will be handled and carried through to your satisfaction.

E. C. McGREW

American Cranberry Exchange, New York City

I have very little to add to what Uncle Arthur has said. We have just come from the Apple Shippers Association Convention which was held the 8th, 9th, and 10th in Cincinnati this year. They have a larger crop of apples on the Western Coast than they had last year. The peach crop is also large. The apple people have not really started their season although early apples are on the market now. They are bringing disappointing prices. However, the general attitude of the trade seems to be much improved.

I do not agree with Uncle Arthur when he says he is more optimistic than I. I believe the cranberry industry has a bright outlook. It was one of the few commodities handled last year on which there was a reasonable profit. Of course the crop was not large enough to make much of a profit on it. I havn't forgotten that it took a lot of serious argument and starting price list to interest dealers and make them forget the disappointment of 1937. However, I think we have overcome that and they will remember 1938 quite favorably. The cranberries must not stop at the dealers, but must go on to the consumer and they must be ready to take care of the cranberries when they come.

MR. E. L. CHAMBERS

Wisconsin State Entomologist

Mr. Chairman and members of the Association.

Mr. Chaney has given a report on the crop and told you that you under-estimated rather than over-estimated it and my report on insects is about the same. Like cranberries, the insects haven't matured either. They are still growing and there is still a chance for grasshoppers to come into the bogs and pick the cranberries. I remember last year, when there was a heavy dew that took some of the cranberries down the river, that the cranberries had been picked by the hoppers more than you realized.

With regard to advertising, the cranberry exhibit in Milwaukee at the State Fair makes contact with about 600,000 people. This is one of your finest forms of advertising.

I am going to make my talk brief. I had hoped that Dr. Stevens would have stressed a little more on false blossom. I frequently have people coming to me and stating that they believe the disease to strawberries is over-estimated. I don't think so. At least we have to remember when we look at stastics that we know a lot of areas that were at one time centers of strawberry production, no longer grow strawberries. There were areas in New York that used to furnish a good many plants and they no longer produce any plants. Fifty years ago Scotland was a large producer of strawberries, but they produce none today. I am bringing that out to show you that sometimes an industry feels pretty secure and then along comes something that changes the picture. There are not many men working on the cranberry diseases, Dr. Stevens, Dr. Franklin and Mr. Bain. We don't want to be too sure of the industry until we become acquainted with the various things we might have to control. There are quite a few pests that scientists have discovered and some that they haven't discovered. The various problems that we have discussed at a meeting of this kind are

difficult because of the fact that you people who are here are the successful growers, while the more unsuccessful ones who need the information are not here.

We have discovered that some of the growers have been using a disk on their spray nozzles that has been worn out two or three years ago. They put on a heavy spray instead of a fine spray that would stay on. You would be surprised at the people who are still trying to spray to get results. They don't know what an agitator is. If the spray material is not stirred up, the insecticide is in the bottom of the tank and will not get control. I could spend the whole afternoon just telling faults of that type.

In Massachusetts, they are sponsoring a cranberry false blossom campaign. The Eastern people have been working on a plan, and have been at it for three years.

There is a question that comes up on the matter of equipment. Some power dusters, some ground dusters and some sprayers are being used. It is a question of psychology in trying to get a cranberry grower to do control work. Until he can see someone who is getting a bigger crop and more berries, he isn't going to worry about control work. This just gives you a brief idea of some of our problems.

MR. HENRY LUNZ

Weed and Seed Department

Mr. Chairman.

We have had a pleasant half day here. We were around to some of the cranberry bogs in Wisconsin Rapids. We don't know anything about your weed problems. Don't even know what some of the weeds are that grow on the bogs. We learned a few things about weeds on talking with some of the cranberry growers. If there is any possible way we can be of any aid or any service in getting together some information for you, we will be glad to do so under Mr. Chambers' leadership. Not knowing about it, I think I have said enough. Thank you.

MR. ALVIN SCHWENDIMAN

Weed and Seed Department

I certainly feel that the matter of cranberry weeds is worthy of our attention and hope that we can devote some time to it. We certainly shall be glad to cooperate and hope we will be able to help you.

KEEPING QUALITY OF THE WISCONSIN CROP FOR 1938

NEIL E. STEVENS

Now that the Wisconsin cranberry crop is safely marketed, it will probobly disturb no one to record the fact that must have already been obvious to many—that the crop was of very poor keeping quality as compared with the very good crop of last year.

Direct comparison between the Wisconsin crops of 1937 and 1938 is made possible on a very limited basis by results of storage tests conducted for the purpose of comparing the keeping quality of a number of unnamed selections grown in the nursery near Wisconsin Rapids.

Table gives the percent decay on November 15th, both years.

Average Condition of Storage Lots of Wisconsin Cranberries Expressed as percent Rotten Berries, November 15th.

	1937	1938
Average of 8 lots unnamed selections	4.9	16.9
Average of 3 lots duplicated in both years	3.4	13.3

Although the selections represented in the first pair of figures were only in part identical, they were all grown in the same area and showed a wide variety of characteristics. The second pair of figures in this table is based on three lots of identical selections. In all cases the berries were hand picked during the second week in September and stored in the Chicago warehouse of the American Cranberry Exchange.

BLACK-HEAD FIRE WORM

Although actual losses from the black-headed fire worm have been relatively light this year, for reasons to be brought out later, I doubt if it ever acted much worse in Wisconsin than it did this year.

In the first place they started hatching early, before Memorial day. Later, hatching as well as the blossoming of the plants was delayed and "scattering", with the extreme result that on a few marshes we found later in the summer, millers flying, while some of the worms of the first brood were just hatched or at least very small, together with eggs and young worms of the second brood. This, of course, made control work very difficult.

As most of you know, we make up during the first part of August each year, a list of marshes which show fire-worm damage in some portion and thus should be carefully watched next spring. Last August there were 12 on this list. This year there are 25, of which 14 showed perceptible browning on one or more sections.

I feel reasonably sure that this is an actual difference, not just the result of greater thoroughness in the survey, for there are included in this list, a number of marshes on which I am reasonably sure there was no appreciable fire-worm injury in 1937 or 1938.

You may remember that I said a moment ago that actual losses from the black-head fire worm have been relatively light this year. This is due, I believe, to unusual activity in spraying and dusting. Mr. Goldsworthy gave a great deal of time to this work and I find that our notes show four marshes which sprayed and nine that dusted more or less extensively.

The question has been raised more than once and may well come up this afternoon as to which is preferable—spraying or dusting? I can't answer that yet, and as a matter of fact, that is only part of the question, for various insecticides are involved. Those of you who read Dr. Franklin's insect chart have noted that he recommends only Pyrethrum in one of its forms, having apparently abandoned Black Leaf 40 altogether. I hope to discuss this matter among others with him during the next few days and perhaps it may seem desirable to try a comparative test next year. Meanwhile, the following observations may be worth recording.

For anything like complete control of the second brood this year, three applications were usually necessary. What apparently happened, was that we killed the worms that were out but a lot more hatched. But with three thorough applications the feeding was checked, a crop obtained and new buds set for next year on areas which would otherwise have been a brown waste, with no crop and no fruit buds. One of the best control jobs I saw was with Pyrethrum soap spray, but it is evident, as Dr. Franklin warns, that this must not be used for the second brood as it injures some of the blossoms and young berries. I should very much like to see it tried next year on the first brood. In general that is where we should place emphasis next year, on the first brood. If we don't get a satisfactory kill, or on those marshes where we have rarely gotten a good kill with water, we should, I believe, go after the first brood with spray or dust.

LEAF HOPPER CONTROL

This may be a good time to take stock and see just what has been done in Wisconsin for the control of the blunt-nosed leaf hopper. This year the plane was used on six marshes. There were also in use three spray outfits and eight ground dusting machines. The material, chiefly pyrethrum dust, used for the control of the insect, this year cost about $5,000. The labor cost, you can estimate more accurately than I can. Has this been worthwhile?

Judged merely as a problem in insect control, the results are satisfactory almost beyond belief. Not only do we get very marked reduction in hoppers, amounting at times to practically 100% after the application of the pyrethrum, but the effects carry over from one year to the next. I mentioned this last year and the same thing was evident this summer.

Averaging together all the marshes or sections of marshes on which Mr. Goldsworthy and I made counts, we find that the average population on marshes which had been treated the year previous was 13 hoppers per 100 sweeps. In contrast to this was the record on marshes or sections which have had no treatment recently, 138 hoppers per 100 sweeps. If from this last we eliminated three marshes in which the hopper population had been reduced by repeated flooding to control fire worm, we

have an average of 171 hoppers per 100 sweeps. Sometimes differences as great as these occur on adjacent sections. Apparaently the leaf hopper is a relatively sluggish insect, or at any rate averse to travel and if the leaf hopper population is greatly reduced on an area, it does not soon become reinfested from neighboring areas. This characteristic explains one of the mysteries of the old days, *Why* if false blossom was infectious, it spread so slowly? Why, for example, on the Whittlesey marsh, vines were False on one side of a dyke and Howes were free for years on the other side? Now we have the answer, the hoppers from one side of the dyke never, or rarely ever crossed to the other side.

But while this is very satisfactory from the standpoint of insect control, in this case we are not primarily interested in insect control, but in checking the spread of falseblossom.

Two questions then arise. Are we reducing the hopper population sufficiently to stop the spread of false blossom? And is it safe to let up? Regarding the first, I can only say I don't know and the only practicable way to find out is to study the yield trends over a period of years. Another possible method would be a tedious series of counts of uprights on selected areas. A job of doubtful value any way.

As to the second, I will hazard the opinion that there are some marshes on which it would apparently be safe to lay off one year out of three. But on marshes with susceptible varieties, certainly in the Brown Bush area, I believe I should continue spraying or dusting as long as there is a hopper to be found.

In view of this uncertainty and the undoubted fact that a lot of cranberries are still grown on marshes where no attention is paid to leaf hopper, the question may still fairly be asked, "Has this experience been worthwhile?"

No doubt cranberries would still be grown in Wisconsin if no control work is done. We had no control prior to about ten years ago and a great many cranberries were grown.

Perhaps I am more impressed with what this has meant to Wisconsin than some of the rest since I have had well rubbed into me what happened in New Jersey in the absence of such control measures. You all know the general outlines of the story and I see no need to repeating it. You can get it more readily by reading as I did night before last in the report of your 1930 meeting, Mr. Scammells' paper entitled, "Cranberry False Blossom From the Viewpoint of the Growers." I might quote parts of two paragraphs. "At times there have been some who have made light of their predictions and of their efforts to acquaint the growers with the facts concerning the diseases as they have found them. This is, of course, a quite natural trend of affairs, but I am glad to say that I believe, most thoroughly, their work has been well and conscientiously done." I find that too much emphasis has not been placed upon the seriousness of the disease. Some of our growers who, as recently as two years ago, clung to the opinion that conditions were being exaggerated have swung around to the view that false blossom is truly rocking the cranberry industry. Speaking for New Jersey, in my opinion, the boat has not only been rocked, but has shipped a lot of water." "To a number of New Jersey properties it has proved almost ruinous and the end is not in sight. I want to convey to you as strongly as possible, that we believe we are up against the most damaging invader that ever has overtaken our industry."

You may add to this the fact that on Dr. Franklin's 1939 insect chart the blunt-nosed leaf hopper is the only one that rates red ink. He rates it the most dangerous of all cranberry insects.

YIELDS

Of course one has to have some busy work for evenings and stormy days. Last year I amused myself looking up some figures on crop estimates. This year I have been tabulating yields.

Early in June while helping Mr. Bain set vines on the new nursery at Biron, and in the course of our numerous arguments, I asserted that under good growing conditions in Wisconsin, Howes would produce a higher average yield than ever had been known in the East. I can't prove my point yet, because I haven't had time to check the eastern records, but I find one marsh with an average of over 60 barrels per acre for the last six years and another one with an average of over 51 barrels per acre for the last five years. Of course, this dosen't sound like much compared to what Searls will do, but it is a whale of a lot of Howes.

Among the factors which I think contributes to the very high yields in Wisconsin are the slightly longer days in the summer, higher temperatures, more hours of sunshine and in general, smaller losses from insects.

From the above you will conclude that I think Wisconsin is a good place to grow cranberries.

LAST WINTERS' WORK

Two things I would very much like to find before I quit cranberries for good are some way to kill or weaken false blossom vines in the marsh without killing the healthy vines, and some way to inactivate the virus in a diseased cutting without killing the cutting itself.

I worked on both last winter and while I made very little progress you might be interested in the attempt. It is generally agreed that during the severe drought of several years ago a larger proportion of false bottom vines died than of healthy ones. Following this lead during the winter and early spring, I tried healthy and diseased cuttings in salt solutions of various concentrations—only to find that the false blossom vines would survive anywhere the healthy ones would.

I also induced a friend and colleague of mine, Prof. Wynd, who is a physicologist, to make some determinations of the osmotic pressure of the cell sap of leaves from diseased and healthy plants, and they came out exactly the same—about 19 atmospheres. In the course of this work we learned again what all of you know, that if they have to, cranberry plants will stand a lot of drying before they will die. Some shipped from New Jersey gave readings of 58.8 atmospheres, yet the cuttings lived and grew.

As a possible means of ridding diseased cuttings of the virus which causes false blossom, I am trying heat. There is nothing particularly new or original about this, as a matter of fact tests of this sort are so general this summer as to amount almost to a fad. Hope of success is based on experience with the virus disease of sugar cane, the virus of which is "killed" in the cane by treatment with hot water, at 113°F to 122°F, for thirty minutes followed by exposures at 122° to 127°. This, I understand, is regular commercial practice in planting sugar cane sets in parts of the Dutch East Indies. The virus of peach yellows is inactivated in the host at 100°F, after 11 hours. All I have to report so far is that cranberries in the dormant condition will stand a lot of hot water. There are now growing under cheesecloth cages at Biron, between 600 and 700 plants which were cut as soon as the water was taken off last spring—immersed in hot water at various temperatures and for various lengths of time, and then set out in peat in the greenhouse first in Urbana, later at the Central States Nursery at Wisconsin Rapids. May I say that I am much indebted to Mr. Wallace and Mr. Brener for the use of greenhouse space and for their courtesies.

As nearly as I can tell from the appearance of the plants, those having had the following treatments are growing as well as the checks:

122° F	15 and 30 minutes (this spring)
120° F	60 minutes
117° F	60 minutes
113° F	60 minutes
110° F	90, 120, 180, 240 minutes

Growing but apparently affected somewhat by the treatment are some of those treated at

127° F	5 minutes
122° F	15 or 30 minutes (last fall)
122° F	40 and 60 minutes (this spring)
117° F	60 minutes (last fall)

You will note that the cuttings treated this spring did rather better than those treated last fall. This was to be expected and I wasted some time—as usual—trying to hurry things up. 122° F seems to be about the limit of temperature the dormant cranberry cuttings will stand for any length of time. About half of those treated at 124° for fifteen minutes and at 131° for five minutes survived. All died that were treated at

131° F	10 minutes
129° F	30 minutes
127° F	15, 60 or 75 minutes
124° F	60 minutes

MINUTES OF THE FIFTY-THIRD ANNUAL MEETING

Meeting called to order at 2:00 p. m., in the Rose Room of the Witter Hotel, Wisconsin Rapids, Wisconsin, on Tuesday, December 19, 1939, by President Ermon Bennett.

The minutes were read and approved. The financial report was read and audited by an appointed committee.

Speakers on the program were A. U. and C. M. Chaney, H. J. Rahmlow, Secretary of the State Horticultural Society, Mr. Henry Lunz, Chief of Section of Seed and Weed Control, Mr. John S. Bordner, of the Land Economic Inventory office, and Mr. Noel Thompson, who represented E. L. Chambers from the State Entomology Department.

Miss Clare Smith and Mr. Carl Getsinger were appointed to draft a resolution on the passing of Mrs. C. D. Searls and Mr. O. O. Potter; and Phil Bennett on the passing of Mr. Raleigh Frost.

The members were reminded to make out muskrat reports.

Moved and seconded that the secretary cast a unanimous ballot for the same officers for the ensuing year. Carried.

A vote of thanks was extended to Mr. Daniels for the use of the Rose Room.

Motion made to adjourn. Motion carried.

The annual banquet was held in the dining room of the Witter Hotel at 6:30 with Mr Theodore Brazeau presiding. Music was furnished by the Castillians.

ANITA BERARD, *Secretary.*

A. U. CHANEY

American Cranberry Exchange, New York City

I have nothing to say except that I am thankful to be here. I hope to be here for many years to come and hope to be able to handle a good many more cranberry crops. I hope your cranberry crops in the future will be as successful as this past year has been. Thank you.

MR. HENRY LUNZ

Chief of the Seed and Weed Division

Mr. Chairman and friends.

I presume I am in a rather enviable position to be here today. I have been asked to say something in regard to weeds on cranberry bogs. I know very little if anything, about them. It is not going to take me very long to tell you what I do know about them. Frankly, I did not know cranberry growers had weed problems until I was at the summer meeting in August. I came here today in just about the same position. I have done considerable work on weed problems on agricultural lands and in the last few years there have been several developments of weeds on agricultural lands which seem to be clearing up some of those problems. In the last few years chemicals and method of operating these lands have come to be of a great deal of benefit in reducing weed problems. I refer in particular to the spray materials which have been used. Whether or not there is something of that kind that can be applied to your problem, I do not know. Mr. Schwendiman came up and spent several days in making a survey of the bogs in this area. All he could do was observe the weeds on the bogs. He collected several specimens of these weeds and went over them quite carefully and attempted to classify them. You probably don't realize just what we are up against in attempting to classify them. It is the first time they have ever been called to our attention. We are starting absolutely from scratch. You have been with this problem and have studied it and more than likely, know much more about it than we do. The information and help we are going to be able to give you is only what information we are going to be able to get from you and pass on to someone else. I suggest that we might co-operate and work together and thus possibly be able to work out something which may be of some advantage to you. Just from our observation, we have found that

there are some sixty species of plants which act as weeds on cranberry bogs. These are not all found in any one area, but are distributed over all the bogs in Wisconsin. Weeds that apparently cause considerable damage on some marshes, do not cause a great deal of damage on other marshes.

The only suggestion that I could make to you would be that if you consider this weed menace serious enough, that it would be advisable and helpful if a committee of cranberry growers would be appointed and we would be glad to meet with them and possibly a program could be worked out in such a way that we could get information pertaining to the conditions under which they grow, water supply, and condition of soil. We will be better able to attack the problems after we know a little more about the characteristics of these plants. It is going to take considerable and careful study. Therefore, I suggest that if some representative group can get together with us and lay out a program by which we may be able to get more valuable information than we now have.

Some people have been using chemicals in the control of weeds and report very good results have been obtained, while others report they did not have very good success with chemicals. There are certain grades of kerosene which have proved to be very effective. Standard Oil kerosene seems to be about the only kerosene which we recommend to be favorable on weeds. It has more compounds than some of the other kerosenes have. Some way or other it is more effective. It may be that some cranberry growers who have used this particular kerosene have found the results to be very profitable. Some may have mediocre or poor results. I am just bringing to your mind a few things which appear to my mind to be well worth looking into. I do not know how effective some others might be on cranberry bogs. I am very reluctant to recommend the use of chemicals on land which is not very productive, or where the situation is such that some method of cultivation or rotation would do the job.

We will be very glad to cooperate with any group or committee which you might appoint to work with us on this problem, and will do all we can to assist you.

Thank you.

WATER AND THE CRANBERRY

John L. Bordner, Land Economics Dept., University of Wisconsin

Introduction

It would be presumptuous for me to come here to talk to you about cranberry culture, because my experience with cranberries has been only that of the consumer and one who has observed them grow wild in bogs, here, there and yonder. However, in listening to the discussion of your problems and occasionally reading about them in your publications, I am reminded of their intracasies and of the confusion which still confronts you in the practice of your art. I am also reminded of a story in which three scientists from distinct fields of endeavor boasted of the superiority of their work. This they tried to prove genetically by tracing themselves back to the beginning. Said the surgeon, surgery is the greatest for did not God take Adam's rib and make Eve, that Parisians might have a form on which to drape their wares? Said the physicist, but before God made Adam and carried on his surgical operation he had to put energy and matter in place and bring order out of chaos. This was the physicists job and then came the economist. Yes said he, but don't you realize that the economist creates chaos and therefore his work dates farther back than either of yours, back to where there was no time and all was chaos and confusion. The sequence therefore seems to be first, chaos, then the thinking and experience of men and women which leads to change and improvement of man's environment, habits and life. That there is still much chaos and confusion in the world no one can gainsay — even in cranberry growing, and it is fortunate that there is else we would realize in knowing it all — *a sort of intellectualtotalarianism where the brain of man would have little else to do but rot.* Something like what life must be in the land from which my ancestors fled 200 years ago. There last year a good motherly housewife in her own language said to a friend of mine, "It is very fine here now, we do not have to think any more, our leader (fuhrer) does it for us." When we realize that this leader was only a house painter, I am sure you will agree with me, in willing that no house painter must ever do all the thinking or even attempt to do all the thinking for us in America and incidentally for the cranberry industry which happens to be one of our greatest cooperative enterprises.

Land Use and Cranberries

Those who have invited me here today know that I am not capable of doing your thinking for you, but that my only purpose in accepting the invitation is stimulating interest in better land use, and I assure you land use for growing cranberries is no exception. To illustrate: — recently when a man said he was sure he could grow cranberries in Grant County, I countered with the question, "why not try to grow corn in Labrador?"

What I have to say here today are conclusions based upon observations I have made, as I have tramped through swamps, marshes and bogs here, there and yonder in this state and where I observed the growth of wild cranberries. These conclusions may not be well founded, but they may at least be thought provoking and therefore aid a bit in bringing order out of chaos for you people engaged in the cranberry culture.

Geographic Distribution of Wild Cranberries

First of all let us look at this map. Did I find cranberries growing up on the ancient or dead bog from which I took this piece of moss peet which grew possibly 5,00 or 10,000 years ago. My answer is no. Did I find wild cranberries growing where sphagnum is still growing luxuriantly? My answer is yes. Logically you ask where were these bogs? The dead bog was in Dane County, in the Rock River Valley. The live bogs were were in parts of central and northern Wisconsin.

Sphagnum and Cranberries

You note, I mention sphagnum as an indicator for wild cranberries. This is because these plants seem to like similar environment. Whether they like the same environment or are merely tolerant to it makes no difference. That is a problem for pure science. We are only interested in what some of the outstanding characteristics of this environment are. They are: relatively low temperature, cold pure water, containing an ample supply of soluables of the right kind for these plants, for *both sphagnum and cranberries have very poor vascular or circulatory systems and therefore must get much of their food by local absorption from water and the dewey vapors that at times hang over their fragile reclining bodies.*

Where is there such water in Wisconsin is another logical question? Observation and reports of ground water analysis indicate such waters within certain geological formations both in the glaciated and unglaciated portions of the state and that these are limited largely to the formations now low in lime and with considerable iron in the ground water.

Limes and Iron

These two elements others being equal or relatively so, seem important to me. I have not had the opportunity to investigate the literature on this subject and have only consulted two men who have given me some helpful suggestions. These are Dr. Curtis, plant physiologist of the University of Wisconsin and Mr. Knight, chemist of the State Department of Agriculture. Both agree that lime and iron, either alone or through combining might have some influence. Now let us look at what might and actually does happen under certain conditions. The presence of considerable lime in the water tends to stimulate the growth of much life, more primitive than either *sphagnum moss or cranberries.* These are the free floating organisms in the water, bacteria and their closely allied green forms. This life respires, i. e. uses oxygen and if green, uses some of the carbon dioxide to build carbohydrates and fats. The remaining carbon dioxide unites with some of the lime, where lime is present and this tends to make the water more alkaline, and the process continues until the water may become so polluted that it actually becomes poisonous as the season advances. Such water is not to the liking of either sphagnum or cranberries. Such water would tend to make the bogs less acid. Such water is hard but all hard water is not like this water, for there is hard water that has a low lime content. To some it may appear that all that is necessary is to use soft water for cranberries, but soft water may also not contain other needed solubles as well as not containing lime. For example water samples in the northern highlands run about 60 parts per million solids, the region south and west of Wisconsin Rapids about 200 parts per million and water in the eastern part of the state high in lime, about 400, with samples reported at Neenah as high as 1500. Some of the water in the western part of the state also runs very high in lime. Sixty parts may

be enough if the right kind of solids, but practical demonstration in this central region shows 200 is enough. This water is not classed as soft water, but it is low in lime and relatively high in iron. This water runs about neutral to slightly hard when given the test for relative acidity.

Iron and Cranberries

As far as I know this soluble iron and its relation to lime has not been given any consideration in cranberry growing. It may have no value but my observations in the field, where I have seen many small bogs, indicate *that there is a relatively close geographic correlation between its presence and the growth of cranberries.* Now I hear you ask, where in your opinion does land in this state become marginal to cranberry growing? I will show you on the map.It is where the lime content has not been thoroughly leached in the unglaciated portions of the state and where the earth mantle is primarily of granite rather than limestone origin in the glaciated portions of the state. In these areas it also so happened, is where iron is found in the ground water. Now what about this iron? Dr. Curtis and Mr. Knight both think it might act as reducing agent, i. e. grab so much of the soluable oxygen in the water that the lower order of plant life of which I have spoken would be held in check for want of oxygen and with this reduced respiration the water would remain cooler and purer, for when iron unites with oxygen in the water it changes from ferrous to ferric oxide. Ferric oxide tends to precipitate and gives the water a brownish color. In fact I note that one of your pioneer cranberry growers reported to you in one of your early meetings that only this brownish water should be used for flooding. He possibly had observed poorer results from the use of other water.

Assuming that iron should reduce the oxygen content, I hear you asking, but do not cranberries breathe? The answer is surely but not much under water and cold water reduces respiration, and if the water beneath the bog can be kept cold it will induce relatively heavier dews from which the cranberr plant may obtain for its entire body through absorption some of the nutriments which its poor circulatory system is not able to provide for it. For a relatively poor root system anchoring it to sterile acid soil does not provide all the nutrients to plants such as cranberries. This method of assimilation may be particularly useful in supplying the cranberry plant with iron which element scientists agree has a very definite value as a chlorophyll builder in plants. They also agree that iron is not easily diffused through such plants, and though it does not change itself, it brings about the condition for other elements to unite in the living chloroplast to use the energy of the sun. This is important for the cranberry because it must make hay rapidly in its short growing season during which it has to gather the nourishment to make a very large berry. Good rich green leaves are therefore important instead of pale anaemic foliage. This latter condition is even referred to as a disease at times; and fruit from such plants is less firm and without color.

It has been known since 1884 that plants deprived of iron build no chlorophyll. While I know of no work done on such privation in cranberries, which grow in a relatively cold climate and on barren acid soil, research carried on in Hawaii may be an indicator of what might be done in cranberry culture. There it was found that rice and pineapples grown particularly on soils high in lime lacked chlorophyll i. e. green color in their leaves, and that this could be overcome by spraying the plants with an 8% solution of iron sulphate at a total cost of 60 cents an acre.

Absorption and Iron

Here again you will note that the plant absorbed its iron rather than obtaining it through its root system, a method of feeding comparable to that through which the cranberry plant possibly gets much of its food. Cranberry plants according to all rules of the games to be highly productive should be stocky and compact and dark green. Whether this is true in practise I do not know, but I do know that all plants suffering from chlorosis (anaemia) grow tall and if decumbent spread out in long useless vines. Such plants with a poor circulatory system have greater difficulty in bringing about a translocation of nutrients into the fruit of the plant, and therefore are relatively less productive.

I shall close by quoting a paragraph from the work of Professor Gile and others in Hawaii, and if I have stimulated any interest let us talk about it afterward. Good rich green leaves are therefore important instead of pale anamic foliage. This

"Gile (1911) applied a solution of ferrous sulphate to calcareous soils, but this showed no effect in reducing the chlorosis of the leaves of the pineapple. Crystals of salt, however, applied in the soil in close proximity to the roots gave very evident results in reducing chlorosis. In another experiment (1916) rice plants were grown in acid, neutral, and alkaline solutions with 0.008 g. of Fe liter in various forms. The plants grown in the acid solution contained the highest percentages of iron. Plants in the neutral solution contained more Fe than the alkaline solution when some forms of Fe were used and an equal amount when others were used. The percentages of nitrogen, phosphorous, calcium, magnesium, and carbon-free ash remain the same in all plants regardless of the reaction of the solution. From these and other experiments, Gile (1911, 1916), Gile and Carrero (1920), Maze" (1912), Sidorin (1914), and Willit and Carrero (1921) agree in considering that lime-induced chlorosis is due to a depression in the available iron. They are inclined to believe that the carbonate of lime in the soil reacts with the Fe forming ferric carbonate and thus depressing the availability of the Fe for the plants."

Some Observations on Alkaline

FLOODING WATER

NEIL E. STEVENS

From reading Mr. Rogers notes, from talking with him and with Mr. Bain, and from my own observations during the past three summers, I have reached the conclusion that there may well be some relation between the acidity of the water used in flooding marshes and certain cultural problems. Since, following my usual incautious habit, I have discussed this idea with a number of growers, some of whom were deeply interested, and I would like at this time to explain the basis of this opinion and add some of the things which I have learned while studying the problem this fall.

It should be admitted at the outset that we havn't a shred of experimental evidence. Moreover, I do not yet see how the idea can be adequately tested very soon. The basis for the idea is a comparison of the present condition of the marshes and their known history with a series of readings on the pH of flooding water taken by Mr. Rogers several years ago,, supplanted by a few taken this summer.

One conspicuous phase of this problem, though perhaps not the most serious in the long run, relates to weeds. Not only are the weeds on the marshes with alkaline water somewhat different but they seem to be more difficult to control. I discussed this point several times with Professor Musbach and it was, I think, his opinion that the bacteria which make nitrogen available for green plants were more active under somewhat alkaline conditions and that the additional available nitrogen encouraged weed growth.

This same condition tends to result in too vigorous growth of cranberry vines associated with too small production of fruit, a situation frequently noted on marshes with alkaline water. In addition to these differences it seems to be true that the much discussed "leaf drop" and certain types of bud injury sometimes mistaken for frost injury, are more likely to occur on marshes with alkaline water. All these conditions seem to be aggravated in marshes with a somewhat alkaline soil, as well as alkaline water.

During the past summer we made a number of tests of the acidity of flooding water and as soon as we began to check our pH readings with those made by Mr. Rogers we ran into difficulties in the form of frequent disagreements between his results and ours. At first we were inclined to blame this on our methods or the way we cleaned our glassware, etc. Finally, however, I consulted Professor Juday of the University of Wisconsin, one of the world's leading authorities on such matters and learned a good many things including the fact that pH of some lakes varies considerably from time to time. In a study of the pH of 245 Wisconsin lakes in different years, Juday, Birge and Meloche found that in 222 of them, or 90 per cent of the total number, the difference did not exceed 1.4 pH units in the various years, but in six lakes the annual difference exceeded 2 pH units.

They also report (p.50) that in certain lakes the summer pH was lower than that of the spring, in others the pH of samples taken in summer was higher than that of those taken in the spring, while in 9 cases the spring and summer readings were the same. There is even a difference between readings taken in a single lake

on the same day. For example, they note that at Trout Lake on August 15 1933, the readings taken during the day time fell between 7.5 and 7.7, but were somewhat lower in the evening, or pH 7.2 to 7.3. All of which means that pH readings by themselves are not going to be very satisfactory for comparing one water source with another unless we have a lot of them over a considerable period. Professor Juday tells me, however, that a series of readings taken in October would be more likely to be comparable among the various reservoirs than readings taken during the summer.

Because of this fluctuation in pH, the Wisconsin Geological and Natural History survey, the Wisconsin State Planning Board and at least some units of the Federal Bureau of Agricultural Economics, all express the hardness of water in parts per million of bound carbon dioxide. There is of course, a relation between the pH (hydrogen-ion concetration) and the bound carbon dioxide content, On the basis of observations made in 499 Wisconsin Lakes, the writers already quoted found that in drainage lakes (those which have an outlet) the neutral in the pH scale, 7.0, usually comes at near the dividing line between soft and medium water, i. e., at about 10 parts per million of bound carbon dioxide.

Before I am ready to discuss this general problem in much detail, we want to make an additional series of tests of flooding water used on marshes throughout the state. In fact, this has already been started. I am so fully convinced of the probable importance of the acidity of flooding water that I sincerely hope that any grower contemplating the establishment of a new marsh will have the water tested and if it is much above pH 7, or 10 parts per million of bound carbon dioxide, will think a long time before he plants.

Of course it is entirely possible that the flooding water has less to do with this whole problem than the soil, but in general the two appear to be associated in Wisconsin marshes.

In this problem of the relation between alkaline water on the one hand, and cranberry weeds and cranberry yields on the other, we can expect little help from the Eastern states. Both Dr. Franklin and Dr. Bergman assure me that there is no bog in Massachusetts using flooding water with a pH above 7.

Regarding conditions in New Jersey, Mr. Charles S. Beckwith writes as follows under date of December 4, 1939: "The water used on cranberry bogs in New Jersey has a pH of approximately 4.5. As far as I have been able to determine this does not vary very much although I was just talking with Mr. Wilcox and he tells me he has some lower records but they were unusual for some reason or other. The exact reasons he did not seem to remember. The water in the Rancocas Creek at Pemberton has a pH of approximately 4.5."

At one time there was a rumor in Wisconsin that cranberries were being successfully grown on Long Island, New York, with alkaline water. However, in some correspondence between Professor Musbach and Dr. Bain, I find a letter to Professor Musbach from J. B. Hartman, Research Instructor at the branch experiment station, Riverhead, Long Island. At Professor Musbach's request Mr. Hartman tested both the water and the soil on the Johnson bogs, the most successful on Long Island. He reported the pH of the water as 5.3 and the pH of the soil as 4.7.

While we apparently cannot learn anything from the eastern growers in this matter of alkaline water and cranberry culture, the history of one Michigan marsh may well be included here.

During August 1928, in the course of our studies of the distribution of false blossom I visited a marsh at Alpena, Michigan. Mr. E. V. Shaw, the manager, was at that time much concerned as to the handling of the property. Although the area had been well developed, the water supply seemed adequate and the vines appeared to be in a healthy condition, the crops had been very unsatisfactory. Up to that time the only big crop had been in 1915. Vine growth was abundant, perhaps too abundant, and the weeds were a very serious problem. We talked the matter over at considerable length, but I was unable to make any useful suggestions. Mr. Shaw had been in charge of the property since about 1912 and had come there after a successful experience as a manager of a number of bogs in Plymouth County, Massachusetts. There seemed to be no reasonable question that the difficulty lay in something inherent in the locality about which at that time I couldn't even make a guess.

Last summer during the time I was puzzling over this problem in Wisconsin and following a long talk with Professor Musbach, it flashed into my mind that conditions on the Alpena marsh were much like those we had faced on several Wisconsin marshes. There was the same excessive vine growth, the same weed problem, the same unfortunate shortage of crops. A hasty visit to the public library showed that one of the chief industries of Alpena was the manufacture of cement. An analysis of samples of water from Devil's Lake, the reservoir of this marsh, obtained in November through the courtesy of Mr. Halliday and tested at Madison, showed that it had a pH of 7.5 exactly that of water obtained the same month from Fox River near Berlin and Willow Creek at Auroraville which furnished the water for the larger marsh there before it was abandoned.

During my visit to Massachusetts in August of this year I had a talk with Mr. Shaw who in 1932, after 29 years, had given up the Alpena proposition as a bad job and returned to Plymouth County where he is again successfully managing a large string of bogs. At that time Mr. Shaw told me that the best recent crop in this marsh was in 1931 in which 1,000 barrels were produced on 30 acres. It is now very hard for me not to hold the opinion that the record of the Alpena marsh strongly indicates that the difficulties encountered there over so long a period of time were associated with the alkaline water used in flooding.

IN MEMORIAM

An all wise Providence has removed from our midst our esteemed friend and member of this Association, Mr. J. J. Emmerick, whose life has been prominently identified with this Association for a good many years. His able and faithful service in all important trusts to which he was called and which characterized him to a large circle of friends and associates of this Association.

The members of this Association in common with the whole community deeply deplore his loss and join with profound respect and regret in placing on record our estimate of his worth.

Carl Getsinger,
Lloyd Rezin.

IN MEMORIAM

WHEREAS, Divine Providence has seen fit to remove from our midst, a fine neighbor, friend and member of this Association, Mrs. Clark Treat, be it therefore

Resolved, That we as an Association, tender to her family and relatives our sympathy in their bereavement and hereby express our deep sense of loss to us all, be it further

Resolved, That this resolution be inscribed on the minutes of this meeting and a copy be sent to the surviving family.

Oscar O. Potter,
Phil Bennett,
Joe Bean.

IN MEMORIAM

Whereas, death has again entered our midst and taken a beloved neighbor and friend Mrs. Mabel Potter, We of the Growers' Association wish to express our deep sympathy for her immediate Family.

George Bennett,
Joe Bean,
Lucetta Case.

MINUTES OF THE FIFTY-FOURTH SUMMER SESSION

The meeting was called to order at 2:30 P. M. in the Rose Room of the Witter Hotel, Wisconsin Rapids, Wisconsin, on Friday, August 9, 1940, by President Ermon Bennett.

The minutes were read and approved.

Financial report was read.

Speakers on the program were A. U. Chaney, Mr. Alvin Schwendiman, Mr. E. L. Chambers and Professor R. H. Roberts of the Horticultural Department at the University of Wisconsin. Professor Roberts and Mr. Schmendiman spoke about the experimental work they had carried out during the summer with relation to cranberries.

Miss Lucetta Case and Miss Clare Smith were appointed to draft resolution on the passing of Mrs. Wm. Harkner.

A vote of thanks was extended to the Weather Bureau for their cooperation during the past season.

A motion was made, seconded and carried to adjourn.

Anita Berard, Secretary.

MR. A. U. CHANEY

American Cranberry Exchange, New York City

I really didn't intend to say anything.

Cape Cod will prabably have 350,000 barrels this year against 425,000 last year. They will have between 60,000 and 125,000 in New Jersey. There was a great deal of blight on some of the bogs.

The prospects for the market conditions are favorable. I believe that we have a favorable season ahead of us. We had hoped that the three states could at least have as many barrels as last year. Mr. Goldsworthy says we can expect 85,000 to 100,000 barrels in Wisconsin. I want to compliment you on having such a nice crop. Thank you.

IN MEMORIAM

WHEREAS, Divine Providence has seen fit to remove from our midst Mrs. Grace Harkner,

BE IT RESOLVED, That this Association extend its deep sympathy to the bereaved husband and little sons, To the Father, brothers and other relatives, and that a copy of this resolution be sent to the husband and also be included in the minutes of the Association.

Lucetta Case
Clare S. Smith

IN MEMORIAM

Death has again entered our midst and taken from us one who will long be remembered by her kindly smile and cheerful manner, Mrs. Mable Fowler. Be it therefore resolved that we, the members of the Wisconsin Cranberry Growers' Association express to the members of her family our heartfelt sympathy.

Lucetta Case
Mrs. Phil Bennett

MR. ALVIN SCHWENDIMAN
SEED AND WEED DIVISION

The Weed Problem of Some Wisconsin Cranberry Marshes in Relation to the Acidity and Alkalinity of the Marsh Water and Soil

For the past fifteen years certain workers on Wisconsin Cranberry marshes have observed an apparent relationship between the use of alkaline flooding waters and certain cultural problems. Among these problems an apparently greater prevalence of weeds on alkaline marshes has been observed.

In order to clarify this problem more fully a recent survey of nine Wisconsin marshes was made. It is fully realized that the number of marshes surveyed is inadequate for drawing any definite conclusions. Nevertheless, certain observations were made which serve to emphasize the difficulty of fully interpreting this problem without more carefully controlled and standardized management practices on the different marshes. Furthermore, certain observations were made which might be of value in planning any future study of the problem.

The prevalence of various weeds on the marshes is summarized in Table I. A total of 42 sections was surveyed on the nine marshes. The ten weeds which occured the most times as one of the five most prevalent weeds on the sections are listed. It is to be observed that sickle grass occured on 31 of the 42 sections as one of the five most prevalent weeds. This particular grass also occured on all nine marshes as one of the five most prevalent weeds. This would seem to indicate that this weed has not been controlled by the various management practices or that it is not limited by high or low pH values since it occured as a prevalent weed on a marsh with a water pH of 8.2 and a soil pH of 6.5 as well as being a prevalent weed on a marsh with a water pH of 6.2 and soil pH of 4.3.

TABLE I, – THE PREVALENCE OF VARIOUS WEEDS ON NINE CRANBERRY MARSHES

Weeds	Number of times the weed occurred in the stated order of prevalence on 42 sections					Total Number of sections on which the weed occurred as one of the 5 most prevalent	Percent of Cranberry marshes on which the weed occurred as one of the 5 most prevalent weeds
	1	2	3	4	5		
Sickle Grass	11	5	7	6	2	31	100
Wire Grass	12	8		1	2	23	66
Star Grass	1	6	5	1	4	17	55
Bluejoint	5	1	5	1		12	66
Marsh Fern		2	4	1	3	10	44
Horsetail	4	1				5	22
Willows		3		2	1	6	33
Beggar's Ticks		1	2	2	2	7	44
Bunch Grass		1	1	2	2	6	33
Rattlesnake Grass					4	4	44

On the marshes surveyed there does not seem to be any clear cut limitation of certain weed species to marshes with either high or low pH values. The study of a much greater number of marshes would be necessary to establish such relationship. The marshes on which the horsetail species occured as the most prevalent were the two most alkaline marshes. Horsetail species were not found on any acid marshes, but since the number surveyed was limited this is in no way conclusive evidence that this weed can be expected to be more serious on alkaline marshes.

Only a general statement can be made as to the relation of the alkalinity of the water and marsh to the prevalence of various weed species, namely, that in general as the marsh water and soil becomes more alkaline, the per cent of the weeds represented by species of marsh grasses, sedges, rushes, and other monocotyle-donous species decreases and the per cent of the weeds represented by species of dicotyledonous upland plants increases. Thus for the three most acid marshes 93 per cent of the weed species were estimated to fall in the first group and 7 per cent into the second group while for the three most alkaline marshes the division was 74 and 26 per cent respectively.

The information presented in Table II shows the cleanest marsh to be the one which is most acid, which has had very good drainage and which has been estimated to have had the third most weeding effort expended on it. On the other extreme the weediest marsh is one of the most alkaline, has had very poor drainage and has had the least weeding effort.

It can also be seen that the second cleanest marsh while having about the same acidity as the fifth cleanest marsh has had better drainage and the most weeding effort expended on it. Likewise, the fourth cleanest marsh with much more alkaline water and soil than the fifth cleanest marsh would appear to be cleaner because of more weeding effort.

Further study of Table II emphasizes the difficulty of attempting to interpret the weediness of a marsh in terms of the acidity or alkalinity of the marsh alone. Although the more acid marshes appear to be cleaner marshes, it also appears that they have had better management while the weediest marshes have had poorer management.

If conclusive evidence is to be obtained of the importance of soil and water pH as a factor affecting the weediness of marshes, it would seem of utmost importance that the management of the marshes to be studied be kept a constant factor and that an accurate record be kept of the weeding effort on the various marshes studied.

Certain other observations on individual marshes seem worthy of recording. The marsh of A. Searles and Son at Hertel, Wisconsin, is underlain with marl at many places and the soil had an average pH value of 6.8. On a newly established marsh which was extremely weedy it was observed and pointed out by one of the operators that where sand from the top of a sand bank had been used. the weeds were less prevalent and the cranberry vines showed much better growth than where sand from the lower portion of the sand bank had been used. Subsequent tests on the sand bank gave the following result:

Depth of Sand	pH
1-2 ft.	5.6-5.8
3 ft.	6.2
5 ft.	6.6-6.8
20 ft.	7.8-8.0

The use of fairly acid sand on neutral or alkaline marsh soil may be of considerable value in establishing the cranberries and eliminating the growth of many weeds.

Observations made on two other marshes indicate that the proper use of sand on marshes may be a factor in reducing weed growth. In a certain section on the marsh of Mr. Taylor at Tunnel City an extremely clean portion was observed adjacent to a sand bank which had been leveled out into the marsh so as to widen the section. The pH of the surface sand in this clean portion of the section was 5.0 while on the opposite side of the section where there was no sand and many weeds the pH of the peat was 5.8. A similar observation under similar circumstances was made on the Walter Case marsh at Turtle Lake, Wisconsin.

Although the information presented in this report is by no means believed to be conclusive evidence of a relation between soil and water pH and the seriousness of the weed problems on cranberry marshes, it is believed that such relationship does exist and that the observations here recorded will aid in planning a more thorough study if and when such a study is possible.

TABLE II. – THE WEED INFESTATION OF MARSHES IN RELATION TO WATER AND SOIL pH AND MARSH MANAGEMENT

Marsh	Acres	Average pH Readings*				Management***	
		Lake or Reservoir Water	Water in Marsh Ditches	Marsh Soil	Weed Infestation Index on Established Marshes**	Drainage	Approximate Rank of Weeding Effort per Acre per Year
Gillette	2	7.6	7.3	6.8	745	Very Poor	9
Bennett	15	8.2	7.1	6.5	650	Fair	7
Searles	50	7.5	7.3	6.8	567	Very Poor	8
Case	20	7.6	7.0	6.5	384	Good	5
Cranberry Lake	160	6.7	7.0	6.5	384	Good	6
Taylor	4	7.9	6.7	5.6	295	Fair	2
Rezin	30	6.5	6.3	5.4	280	Good	4
Shue	4	6.9	6.4	5.2	100	Very Good	1
Jack	4	6.2	6.0	4.3	80	Very Good	3

* All values the average of from 3 to 8 readings.

** These values are based on an estimation of the extent of the weed infestation and its density. Thus if 20 per cent of a section were covered with a light general infestation of a density of 2 and 70 per cent of the same section was covered with definite patches of a heavy density of 6, the index would be 20x2 + 70x6 =460.

*** This information based on observation and statements from the managers of the various marshes.

MINUTES OF THE FIFTY-FOURTH WINTER MEETING

The meeting was called to order on December 18, 1940, at 2:30 P. M. in the Rose Room of the Witter Hotel, at Wisconsin Rapids, Wisconsin by Pres. Ermon Bennett.

The minutes of the meeting were read and approved.

The financial report was read and approved.

Motion made and seconded to re-elect all the old officers for the ensuing year. Motion carried.

Speakers on the program were Mr. A. U. Chaney, E. L. Chambers, State Entomologist, and Professor R. H. Roberts, of the Horticultural Department of the University of Wisconsin. Professor Roberts showed quite a number of slides with relation to the research work he had carried out during the past summer, and discussed many of his findings with the growers.

A vote of thanks was given to Mr. Daniels for the use of the Rose Room.

There being no further business, a motion was made to adjourn. Motion carried.

The annual banquet was held at 6:30 in the dining room of the Witter Hotel. Because of the inclement weather there were only about one hundred members and their wives present. Music for dancing was furnished by the Castilians. Mr. G. O. Babcock acted as master of ceremonies.

Anita Berard, Secretary.

A. U. CHANEY
PAST SEASON'S SUCCESS

Gentlemen, Mr. President and friends.

I know I have very little to say. I want to congratulate you on the largest crop you have ever produced. I don't know how many more big crops are going to follow in succession. The Exchange average price will be approximately $13.10 or something like that. For a big crop that is a good average. The Eastern companies will average about $3.00 a barrel less than you will for their returns. You have a freight advantage of about $1.00. I think the Exchange has demonstrated its ability to pay you good returns. All three states will show very satisfactory returns for the past season. I think we all have reasons to be very happy. I sincerely hope we will see other years like this. We don't often have them. I don't know if we have ever had three big crops in a row before or not. Mr. Hedler said he thought it would be nice to have $10.00 a barrel for a big crop if he could have a big crop every year. The price depends a great deal on the demand as well as the production. The demand is just as important as the supply.

We try to get all we can for the berries and sell the entire crop each year. We figure the prices on a period of five year averages. By cooperating and continuing to stick together, we can get the full value for the crop if we have it, be it large or small, but without cooperation we could do very little. By cooperation we can guess as to what we can get for the starting price. It is very largely a guess. We try to estimate the demand, you estimate the supply. By experimenting, we feel we are a judge as to the conditions of berries which are to be consumed. The demand effects the price more than the supply. All of these things taken into consideration have to be thought of when we guess at the starting price. By cooperating, we try to start with a good price and sustain it and I think we did a good job this year.

SOLVING OUR PEST CONTROL PROBLEMS
E. L. CHAMBERS

There are certain limiting factors governing the well being of any industry, and success or failure depends upon the ability of the individual to cope with these factors. While Wisconsin has fewer serious pests to deal with than many states, especially as compared with our eastern states, we can by no means claim to have a Utopia. The state of Michigan once was in a position to claim, as it did, for many years, that it was an ideal apple growing state because of the absence of the Codling moth, which was and is today our most serious pest of the apple.

Pests exist by reason of the unnatural surroundings of the civilization in which we live. In a state of nature, there is, correctly speaking, no such thing as a pest, but man, now living in an artificial world of his own making and by his every act, particularly by cultivating land, has disturbed the balance of nature to such an extent that pests are now inevitable. Man is therefore compelled to fight nature for his very existence, having produced food supplies in unnatural abundance in limited areas as is being done in cranberry production, for instance.

The creatures which naturally feed thereon have been encouraged, likewise, under the most favorable conditions. Then again, other organisms, finding their natural food plants diminishing in number, have turned their attention to the limitless supply provided by cultivated bogs, In addition to this, the spread of civilization and the development of agriculture in general, as well as the more direct action of man himself, have all tended to destroy or discourage many of the natural enemies of these species which have now, in many cases, become pests.

Moreover, cultivated plants bred to give increased production or to improve the quality of fruit, are frequently more subject to and more affected by the attack of insects and diseases. We can observe instances of this kind on every hand in our propagation work. One striking example of this has recently been brought to our attention in the development of hybrid corn, now being used so extensively to replace the less desirable open pollenated varieties. The corn leaf aphis, seldom seen and never observed doing serious injury over large areas, has, during the past few years, appeared as the worst pest of field corn where some of these hybrids are being grown. Apparently, certain immune factors which were developed naturally over years of time eliminated this pest problem, and then in inbreeding to develop strains desirable from other standpoints, this weakness has been brought to life.

Man, through scientific research, is constantly working against nature and it is essential that he persist in doing so with ever increasing vigor if he is to remain successful in the struggle for existence. As I have pointed out repeatedly, our knowledge of pests and the methods of dealing with them is, as yet, very incomplete, and much still remains to be discovered even though great strides have been made in recent years. We know a little about a lot of pests, but not enough about any of them. This is especially true with cranberry pests. We shouldn't become discouraged because it seems to be taking a long time to get sufficient research done on a cranberry pest to give us a sure cure, because after all, it takes years and years, as has been demonstrated in the case of the Codling moth which has been studied by scores of investigators in most of our forty-eight states for fifty years or more. We still have not been able to cope with this pest without following a complicated and expensive spray program over the entire growing season.

While general principles of insect and disease control can be worked out that have nationwide application, we must face the fact that no spray schedule can be worked out applicable to all cranberry growing regions, or, in many cases, even in the same region. It is for this reason that we feel it is very important for each grower to try out recommendations found useful on another bog on a smaller scale at first, maintaining adequate checks to enable him to determine definitely how much was gained through the treatment. Sometime startling results are obtained and credited to a treatment, whereas had a check plot been maintained, it would have been revealed that there was no significant difference between the treated and untreated plots, and the real factors can then be discovered. We are hopeful that we can develop an adequate supply of insect and disease free vines to take care of the demands for vines for new plantings. However, at the present time we are compelled to certify vines having a trace of false blossom in order to meet the needs for planting stock. Until we find an effective control measure for the pests we already have on our bogs, we must depend upon regulatory measures in the way of plant quarantine enforcement to delay the spread of new pests, and to this end, the department cooperates with the federal government in the enforcement of more than a score of domestic and foreign plant quarantines. Such pests as the Japanese beetle, brown tail and gipsy moths, and the white-fringed beetle, which do not occur as yet in Wisconsin, are subjects of these quarantines.

If we could deport from our country undesirable insects as we do undesirable citizens at times, these insects just named would be on the top of the list selected for expulsion. The Japanese beetle has spread westward from New Jersey, where it was first discovered in 1916, as far as St. Louis and Chicago, and is now as near our borders as Evanston and Elgin, Illinois. Each year, especially constructed traps baited with geranol are put out in areas outside the known infested areas of the country, including points here in Wisconsin, but no beetles have been recovered here as yet in these traps.

Some of our growers have been approached by representatives of firms manufacturing electric insect traps and electrocution units, and have inquired of our office about their merit. The literature we have examined would indicate that "the most bugs, moth, and insects" as they word it, are attracted by light and so they leave the impression that with some of these electrocuters in your possession, you could solve your bug problems, including the annoying mosquito. On the contrary, we wish to point out that it is common knowledge among economic entomologists who have long made use of various types of light traps, that the bulk of our honest to goodness pests are not attracted to such lures. The fact of the matter is that many of the light susceptible insects which succumb to these electrical devices include mostly such indispensable forms as devourers of plant lice, parasites of many of our plant pests, and pollenators of blossoms. Furthermore, those aquatic insects that in one period or another of their life cycle furnish the natural food of fish are highly susceptible to these lights, and cottages along our river banks and lakeshores equipped with these electric grids destroy an incalculable number of the natural sources of food for fish. Such insects as Caddis flies, fish flies, stone flies, Dobson flies, and May flies, do no harm and furnish an irreplacable food for trout and other fish.

If these lamp manufacturers could show us evidence of mosquitoes being lured to and destroyed against the live wires, we would be a little more enthusiastic about recommending them, at least for use in summer cottages along the lake shore. We understand that mosquitoes have been experimentally attracted by electrically controlled vibrations that reproduce the hum or musical note produced by the whirring wings of the mosquitoes, but even this arrangement we fear would have little effect

on the mosquito population. In short, we do not think the electric insect traps and electrocutors would be a worthwhile investment for cranberry pest control.

IN MEMORIAM

An all wise Providence has seen fit to remove from our midst Mrs. Frank Wuersch, a fine neighbor and member of this Association, therefore be it

Resolved, That we extend our sympathy to the surviving family and that a copy of this resolution be placed on record.

Joe Bissig
A. E. Bennett

SUMMARY OF TALK BY PROFESSOR R. H. ROBERTS

Professor of Horticulture, University of Wisconsin College of Agriculture, Madison, Wisconsin

From the results of preliminary observations and experiments of cranberry cultural problems in Wisconsin, Professor Roberts placed the principal emphasis on the matter of growth and fruiting habits of cranberry plants. In other words, how cranberries actually grow, rather than any definite procedure of how the growers should grow cranberries. No consideration was given to the insect pests and plant diseases found on cranberry bogs in Wisconsin, but some study was given to the weed problem which is very important in Wisconsin. A number of Wisconsin growers cooperated in gathering data on the growth, fruit set and yields of cranberries. These growers are C. L. Lewis, Jr., and his son Charles Lewis, Guy Nash and his son Philleo Nash, Ermon Bennett and Newell Jasperson.

The most striking and consistent relation was found between the growth and productivity of the cranberry plants. A total annual growth of 2½ to 3½ inches was found in practically all instances where the vines were in heavy production. This seemed to be true for the different varieties. It was further observed that some varieties grew more than others and consequently this made these varieties have a lower production. This was found to be true particularly in the case of the Howe variety.

In taking measurements of the growth made by an upright during any year it was found by the time the fruiting uprights came to full bloom, that a desirable amount of growth was reached. This then would suggest that an important item is the handling of water to avoid excessive early season growth. Further study of the role of temperature and the amount of growth procured should be studied in connection with the problem of reflooding in the spring. The problem raised is, does late growth, when the weather is apt to be warmer, tend to give too much growth? It is very evident many marshes made more growth than that which was found to be associated with good yields.

An important factor effecting the production is that of shade, either by weeds or the self-shading thick vine growth. The blossom bud formation did not seem to be much effected by poor production resulting from poor setting of fruit. Preliminary work was done on some of the Wisconsin Marshes with the effect of different amounts of pruning done to improve the light conditions. Increased light reduces the amount of growth as well as the percentage of blossom setting. Uudoubtedly, actual yields may be increased in the case of too heavy stands of plants if the pruning is not severe enough to greatly reduce the number of uprights. Professor Roberts gave particular attention to the problem of pollenation. It was found by Professor Roberts that the pollen is ripe and the blossoms are receptive to pollenation during the short time when the blossoms are first opening. It was further found that the pollen was distributed by gravity and when the open blossoms are shaken by wind, visiting insects, or any other jarring agencies. Insects which carry pollen were particularly absent from many marshes this year, indicating they are not responsible for the good crops of fruit which set the past year. In examination of the fruit, it was found the size of the fruit is associated with increase of cell size rather than increase of cell number.

Other items studied, but of which a definite report could not be given at this time are the reaction of a specific fertilizer elements, winter protection, irrigation, time of blossom formation, water during the leaf drop.

OUR PEST CONTROL STATUS

E. L. CHAMBERS

Without doubt, the cranberry industry, if not already so, is rapidly becoming one of Wisconsin's biggest "Little Industries." It deserves all the encouragement that can be given it by the various agencies of the state if for no other reason than because of the thousands of acres of otherwise useless land it places on the tax roll and the thousands of men and women to which it offers employment. With the Wisconsin crop selling as it has during the past two years for more than a million dollars, who can say it isn't worth a little investment on the part of the state to safeguard against such calamities as insect and plant disease losses. With still more marsh area especially well adapted to the culture of cranberries and of no practical value for anything else, there is plenty of opportunity for expansion in this industry here in Wisconsin. In fact, this state has possibilities of some day leading the nation in the production of this crop. Already it competes with New Jersey at times for second place, and certainly ranks first in the production of berries with superior keeping qualities.

A recent check-up reveals that 2,334 acres of cranberries are now under cultivation, and while there has been only slightly over 100 acres' increase in acreage during the past decade, there has been a very substantial increase in producaion. A glimpse at a graph giving the average annual production from 1929 to 1938, for instance, shows an almost unbroken line with an increase of ten percent each year, starting at 42,000 barrels in 1929 and ranging to 92,000 barrels in 1938. The 1940 crop, we understand, like the 1939 one, will exceed 100,000 barrels. This represents an increase in production for the state as a whole of from 20 barrels per acre to slightly over 39 barrels per acre.

While many factors, some of them perhaps unrecognized, must have entered into the noticeable change, no one familiar with the industry would question that the assistance by our cranberry specialists, making possible improved insect control and other changes, plays a very important part. All vines used in replanting old sections and planting new ones are carefully inspected and only those found reasonably free from false blossom are certified for planting. A careful check is maintained for incipient insect outbreaks and the growers are advised, following field inspections, as to what insect control measures should be applied and when to apply them.

Probably the most important development in this project during the past few years is the establishment at Biron of a trial vine nursery under the cooperative agreement of the Wisconsin Cranberry Sales Company, the United States Bureau of Plant Industry, and the Wisconsin Department of Agriculture. The Department hopes to be able to select strains of varities of cranberries having superior commercial qualities and possessing a certain amount of resistance to false blossom, the virus disease which looms over the industry as a threat to its future. These vines, you will recall, originate from some of the hybridization work carried on by Mr. Bain a few years back and give promise of being very much worthwhile.

Included in this trial nursery are some twenty of the best native wild varieties that were growing in Wisconsin during the years from 1922 to 1936, and selected by one of our specialists. Most of the other plants, however, are seedlings which resulted from crosses between varieties known to be commercially successful here. These crosses were made as I mentioned by Mr. Bain of the U. S. Bureau of Plant Industry, formerly a specialist with this Department. Exactly 984 such seedlings planted at Biron were selected from 1,700 plants being grown under observation by the government in a New Jersey trial nursery. Arrangements have been made to secure additional selections of other seedlings coming into bearing in that nursery.

Since growing conditions in Wisconsin are so different from those in New Jersey, it is important to be able to thoroughly test these plants in a trial plot here before attempting commercial planting. Besides the original cost of planting, which in itself represents a big outlay of cash, the maintenance of the bogs for five of six years before a crop can be harvested makes it important that only vines which have been tried and found to be satisfactory should be recommended. Being able to select seedlings from the New Jersey trial bog is of decided advantage in that the obviously inferior plants are discarded, eliminating the need and expense of testing them here.

Studies made by our specialists during the past few years in an attempt to find a solution to certain field problems, reveal that the relation of alkaline flooding water to cranberry culture in this state has not yet been given enough consideration. In a paper recently accepted for publication by the Wisconsin Academy of Science, the specialists have summarized their observations supporting this point over a period of 15 years. The evidence presented was based on the history of the industry in Wisconsin and on the known performance of most of the cultivated marshes here.

Because it is becoming increasingly difficult to secure adequate quantities of the vines of certain desirable varieties free from false blossom, attempts have been made during the past two years to free infected plants from the disease by drastic treatments with heat. This method has apparently been successful in the case of one or two virus diseases, and has proved a failure in others. It will be at least another year or two before the final results of the experiments will be available. It has been discovered that dormant cranberry cuttings will endure submergence in water at a temperature of 50 degrees Centigrade for thirty minutes without injury. The possibility of establishing a disease-free nursery to serve as a source of plants has been considered.

Dusting and spraying for the control of the blunt-nosed leaf hopper which transmits the false blossom virus disease from infected to healthy plants, is carried on regularly by most of the larger growers now on whose marshes the disease is at all abundant. While the growers usually secure fairly satisfactory control of this insect and the progress of the disease has been greatly retarded by these measures, its continued spread does not appear to have been stopped on the most susceptible varieties. Pyrethrum and rotenone dusts and sprays are being used to an increasing degree, to replace the former practice of flooding with water, due to the risk of injury to buds incident to flooding.

The cranberry fruit worm, while usually of local rather than general occurence on Wisconsin marshes, recently has caused serious losses on a number of them. Good control has been obtained by dusting with rotenone bearing dusts where the applications were accurately timed.

While the Department has been able to maintain insect and disease control at a fair level of efficiency on the basis of earlier research and by taking advantage of the Massachusetts Cranberry Experiment Station, additional research work under Wisconsin conditions is greatly needed. Specialists in this field are hard to find, in that they must be versed in both the culture of cranberries and trained in recognizing and controlling their insect and disease enemies.

Soon after the Department laboratory was established, the Department's specialist was taken over by the federal government and the appropriation cut one-half with the result that the activities during the past few summers have been restricted to locating incipient outbreaks and to control activities only. Because of a lack of available information on the control of these pests, there is a need for considerable investigation work under Wisconsin conditions before our specialists will be able to provide the growers with the service they need.

While Dr. Stevens expects to be with us the entire summer this year and will devote about four months' time beginning about May 22nd, you realize that this is hardly adequate to even take care of the emergencies that arise and does not permit of any of the much needed research, to say nothing of directing field control work. In Massachusetts, we understand, Dr. Franklin has two federal assistants working with him in the laboratory carrying on research work the year round, and the state has a full time man working in the field. Likewise, we are told that the larger growers have full time men doing insect control work. Three of the largest growers there, we believe, have nearly 2,800 acres among them, and employ six full time men, while here in Wisconsin we have but one specialist working only during the summer on nearly as great an acreage, spread out over several counties requiring much time for travel. Were it not for the splendid cooperation we have been able to receive from Mr. Vernon Goldsworthy, your Cranberry Sales Company Manager, in assisting you in your pest control problems, we would find it impossible to do even as well as we are.

MINUTES OF THE 55TH WINTER MEETING—2:30 P. M., ROSE ROOM WITTER HOTEL

The meeting was called to order on December 8, 1941 at 2:30 P. M. in the Rose Room of the Witter Hotel, at Wisconsin Rapids, Wisconsin, by Pres. Ermon Bennett.

The minutes of the August meeting were read and approved.

The financial report was read and approved.

Motion made and seconded to re-elect all the old officers for the ensuing year. Motion carried.

Speakers on the program were Mr. A. U. Chaney, E. L. Chambers, State Entomologist and Prof. R. H. Roberts of the Horticultural Department of the University of Wisconsin. Prof. Roberts showed quite a number of slides with relation to the research work he had carried on during the past summer and discussed many of his findings with the growers.

A vote of thanks was given to Mr. Daniels for the use of the Rose Room.

There being no further business a motion was made to adjourn. Motion carried.

The annual banquet was held at 6:30 in the dining room of the Witter Hotel. Because of the inclement weather there were only about one hundred members and their wives present. Music for dancing was furnished by the Castilians. Mr. G. O. Babcock acted as master of ceremonies.

Anita Berard, Secretary and Treasurer.

MINUTES OF THE 55TH SUMMER MEETING, 2:30 P. M., ROSE ROOM WITTER HOTEL, ANGUST 14, 1941

The meeting was called to order on August 14, 1941, in the Rose Room of the Witter Hotel at Wisconsin Rapids, Wisconsin, by President Ermon Bennett.

The minutes of the December meeting were read and approved.

It was announced that anyone wanting muskrat tags would have to get them from their local game wardens as the Sales Company would no longer be able to furnish them to the growers.

Speakers on the program were Mr. C. M. Chaney who spoke on the crop prospects, and the present marketing conditions. Mr. Chaney also read a telegram from Mr. A. U. Chaney who was unable to come to the meeting because of his health. Prof. R. B. Roberts of the University of Wisconsin, Department of Horticulture, gave a brief summary of his work with cranberries during the summer. Dr. Neil E. Stevens gave a talk on "Boom Days in Berlin." There was a brief discussion on Dr. Stevens talk.

A vote of thanks was given to Mr. Daniels for the use of the Rose Room.

There being no further business the meeting was adjourned.

Anita Berard, Secretary and Treasurer.

MINUTES OF THE 56TH SUMMER MEETING OF THE WISCONSIN CRANBERRY GROWER'S ASSOCIATION, AUGUST 12, 1942

Meeting was called to order by President Rolland Potter of Camp Douglas, who gave the opening talk.

President Potter next called upon C. M. Chaney to give us his impressions of the outlook for the 1942 marketing season. Mr. Chaney said he thought 1942 would be a very successful season for the Wisconsin Cranberry Growers and while sugar would be a problem it probably would not be a serious one. Mr. Chaney also discussed the value of the advertising in selling cranberries and stated that the consumer buying power was very large.

President Potter next called upon Noel Thompson from Mr. E. L. Chambers' department. Mr. Thompson gave a very interesting talk on flooding injury at the time of fireworm flooding because of the lack of oxygen. He pointed out several practices which the growers might make use of to avoid injury and suggested several new ways to approach one problem of water injury.

Clyde McGrew next spoke on the matter of transportation telling the growers the change of methods in loading cars and the new rules regulating the length of time a car could be held on the track.

The next speaker was Mr. Weifenback of the War Production Board who gave the growers information on how to proceed in order to get a priority rating for equipment and supplies that they might need. He explained the scarcity of many supplies and the need for our Government to regulate all our supplies if we were to win the war in the most economical manner. He told us he would be very glad to be of any assistance he could at any time.

Mr. Anderson of Cranberry Canners was present and spoke on the increase in canning the last few years and how it helped to benefit the cranberry industry by taking the poor berries off the market.

Mr. Potter next appointed a committee of Dan Rezin, Albert Hedler, and Roy Potter to pass on and draw up a resolution on the passing of Mrs. Jacob Searls, and Mr. F. D| Calway.

Dr. Bergman of the Experimental Station in Massachusetts was the next speaker. He gave a fine and instructive talk on winter flooding injury. As a direct result of his talk many of the Wisconsin cranberry growers will change their flooding practices and thus add materially to their crop in future years.

Mr. H. H. Smith of the Farm Placement, Supervisor of the U. S. Employment Service gave a talk on the matter of securing the necessary labor to harvest the 1942 crop. Both he and Mr. Flynn of the same office, who followed him on the program, spoke of their willingness to help the growers secure help for harvesting in 1942 and suggested several worth while procedures.

Mr. W. F. Huffman next suggested the Growers' Association take some action on having the key men in the cranberry industry deferred. After some discussion by the various members a war activities committee was formed. Mr. Potter named on the committee, Mr. Wm. F. Huffman, chairman, Guy Nash and Bernard Brazeau.

There being no other business, the meeting was adjourned.

Vernon Goldsworthy, Secretary.

MINUTES OF THE 56TH ANNUAL MEETING OF THE WISCONSIN CRANBERRY GROWERS' ASSOCIATION, HELD AT THE REALTY HALL, WISCONSIN RAPIDS, WIS, DECEMBER 16, 1942

The meeting was called to order by Mr. Wm. F. Huffman, Vice President, as Rollie Potter was unable to attend.

After Mr. Huffman's opening talk the first speaker was Mr. E. L. Chambers, State Entomologist from Madison, who spoke on the work of his department and their plans for 1943 insofar as cranberry work is concerned. Mr. Chambers also told the growers that practically all insecticides would be very scarce and very difficult to get next year, and he warned them to be on a look out for the beginning of insect infestation so that it could be checked promptly with a small amount of insecticides rather than waiting until later which would require a much heavier application of insecticides with probobly less successful results in the matter of control because the insects are so much harder to kill when they approach maturity. Mr. Chambers also spoke on the work of his department during the past year and gave some of the results of Dr. Stevens' and Mr. Thompson's experiments with relation to the oxygen deficiency for cranberry flooding water.

After Mr. Chambers talk the Secretary read a letter from Dean Christensen of the College of Agriculture expressing his regrets of being unable to attend the Grower's Association meeting because of a previous engagement.

The next speaker was Mr. Fred Bushnell of Wisconsin Rapids, Secretary of the Rationing Board, who spoke to the members on various phases of rationing such as gasoline, rubber boots, fuel oil and similar items. Mr. Bushnell's talk was particularly instructive and was followed by numerous questions from the floor by various members.

County Agent's, Mr. Lathrope's letter was read with reference to securing a cranberry appropriation from the Legislature to carry on cranberry work for 1943. After some discussion with members the matter was tabled until some future time.

Mr. Huffman then next called upon Mr. Carl Vehrs of Wisconsin Rapids who is chairman of the County War Board. Mr. Vehrs explained the rationing of farm machinery and discussed the benefit payments of cranberry growers under the A. A. A. He stated that standing payments for cranberries was being discontinued because of the lack of funds and it was necessary for the A. A. A. Program to drop that part of their work with benefit payments for usual farm practices of which cran-

berry sanding is considered as such. Several of the growers discussed the matter of Soil Conservation Benefit Payments for sanding and all growers expressed a desire to see it continued if at all possible so as to keep cranberries listed as an essential food.

Mr. Huffman next reported on his committee known as the War Activities Committee of which he is chairman and brought up to date the matter of draft deferment of the key men in the Cranberry Industry.

A report was also given by the Secretary of the meeting in Chicago with the A. A. A. officials with reference to sanding under that Program.

A motion was made by Mr. F. F. Mengel to appoint a labor committee to work out the labor problems for the various growers in 1943. This motion was seconded by Mr. Jonjak. The motion was unanimously carried. The members of the Labor Committee as appointed by Mr. Huffman are as follows: The Wisconsin Rapids District—Bernard Brazeau, Roy Potter, F. F. Mengel.

The Warrens-Mather District—Guy Potter, Dan Rezin, Chelcie Treat.

The Hayward District—Tony Jonjak.

The Spooner District—C. L. Lewis.

The Phillips District—Albert Hedler.

The matter of dues was next brought up and in a motion made by Mr. Duckert it was suggested to have the dues of the Wisconsin Cranberry Sales Company of $2.00 a year raised to $3.00 a year. The motion was seconded by Mr. Brazeau. The motion was carried unanimously.

A motion was made by Mr. A. E. Bennett that the Secretary get together the minutes of the last six years which have not been published and get figures on the cost of their publication and report at the next meeting. The motion was seconded by Mr. Hill and was carried unanimously.

The next matter of business that was brought up was the election of officers. Mr. A. E. Bennett made a motion that the officers be re-elected for the coming year. Motion was seconded by Mr. Hill. A motion on a vote of acclamation. Motion was lost. Mr. A. E. Bennett then made a motion to rescind the previous motion and this was seconded by Mr. Hill. The motion carried.

A nomination committee was next appointed consisting of Roy Potter, F. F. Mengel, and Albert Amundson, with Albert Amundson as chairman. The nominating committee made a report as follows: Mr. Wm. F. Huffman, President, Mr. Bernard Brazeau, Vice President, Mr. Vernon Goldsworthy, Secretary and Treasurer. A motion was made by Mr. Treat and seconded by Mr. Hill that the Secretary cast a unanimous vote for the above officers. The motion was carried. There being no other business the meeting was adjourned.

Vernon Goldsworthy, Secretary.

MINUTES OF THE 57TH SUMMER MEETING OF WISCONSIN STATE CRANBERRY GROWERS' ASSOCIATION, HELD AT THE REALTY HALL AUGUST 11, 1943, 10:00 O'CLOCK A. M.

The meeting was called to order by President, William F. Huffman.

Moved by Albert Amundson that the reading of the previous meeting be dispensed with because of a full program. Seconded by Bernard Brazeau. On vote by acclamation. Motion carried.

Mr. Huffman first called upon Mr. C. M. Chaney of the American Cranberry Exchange who gave a brief report on the crop situation to date. Mr. Chaney indicated that the crop prospects were for a smaller crop than last year, but for a larger crop than a normal one. He anticipated that the price would be good and said that the Exchange had more orders for fresh cranberries than they could possibly fill. He urged the growers to harvest as late as possible to get quality fruit.

Clyde McGrew was next called upon and he spoke of his visit at the various markets during the summer and stated that cranberries like all other fruit would sell for a very good price. He was quite sure the growers would get very good prices for their 1943 cranberry crop if we did not have a price ceiling.

Motion made by Guy Nash that the reports of the Wisconsin State Growers' Association be printed and published. Motion was seconded by C. L. Lewis, Jr. Motion carried.

Mr. Wm. F. Huffman next called for a show of hands to determine the number of marshes represented. By a count of hands sixty marshes were represented.

Mr. Wm. F. Huffman next discussed the work the Wisconsin State Cranberry Growers' Association had been doing with reference to getting key men in the industry deferred and stated that from now on the growers should make their applications individually, but that the Association was willing to help any time they could be of assistance. Such a procedure was found to be most satisfactory to the draft board in Wisconsin.

Major Gilbert Seaman of the State Selective Service Headquarters at Madison, was next called upon to bring the members up-to-date with reference to the Selective Service Regulations, as it affected the Cranberry industry in Wisconsin. He gave a very full report on this subject.

Fred Bushnell next gave a discussion as to the services the rationing board could render the cranberry growers. He stated that gas would be available for everyone employed in harvesting cranberries and that application could be made to the local rationing board where the marsh was located or the gasoline coupons could be handed out by the growers to their harvesting help. Mr. Bushnell also said that boots were available and that growers should apply to their local rationing board for certificates to buy boots. He said he is quite sure that most stores have a stock of boots on hand and the growers could encounter little difficulty in getting their boot requirements for this year.

George Baumeister, County Agent of Shawano County, who was appointed by Arlie Mucks, supervisor of farm procurement to handle several of the state labor recruitment programs appeared with Mr. Mucks. Howard Lathrope and Ed Vruwink, and outlined the plans that they had worked out for the recruitment of labor for the cranberry harvest. Mr. Baumeister said they felt reasonably sure that they would be able to handle the labor situation for the cranberry harvest to the satisfaction of the growers. He suggested that the labor committee still function and serve in an advisory capacity to him and stated, while their task was not an easy one he was sure they could handle it.

Bernard Brazeau next gave a very complete and comprehensive report on the study of the manpower situation insofar as the cranberry industry was concerned. He stated he thought it would take about eighteen hundred to twenty-one hundred men for the cranberry harvest and that the work of the committee showed that part of this labor requirement could be acquired by the growers themselves, but the balance would have to be obtained from some outside source. It seemed, according to his report, that most of the marshes would be able to get along pretty well with their own recruitment program with the exception of Wood County marshes and they would have to have some help. Mr. Brazeau also told of his experience with the Jamaicans, of which he had about thirty employed at this time.

Professor Marvin Schaars, of the State Selective Headquarters at Madison, who has complete charge of agricultural deferments in Wisconsin next gave a very interesting discussion on the deferments of agricultural workers. He suggested any growers could contact him at any time with their individual problems and he would be glad to be of any assistance that he could to the cranberry industry.

Mr. Huffman next outlined the program of his labor committee with reference to advertising for harvesting help in a number of Wisconsin newspapers and on the radio. After some discussion of the program by the members, a motion by Mr. Mengel that the Wisconsin State Cranberry Growers should carry on such program and assess the members two dollars to carry on such work. The motion was seconded by Bernard Brazeau. Motion carried.

Motion by Bernard Brazeau that the advertising that went out on the radio and in the newspapers specify minimum wage rate of sixty cents an hour plus an opportunity to earn more, with the details being furnished by the local farm labor recruitment office. The motion seconded by William Thiele. Motion carried 25 to 3.

Mr. Huffman next called upon Doctor Neil Stevens to give his report and Dr. Stevens said because of the lateness of the hour he would dispense with his talk.

Motion by Bernard Brazeau, seconded by F. F. Mengel to adjourn. Motion carried.

Vernon Goldsworthy, Secretary.

MINUTES OF THE 57TH ANNUAL MEETING OF THE WISCONSIN STATE CRANBERRY GROWERS' ASSOCIATION — REALTY HALL DECEMBER 8, 1943 — 2:00 P. M.

Meeting called to order by President Wm. F. Huffman.

Mr. Huffman first spoke on the passing of three members of the Wisconsin State Cranberry Growers' Association. Namely: Albert Amundson, Gus Otto and Lucetta Case. Motion by A. E. Bennett that the Secretary write the families of the above three members a letter of condolence. Seconded by Guy Potter. Motion carried.

Mr. Wm. F. Huffman next called upon Mr. Clarence Jasperson to tell the growers about the picking machine, which had been developed this fall by Robert Case and sponsored by eight Wisconsin growers, Clarence Jasperson, Charles Dempze, Roy Potter, Guy Potter, O. O. Potter, A. E. Bennett, F. F. Mengel and Bernard Brazeau. Mr. Jasperson said he was sure the picking machine had very definite possibilities and he was sure that the bugs could be all ironed satisfactory this winter or by one more harvesting season. While he thought it might soon be possible to market the machine he was sure it would be a year before they could get into production.

President Huffman next called upon Mr. A. M. Chaney to give a report on the 1943 season. Mr. Chaney said he was sure that the 1943 season was the most successful that the Exchange had ever experienced. He stated that the Wisconsin crop was of unusually good color and quality this year and complimented the Wisconsin growers on their good judgment in having a good supply of boxes on hand. He said The Eastern growers lost thousands of dollars in 1943 because they did not have a supply of boxes on hand.

Mr. Charles Lewis was the next speaker and gave a very interesting talk on the oxygen content of flooding water at Beaver Brook. He illustrated his talk with graphs which showed clearly that flooding can be deficient in oxygen content and that when this condition is present cranberry vines are sure to suffer leaf-drop or definite injury to the fruit buds.

Noel Thompson of Mr. E. L. Chambers Department next spoke on some of the experimental work he had carried out during the past summer with relation to fireworm flooding and the resulting injury. He stated he was sure that the color of the water and its temperature were very important insofar as damage due to flooding for fireworm was concerned.

Moved by Guy Potter, chairman of the nominating committee that the following officers be elected for the coming year: Bernard Brazeau, President, Wm. Thiele, Vice President and Vernon Goldsworthy, Secretary and Treasurer. Seconded by George Hill. Motion carried unanimously.

Mr. Brazeau then took the chair.

Moved by Albert Hedler that the labor committee be continued with the President as chairman of the committee. Seconded by Dan Rezin. Motion carried unanimously.

Mr. Huffman brought up the matter of having the annual reports printed. After some discussion on the subject Guy Potter moved that the financing of the publication be assessed the members on a barrel basis. Seconded by Craig Scott. Discussion by Mr. Nash with reference to various members making additional donation to support this work. Question called for and on vote motion carried unanimously.

Moved by Dan Rezin and seconded by Joe Bissig to adjourn. Motion carried.

Vernon Goldsworthy, Secretar.

MEETING OF THE WISCONSIN STATE CRANBERRY GROWERS' ASSOCIATION — DECEMBER 8, 1943

SUBJECT: — PICKING MACHINE

by CLARENCE JASPERSON

Automatic Cranberry Device, if likened to your wife, she has faults but you do not tell about them. Last September eight cranberry growers got together and discussed the financing and building of such a machine. For many years past there has been no decided improvement in the harvesting of cranberries. Years ago on our marsh there were 200 to 300 pickers, who picked by hand. The entire crop now is being harvested by raking.

Ten years ago Harry Whittlesey lived with me and was working on a harvesting machine. He worked on plans one whole winter. He died and I know nothing of those plans. I wished I had been more attentive and interested then. In the East they have been working on the development of a harvesting machine and trying to perfect one. The cost of such a machine is about $2,500 or $3,000. There was no group around here who would want to invest that much money to develop such a machine, but there were eight growers who pooled their financial interests and employed Robert Case full time to work on a machine.

In September 1942, we employed Mr. Case. In April of this year Bob said, "I have the machine far enough along so that I would like to give you a demonstration." We made a trip to Warrens and tried the machine out on the Oscar Potter marsh. There was no belt on the machine, just teeth and rakes. In April we had a demonstration and I took a box of dried up cranberries and scattered them before the machine on the marsh and the machine picked them up, but we found three faults in it.

The bed plate was too low as vines got caught in it. We installed conveyors and raised this lower bed plate. In three weeks it was tried out on the Roy Potter marsh. It worked fairly well. We then took the machine and went on the Bennett marsh. Mr. Bennett said, if it will work on the Bennett marsh it will work anywhere. It did a good job on the marsh, be we had no berries to pick up. The belt was not wide enough to convey the berries. They came up, but the machine did work.

The growers decided to build some of the machines. One machine was completed for theWhittlesey marsh, the second for Charlie Dempze and the third one was put on the Oscar Potter marsh. The machine on the Dempze marsh did not work at all and was put in the shed and that is where it is now.

With the machine on the Whittlesey marsh we decided to dry rake. It worked fair. The vines kept falling over so the machine had to be stopped. One feature is that this machine went along and made two tracks. It picked up the berries, but on the next strip there was a stream of cranberries in the wheel tracks. It also rolled the vines down. The next day we tried to rake where the marsh was quite level and where there was a nice crop of berries. We learned about the level of the water and where it works most satisfactorily. The water made a little wave and the berries rolled around. I thought about that at night and decided to put a screen across there. The machine then worked very well.

It required one driver, and two men to change the boxes, and one man to drive the tractor, so in all it took four men to operate this machine. At 4:15 of one day the machine had raked so many berries that there was no place to put them. From 7:30 to 4:15 it had raked 500 bushels of berries. The machine picked up one barrel every minute and a quarter. The machine can rake two acres per day.

The machine was built out of many old parts and it broke down quite often and we noted its faults and by next fall they will be fixed and corrected. For one thing it has a motorcycle clutch which is not very good for starting and stopping. In the third machine built there were ½ inch teeth without the grooves. The next teeth were put in were ⅝ inch and it was tried out on the Emmerick marsh.

There are some problems in connection with the operation of the machine on a cranberry marsh. You cannot harvest berries from both sides. You can only harvest from one side. The machine weight 600 to 700 pounds. The bull grass does not bother the machine at all, but ferns do get into that lower plate and are a nuisance. If there is a way of building this machine so that we can get rid of these lower bed plates a great deal will be accomplished. A 20 acre crop can be harvested with two or three men.

At the present time there are three machines pretty well completed. Two machines are ready to be assembled, so that this next fall there should be five machines working in good shape. It will be several years before there will be any on the market.

One of the problems is to get it back to the beginning of the picking. We had to buy a good tractor and a trailer. It will take a lot of engineering yet to make it good.

The eight growers who are financing this machine are going to pay more for it than those who will buy it when it will be produced commercially. They cost us more but eventually they will sell for from $1,000 to 1,2000.

MEETING OF THE WISCONSIN STATE CRANBERRY GROWERS' ASSOCIATION — DECEMBER 8, 1943

SUBJECT:—A study of Oxygen defiency in Winter Flooding Water at Beaver Brook

by CHARLES LEWIS

As most of you have already learned, leaf drop, flower bud absorption and other forms of winter water injury have often been serious in Wisconsin. Careful Field observation by L. M. Rogers and detailed studies by H. F. Bergman left little doubt that such injury was due in a large part to oxygen deficiency in the water.

Dr. Stevens and I working together for the past two and one-half years have studied the problems of oxygen deficiency, its causes and effects on the Badger Cranberry Co. property at Beaver Brook, and we have found how that situation may be remedied there.

In testing for oxygen deficiency in the water, we have made use of two different oxygen tests. One is oxygen content in the water, and the other the Biochemical Oxygen Demand in the water, or B. O. D. in simplified and familiar terms. The oxygen content is a measurement of the actual amount of free oxygen in the water in parts per million. The B. O. D. is the measurement of the demand created for oxygen by organic and decaying material in the water.

Much of the inside work on the water tests, analysis, etc., was done at the Biology Fish Laboratory at Spooner, Wisconsin and we are deeply indebted to J. D. O'Donnell, head of that laboratory and biologist for Wisconsin State Conservation Department for his help and cooperation.

As long as we are concerned with oxygen mainly we will review the process of respiration and photosynthesis. A plant respires, or breathes oxygen just as humans do, combining the free oxygen of the air or water, whichever medium it happens to be in, with its own plant sugars and giving off carbon dioxide and water. The plant also makes its own food in the process of photosynthesis, using carbon dioxide and water in the presence of light and chlorophyll, a green plant substance, it makes sugars, and oxygen is given off as a by product.

These two processes go on in the water under the ice if all the necessary items are present. In the case of photosynthesis in the water under the ice light is usually the lacking item. Bergman states that from 74-88% of the incident light can penetrate ice 4-4½ inches thick and usually is sufficient for photosynthesis, but only about one-fourth to one-third of incident light will penetrate one inch of snow.

The plants use up the available oxygen in the water in respiration, and if photosynthesis doesn't take place to replace this oxygen, the oxygen content is depleted to a point where it is injurious to the plant. The saturation point of oxygen in water of course depends on the temperature of the water—the warmer the water, the less oxygen it will hold. The saturation point at 32 degrees F. or O degrees C. (temperature of water under ice) is 14.62 ppm. When water gets below 4.0 ppm. the danger point set by Dr. Bergman, it is injurious to cranberry plants.

The impetus led us to try these experiments was the fact that the Beaver Brook marsh came up with a very severe case of leaf drop in the spring of 1941. Its severity may be judged by the fact that in the fall of '41 the 60 acre marsh produced 750 barrels, compared to a five year average of 3300 barrels. Of the '41 crop, 150 barrels were produced on 5 acres of Howes, which variety is much less subject to an injury of this type. It was obvious that the vines had been severly injured. The leaf drop was general over the marsh, and many flower buds were killed outright. It was noticeable however, that the injury was more severe in some sections that in others. In the late fall of 1941 there occured a second defoilation on certain sections of which we can find no better explanation than it was a sequel to the severe injury the previous winter. That is, we figured the vines were so weakened the winter before they were not strong enough to hold the leaves produced that summer throughout the next winter.

The effects of this fall leaf drop were carefully mapped, and it became evident at this time that the severity of winter injury was closely correlated to the flume through which the water entered the marsh (three gates: east, middle and west). When it became apparent that the sections injured most severely were those flooded through the east gate, it was at first suggested that the water in this part of the reservoir might be different—either in oxygen content or B. O. D. A series of analysis spaced at intervals over the reservoir failed to show any significant difference.

In comparing the process of flooding through the three reservoir gates we noticed a difference in the effect of their construction on the oxygen content. We found through a series of tests of dissolved oxygen that water can be aerated by splashing over the flumes and the oxygen content could be raised as much as 8 ppm depending on how much oxygen it contained at the beginning and the amount of splashing.

The middle and west gates are so constructed that the floors are dug down lower than the reservoir bottom, therefore when the gates are opened, no matter how low the water is in the reservoir, it will have to fall some distance to the floor on the gate, splashing around and being somewhat aerated.

The east gate is so built that its bottom is level with the reservoir at that point, and if the reservoir is low, the water runs through with no drop. To make matters still worse, in the winter of '40-'41 there was not enough water in the reservoir to flood the entire marsh at one time, so sections 20-29 were flooded later when the reservoir water was very low.

In doing this work we obtained water samples for oxygen tests from the reservoir and from the flooding water under the ice on the marsh for the past two winters.

First, what was done in testing the reservoir water: In the winter of '41-'42 we took the oxygen content of the water under the ice only during that time that we were using water for flooding purposes. This was a very open winter and our readings never showed less than 5.0ppm. In fact, according to O'Donnell, there was no occasion of a Wisconsin lake "freezing out" that winter. No fish died that year. Water we used for flooding was sufficiently supplied with oxygen. We took no B O. D.

Last winter, '42-'43, we made a much more extensive study of the trend of the oxygen content in our reservoir as we tested for oxygen Content and B. O. D. from Nov. 29th to May 10th, several weeks after the ice went out. The reservoir froze over Nov. 26th, The ice increased in thickness up to 20 inches about March 26th and was covered with snow 6 inches to one foot most of the winter.

The oxygen content, 12.1, Nov. 29th, first reading, declined to zero by Jan. 27th, while the demand (B. O. D.) kept getting greater and greater. These conditions in oxygen content remained unchanged except for a slight rise Feb. 26th-27th caused by pumping back large quantities of water used in flooding the marsh Feb. 24th. Between March 25th-31st the reservoir was raised one foot by melting ice and snow, and there was a marked increase in oxygen which was still further increased by pumping on April 5th, 6th, and 7th.

The B. O. D. climbed slowly until Feb. 1st, then rose more rapidly until shortly after Feb. 26th when it dropped some as a result of the pumping. The B. O. D. is very high until March 31st. It then declined rapidly. However, it should be especially noted that while the B. O. D. was very much lower on April 7th than on March 31st, it was by no means reduced to zero; in fact, it was still measurable on April 16th, nine days later. You can see that even though the oxygen content was considerably high after April 1st, the demand had been so great that it took several days for it to become satisfied or zero.

Last winter was a severe winter. O'Donnell reported that quite a number of lakes "froze out." In our own reservoir all the smaller fish were dead by Feb. 1st and only the ones surviving were the larger ones able to migrate to the springs.

We now had records on the reservoir for two different types of winter: One mild; one severe.

The other tests were made on the marsh itself under the ice. We took oxygen contents only. The oxygen contents were taken as often as possible on several sections from the day the flood was put on the marsh until the day the water was withdrawn.

In the years before the water was tested for oxygen, we used to flood the marsh and leave the water on until 10-12 inches of ice had formed. Sometimes this took a month or more. Now since the water is tested for oxygen we leave it on only until the oxygen content gets down to 4.0 ppm. then it is let off regardless of the thickness of ice. Sometimes we only get 4 inches of ice and have to withdraw the water, but later we reflow with fresh water and get more ice.

I have a graph here showing the trend of oxygen content on the marsh under the ice on several sections for the past two winters. Curve 1-A is for a period of 19 days in 1941-42, (Water was put on Dec. 10, 1941.) It can be observed that at the end of the first day the water contained 11.6 ppm. of oxygen; the next four days when the water was covered with 4 to 6 inches of ice and at times 4 inches of snow, the oxygen content fell to 4.2. Then with warmer weather the snow melted and part of the ice. Under these conditions the oxygen rose and remained at, or about 8 ppm

up to the eleventh day. As late as the 19th day it was 4.5, safely above 4.0 ppm. the danger point set by Bergman.

In sharp contrast to the record given in A is that of the flooding water under the ice in the same section the following winter. On Jan. 19, 1943, at the end of the first days flooding the water contained only 5.6 ppm oxygen. With conditions of ice and snow closely resembling those of the previous year it had fallen by the fifth day to 2.1ppm. and had to be withdrawn to prevent injury to the vines. The explanation of this striking difference in the behaviour must be found in the difference in the reservoir water at the time it was put on the marsh. In the year of '41-'42 the reservoir water before flooding contained 12.1 ppm. with probably little or no B. O. D. was 8. This water had been raised to 5.6 ppm. oxygen by splashing over the gates.

The importance of the condition of the water as it goes under the ice is still more strikingly shown by the record of the water from the reservoir from another section later in the same year. This is shown in Curve C. In this case the water was put on March 2nd. At the end of the first day the water had 8.3 ppm. oxygen, but within three days only the oxygen content of water had fallen to 2.8, and the water had to be withdrawn. In this case the water in the reservoir at the time of flooding is known to have contained 2.5 ppm. or more than on Jan. 19th because of recent pumping, and B. O. D. had risen to 9. Even though the water was very well aerated by specially arranged splashing boards in flumes, its B. O. D. must have been still very high when it went on the marsh.

What have we learned from all this? Several very significant facts have been learned from these tests relative to the treatment given to the flooding of cranberry vines during the winter period. We have found that if the reservoir water is needed for flooding at a time when its oxygen content is near zero, the water can be aerated and oxygen content raised by a system of splash boards placed in the flooding gates at angles to break up the falling water, and after the water is on the beds its oxygen content can be maintained better if some fresh water from the reservoir is allowed to circulate through the cranberry bed.

The importance of B. O. D. in water used for flooding cranberries is not yet fully understood, but it is evident that it might be very great. The water which reaches the vines may have a fairly high oxygen content due to splashing over the gates and through the flumes, or the water in the reservoir may have a high oxygen content from recent pumping or an addition of rain water or melted snow, and yet it may have so high a B. O. D. that this oxygen is quickly exhausted. Therefore, although we can by no means as yet eliminate the effect of the B. O. D. in the water, we can alleviate the situation some by raising the content as high as possible by splashing and keep it up by circulation.

Since we started these tests at Beaver Brook we have had no injury from oxygen deficiency during the winter. However, we did have injury which we thought to be oxygen deficiency in May, spring of '42 from frost flooding. That was open water not under the ice, so we now also test the water during the spring floods.

We think we have the problem of oxygen deficiency pretty well in hand. We have other problems we havn't solved as yet, but I won't go into that.

I know it is impractical for most of you to make a lot of tests, however, if you have any troubles that resemble ours you might try some of our methods of handling water.