4. B. Carlton

UNIVERSITY OF CALIFORNIA
COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION

PROJECT NO. 1686

REPORTED BY H.B. Schultz

Davis - Ag. Engineering
Campus and Division or Department

DATE Dec. 31, 1960

Annual Summary Statement of Progress for year ending Dec. 31, 1960
This Summary is in addition to, not in place of, more complete reports of progress prepared periodically and at least once a year with a deadline of Feb. 1.

Title: PEAT LAND CONSERVATION AND PEAT DUST ABATEMENT

Personnel: H.B.Schultz and A.B.Carlton

Principal results of year: In the 1960 season, seven California Spot Climate Recorders were operated in the San Joaquin Delta Islands. Tests of wind reduction by interplantings were continued with methods begun last year. At 1" ft. height, the wind over the asparagus ridges was diminished to 50 to 60% by interplanted barley strips, for about all wind angles.

The general wind survey revealed a comparatively large number of dust producing winds in 1960. The increase in number occurred mainly in the months that usually experience no dust hazard. (April, July, August)

The station at the southern edge of the peat land recorded some dust velocities from the SW which never were observed at any other location. More careful survey is needed in this section next season.

Publications: H.B.Schultz and C.F.Kelly "Studies on Wind Protection Efficiency of Slatted Fence Windbreaks" Calif. Agric. 14, No.4 (1960)

(If more space is needed, use back of this sheet.)

Form C-10m-6 '58 (4664)

D—029754

D-029754

Form B-20m-11,'60(B6081)

UNIVERSITY OF CALIFORNIA
DIVISION OF AGRICULTURAL SCIENCES
AGRICULTURAL EXPERIMENT STATION

PROJECT NO. 1686 PG. 176

REPORTED BY H.B. Schultz

Davis - Ag. Engineering
Campus and Department

DATE Dec. 31, 1960

TITLE: PEATLAND CONSERVATION AND PEAT DUST ABATEMENT

PERSONNEL: H.B.Schultz, A.B.Carlton

PART 1: Determination of effectiveness of inter-row plantings in ridged asparagus fields

In the 1959 season, a new method was tried for verifying previous years' results. This was considered desirable because the results for wind reduction by inter-plantings (barley strips) were very astonishing. They can be summarized in two statements:

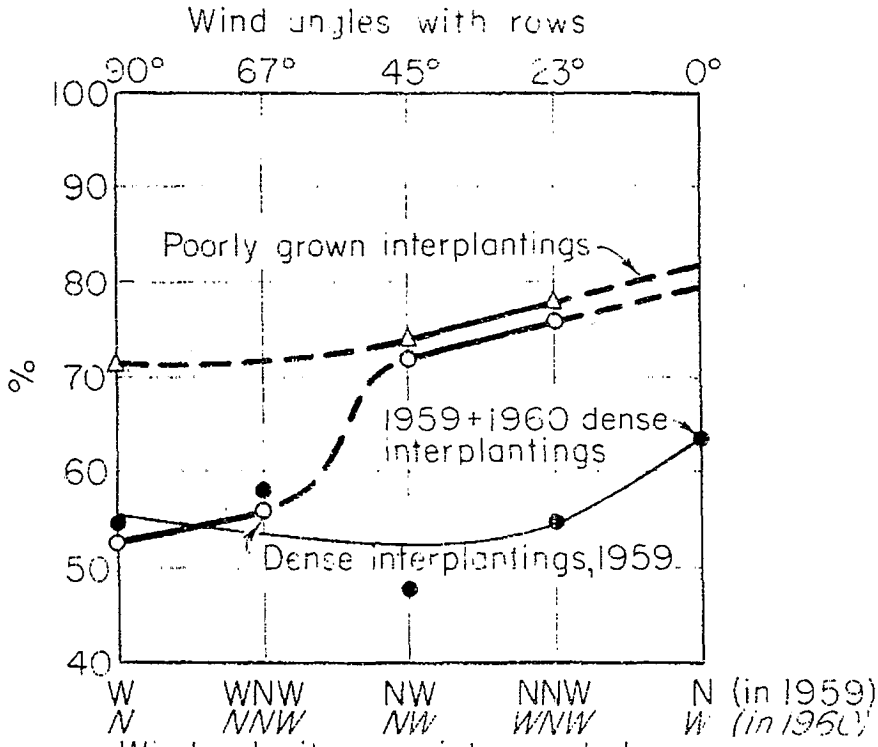
1. Inter-row plantings, in contrast to any conventional wind break, provide protection for winds at all angles with the rows, even for parallel wind.

2. The maximum protection was not found for perpendicular wind angles, but for winds from directions between 0° and 90° to the rows.

The verification method, tried for the first time in 1959, was rather elementary and was avoided before because of the possibility of many sources of errors: anemometers were sunk into the ground so that only the rotating cups were sticking out of the ridgetops at 1 in. height. As expected, there was a large scattering in the data. But of all possible errors, only one had turned out to be of major importance - due to the spring drought, the interplantings were poorly developed. This gave the barley strips a very uneven appearance so that the anemometers "saw" different heights and compactness in the various directions. Separating the data by well and poorly grown patches of barley for the various wind directions eliminated most of the scatter but furnished incomplete results.

For this reason, the 1959 method of verification was repeated in the 1960 season on a plot on King Island. The data gathering was expected to be more

successful than in the previous year because of more fortunate circumstances, such as evenly grown barley strips in every row, sufficiently strong winds from all desired directions, and rearrangement of instrumentation (4 spot climate recorders) in the field to avoid some of last year's troubles. Nevertheless, a large scattering of data occurred again. But this time, the cause was found in the fast and continuously eroding soil at the control station in the non-protected area. This was noticed by A.B.Carlton in time and resetting to the original 1 in. anemometer height was made at that station sometimes. Very fortunately, this trouble did not develop in previous season's tests because the control station happened to be installed on non-erodible heavy soil. Thus, a certain number of data of the 1960 season had to be eliminated so that only 49 reliably recorded hours were available. However, a fair distribution over the various wind angles was obtained so that a new curve was tried which is plotted on last year's diagram to facilitate the discussion. According to this new curve for dense interplantings, the wind velocity there is only 50 to 60% of the normal wind at 1 in. height above the ridges. Although it was difficult to determine exactly the run of the curve on the left of the 45° angle, it still seems justified to locate the optimum of protection for a wind angle of 45° . This would be in agreement with results discussed in former reports. As for last year's preliminary curves, the one obtained for a poor stand of interplantings looks reasonable. However, the curve for the "dense" barley stand, though the best possible location was chosen, was drawn without screening of data, although in the NW and NNW directions, the anemometers "saw" lower barley plants. The 1960 data was obtained in velocities ranging from 4 to 17 mph but most of them were near 10 mph, measured at 6 ft. height. An attempt to find an influence of velocity on the figures for wind reduction failed.



Wind velocity over interplanted ridges in % of velocity over non-interplanted ridges, all anemometers 1" above ridges.
W-wind is perpendicular, N-wind is parallel to the ridges in 1959.

The wind reduction curve was obtained in an asparagus field with interplanted barley strips in every row, the barley plants being about 12 in. taller than the asparagus ridges. The protection provided seems to be larger than is actually needed, considering a critical velocity of around 15 mph and highest wind speeds after May 1st are hardly more than 20 mph. As interplanting every row is said to hamper some phases of asparagus field work, a test field with interplantings in every other row is considered for next season. Determining the degree of wind protection under such conditions might be worth while.

PART 2. Wind Survey in the San Joaquin Delta

In continuation of the wind survey in the spring and summer months, three California Spot Climate Stations were installed in the 1960 season. Besides the "key" station at Terminous, a full season's record was also obtained on Bacon Island and ten weeks were recorded on a trial basis on Victoria Island at the southern edge of the peat soil area.

The results are presented in four tables as was done in the four previous years. According to Table 3 for Terminous, the number of hours with high velocities was comparatively large in the 1960 season. The "peak" month of May does not show this increase as much as the neighboring months. Even July and August, usually without strong winds, contain several stormy periods. Extremely high was the number of strong wind hours in April. Although little attention was given to this month in the past because the soil is less erodible due to occasional rain, it seems that some erosion conditions must have existed in the 1960 season. For a comparison of all five surveyed years, the occurrence of hourly velocities over 15 mph with a persistence of at least five hours are tabulated:

		April	May	June	July	August	September
1960	(Terminous)	10	6	5	2	1	2
1959	"	(1)	9	5	0	0	4
1958	"	8	10	7	3	2	0
1957	(Ridge Island)	1	4	1	0	0	0
1956	" "	2	5	1	0	0	0

As the most severe dust storms were experienced in velocities over 15 mph or still longer persistence, the following compilation contains the number of such periods with at least 8 hours duration:

	April	May	June	July	August	September
1960	6	5	4	0	0	2
1959	(1)	6	1	0	0	1
1958	3	4	3	0	0	0
1957	0	3	1	0	0	0
1956	0	2	0	0	0	0

According to this presentation, the 1960 season must have been one of the most hazardous for the peat soil. The figures for 1956 and 1957 were taken from the Ridge Island data where somewhat lower velocities are experienced (1958 report.)

The same is true for this year's stations on Bacon Island and Victoria Island. The Tables 1 to 4 for Bacon Island show this fact only slightly, because this location - though 10 miles south of Terminous, is not much less exposed to the winds channeled through Carquinez Straits, except that due to the more southerly location the sea breeze direction mainly is around NW (Table 2.) As for the velocities on Bacon Island, the decrease vs. Terminous is so little that it does not appear uniformly in the various months. It can best be seen in Table 4 ; the sea breeze is often invading the land in the form of a gust-like a miniature cold front. At Terminous, this gust can be identified by an increased number of strong winds between 6 and 9 a.m., whereas this maximum is delayed by one hour in the Bacon Island table (between 9 and 10 a.m.) In the afternoon, on the other

hand, the winds on Bacon Island die out rapidly after 7 p.m. whereas they persist somewhat longer at Terminous.

The third survey station on Victoria Island, only 4 miles further south, reveals a more pronounced decrease of the sea breeze influence. As data for only June and July are available, the number of hours with strong winds was combined for these months and are compared with similar data from Tables 3:

	Terminous	Bacon Island	Victoria Island
Velocity Hours over 10mph	387	304	190
" " " 15 mph	98	101	43

The main purpose, however, of installing the two additional stations in the southern part of the peat area was a survey of wind directions. Occasional dust storms from a southwesterly instead of a northwesterly direction are reported and verification has become desirable. Table 2 for Bacon Island does not reveal a participation of southwesterly directions - they only make 1% of all winds. Surprisingly, however, the Victoria Island station, only 4 miles further south, had recorded southwesterly directions on several days. Because of the short period of operation, only 35 days with direction registering for velocities over 10 mph are available. Although the majority of them were NW, on 10 days the strong velocities were from SW - a ratio of about 30%. Because of the scarcity of data, more information should be sought next season before a detailed analysis can be made.

1980 182

H.E.Schulte

Davis - Ag Engineering

Dec. 31, 1980

Terminus 1980 Wind Survey

Table 1. Number of days with at least one hourly velocity over 10 mph

	April	May	June	July	Aug	Sept.	Total
No. of days with records	29	31	30	26	31	30	179
No. of days vel. over 10mph	23	25	29	20	24	16	140
Same with dir.from NNW-WNW	20	22	24	20	23	15	123
Same in % of all days over 10 mph	87	79	83	100	96	94	88

Table 2. Prevailing directions for velocities over 10 mph (April to Sept.)

Directions	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	Total
No. of days	0	0	0	72	38	13	2	13	0	0	0	0	0	0	2	0	140
Same in %	0	0	0	52	27	10	1	9	0	0	0	0	0	0	1	0	100

Table 3. Frequency of hours of high velocities for the various months.

	April	May	June	July	Aug.	Sept.
No. of hours over 10 mph	273	250	225	162	157	160
No. of hours over 15 mph	109	91	71	27	21	32
Ave. duration of one daily period over 10 mph	11.8	10.4	7.8	8.1	6.5	10.0

Table 4. Daily cycle of frequency of hourly velocities over 10 mph April to September

PST	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
AM	19	20	18	19	18	21	32	45	54	48	49	51
PM	55	68	66	102	112	115	90	73	58	48	34	31

Same for velocities over 15 mph

AM	3	4	2	4	2	1	8	11	15	12	10	15
PM	15	20	28	42	51	43	22	19	8	7	5	3

Form R-20m-11,'60(B6034)

UNIVERSITY OF CALIFORNIA
DIVISION OF AGRICULTURAL SCIENCES
AGRICULTURAL EXPERIMENT STATION

PROJECT NO. 1686 PG. 183

REPORTED BY H. E. Schultz

Davis - Ag. Engineering
Campus and Department

DATE Dec. 31, 1960

WIND SURVEY AT BACON ISLAND, 1960

Table 1. Number of Days With At Least One Hourly Velocity Over 10 MPH

	April	May	June	July	Aug.	Sept.	Total
No. of Days with Records	29	31	30	29	30	30	181
" " " w/ Velocity Over 10 MPH	25	30	30	16	6	2	113

Table 2. Prevailing Directions for Velocities Over 10 MPH

Directions:	S	SSW	SW	WSW	W	WNW	NW	NNW	N	NNE	NE	ENE	E	ESE	SE	SSE	Total
No. of Days	0	0	1	0	4	9	59	18	0	0	0	0	0	0	0	1	88
Same in %	0	0	1	0	5	10	65	20	0	0	0	0	0	0	0	1	100

Table 3. Frequency and Duration of Hours of High Velocities for The Various Months

	April	May	June	July	Aug.	Sept.	
No. of Hrs. Over 10 MPH	220	290	290	65	21	13	
" " " " 15 MPH	70	123	100	1	4	0	
Average Duration of One Daily Period Over 10 MPH	8.3	9.7	8.0	4.1	3.5	3.6	Hours

Table 4. Daily Cycle of Hourly Velocities Over 10 MPH

PST	0-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12
AM	4	6	3	4	5	5	11	29	33	39	37	42
PM	53	66	62	91	93	94	67	31	17	13	13	13
Same for Velocities Over 15 MPH												
AM	1	1	0	1	1	2	2	9	10	11	10	14
PM	17	21	29	42	22	38	19	6	4	3	3	2

D—029762

D-029762