

Range Cattle Research and Education Center
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CLIMATOLOGICAL REPORT 2000

Range Cattle Research and Education Center

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Weather conditions strongly influence agricultural operations from planting through harvesting. Knowledge of annual rainfall and temperature cycles along with their extremes help producers determine optimum times to prepare and plant seedbeds, fertilize pastures, apply herbicides, control water, and to supplement cattle on pasture or range. Weather conditions influence germination, forage growth, palatability, and nutritive value. A knowledge of weather cycles and extremes is helpful to a successful cattle operation.

This research report presents a summary of rainfall, air temperature, evapotranspiration, and solar radiation for 2000 obtained at the Range Cattle Research and Education Center (REC) Ona, Florida. The center is located 82° 55' W and 27° 26' N in south central Florida approximately 45 miles (72 km) east of the Gulf of Mexico and 100 miles (160 km) west of the Atlantic Ocean.

Weather observations were collected with a Weather Watch 2000 (Campbell Scientific, Inc). Accuracy of rainfall as measured by the Weather Watch 2000 was checked by comparing with rainfall measured by a US Weather Service standard gauge.

Rainfall:

Annual rainfall for 2000 was 32.02 inches, which was 21.13 inches (40%) less than the 59-year average (53.15 inches). The driest year had been 1956 when 36.73 inches were measured, and the year with the greatest rainfall was 1959, when 78.82 inches were recorded.

Table 1. Weather at Range Cattle REC, 2000.

<u>Day</u>	<u>January</u>				<u>February</u>				<u>March</u>				<u>April</u>			
	Max °F	Min °F	Rain inches	MJ/ m ²	Max °F	Min °F	Rain inches	MJ/ m ²	Max °F	Min °F	Rain inches	MJ/ m ²	Max °F	Min °F	Rain inches	MJ/ m ²
1	77	57	0.00	12.10	58	48	0.14	2.59	82	50	0.00	20.74	86	62	0.00	17.28
2	81	57	0.00	12.10	66	49	0.03	12.96	80	54	0.00	17.28	87	60	0.00	21.60
3	80	56	0.00	14.69	61	49	0.04	7.78	81	57	0.01	19.01	86	60	0.00	23.33
4	82	59	0.00	12.96	64	46	0.13	5.18	80	59	0.00	16.42	86	62	0.00	24.19
5	82	56	0.00	12.10	71	41	0.00	17.28	80	45	0.00	16.42	82	47	0.02	12.96
6	69	56	0.00	12.96	62	34	0.00	19.01	80	46	0.00	21.60	72	38	0.00	27.65
7	82	64	0.00	9.50	69	41	0.00	19.01	82	54	0.00	21.60	81	48	0.00	27.65
8	80	63	0.00	12.10	73	46	0.00	18.14	80	55	0.00	18.14	82	53	0.00	25.06
9	79	57	0.00	9.50	71	43	0.00	10.37	79	56	0.00	14.69	83	46	0.00	23.33
10	81	59	0.00	13.82	69	37	0.00	18.14	82	57	0.00	17.28	71	45	0.00	27.65
11	81	65	0.18	12.10	72	39	0.00	18.14	84	59	0.00	19.01	79	55	0.00	26.78
12	78	44	0.00	16.42	76	43	0.00	18.14	83	67	0.00	18.14	82	61	0.00	25.06
13	81	47	0.00	15.55	78	49	0.00	18.14	80	47	0.00	19.87	85	58	0.16	19.01
14	80	54	0.00	15.55	81	61	0.00	13.82	79	50	0.00	22.46	84	64	1.33	13.82
15	67	44	0.00	16.42	80	54	0.02	9.50	81	55	0.00	22.46	72	62	0.18	6.91
16	69	46	0.00	15.55	82	48	0.00	19.01	82	63	0.00	15.55	82	62	0.90	18.14
17	72	41	0.00	15.55	84	54	0.00	18.14	84	59	0.02	14.69	87	63	0.00	23.33
18	73	45	0.00	16.42	84	53	0.00	19.01	82	59	0.00	12.96	83	61	0.00	26.78
19	73	53	0.00	14.69	85	56	0.00	15.55	84	66	1.13	19.01	80	53	0.00	26.78
20	76	60	0.00	12.10	83	61	0.01	15.55	75	65	0.00	8.64	84	58	0.00	26.78
21	76	37	0.00	10.37	81	48	0.00	16.42	83	55	0.00	20.74	88	55	0.00	26.78
22	62	36	0.00	17.28	74	52	0.00	20.74	84	52	0.00	23.33	82	58	0.00	22.46
23	73	46	0.00	16.42	79	52	0.00	18.14	85	54	0.00	22.46	79	47	0.00	27.65
24	77	58	1.95	14.69	78	53	0.00	12.10	78	60	0.00	22.46	83	52	0.00	25.06
25	67	41	0.06	8.64	77	55	0.00	14.69	80	56	0.00	18.14	85	72	0.00	21.60
26	58	34	0.00	10.37	81	56	0.00	17.28	82	55	0.00	22.46	83	49	0.00	22.46
27	54	30	0.00	17.28	83	55	0.00	20.74	77	62	0.00	13.82	79	47	0.00	27.65
28	59	38	0.00	17.28	83	56	0.00	17.28	80	60	0.29	12.96	81	46	0.00	27.65
29	71	52	0.00	12.96	82	52	0.00	19.01	80	53	0.00	24.19	80	61	0.00	24.19
30	79	53	0.00	13.82					87	64	0.00	24.19	85	50	0.00	25.06
31	79	57	0.00	15.55					85	70	0.01	19.87				
Avg	74	50		13.22	75	49		15.58	81	57		18.73	82	55		23.16
Max	82	65	1.95	17.28	85	61	0.14	20.74	87	70	1.13	24.19	88	72	1.33	27.65
Min	54	30	0	8.64	58	34	0	2.59	75	45	0	8.64	71	38	0	6.91
Total			2.19	426.82			0.37	451.87			1.46	580.61			2.59	694.66

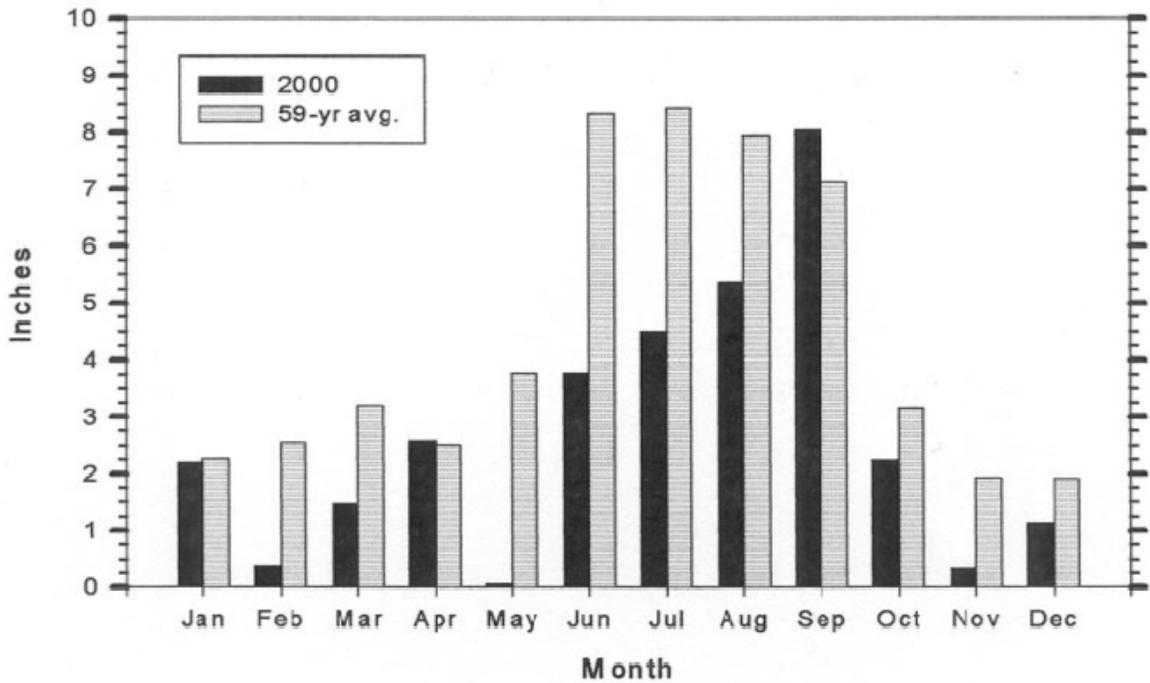
Day	May				June				July				August			
	Max	Min	Rain	MJ/	Max	Min	Rain	MJ/	Max	Min	Rain	MJ/	Max	Min	Rain	MJ/
	°F	°F	inches	m ²	°F	°F	inches	m ²	°F	°F	inches	m ²	°F	°F	inches	m ²
1	85	50	0.00	27.65	92	66	0.00	24.19	88	72	0.02	19.01	93	71	0.53	23.33
2	85	57	0.00	25.06	94	66	0.00	25.06	81	70	0.10	9.50	91	69	0.94	23.33
3	86	56	0.00	22.46	96	66	0.00	27.65	90	71	0.00	23.33	89	69	0.06	19.87
4	84	60	0.00	17.28	98	67	0.00	22.46	90	71	0.00	22.46	92	73	0.00	23.33
5	85	59	0.00	27.65	97	66	0.00	25.92	91	69	0.09	19.01	93	73	0.00	25.06
6	86	55	0.00	25.92	94	66	0.00	25.06	89	69	0.00	19.01	94	71	0.21	22.46
7	85	60	0.00	21.60	93	69	0.00	23.33	95	72	0.00	23.33	90	72	0.39	14.69
8	85	63	0.00	16.42	91	68	0.00	14.69	91	75	0.00	19.87	93	72	0.00	24.19
9	90	67	0.00	24.19	89	65	0.06	17.28	88	70	0.22	12.96	93	69	0.00	24.19
10	88	63	0.04	19.01	91	63	0.00	24.19	92	71	0.00	23.33	90	69	0.00	22.46
11	90	64	0.00	24.19	90	65	0.00	21.60	93	69	0.00	25.06	93	70	0.00	22.46
12	92	63	0.00	25.92	87	68	0.23	18.14	96	70	0.00	26.78	91	73	0.12	23.33
13	94	66	0.00	26.78	93	67	0.02	20.74	95	70	0.00	22.46	79	72	0.53	8.64
14	91	70	0.00	22.46	95	70	0.03	19.87	92	73	0.00	25.06	89	73	0.06	20.74
15	90	64	0.00	19.87	95	70	0.04	19.87	89	72	0.02	17.28	90	71	0.16	17.28
16	91	66	0.00	25.06	94	70	0.00	21.60	81	71	0.56	4.32	89	71	0.07	19.01
17	91	62	0.00	25.92	95	72	0.00	22.46	91	73	0.00	23.33	91	65	0.00	24.19
18	90	58	0.00	25.06	96	68	0.41	19.87	92	73	0.00	25.92	91	67	0.00	24.19
19	91	60	0.00	25.92	96	68	0.03	23.33	90	75	0.42	15.55	93	69	0.00	23.33
20	91	55	0.00	27.65	94	68	0.14	20.74	92	75	0.00	19.87	95	70	0.00	24.19
21	92	61	0.00	27.65	94	67	0.45	19.87	93	73	0.01	23.33	94	69	0.00	18.14
22	91	66	0.00	24.19	93	68	0.00	23.33	92	71	1.45	15.55	94	71	0.00	22.46
23	88	65	0.00	22.46	92	68	0.05	18.14	86	73	0.12	14.69	89	72	0.00	12.10
24	89	65	0.01	24.19	88	70	1.19	13.82	89	70	0.27	22.46	94	73	0.07	19.87
25	91	67	0.00	25.92	90	67	0.01	21.60	86	70	0.23	12.10	94	70	0.00	19.01
26	93	65	0.00	23.33	91	70	0.40	16.42	89	70	0.77	17.28	95	70	0.63	20.74
27	95	72	0.00	23.33	87	69	0.17	12.10	93	68	0.00	21.60	92	68	0.00	17.28
28	97	70	0.00	25.92	85	70	0.55	7.78	91	71	0.00	19.01	91	68	0.00	23.33
29	95	67	0.00	27.65	60	70	0.00	22.46	93	71	0.00	24.19	91	71	0.00	22.46
30	92	64	0.00	24.19	87	72	0.00	23.33	93	70	0.22	23.33	85	72	1.58	6.91
31	95	67	0.00	25.06					88	69	0.00	12.96	91	71	0.00	20.74
Avg	90	63		24.19	91	68		20.56	90	71		19.48	91	70		20.43
Max	97	72	0.04	27.65	98	72	1.19	27.65	96	75	1.45	26.78	95	73	1.58	25.06
Min	84	50	0	16.42	60	63	0	7.78	81	68	0	4.32	79	65	0	6.91
Total			0.05	749.95			3.78	616.90			4.50	603.94			5.35	633.31

Day	September				October				November				December			
	Max	Min	Rain	MJ/	Max	Min	Rain	MJ/	Max	Min	Rain	MJ/	Max	Min	Rain	MJ/
	°F	°F	inches	m ²	°F	°F	inches	m ²	°F	°F	inches	m ²	F	F	inches	m ²
1	88	75	0.00	17.28	86	68	0.00	12.10	82	46	0.00	17.28	76	47	0.00	15.55
2	91	73	0.00	18.14	87	69	0.00	18.14	82	53	0.00	18.14	79	52	0.00	14.69
3	92	70	0.00	21.60	88	74	0.00	15.55	81	49	0.00	17.28	79	46	0.00	12.96
4	93	71	0.16	18.14	84	72	0.54	9.50	82	51	0.00	17.28	68	42	0.00	10.37
5	91	71	0.00	21.60	88	72	0.00	13.82	83	51	0.00	15.55	67	48	0.00	12.96
6	89	71	0.79	17.28	89	70	0.02	13.82	83	60	0.00	14.69	70	45	0.00	14.69
7	90	71	0.04	15.55	88	71	1.67	10.37	84	61	0.00	15.55	73	50	0.00	12.10
8	91	71	0.75	17.28	88	66	0.00	18.14	86	60	0.00	13.82	73	51	0.00	13.82
9	92	72	0.06	20.74	85	61	0.00	16.42	87	62	0.00	14.69	82	55	0.00	12.96
10	86	74	0.00	12.10	71	51	0.00	15.55	84	66	0.01	12.96	83	60	0.00	12.96
11	93	71	0.00	21.60	78	61	0.00	18.14	84	51	0.00	9.50	83	68	0.00	10.37
12	91	66	0.00	20.74	81	62	0.00	19.01	78	49	0.00	16.42	80	63	0.02	6.91
13	91	68	0.00	23.33	83	59	0.00	19.01	78	50	0.00	17.28	83	62	0.00	10.37
14	94	71	0.00	22.46	83	60	0.00	19.01	82	60	0.00	12.10	86	66	0.00	11.23
15	93	70	0.00	19.01	84	61	0.00	17.28	81	44	0.09	6.91	86	66	0.00	10.37
16	91	73	0.00	15.55	82	51	0.00	19.87	71	47	0.00	17.28	86	63	0.00	11.23
17	81	67	4.36	5.18	83	49	0.00	19.87	81	61	0.00	16.42	85	67	0.27	11.23
18	79	69	0.55	9.50	83	52	0.00	19.87	83	59	0.03	12.96	69	33	0.00	13.82
19	86	71	0.14	16.42	84	54	0.00	19.01	81	60	0.00	13.82	70	34	0.00	15.55
20	91	76	0.01	18.14	85	57	0.00	18.14	83	56	0.00	11.23	69	33	0.04	6.91
21	89	75	0.61	12.96	85	62	0.00	15.55	68	44	0.00	11.23	50	28	0.00	15.55
22	91	76	0.00	17.28	86	62	0.00	16.42	64	29	0.00	17.28	64	43	0.00	12.96
23	91	73	0.00	15.55	84	62	0.00	15.55	68	42	0.00	16.42	70	45	0.00	12.10
24	94	73	0.33	19.87	83	66	0.00	17.28	69	49	0.00	9.50	75	52	0.00	12.96
25	93	71	0.00	19.01	84	63	0.00	16.42	80	63	0.00	11.23	74	51	0.00	12.10
26	94	70	0.00	19.87	84	63	0.00	16.42	81	66	0.04	6.05	75	50	0.00	12.96
27	90	73	0.00	19.01	83	56	0.00	16.42	71	51	0.17	5.18	75	47	0.00	12.96
28	91	72	0.23	15.55	81	47	0.00	18.14	71	39	0.00	15.55	77	56	0.06	12.10
29	86	70	0.00	19.01	84	52	0.00	18.14	74	51	0.00	13.82	74	52	0.74	3.46
30	89	72	0.00	19.01	85	54	0.00	17.28	77	50	0.00	9.50	57	38	0.00	6.05
31					85	61	0.00	15.55					56	28	0.00	15.55
Avg	90	72		17.63	84	61		16.64	79	53		13.56	74	50		11.93
Max	94	76	4.36	23.33	89	74	1.67	19.87	87	66	0.17	18.14	86	68	0.74	15.55
Min	79	66	0	5.18	71	47	0	9.50	64	29	0	5.18	50	28	0	3.46
Total			8.03	528.77			2.23	515.81			0.34	406.94			1.13	369.79

There were no records broken for low rainfall totals for individual months, but every month in 2000, except September with 8.03 inches (compared to the 59-year mean of 7.13 inches), had lower rainfall compared to the 59-year mean for that month (Tables 1 and 2, Figure 1). There were only eight occurrences during the year when daily rain exceeded 1 inch. The single greatest daily rain event was on September 17 when 4.36 inches were recorded (13.5% of annual rainfall). Limited rain resulted in none of the

typical flooding in pastures, and most maidencane (*Panicum hemitomon*) ponds and drainage ditches remained dry as well.

Table 2. Summary of rainfall by months. Range Cattle REC, 2000.					
	1942 to 2000			2000	
	Maximum month	Minimum month	59-yr Average	Total	Diference from 59-yr average
	----- inches* -----				
January	8.45	0.03	2.26	2.19	-0.07
February	9.59	0.13	2.55	0.37	-2.18
March	12.34	0.13	3.20	1.46	-1.74
April	11.91	0.00	2.52	2.59	+0.07
May	10.58	0.00	3.77	0.05	-3.72
June	18.99	2.79	8.33	3.78	-4.55
July	19.74	1.87	8.43	4.50	-3.93
August	15.72	3.13	7.96	5.35	-2.61
September	20.11	1.14	7.13	8.03	+0.90
October	11.23	0.04	3.16	2.23	-0.93
November	11.22	0.07	1.93	0.34	-1.59
December	8.61	0.16	1.91	1.13	-0.78
Year total			53.15	32.02	-21.13
*Inches x 2.54 = cm.					



Total 2000 rainfall=32.02 vs. 59-yr average=53.15

Figure 1. Monthly 2000 rainfall at the Range Cattle REC compared to the 59-year mean rainfall at Range Cattle REC.

Evapo-transpiration

Evapo-transpiration exceeded rainfall in 9 months during 2000 (Figure 2). Only during July to September did rainfall exceed evapo-transpiration. For the year, evapo-transpiration exceeded rainfall by 10.8 inches.

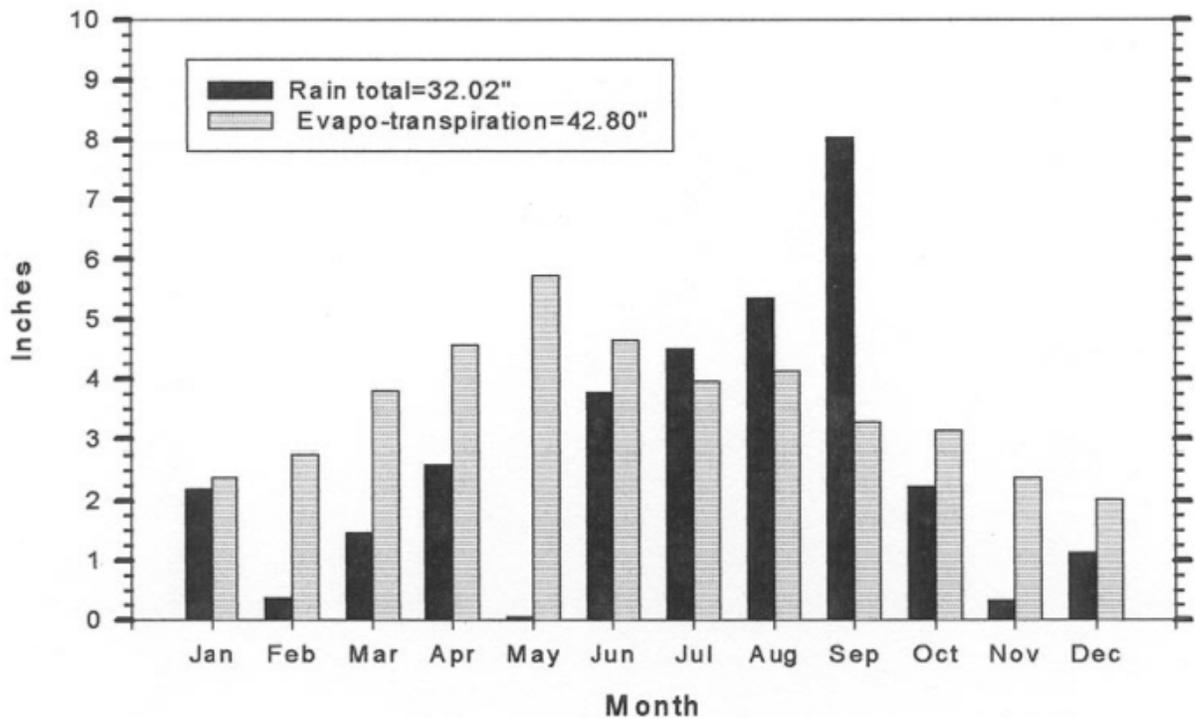


Figure 2. Monthly rainfall compared with evapo-transpiration during 2000.

Temperature:

The average low shelter temperature was colder for eight months compared with the 57-year average for that month (Table 3). The annual average low shelter temperature for 2000 was 1°F colder than that for the 57-year period. There were four and nine days when extreme daily low shelter and ground temperatures, respectively, dropped below 32°F.

	Shelter Temperature				Ground Temperature		
	1944-00	2000	1944-00	2000	2000		
	Avg. Low	Avg. Low	Extreme Low	Year	Extreme Low	Avg. Low	Extreme Low
January	49.5	50.5	18	1981	30	48.2	27
February	50.5	49.3	26	1976	34	46.7	30
March	54.3	56.9	26	1980	45	54.0	43
April	58.1	55.2	34	1971	38	52.8	35

May	63.3	62.8	43	1945	50	60.2	46
June	68.8	68.0	52	1984	63	65.9	60
July	71.1	71.2	62	several	68	69.5	66
August	71.7	70.5	61	1977	65	68.6	63
September	71.0	71.5	56	1962	66	69.9	64
October	64.6	60.9	42	several	47	59.0	45
November	56.8	52.7	25	1970	29	49.7	27
December	51.1	49.7	20	1962	28	47.4	25
Avg.	60.9	59.9			46.9	57.7	44.3
* °C = (°F - 32) x 0.555							

Solar Radiation:

Daily solar radiation is shown in Table 1, and 2000 total monthly solar radiation can be seen graphically in Figure 3. For interpretation of solar radiation as it pertains to plant growth, 1 MJ results in about 14.3 lb/A of plant dry matter if soil water, temperature, and fertility are not limiting and vegetative cover is complete. Theoretically, enough solar radiation was received in May 2000 (750 MJ) to produce 10,725 lb/A of plant dry matter. Total solar radiation for 2000 was 6579 MJ.

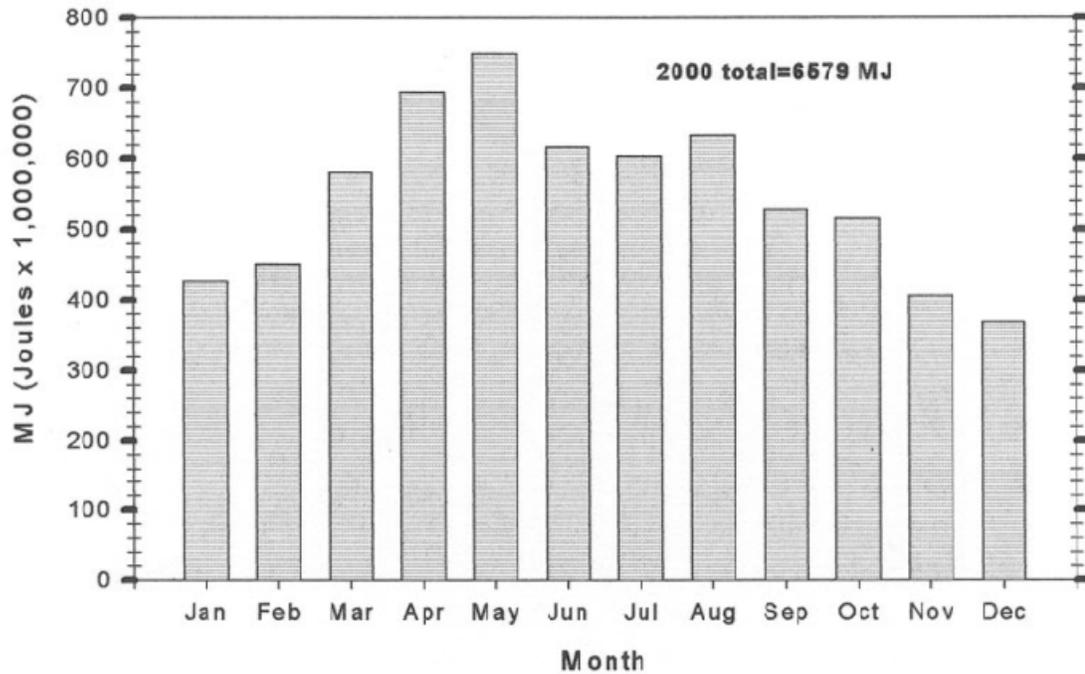


Figure 3. Total monthly solar radiation for 2000.

Freeze hazard:

The fall and spring freeze hazards for the Range Cattle REC are shown in Figures 4 and 5, respectively. The fall freeze hazard shows the chance of experiencing the first attainment of a critical temperature before a selected date, while the spring freeze hazard shows the chance of the last attainment of a critical temperature before a critical date. Based on records from 1944 to 1991, these data will not predict what will occur in a given year, but what can be expected over a period of years. In an example using the spring freeze hazard, a frost susceptible crop (assuming 32°F) planted before the 1st of February would stand a 50% chance of survival (Figure 4). A grower would probably lose five crops over 10 years by planting before the 1st of February.

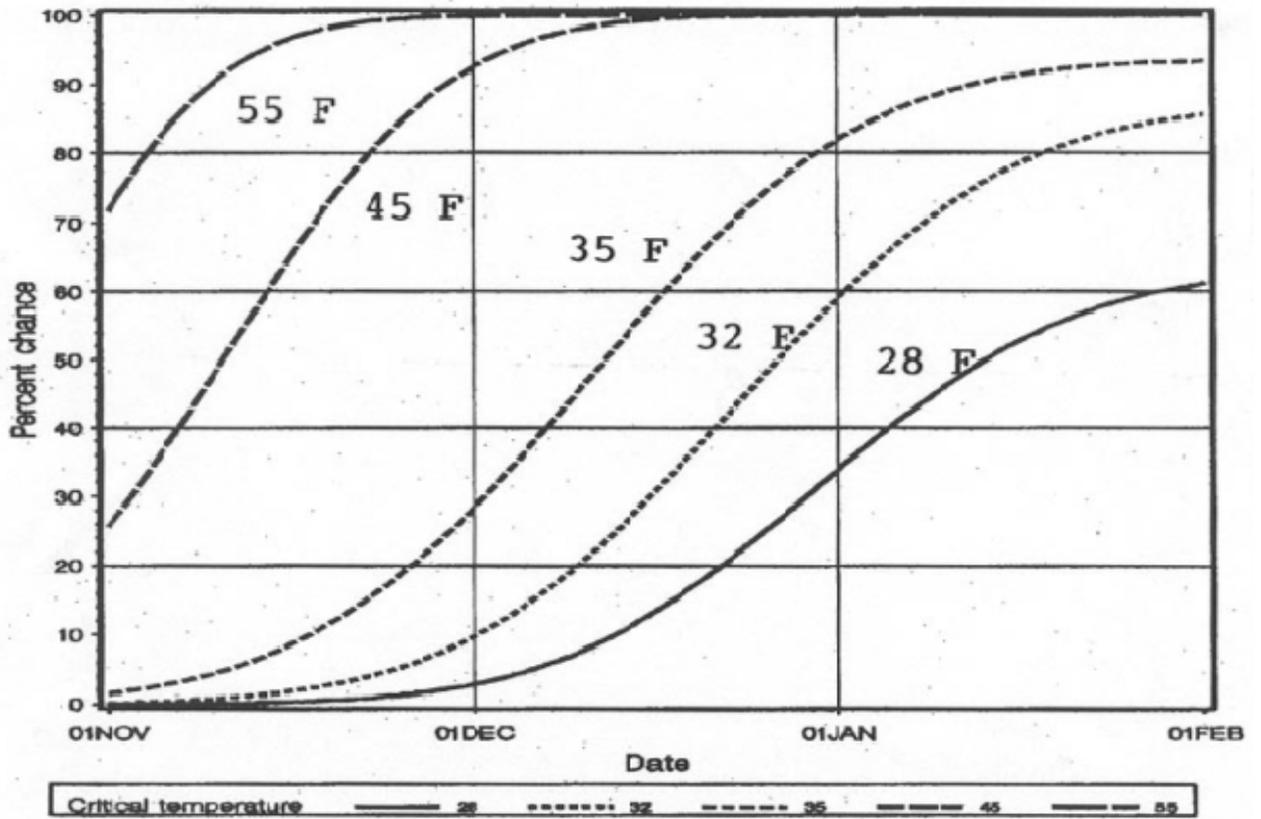


Figure 4. Fall freeze hazard showing the chance of the first attainment of a given temperature before a selected date.

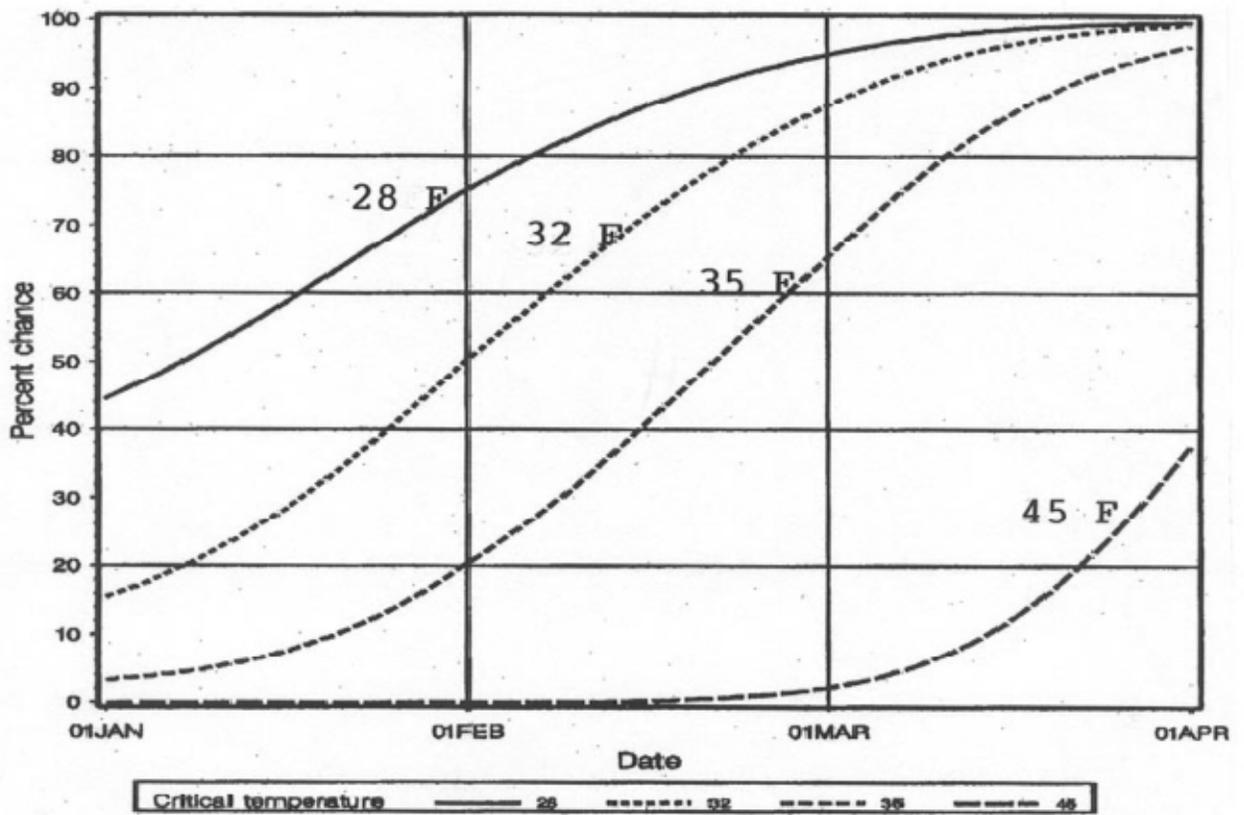


Figure 5. Spring freeze hazard showing the chance of the last attainment of a given temperature before a selected date.

Acknowledgments:

We gratefully acknowledge data collections by Shirley Searcy, as well as data preparation by Lisa Roberts.