

CLIMATOLOGICAL REPORT 2001

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 2001 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 2001 was 64.67 inches, which was 11.31 inches (21%) greater than the 60-year average of 53.36 inches (standard deviation 10.99 inches) (Table 1). The driest year had been 2000 when 32.02 inches were measured, and the year with the greatest rainfall was 1959 when 78.82 inches were recorded.

Table 1. Summary of rainfall by months. Range Cattle REC, 2001.					
1942 to 2000			2001		
	Maximum	Minimum	60-yr	Total	Diference

	month	month	Average		from 60-yr average
	----- inches* -----				

January	8.45	0.03	2.23	0.34	-1.89
February	9.59	0.02	2.51	0.02	-2.49
March	12.34	0.13	3.25	6.33	+3.08
April	11.91	0.00	2.50	0.96	-1.54
May	10.58	0.00	3.72	1.30	-2.42
June	18.99	2.79	8.37	10.58	+2.21
July	19.74	1.87	8.53	14.26	+5.73
August	15.72	3.13	8.00	10.11	+2.11
September	20.11	1.14	7.31	17.76	+10.45
October	11.23	0.04	3.15	2.38	-0.77
November	11.22	0.07	1.90	0.16	-1.74
December	8.61	0.16	1.89	0.47	-1.42
Year total			53.36	64.67	+11.31
*Inches x 2.54 = cm.					

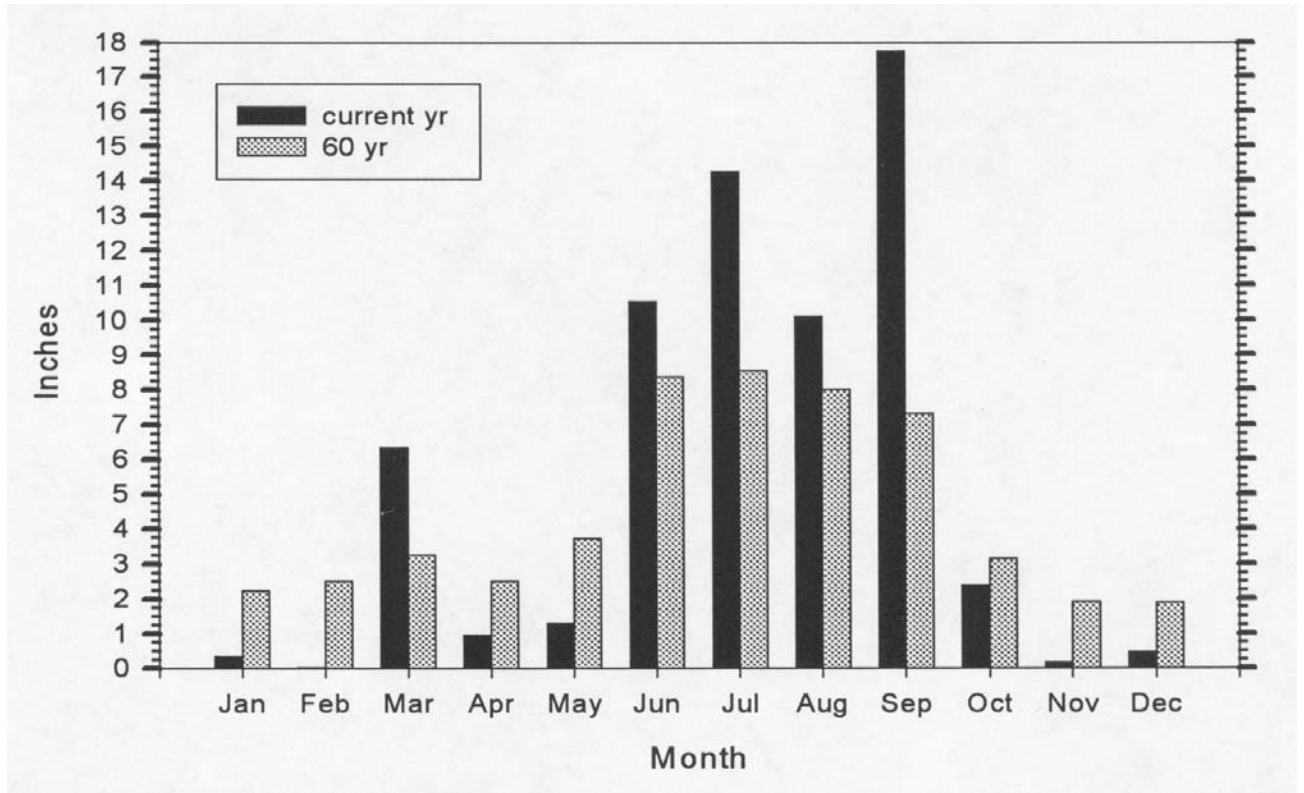
Table 2. Weather at Range Cattle REC, 2001.(Following four pages)

Day	January				February				March			
	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
1	51	27	0.00	16.42	84	64	0.00	13.82	84	57	0.00	18.14
2	60	37	0.00	15.55	82	64	0.00	12.96	84	59	0.00	17.28
3	58	36	0.00	11.23	77	55	0.00	6.91	85	61	0.00	18.14
4	63	31	0.00	14.69	63	57	0.02	6.05	87	67	0.00	19.87
5	56	23	0.00	16.42	73	53	0.00	10.37	84	49	1.08	8.64
6	63	40	0.00	15.55	70	28	0.00	14.69	67	44	0.00	23.33
7	70	28	0.00	15.55	78	41	0.00	19.01	64	44	0.00	24.19
8	71	45	0.00	15.55	80	51	0.00	17.28	68	37	0.00	25.06
9	77	42	0.16	9.50	81	54	0.00	18.14	73	35	0.00	24.19
10	56	30	0.00	16.42	83	55	0.00	18.14	76	56	0.05	20.74
11	63	41	0.00	14.69	86	61	0.00	14.69	77	47	0.00	19.01
12	74	47	0.00	14.69	87	65	0.00	16.42	80	55	0.00	21.60
13	76	41	0.00	12.10	87	62	0.00	15.55	89	70	0.00	19.01
14	66	45	0.00	14.69	86	60	0.00	16.42	80	60	0.19	5.18
15	76	46	0.00	12.10	86	57	0.00	15.55	80	61	0.01	11.23
16	80	55	0.00	13.82	86	57	0.00	15.55	85	67	0.00	15.55
17	80	59	0.00	12.10	85	62	0.00	19.01	82	66	0.00	9.50
18	82	58	0.00	12.10	84	55	0.00	15.55	84	60	0.00	16.42
19	83	56	0.00	12.96	79	52	0.00	19.01	79	63	0.00	16.42
20	87	63	0.17	13.82	81	54	0.00	17.28	75	66	0.35	6.91
21	64	31	0.01	4.32	81	62	0.00	13.82	75	53	0.01	15.55
22	55	38	0.00	16.42	81	50	0.00	11.23	66	52	0.00	12.10
23	65	39	0.00	7.78	84	55	0.00	18.14	70	41	0.00	25.06
24	61	33	0.00	17.28	84	60	0.00	14.69	80	47	0.00	25.06
25	66	32	0.00	17.28	87	61	0.00	18.14	83	49	0.00	24.19
26	66	29	0.00	18.14	86	59	0.00	13.82	82	48	0.00	23.33
27	69	36	0.00	16.42	86	56	0.00	16.42	76	49	0.00	17.28
28	67	39	0.00	10.37	89	58	0.00	19.87	78	53	0.00	25.06
29	76	50	0.00	15.55					83	67	0.00	21.60
30	78	58	0.00	12.96					84	62	4.64	8.64
31	81	64	0.00	12.96					77	65	0.00	11.23
Avg	69	42		13.85	82	56		15.30	79	55		17.73
Max	87	64	0.17	18.14	89	65	0.02	19.87	89	70	4.64	25.06
Min	51	23	0	4.32	63	28	0	6.05	64	35	0	5.18
Total			0.34	429.43			0.02	428.53			6.33	549.51

<u>Day</u>	<u>April</u>				<u>May</u>				<u>June</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
1	83	59	0.66	16.42	77	63	0.00	13.82	93	68	0.00	19.87
2	78	48	0.00	26.78	80	61	0.00	19.87	86	69	0.25	13.82
3	82	53	0.00	26.78	85	61	0.00	24.19	91	69	0.00	24.19
4	86	58	0.00	25.92	83	62	0.06	15.55	92	68	0.28	21.60
5	85	60	0.00	19.87	85	62	0.00	25.92	93	70	0.12	24.19
6	85	63	0.14	23.33	85	61	0.00	26.78	92	70	0.24	20.74
7	84	60	0.00	19.87	86	56	0.00	28.51	92	71	0.25	20.74
8	85	65	0.02	17.28	86	63	0.00	25.92	92	70	0.09	19.01
9	88	64	0.13	24.19	82	61	0.00	23.33	89	71	0.06	19.87
10	90	63	0.00	22.46	83	55	0.00	22.46	91	71	3.36	20.74
11	87	62	0.00	22.46	84	54	0.00	26.78	93	69	0.01	25.92
12	89	65	0.00	26.78	86	55	0.00	25.06	92	70	0.00	25.92
13	91	65	0.00	24.19	86	54	0.00	28.51	91	71	0.00	25.06
14	90	65	0.00	22.46	91	58	0.00	25.06	93	69	0.01	19.87
15	90	64	0.00	25.92	91	67	0.00	24.19	94	70	0.00	25.92
16	88	63	0.00	25.92	89	62	0.00	25.06	94	65	0.07	21.60
17	85	51	0.00	25.92	89	58	0.00	28.51	93	66	0.00	24.19
18	83	51	0.00	27.65	91	58	0.00	26.78	94	68	1.76	25.92
19	70	37	0.00	30.24	92	53	0.00	25.92	93	69	0.14	25.06
20	78	50	0.00	28.51	91	54	0.00	28.51	91	70	0.92	18.14
21	83	53	0.00	27.65	91	63	0.00	27.65	92	69	0.63	23.33
22	84	58	0.00	25.92	95	70	0.07	24.19	91	69	0.15	23.33
23	87	60	0.00	23.33	94	71	0.63	19.87	82	70	0.31	10.37
24	89	62	0.00	24.19	91	63	0.00	22.46	82	69	0.61	6.91
25	88	61	0.00	24.19	91	69	0.00	25.92	85	68	0.45	19.87
26	82	64	0.00	15.55	92	66	0.00	23.33	88	68	0.00	20.74
27	80	51	0.00	25.92	89	61	0.00	25.92	91	70	0.64	20.74
28	84	54	0.00	28.51	90	66	0.00	22.46	88	71	0.00	21.60
29	82	64	0.00	19.01	86	68	0.51	15.55	86	72	0.13	15.55
30	76	65	0.01	12.96	90	66	0.03	22.46	90	72	0.10	19.87
31					93	63	0.00	25.92				
<u>Avg</u>	84	59		23.67	88	61		24.08	90	69		20.82
<u>Max</u>	91	65	0.66	30.24	95	71	0.63	28.51	94	72	3.36	25.92
<u>Min</u>	70	37	0	12.96	77	53	0	13.82	82	65	0	6.91
<u>Total</u>			0.96	710.18			1.30	746.46			10.58	624.68

Day	July				August				September			
	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	91	72	0.11	17.28	90	72	0.30	12.10	89	72	0.48	10.37
2	92	70	0.00	23.33	86	72	0.19	12.10	94	73	0.67	21.60
3	93	72	0.00	25.06	76	72	0.51	3.46	93	67	1.43	22.46
4	93	71	0.00	25.06	82	72	0.00	12.96	95	73	0.00	23.33
5	93	71	0.01	21.60	86	73	0.32	12.10	93	51	1.74	20.74
6	89	71	0.00	19.87	90	72	0.00	18.14	92	73	0.02	19.87
7	91	69	2.79	15.55	93	71	3.99	19.01	93	72	0.05	16.42
8	93	70	0.00	22.46	93	75	0.00	18.14	89	71	2.78	15.55
9	90	69	0.18	15.55	93	75	0.01	19.87	85	72	1.08	16.42
10	85	72	0.23	10.37	92	73	0.00	17.28	85	73	0.08	16.42
11	89	71	2.06	12.96	93	71	1.43	23.33	86	74	0.69	14.69
12	94	74	1.09	12.10	92	72	0.00	23.33	90	74	0.27	16.42
13	85	75	0.31	16.42	94	71	2.04	24.19	87	72	0.48	12.10
14	86	75	0.53	12.10	94	75	0.00	22.46	77	72	5.21	4.32
15	87	72	1.62	11.23	92	74	0.00	23.33	76	69	1.34	6.91
16	86	73	0.04	19.87	90	75	0.00	19.87	78	68	0.00	19.01
17	90	73	0.25	15.55	92	77	0.30	19.87	85	67	0.00	22.46
18	84	73	0.00	8.64	95	76	0.00	25.06	89	70	0.00	20.74
19	88	73	1.00	17.28	95	75	0.01	19.01	89	71	0.00	17.28
20	87	74	0.40	16.42	92	71	0.13	17.28	91	73	0.00	22.46
21	90	74	0.00	17.28	94	72	0.00	24.19	90	72	0.09	16.42
22	83	73	1.03	10.37	90	71	0.74	17.28	91	73	0.00	19.87
23	84	74	0.61	18.14	92	73	0.00	23.33	90	71	0.15	17.28
24	80	70	0.43	10.37	92	72	0.00	21.60	91	73	0.00	20.74
25	91	73	0.02	20.74	93	71	0.00	25.06	89	72	0.36	17.28
26	92	72	1.55	19.01	95	74	0.00	24.19	87	73	0.02	17.28
27	90	74	0.00	20.74	91	68	0.00	22.46	82	73	0.09	6.91
28	89	73	0.00	17.28	91	72	0.00	21.60	77	70	0.15	6.05
29	94	71	0.00	22.46	93	73	0.00	20.74	81	71	0.33	8.64
30	93	75	0.00	25.92	95	75	0.00	22.46	81	64	0.25	14.69
31	95	75	0.00	22.46	94	71	0.14	21.60				
Avg	89	72		17.53	91	73		19.59	87	71		16.16
Max	95	75	2.79	25.92	95	77	3.99	25.06	95	74	5.21	23.33
Min	80	69	0	8.64	76	68	0	3.46	76	51	0	4.32
Total			14.26	543.47			10.11	607.40			17.76	484.73

Day	<u>October</u>				<u>November</u>				<u>December</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
1	84	61	0.00	20.74	79	66	0.03	10.37	83	56	0.00	13.82
2	79	58	0.00	22.46	83	67	0.00	12.10	82	57	0.00	14.69
3	83	63	0.00	21.60	85	68	0.03	13.82	82	57	0.00	13.82
4	85	66	0.00	22.46	84	70	0.01	12.96	81	65	0.00	12.10
5	88	68	0.00	19.01	78	68	0.09	6.05	82	62	0.00	12.96
6	90	73	0.00	17.28	73	57	0.00	7.78	81	64	0.00	9.50
7	88	71	0.00	15.55	79	54	0.00	17.28	82	67	0.00	10.37
8	88	72	0.03	12.96	79	56	0.00	17.28	83	67	0.02	10.37
9	88	70	0.00	14.69	79	56	0.00	14.69	84	65	0.05	11.23
10	86	67	0.00	18.14	79	54	0.00	16.42	85	67	0.04	11.23
11	87	68	0.00	19.01	81	53	0.00	16.42	84	61	0.00	10.37
12	87	66	0.00	18.14	82	59	0.00	14.69	85	66	0.01	13.82
13	86	66	0.00	17.28	78	56	0.00	15.55	84	61	0.00	12.10
14	88	72	0.00	18.14	80	63	0.00	14.69	84	67	0.00	13.82
15	88	72	0.21	12.96	75	63	0.00	9.50	86	64	0.00	12.10
16	85	69	0.00	13.82	72	57	0.00	6.91	85	67	0.00	12.96
17	84	61	0.00	12.96	80	60	0.00	16.42	85	67	0.00	11.23
18	75	59	0.00	14.69	83	63	0.00	14.69	84	61	0.16	11.23
19	81	66	0.00	13.82	82	63	0.00	12.10	76	46	0.01	14.69
20	87	70	0.00	13.82	79	56	0.00	12.96	73	52	0.00	13.82
21	87	73	0.00	13.82	79	56	0.00	13.82	70	42	0.00	15.55
22	85	71	0.70	6.05	79	55	0.00	14.69	74	47	0.00	14.69
23	84	71	0.00	10.37	82	61	0.00	15.55	76	52	0.00	13.82
24	83	73	0.92	9.50	82	62	0.00	12.10	78	62	0.00	9.50
25	88	76	0.00	12.96	85	62	0.00	13.82	77	52	0.00	10.37
26	88	66	0.52	10.37	84	61	0.00	14.69	58	45	0.18	2.59
27	75	55	0.00	9.50	81	59	0.00	11.23	59	37	0.00	12.96
28	67	48	0.00	17.28	82	59	0.00	14.69	57	43	0.00	8.64
29	72	56	0.00	16.42	82	60	0.00	12.96	73	54	0.00	12.10
30	77	60	0.00	14.69	82	57	0.00	13.82	76	51	0.00	11.23
31	80	62	0.00	14.69					72	57	0.00	8.64
Avg	84	66		15.33	80	60		13.34	78	57		11.82
Max	90	76	0.92	22.46	85	70	0.09	17.28	86	67	0.18	15.55
Min	67	48	0	6.05	72	53	0	6.05	57	37	0	2.59
Total			2.38	475.18			0.16	400.05			0.47	366.32



Total 2001 rainfall=64.67 vs. 60-yr average=53.36

Figure 1. Monthly 2001 rainfall at the Range Cattle REC compared to the 60-year mean rainfall at Range Cattle REC.

February 2001 set a new record for low rainfall with 0.02 inches (Tables 1 and 2, Fig.1). There were 19 occurrences during 2001 when daily rain equaled or exceeded 1 inch. The single greatest daily rain event was on September 14 (tropical storm Gabrielle) when 5.21 inches were recorded (8.1% of annual rainfall). There were seven rain events that exceeded 2 inches, four events exceeding 3 inches, and two events exceeding 4 inches of rain. Above average rain in June to September resulted in typical flooding of pastures at Ona.

Evapo-transpiration

Evapo-transpiration exceeded rainfall in 7 months during 2001 (Figure 2). Only in March and in the July to September period did rainfall exceed evapo-transpiration. For the year, rainfall exceeded evapo-transpiration by 10.8 inches.

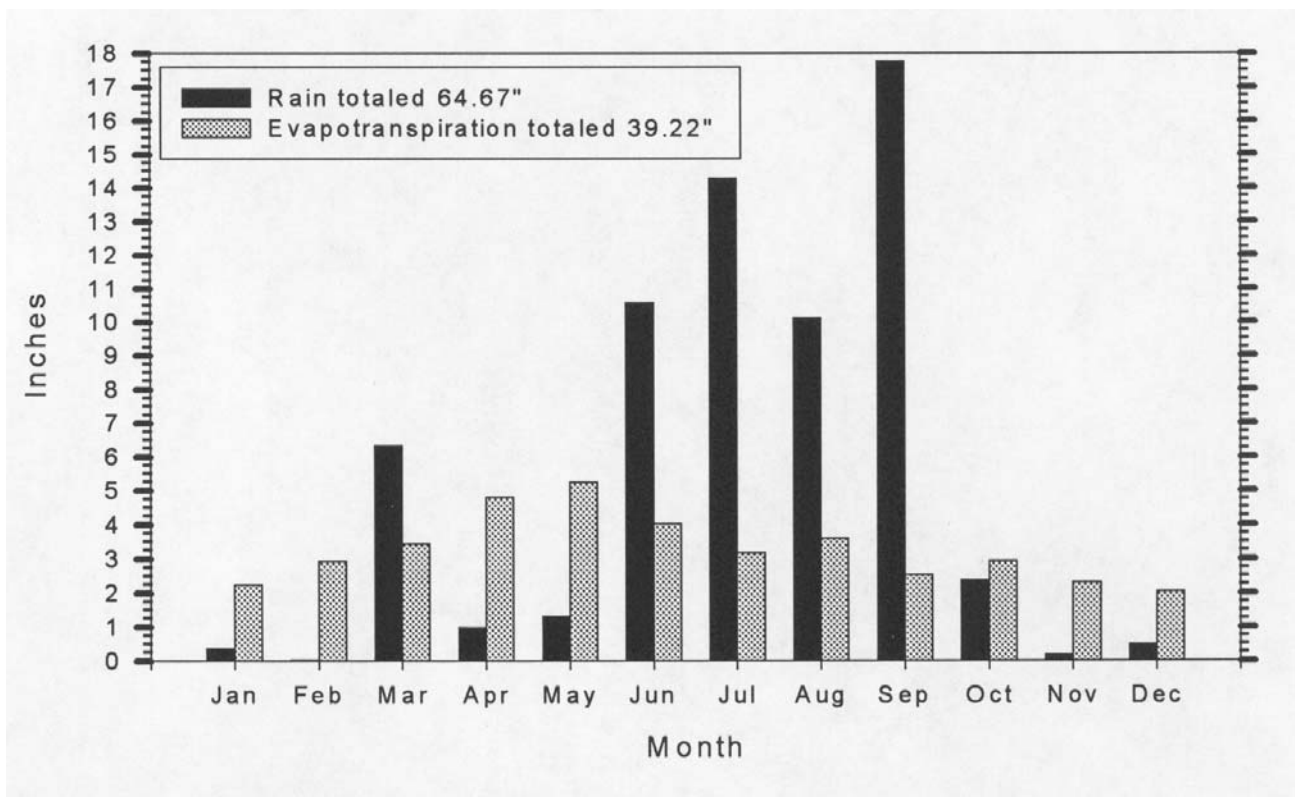


Figure 2. Monthly rainfall compared with evapo-transpiration during 2001.

Temperature:

There were eight and nine days when daily low shelter and daily low ground temperatures, respectively, were at or below 32 °F (Table 2). There were about 13 incidences of frost (data not shown), and frost occurred as late as April 19. In spite of numerous cold days, only January and September had mean-monthly low shelter-temperatures below the respective 58-year mean for that month (Table 3). The extreme low temperature for 2001 occurred on January 5 when shelter and ground temperature reached 23 and 19 °F, respectively.

	Shelter Temperature				Ground Temperature		
	1944-01	2001	1944-01	2001	2001		
	Avg.	Avg.	Extreme	Year	Extreme	Avg.	Extreme
Jan	23	23	23	23	23	19	19
Feb	28	28	28	28	28	25	25
Mar	32	32	32	32	32	28	28
Apr	35	35	35	35	35	30	30
May	38	38	38	38	38	32	32
Jun	42	42	42	42	42	35	35
Jul	48	48	48	48	48	38	38
Aug	52	52	52	52	52	40	40
Sep	55	55	55	55	55	42	42
Oct	58	58	58	58	58	45	45
Nov	55	55	55	55	55	42	42
Dec	52	52	52	52	52	40	40

	Low	Low	Low		Low	Low	Low
January	49.5	41.9	18	1981	23	40.0	19
February	50.6	56.0	26	1976	28	53.2	25
March	54.3	55.2	26	1980	35	53.0	33
April	58.1	58.6	34	1971	37	55.5	33
May	63.2	61.4	43	1945	53	58.7	50
June	68.8	69.4	52	1984	65	67.2	63
July	71.1	72.4	62	several	69	70.5	67
August	71.7	72.8	61	1977	68	71.2	65
September	71.0	70.6	56	1962	51	70.1	63
October	64.6	66.1	42	several	48	64.3	44
November	56.8	60.0	25	1970	53	57.4	50
December	51.2	57.5	20	1962	37	55.0	34
Avg.	60.9	61.8			47.3	59.7	45.5
* °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.

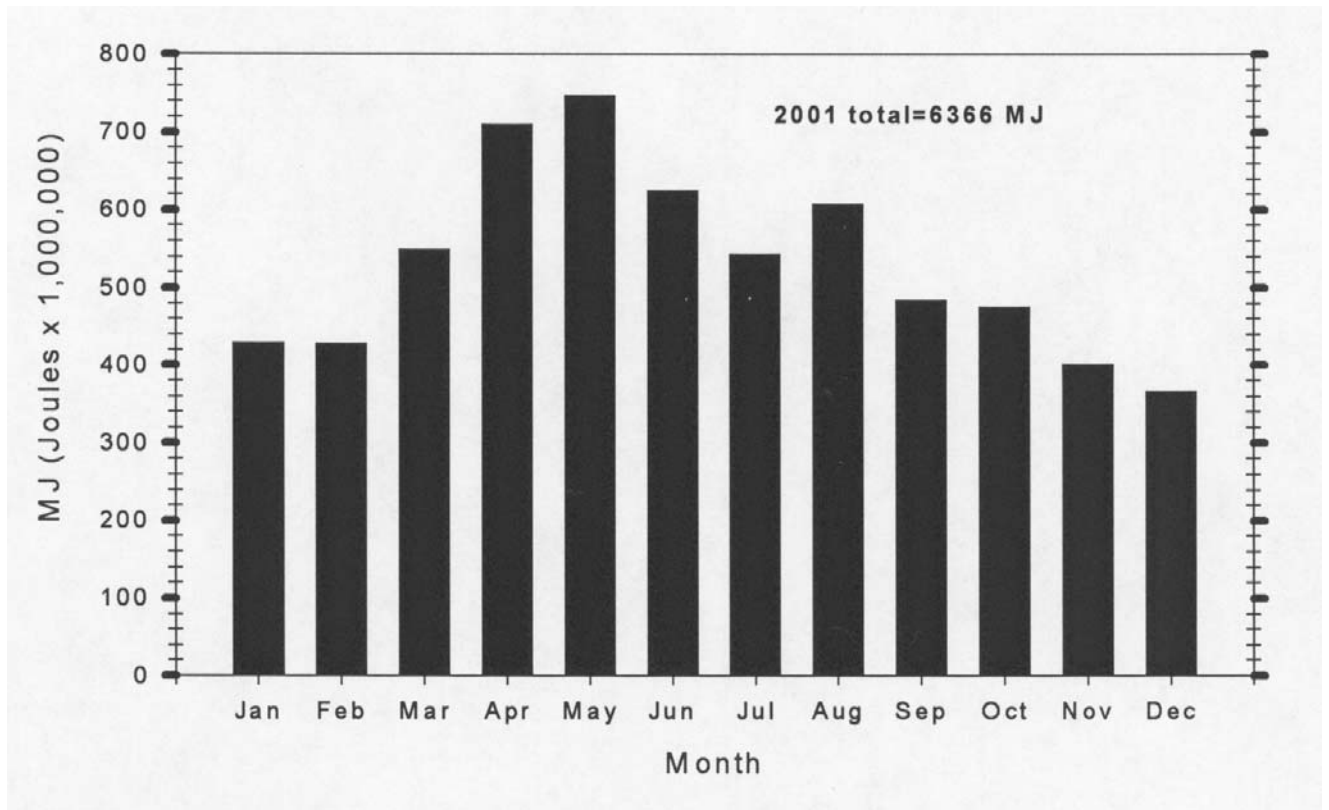


Figure 3. Total monthly solar radiation for 2001.

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.

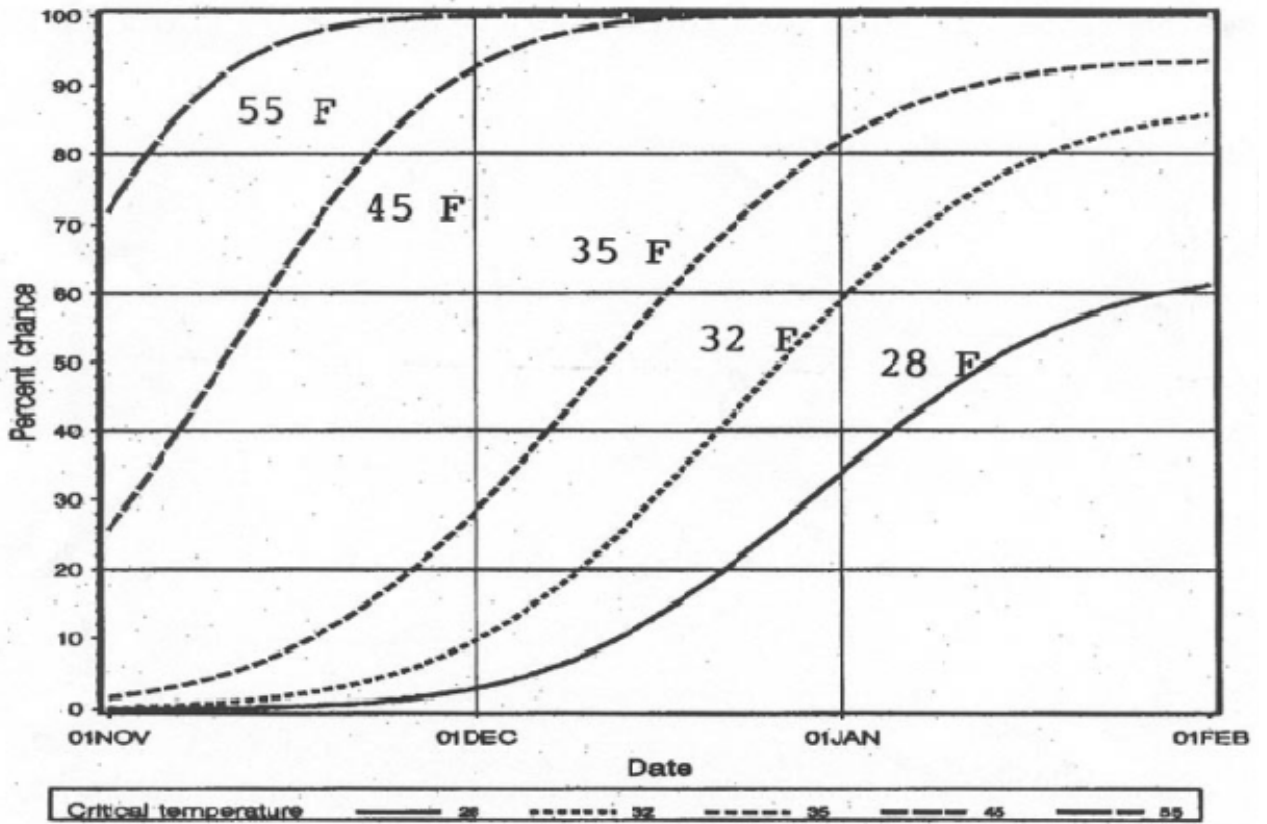


Figure 4. Fall freeze hazard showing the chance of the first attainment of a given temperature before a selected date.

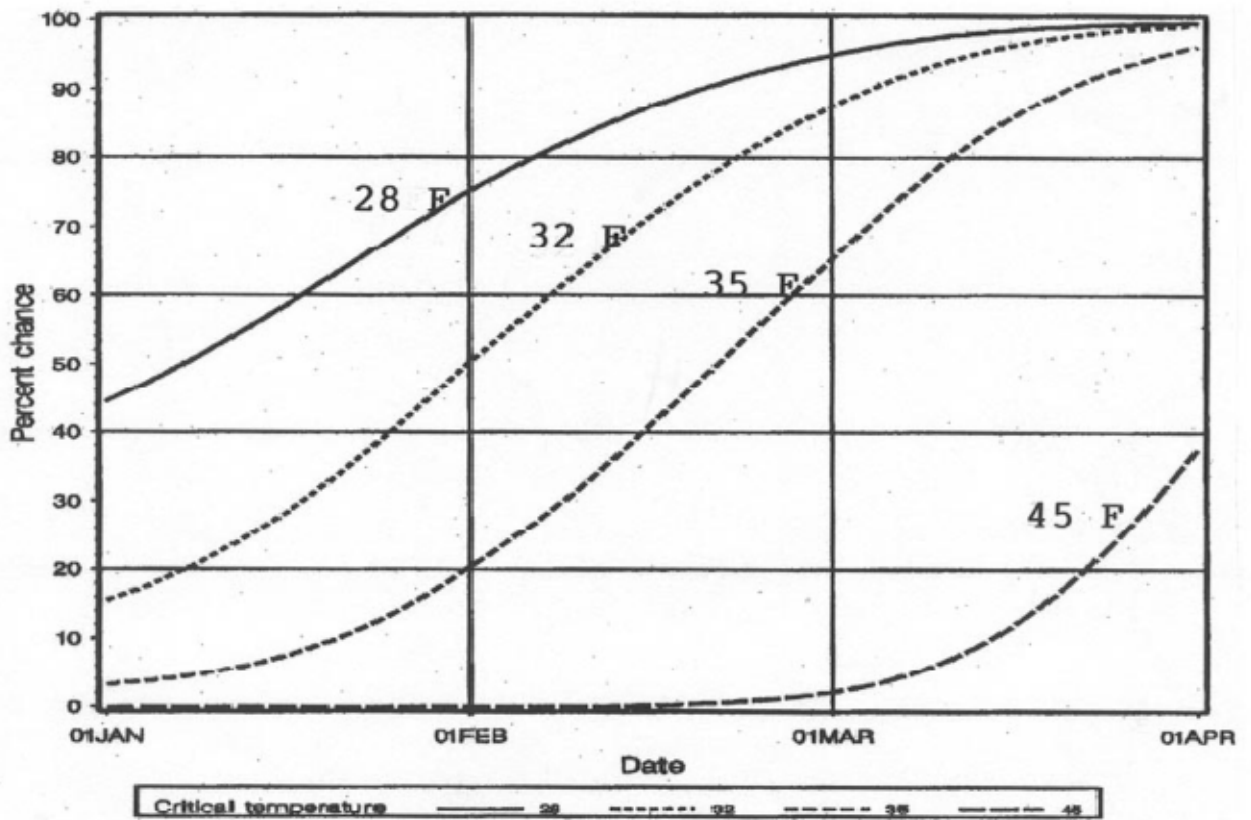


Figure 5. Spring freeze hazard showing the chance of the last attainment of a given temperature before a selected date.

Acknowledgments:

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