

CLIMATOLOGICAL REPORT 2005
Range Cattle Research and Education Center

Brent A. Sellers

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 operation.

This research report presents a summary of rainfall, air temperature, evapo-transpiration, and solar radiation for 2005 obtained at the Range Cattle Research and Education Center (REC) Ona, Florida, and is compared to a 64-year summary of data collected from this location. 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. Measurements reported here were taken at 0900 h, thus data on a given day represent the previous 24-h period.

Rainfall

Annual rainfall for 2005 was 61.83 inches (Table 1), which was 7.56 inches (14%) greater than the 64-year average of 54.27 inches (standard deviation 10.93 inches) (Table 1). The year with the least rainfall was 2000 when 32.02 inches were measured, and the year with the greatest rainfall was 1959 when 78.82 inches were recorded.

Monthly rainfall totals were above the 64-year average for all months except January, August, September, and December (Figure 1; Table 1). In most cases, rainfall was evenly distributed over the months when rainfall exceeded the 64-year average. Above average rainfall in May and June hindered many planting/sprigging and haying operations. If not for Hurricane Wilma on 24 October, which resulted in 4.66 inches of rain, October would have been relatively dry.

There were 17 occurrences during 2005 when daily rain equaled or exceeded 1 inch, three rain events that exceeded 2 inches, and one event that exceeded 4 inches of rain (Table 2). The single greatest daily rain event was 24 October when 4.66 inches were recorded.

Table 1. Summary of rainfall by months. Range Cattle REC, 2005.

Month	1942 to 2005		64-year average†	2005	Difference from 64-year average
	Maximum / month	Minimum / month		Total	
	-----inches-----				
January	8.45	0.03	2.19	2.02	-0.17
February	9.59	0.02	2.62	3.93	+1.31
March	12.34	0.13	3.20	4.83	+1.63
April	11.91	0.00	2.53	3.57	+1.04
May	10.58	0.00	3.80	6.25	+2.45
June	18.99	2.79	8.73	11.68	+2.95
July	19.74	1.87	8.48	8.56	+0.08
August	15.72	3.13	8.21	7.30	-0.91
September	20.11	1.14	7.42	3.37	-4.05
October	11.25	0.04	3.12	6.13	+3.01
November	11.22	0.07	1.97	3.59	+1.62
December	8.61	0.16	2.00	0.60	-1.40
Year total			54.27	61.83	+7.56

*Inches x 2.54 = cm.

† Since rainfall records began in July 1942, means for January to June are 63-year means.

Table 2. Daily minimum and maximum temperature, precipitation, and solar radiation for 2005, Range Cattle REC.

Day	January				February				March				April			
	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	9.50	71	47	0.00	17.28	77	52	0.01	17.28	86	67	0.00	18.14
2	77	56	0.00	12.10	75	52	0.00	16.42	70	45	0.00	19.87	87	65	0.78	21.60
3	78	55	0.00	13.82	74	57	0.00	11.23	65	46	0.00	21.60	72	49	0.00	24.19
4	78	54	0.00	10.37	78	50	0.00	14.69	57	50	0.29	4.32	73	44	0.00	27.65
5	79	57	0.00	12.10	56	45	0.00	6.05	70	42	0.00	22.46	81	55	0.00	27.65
6	81	60	0.00	13.82	69	50	0.00	17.28	72	49	0.00	22.46	81	60	0.00	25.06
7	82	63	0.01	12.96	75	52	0.00	12.96	74	56	0.00	21.60	82	65	0.00	19.87
8	84	59	0.00	12.10	76	54	0.00	14.69	77	59	0.01	17.28	83	64	0.77	13.82
9	83	57	0.00	14.69	77	47	0.00	15.55	72	49	0.01	15.55	78	56	0.00	22.46
10	81	55	0.00	14.69	78	53	0.00	18.14	54	46	0.80	4.32	79	57	0.00	24.19
11	81	54	0.00	13.82	74	39	0.02	15.55	67	48	0.00	24.19	82	55	0.00	22.46
12	80	54	0.00	12.10	61	36	0.00	20.74	71	48	0.00	19.87	82	57	0.00	25.92
13	81	64	0.00	13.82	68	37	0.00	20.74	73	48	0.00	25.06	82	67	0.18	19.87
14	83	63	1.83	9.50	76	50	0.00	19.87	78	56	0.00	21.60	79	53	0.00	25.06
15	65	57	0.07	3.46	79	52	0.00	19.01	80	63	0.00	14.69	79	52	0.00	25.06
16	69	52	0.07	5.18	81	51	0.00	14.69	79	67	0.00	9.50	72	53	0.00	21.60
17	62	41	0.00	9.50	79	52	0.00	17.28	84	66	1.84	16.42	73	47	0.00	27.65
18	59	40	0.00	17.28	79	53	0.00	12.96	67	57	1.60	3.46	77	51	0.00	28.51
19	63	42	0.00	16.42	71	43	0.00	19.87	67	45	0.00	21.60	81	54	0.00	25.92
20	66	40	0.00	14.69	76	48	0.00	20.74	70	49	0.00	25.06	79	58	0.00	24.19
21	65	48	0.00	6.91	79	51	0.00	20.74	77	58	0.04	22.46	79	55	0.00	19.01
22	72	52	0.01	12.96	79	58	0.00	18.14	79	66	0.00	12.10	82	56	0.00	23.33
23	74	54	0.00	9.50	82	61	0.00	17.28	87	71	0.00	19.01	84	55	0.00	25.92
24	59	32	0.00	17.28	82	60	0.00	14.69	75	64	0.17	4.32	79	51	0.01	25.06
25	59	35	0.00	18.14	81	59	0.00	15.55	81	69	0.01	10.37	71	43	0.00	29.38
26	67	45	0.00	17.28	77	61	0.24	8.64	85	72	0.00	16.42	78	52	0.00	28.51
27	73	54	0.01	12.96	77	64	1.98	12.96	87	69	0.00	17.28	84	64	1.83	19.87
28	78	55	0.00	13.82	75	62	1.69	2.59	85	68	0.01	13.82	82	51	0.00	21.60
29	70	58	0.02	7.78					75	53	0.04	20.74	83	60	0.00	28.51
30	75	58	0.00	13.82					79	46	0.00	25.92	86	61	0.00	27.65
31	77	50	0.00	13.82					82	64	0.00	23.33				
<u>Avg</u>	73	52	0.06	12.46	75	52	0.14	15.58	75	56	0.16	74.70	80	56	0.12	23.99
<u>Max</u>	84	64	1.83	18.14	82	64	1.98	20.74	87	72	1.84	87.1	87	67	1.83	29.38
<u>Min</u>	59	32	0.00	3.46	56	36	0.00	2.59	54	42	0.00	53.82	71	43	0.00	13.82
<u>Total</u>			2.02	386.19			3.93	436.33			4.83	533.96			3.57	719.71

Table 2. Continued.

Day	May				June				July				August			
	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	88	68	0.26	21.60	86	69	1.87	17.28	88	75	0.42	16.42	92	74	0.11	19.87
2	81	66	0.00	12.96	77	68	1.30	6.91	90	75	0.07	21.60	93	73	0.00	22.46
3	84	66	0.00	20.74	81	69	0.95	12.10	88	75	0.00	24.19	94	74	0.00	22.46
4	85	67	1.62	14.69	77	70	0.75	7.78	91	74	0.00	22.46	93	74	0.00	25.06
5	74	68	0.47	3.46	86	71	0.95	12.96	94	74	0.07	23.33	95	71	0.14	25.06
6	81	64	0.00	10.37	87	72	0.23	15.55	94	73	0.00	25.92	93	71	0.26	19.87
7	78	55	0.00	24.19	90	74	0.00	22.46	94	74	0.00	26.78	92	73	0.53	16.42
8	82	59	0.00	25.92	91	72	0.00	18.14	95	76	0.00	25.92	90	72	1.65	12.10
9	84	59	0.00	26.78	91	75	0.00	22.46	94	71	2.16	19.87	88	74	1.62	16.42
10	86	60	0.00	28.51	88	75	0.14	12.96	83	72	1.15	6.91	88	74	0.11	19.01
11	86	63	0.00	25.92	81	75	1.16	6.91	87	75	0.51	9.50	93	75	0.04	21.60
12	86	62	0.63	20.74	89	77	0.66	19.01	93	74	0.00	25.06	94	76	0.00	24.19
13	85	60	0.00	25.92	90	75	1.45	13.82	94	75	1.30	22.46	95	74	0.00	23.33
14	85	60	0.00	26.78	91	73	0.00	23.33	90	74	0.01	15.55	95	75	0.06	23.33
15	86	64	0.00	25.92	92	75	0.00	24.19	93	73	0.49	22.46	94	72	0.01	19.87
16	87	67	0.00	25.06	94	74	0.00	24.19	94	75	0.48	23.33	95	76	0.00	24.19
17	87	68	0.00	20.74	90	74	0.00	24.19	94	76	0.11	22.46	96	76	0.35	25.06
18	89	67	0.17	25.06	90	75	0.00	24.19	93	76	0.00	20.74	97	74	0.67	25.92
19	87	65	0.00	25.06	90	71	0.00	23.33	91	76	0.00	24.19	97	75	0.11	25.92
20	86	64	0.00	23.33	91	72	0.00	24.19	92	74	0.01	18.14	96	74	0.00	23.33
21	89	66	0.00	26.78	88	73	0.06	15.55	92	74	0.03	21.60	96	74	0.00	25.06
22	86	69	0.01	26.78	85	74	0.02	14.69	94	76	0.00	25.06	94	74	0.55	19.87
23	89	68	0.02	25.06	84	71	0.06	10.37	92	75	0.00	16.42	94	73	0.03	20.74
24	90	64	0.00	23.33	85	71	0.78	11.23	93	77	0.00	23.33	94	74	0.00	19.87
25	87	74	0.00	24.19	83	71	0.00	19.87	93	74	0.61	18.14	92	76	0.12	21.60
26	88	67	0.00	22.46	87	72	0.00	17.28	93	76	0.01	23.33	89	77	0.28	12.96
27	85	66	2.14	19.01	93	74	0.00	24.19	94	76	0.60	21.60	89	74	0.04	16.42
28	88	67	0.00	23.33	89	74	0.17	12.10	95	77	0.43	20.74	89	74	0.62	12.10
29	87	67	0.00	25.06	91	75	0.79	17.28	94	74	0.00	19.87	93	77	0.00	19.87
30	89	68	0.00	21.60	86	75	0.34	11.23	94	73	0.00	20.74	92	78	0.00	22.46
31	93	70	0.93	22.46					94	73	0.10	19.87	92	75	0.00	21.60
<u>Avg</u>	86	65	0.20	22.38	87	73	0.39	16.99	92	75	0.28	20.90	93	74	0.24	20.90
<u>Max</u>	93	70	2.14	28.51	94	77	1.87	24.19	95	77	2.16	26.78	97	78	1.65	25.92
<u>Min</u>	74	55	0.00	3.46	77	68	0.00	6.91	83	71	0.00	6.91	88	71	0.00	12.10
<u>Total</u>			6.25	693.81			11.68	509.74			8.65	647.99			7.30	648.02

Table 2. Continued.

Day	September				October				November				December			
	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	91	75	0.67	17.28	91	73	0.00	19.87	81	61	0.00	14.69	70	43	0.00	16.42
2	91	74	0.00	14.69	90	74	0.00	20.74	79	65	1.83	5.18	67	43	0.00	16.42
3	94	74	0.22	17.28	91	74	0.17	18.14	78	61	0.00	14.69	70	43	0.00	16.42
4	92	74	0.00	22.46	90	74	0.00	16.42	82	59	0.00	15.55	75	46	0.00	16.42
5	90	73	0.00	23.33	84	74	0.10	9.50	85	64	0.00	17.28	78	55	0.00	14.69
6	88	73	0.03	17.28	87	75	0.00	12.10	84	62	0.00	14.69	81	65	0.17	12.96
7	90	75	0.08	18.14	86	75	0.57	9.50	85	63	0.00	14.69	68	56	0.00	3.46
8	89	74	0.21	17.28	87	74	0.00	14.69	82	66	0.00	13.82	73	65	0.17	4.32
9	87	72	0.00	14.69	89	73	0.20	14.69	85	65	0.00	15.55	79	65	0.03	8.64
10	90	72	0.08	19.01	89	76	0.00	14.69	83	57	0.00	15.55	81	61	0.09	11.23
11	91	71	0.00	23.33	91	74	0.00	16.42	82	58	0.00	17.28	79	55	0.00	12.10
12	91	65	0.00	24.19	89	74	0.00	16.42	81	58	0.00	17.28	68	43	0.00	8.64
13	90	68	0.00	22.46	89	75	0.00	15.55	81	61	0.00	16.42	65	44	0.01	15.55
14	90	68	0.00	21.60	84	72	0.00	9.50	83	64	0.00	15.55	68	42	0.00	15.55
15	90	67	0.00	21.60	87	66	0.00	17.28	77	64	0.03	8.64	74	53	0.00	14.69
16	91	70	0.00	20.74	85	63	0.00	17.28	85	63	0.00	14.69	79	54	0.01	12.10
17	94	71	0.00	20.74	84	58	0.00	20.74	87	64	0.00	12.96	71	57	0.07	12.10
18	93	68	0.00	22.46	85	63	0.00	19.87	75	58	0.00	8.64	74	58	0.01	6.05
19	92	73	0.00	22.46	86	67	0.00	18.14	78	62	0.00	11.23	78	57	0.00	6.05
20	91	76	0.00	20.74	85	71	0.02	11.23	81	68	0.00	9.50	65	52	0.00	4.32
21	88	75	0.38	12.96	89	73	0.00	14.69	86	69	0.00	12.10	68	46	0.00	10.37
22	91	75	0.31	10.37	84	71	0.34	6.05	81	51	0.01	10.37	62	36	0.00	13.82
23	84	76	0.03	6.05	87	73	0.00	8.64	68	42	0.00	15.55	64	36	0.00	16.42
24	90	72	0.11	12.10	87	64	4.66	8.64	66	47	0.00	17.28	70	46	0.00	14.69
25	92	69	0.00	21.60	72	51	0.07	13.82	78	56	0.00	13.82	74	55	0.00	12.96
26	90	70	0.00	19.87	68	47	0.00	18.14	82	54	0.00	13.82	73	45	0.04	10.37
27	91	66	0.03	21.60	68	46	0.00	19.87	80	59	0.00	14.69	65	35	0.00	14.69
28	90	70	0.47	19.87	80	52	0.00	19.87	80	66	0.00	12.10	69	37	0.00	15.55
29	89	68	0.57	15.55	79	54	0.00	19.01	81	68	0.97	6.91	71	50	0.00	14.69
30	91	71	0.18	19.87	77	55	0.00	19.01	72	57	0.75	3.46	74	43	0.00	14.69
31					77	58	0.00	16.42					77	51	0.00	14.69
<u>Avg</u>	90	71	0.11	18.72	84	67	0.20	15.38	80.19	60.37	0.12	13.13	71.94	49.58	0.02	12.29
<u>Max</u>	94	76	0.67	24.19	91	76	4.66	20.74	86.50	69.27	1.83	17.28	81.10	65.45	0.17	16.42
<u>Min</u>	84	65	0.00	6.05	68	46	0.00	6.05	65.68	42.02	0.00	3.46	61.57	34.93	0.00	3.46
<u>Total</u>			3.37	561.60			6.13	476.93			3.59	393.98			0.60	381.07

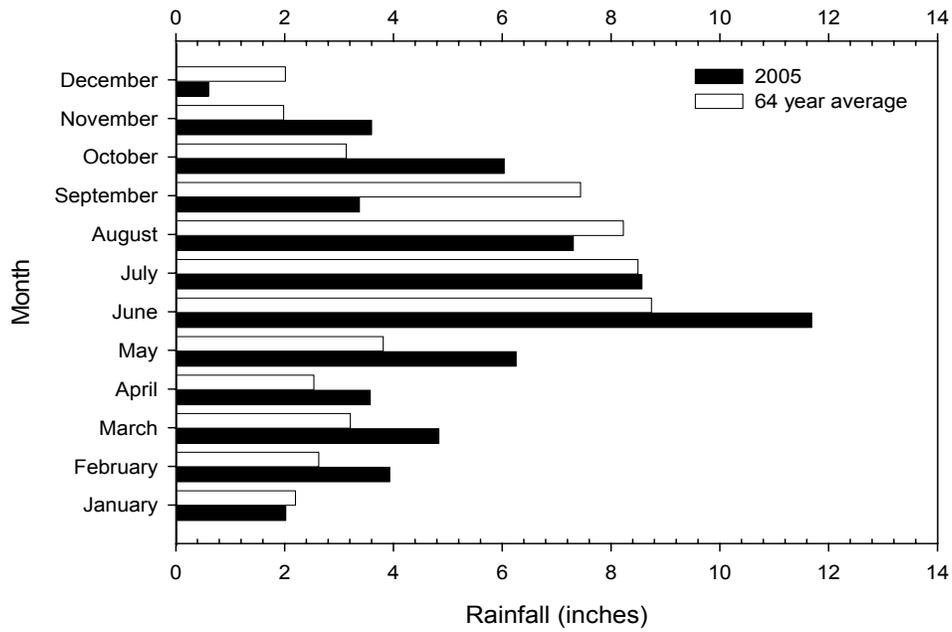


Figure 1. Monthly rainfall in 2005 compared with the 64-year average.

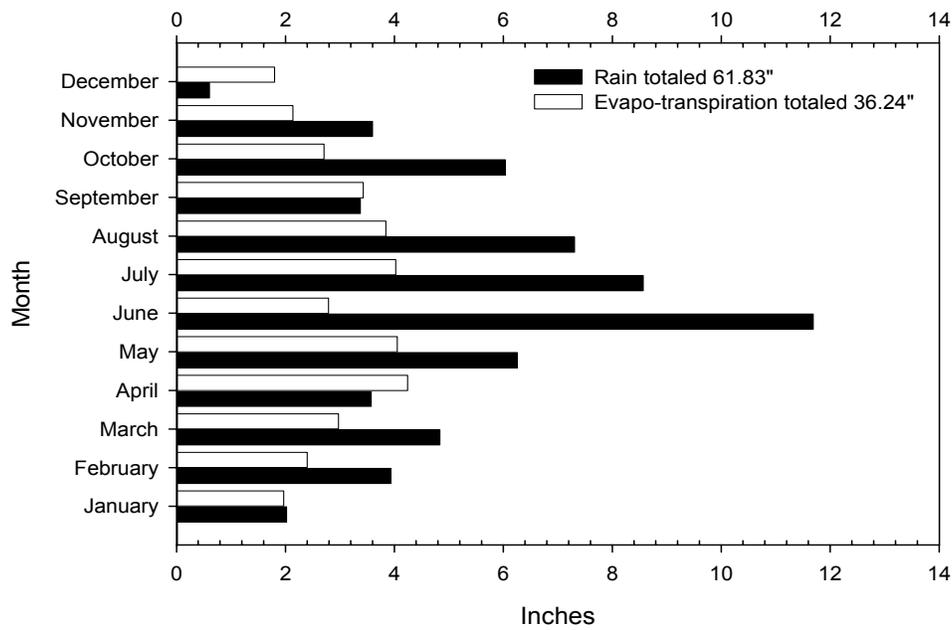


Figure 2. Monthly rainfall compared with evapo-transpiration during 2005.

Evapo-transpiration

Evapo-transpiration is the total amount of water transferred from the earth to the atmosphere. Rainfall exceeded evapo-transpiration in all but three months during 2005 (Figure 2). This was atypical because evapo-transpiration generally exceeds rainfall in January to May and October to December, which are months with limited rainfall. For the year, rainfall exceeded evapo-transpiration by 25.59 inches.

Temperature

There was 1 day when daily-low shelter temperature was at or below 32 °F and 4 days when low ground temperature reached freezing (Table 2). The extreme low temperature for 2004 occurred on 24 January when shelter and ground temperature reached 32 and 30 °F, respectively. Scattered frost occurs when ground temperature reaches 35 °F. Based on this observation, there were 4 incidences of frost (data not shown). Except for April and December, all months in 2005 had greater mean low temperatures compared with the 62-year means (Table 3). Overall, mean temperature for 2005 was 1.6 °F greater than the 62-year mean.

Table 3. Summary of minimum temperature* for 2005 by months, Range Cattle REC.

Month	Shelter†				Ground level‡		
	1944-05	2005	1944-05	Year	2005	2005	
	Avg. low	Avg. low	Extreme low		Extreme low	Avg. low	Extreme low
-----°F-----				-----°F-----			
January	49.3	52.3	18	1981	32	49.4	30
February	50.8	51.5	26	1976	36	48.5	31
March	54.6	56.1	26	1980	42	53.5	39
April	58.2	55.9	34	1971	43	52.9	40
May	63.4	65.2	43	1945	55	62.4	52
June	69.0	72.8	52	1984	68	71.2	67
July	71.2	74.5	62	several	71	72.6	69
August	71.8	74.3	61	1977	71	72.8	70
September	71.1	71.5	56	1962	65	69.4	63
October	64.8	66.7	51	several	46	64.1	42
November	57.0	60.4	25	1970	42	71.9	68
December	51.2	49.6	20	1962	35	66.0	62
Average	61.0	62.6			51	62.9	

*°C = (°F – 32) x 0.555

† Air temperature is measured using a thermometer in an instrument shelter designed to protect meteorological equipment from exposure to direct sunlight, precipitation, and condensations, while allowing for adequate ventilation so that the instruments measure environmental parameters accurately.

‡ Ground level temperature is measured with a soil probe, which measures the temperature at the soil surface.

Solar Radiation:

Daily solar radiation is shown in Table 2, and 2005 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 April 2005 (720 MJ) to produce 10,296 lb/A of plant dry matter. Total solar radiation for 2005 was 6,389 MJ.

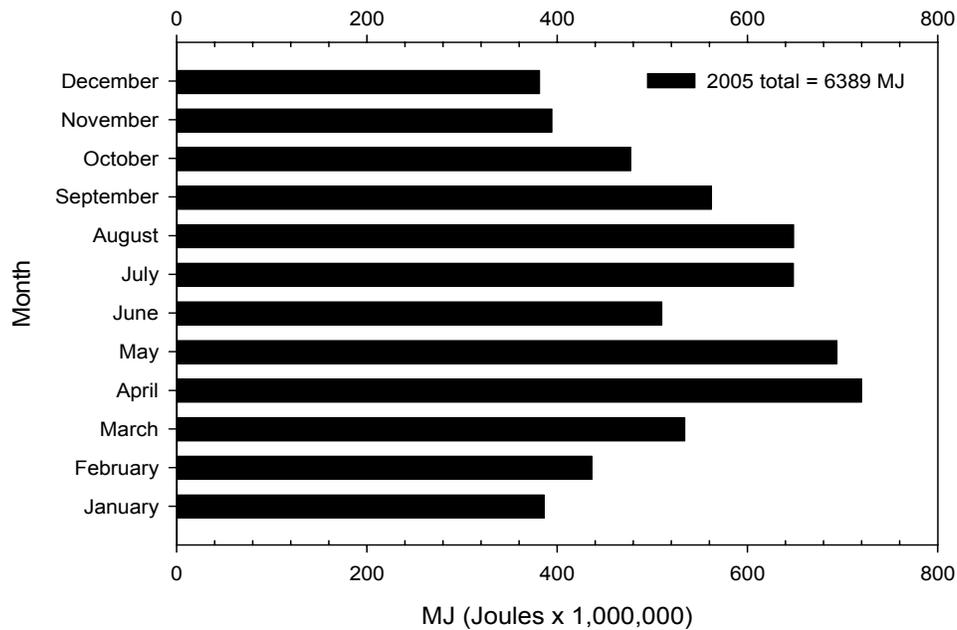


Figure 3. Total monthly solar radiation for 2005.

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.

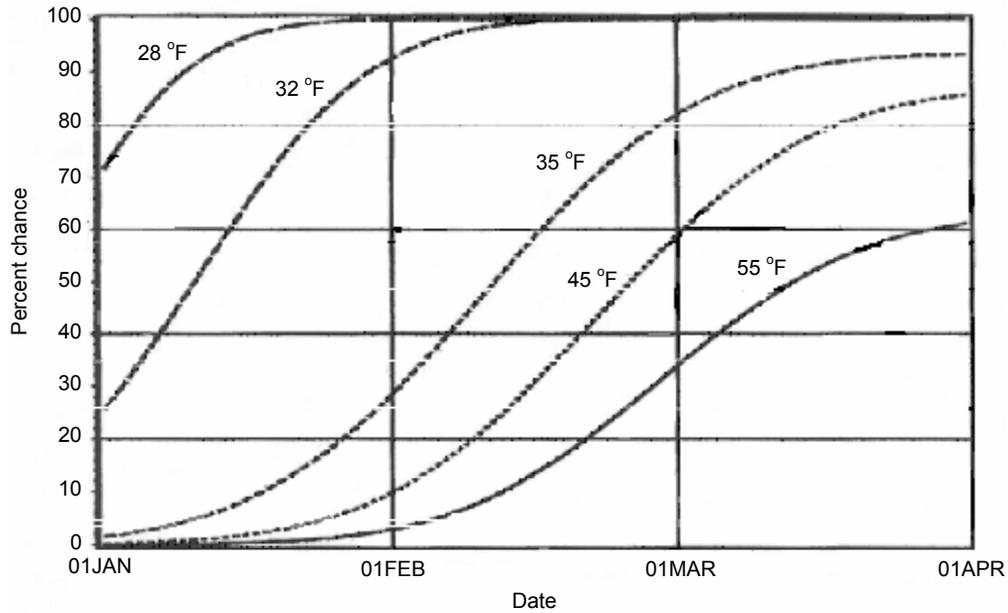


Figure 4. Fall freeze hazard showing the chance of the first attainment of a given temperature before a selected date.

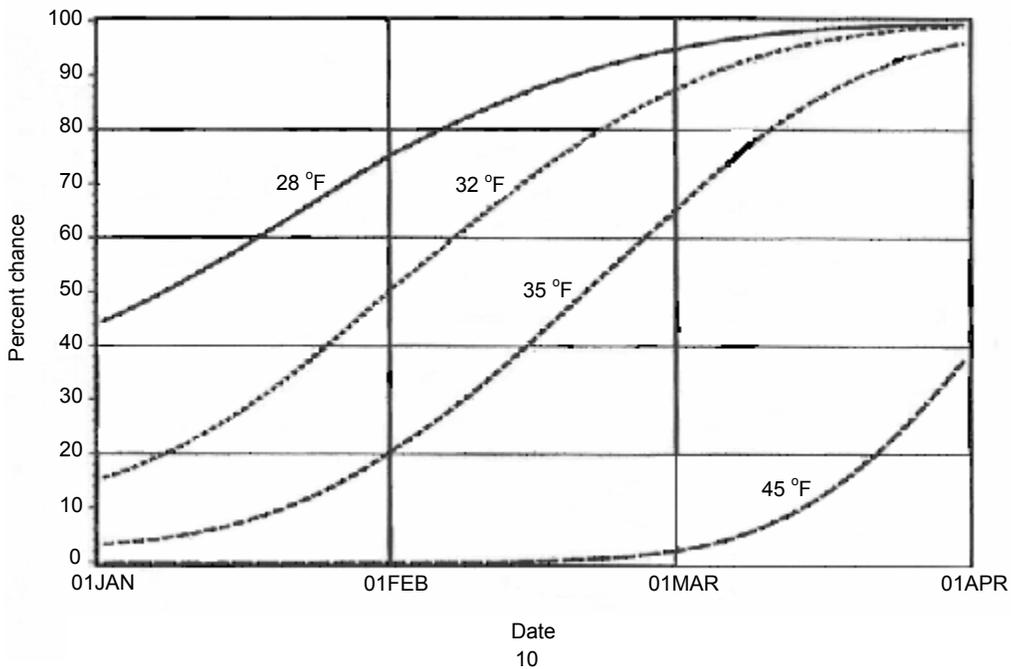


Figure 5. Spring freeze hazard showing the chance of the last attainment of a given temperature before a selected date.

Acknowledgements: The author wishes to thank Shirley Searcy for data collection as well as Andrea Dunlap, Toni Wood, and Walt Beattie for data preparation.