

Range Cattle Research and Education Center

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Research Report RC-2017-1

CLIMATOLOGICAL REPORT 2016  
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 supplement cattle on pasture or range. Weather conditions influence forage seed germination, growth and development, palatability, and nutritive value.

This research report presents a summary of weather conditions observed during 2016 at the Range Cattle Research and Education Center (RCREC), Ona, Florida. The center is located  $81^{\circ} 56.406'$  W and  $27^{\circ} 23.733'$  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.) from 1997 until 2005. Beginning in 2006, observations were collected using the Florida Automated Weather Network (FAWN). Measurements reported prior to 2006 were recorded at 0900 h; thus, data on a given day represented the previous 24-hour period. Beginning in 2006, measurements were recorded for an entire 24-h period beginning at midnight.

Daily observations of rainfall, temperature, and solar radiation are summarized in Table 1. These data are then compared to a 75-year summary of rainfall data and a 73-year summary of temperature data collected at this location. In addition, monthly evapotranspiration and freeze hazard information are reported.

**Table 1. Daily maximum and minimum temperature, precipitation, and solar radiation for 2016, Range Cattle REC.**

Day	January				February				March				April			
	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>
1	84.31	64.44	0.00	12.47	81.93	58.59	0.00	14.57	81.36	51.64	0.00	22.70	89.85	63.16	0.00	22.40
2	68.72	63.27	0.00	3.05	84.54	58.96	0.00	12.77	80.15	54.91	0.00	17.16	80.10	67.95	0.21	4.07
3	60.46	56.10	0.66	2.19	85.57	69.46	0.00	13.86	79.54	50.40	0.00	18.93	76.05	57.58	0.00	22.74
4	67.15	48.87	0.00	17.10	81.18	58.46	0.30	9.36	81.14	54.64	0.00	23.72	82.04	55.51	0.00	25.41
5	70.75	47.44	0.00	14.09	63.43	45.59	0.01	21.90	76.59	50.77	0.00	19.12	83.44	52.95	0.00	29.17
6	71.19	56.39	0.00	9.65	66.25	47.71	0.47	4.72	77.13	49.23	0.00	25.99	80.98	55.72	0.52	24.57
7	69.87	56.43	0.00	6.78	58.77	39.86	0.00	19.85	78.37	45.82	0.00	23.74	79.92	57.40	0.17	16.85
8	80.37	58.33	0.28	9.34	67.01	37.54	0.00	18.08	78.22	53.47	0.00	18.10	81.19	55.33	0.00	27.41
9	80.58	59.67	0.27	11.74	62.51	50.92	0.00	12.72	81.97	58.21	0.00	20.97	76.03	51.69	0.00	29.94
10	73.40	54.39	0.04	8.78	61.61	37.41	0.00	14.91	85.06	58.39	0.00	21.40	81.34	46.85	0.00	28.40
11	65.89	44.10	0.02	17.47	70.20	35.86	0.00	21.89	84.69	60.98	0.00	21.63	83.34	55.22	0.00	26.14
12	68.14	42.35	0.00	14.41	74.34	39.37	0.00	22.11	85.77	63.30	0.00	20.48	84.65	53.83	0.00	27.02
13	62.56	51.13	0.00	8.56	74.05	47.89	0.00	21.06	86.41	61.99	0.00	21.29	86.20	59.43	0.00	21.23
14	70.75	49.77	0.00	7.44	73.00	42.43	0.00	21.31	85.06	64.24	0.00	20.66	88.45	63.48	0.00	21.39
15	75.38	56.23	1.67	9.88	73.87	53.46	0.00	9.32	86.02	68.50	0.03	23.02	82.06	62.62	0.07	14.04
16	78.71	53.26	0.23	18.18	76.64	53.58	0.62	21.03	87.71	64.87	0.00	22.41	80.11	66.11	0.00	20.26
17	72.27	48.06	1.20	15.03	75.63	48.43	0.00	22.53	86.99	67.14	0.00	21.03	80.26	59.29	0.00	25.66
18	62.82	43.58	0.00	18.58	73.63	49.91	0.00	22.82	83.55	56.80	0.00	17.23	81.68	57.15	0.00	24.42
19	59.04	37.96	0.00	17.75	75.33	50.34	0.00	19.12	77.85	59.85	0.75	5.41	81.90	55.83	0.00	28.00
20	67.32	37.24	0.00	15.31	77.22	51.78	0.00	18.58	79.63	61.92	0.00	4.83	82.09	53.96	0.00	25.63
21	70.83	44.96	0.00	11.64	77.83	49.03	0.00	15.49	64.54	44.83	0.00	25.98	83.80	58.19	0.00	23.06
22	70.47	52.05	0.01	5.45	81.95	51.80	0.00	19.73	75.61	40.40	0.00	28.27	86.45	62.31	0.00	22.96
23	59.02	42.48	0.01	16.01	82.35	61.41	0.00	13.86	80.78	47.66	0.00	22.63	84.81	67.05	0.00	28.55
24	59.81	35.32	0.00	19.59	74.73	58.62	0.55	4.44	84.45	56.10	0.15	13.20	88.43	57.20	0.00	26.44
25	71.46	34.58	0.00	18.50	65.26	45.52	0.00	23.49	84.76	59.95	0.02	17.01	86.09	63.52	0.00	21.74
26	78.57	51.12	0.01	14.69	66.56	40.73	0.00	24.08	89.38	68.22	0.03	18.71	88.56	64.74	0.00	26.67
27	69.55	64.35	1.32	2.48	66.56	38.30	0.00	24.21	86.29	67.96	0.00	14.29	87.89	62.60	0.00	24.28
28	70.47	60.62	0.44	2.96	74.14	41.01	0.00	20.90	85.98	68.58	0.00	15.14	90.77	61.45	0.00	28.71
29	64.11	46.31	0.01	16.01	78.58	52.54	0.00	19.83	77.90	65.21	0.10	5.28	91.92	64.81	0.00	26.53
30	70.30	45.79	0.00	16.26					81.81	62.24	0.01	22.29	87.08	65.34	0.00	21.80
31	73.27	51.06	0.00	9.50					86.94	62.24	0.00	23.68				
<u>Avg</u>	69.92	50.25	0.20	11.96	73.26	48.85	0.07	17.54	81.99	58.08	0.04	19.24	83.92	59.28	0.03	23.85
<u>Max</u>	84.31	64.44	1.67	19.59	85.57	69.46	0.62	24.21	89.38	68.58	0.75	28.27	91.92	67.95	0.52	29.94
<u>Min</u>	59.02	34.58	0.00	2.19	58.77	35.86	0.00	4.44	64.54	40.40	0.00	4.83	76.03	46.85	0.00	4.07
<u>Total</u>			6.17	370.88			1.95	508.54			1.09	596.29			0.97	715.52

Table 1. Continued.

Day	May				June				July				August			
	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>
1	90.37	61.83	0.00	27.40	91.60	67.55	0.00	29.85	93.04	72.82	0.17	28.14	93.02	73.00	0.00	27.02
2	92.66	63.97	0.00	24.71	92.07	67.05	0.19	25.35	91.56	72.07	0.07	18.58	94.96	73.67	0.02	25.47
3	88.56	69.35	0.00	23.72	93.18	70.45	1.94	23.72	93.90	73.27	0.00	23.10	93.00	71.76	0.00	28.44
4	72.93	66.15	0.94	3.99	92.01	72.12	0.01	24.99	92.75	73.29	0.00	21.12	91.02	72.82	0.08	18.82
5	80.58	57.79	0.00	29.51	90.81	71.69	0.35	17.77	96.04	72.30	0.00	26.62	90.77	72.28	0.00	17.90
6	76.98	54.28	0.00	31.45	82.58	69.75	0.91	4.39	95.74	75.07	0.00	1.11	89.04	72.79	0.66	13.27
7	80.46	49.24	0.00	31.98	85.28	77.70	0.54	10.34	95.90	75.83	0.00	24.12	87.37	75.06	0.16	11.66
8	84.60	50.31	0.00	31.95	91.08	73.33	1.74	16.17	96.67	74.84	0.00	22.39	83.57	73.51	0.04	9.10
9	85.84	53.17	0.00	30.39	82.99	72.30	0.12	12.07	95.16	74.30	0.00	22.97	85.51	73.08	0.73	8.66
10	87.98	57.83	0.00	28.55	81.66	73.72	0.93	9.27	93.83	74.61	0.00	23.22	93.61	73.54	0.00	24.31
11	88.77	66.38	0.00	24.43	89.13	74.16	0.47	17.30	94.84	73.99	0.00	24.88	93.34	72.97	0.29	24.31
12	88.09	62.44	0.00	19.59	91.31	71.94	0.01	24.75	95.54	73.08	0.07	22.39	90.77	71.73	0.81	19.10
13	88.65	62.94	0.00	25.14	94.12	72.46	0.00	20.84	96.67	71.44	0.19	24.69	92.66	71.69	0.09	25.36
14	89.15	63.75	0.00	27.72	93.34	74.26	0.04	19.63	91.09	71.40	0.40	19.38	91.02	74.28	0.00	14.24
15	90.46	56.43	0.00	30.77	93.87	75.07	0.00	27.76	94.95	72.16	0.00	26.89	93.61	76.17	0.01	24.94
16	89.92	67.17	0.49	23.36	90.18	73.20	0.00	26.12	93.74	72.32	0.94	24.42	92.70	75.49	0.06	19.54
17	89.08	69.85	0.10	15.68	85.19	75.42	0.85	15.46	93.52	71.31	0.04	24.21	92.66	74.37	0.01	23.53
18	87.42	69.21	0.01	19.31	90.46	72.36	0.06	24.69	92.17	73.27	0.08	20.36	93.11	73.81	0.04	23.57
19	88.02	68.27	0.20	21.20	82.54	69.76	0.05	17.76	88.45	72.09	0.00	15.04	94.28	73.89	0.00	25.24
20	89.94	70.38	0.74	25.06	86.67	68.40	0.00	22.34	93.00	72.55	0.87	23.65	94.73	74.43	0.00	23.76
21	88.52	69.42	0.13	26.06	88.39	64.74	0.00	28.27	89.40	73.56	0.01	15.26	95.38	74.07	0.00	25.22
22	87.51	67.62	0.00	26.04	92.03	69.15	0.00	24.25	93.38	73.29	1.69	23.95	96.42	73.26	0.00	23.90
23	86.81	68.22	0.00	25.27	95.27	73.67	0.02	27.13	91.63	70.07	0.00	23.89	96.57	74.30	0.00	24.94
24	91.04	61.65	0.00	30.88	95.95	72.52	0.00	28.08	90.77	70.47	1.00	21.21	91.51	75.13	0.06	19.86
25	87.58	66.25	0.00	28.51	95.49	73.44	0.12	29.98	92.17	71.20	0.01	27.28	88.72	75.18	0.00	20.40
26	86.38	59.04	0.00	30.36	94.08	73.42	0.20	20.79	92.70	74.30	0.04	25.72	92.17	75.22	0.33	18.31
27	87.73	61.54	0.00	28.48	93.15	70.63	0.00	29.98	92.95	74.71	0.00	25.49	91.69	74.95	0.38	15.20
28	89.17	67.30	0.00	22.52	91.98	73.29	1.63	18.38	93.87	73.69	0.00	27.69	91.63	76.51	0.00	24.12
29	92.97	67.10	0.70	20.91	90.63	73.69	0.00	29.02	91.49	75.92	0.65	20.52	91.29	75.07	0.01	16.98
30	91.54	65.03	0.03	27.92	90.16	72.03	0.35	21.27	92.86	75.25	0.33	20.74	89.42	73.85	0.12	16.44
31	90.91	66.83	0.01	24.63					92.03	71.62	0.00	27.63	83.17	75.36	1.44	4.42
<b>Avg</b>	87.44	63.25	0.11	25.40	90.24	71.98	0.35	21.59	93.28	73.10	0.21	22.47	91.57	73.98	0.17	19.94
<b>Max</b>	92.97	70.38	0.94	31.98	95.95	77.70	1.94	29.98	96.67	75.92	1.69	28.14	96.57	76.51	1.44	28.44
<b>Min</b>	72.93	49.24	0.00	3.99	81.66	64.74	0.00	4.39	88.45	70.07	0.00	1.11	83.17	71.69	0.00	4.42
<b>Total</b>			3.35	787.52			10.53	647.73			6.56	723.44			5.34	618.04

**Table 1. Continued.**

Day	September				October				November				December			
	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>	Max °F	Min °F	Rain inch	S Rad MJ/m <sup>2</sup>
1	85.73	72.70	0.04	8.01	91.54	70.00	0.01	22.75	85.01	59.92	0.00	18.41	82.78	63.27	0.00	9.10
2	82.35	73.63	0.33	8.17	93.13	70.29	0.90	21.06	84.38	63.79	0.08	13.21	77.95	58.39	0.00	16.06
3	91.38	71.71	0.00	25.44	85.53	71.55	0.84	13.61	84.06	63.73	0.01	16.14	80.38	53.22	0.00	16.34
4	94.26	72.43	0.00	27.21	90.63	73.45	0.02	18.53	85.01	58.48	0.00	19.19	83.46	58.64	0.00	15.25
5	91.99	73.02	0.01	22.13	89.85	72.84	0.00	18.67	83.23	65.84	0.00	18.58	86.40	63.75	0.00	12.06
6	88.20	73.22	0.00	20.83	87.62	75.81	0.01	11.70	83.08	61.86	0.00	18.10	83.44	66.60	0.53	6.45
7	90.25	71.78	0.03	19.61	83.23	75.72	0.01	7.87	81.18	59.49	0.00	13.57	80.35	62.73	0.01	14.47
8	91.98	71.64	0.09	22.48	88.99	72.57	0.00	21.67	83.14	57.69	0.00	16.72	70.66	55.26	0.00	9.01
9	92.07	74.05	0.00	22.74	87.51	70.57	0.00	20.44	82.98	57.02	0.00	16.19	61.27	53.04	0.00	5.12
10	93.06	73.56	0.00	23.64	83.05	63.81	0.00	20.48	82.78	59.95	0.00	18.84	75.47	51.15	0.00	14.49
11	91.58	73.08	0.00	23.06	82.08	67.87	0.00	11.49	80.76	52.61	0.00	17.89	77.04	56.08	0.00	9.40
12	91.98	73.20	0.17	16.83	84.70	69.15	0.00	14.60	82.62	52.79	0.00	17.81	85.55	67.48	0.00	11.55
13	84.65	72.63	0.10	18.83	86.67	69.06	0.00	19.59	84.70	50.77	0.00	17.47	85.48	60.12	0.00	14.58
14	89.47	74.23	0.01	18.18	87.46	68.72	0.00	19.59	75.81	61.12	0.00	8.64	83.07	59.86	0.00	15.24
15	93.45	72.14	0.00	21.27	86.31	69.67	0.09	14.33	73.45	60.64	0.00	12.26	78.58	60.06	0.00	14.66
16	93.31	73.02	0.38	22.23	87.01	71.47	0.00	15.68	78.37	46.90	0.00	17.94	80.55	50.94	0.00	13.65
17	93.79	73.27	0.01	24.98	87.96	68.32	0.00	18.73	79.41	49.46	0.00	18.52	83.59	55.49	0.00	12.37
18	92.43	73.96	1.06	16.95	88.23	65.95	0.00	19.47	80.85	53.67	0.00	15.97	87.66	66.81	0.00	12.27
19	90.91	72.97	0.04	16.67	86.95	64.51	0.00	19.46	79.50	51.17	0.00	16.68	87.87	65.39	0.00	10.96
20	91.89	72.32	0.00	22.75	87.12	65.17	0.00	20.77	69.85	42.23	0.00	18.92	79.93	67.39	0.00	7.26
21	94.51	72.18	0.00	22.39	85.60	61.00	0.00	19.38	72.19	37.60	0.00	18.74	69.62	64.08	0.00	5.49
22	93.92	71.83	0.00	23.92	76.95	54.88	0.00	22.76	77.77	37.02	0.00	18.22	81.10	56.66	0.00	13.82
23	93.09	71.65	0.00	19.14	79.07	47.14	0.00	22.08	81.14	50.20	0.00	14.22	82.67	54.91	0.00	14.77
24	93.40	70.84	0.00	18.24	80.47	54.55	0.00	19.30	83.91	57.09	0.00	15.64	84.83	58.95	0.00	13.82
25	93.31	69.42	0.00	24.87	81.99	58.48	0.02	19.01	83.16	58.15	0.00	14.70	86.02	63.41	0.00	12.97
26	91.74	72.21	0.76	17.47	84.11	61.39	0.00	19.49	80.17	59.83	0.00	14.23	84.02	61.68	0.00	14.30
27	89.42	69.15	0.99	16.85	81.91	63.88	0.00	13.61	80.06	51.75	0.00	15.36	84.87	62.47	0.00	15.49
28	90.25	69.33	0.47	19.49	82.44	65.91	0.00	16.11	-	-	0.00	-	83.86	58.69	0.00	13.04
29	87.21	70.30	0.23	13.41	85.69	67.93	0.00	13.91	-	-	0.02	-	82.06	56.23	0.09	15.11
30	87.13	71.67	0.23	17.43	85.59	68.20	0.00	15.27	83.39	63.46	0.05	10.44	61.54	47.59	0.00	12.19
31					85.93	62.28	0.00	20.48					76.66	35.32	0.00	16.65
<b>Avg</b>	90.96	72.24	0.17	19.84	85.66	66.52	0.06	17.80	79.97	55.89	0.01	16.16	80.28	58.57	0.02	12.51
<b>Max</b>	94.51	74.23	1.06	27.21	93.13	75.81	0.90	22.76	85.01	65.84	0.08	19.19	87.87	67.48	0.53	16.65
<b>Min</b>	82.35	69.15	0.00	8.01	76.95	47.14	0.00	7.87	69.85	37.02	0.00	8.64	61.27	35.32	0.00	5.12
<b>Total</b>			4.95	595.22			1.90	551.89			0.16	452.60		0.63	387.94	

## Rainfall

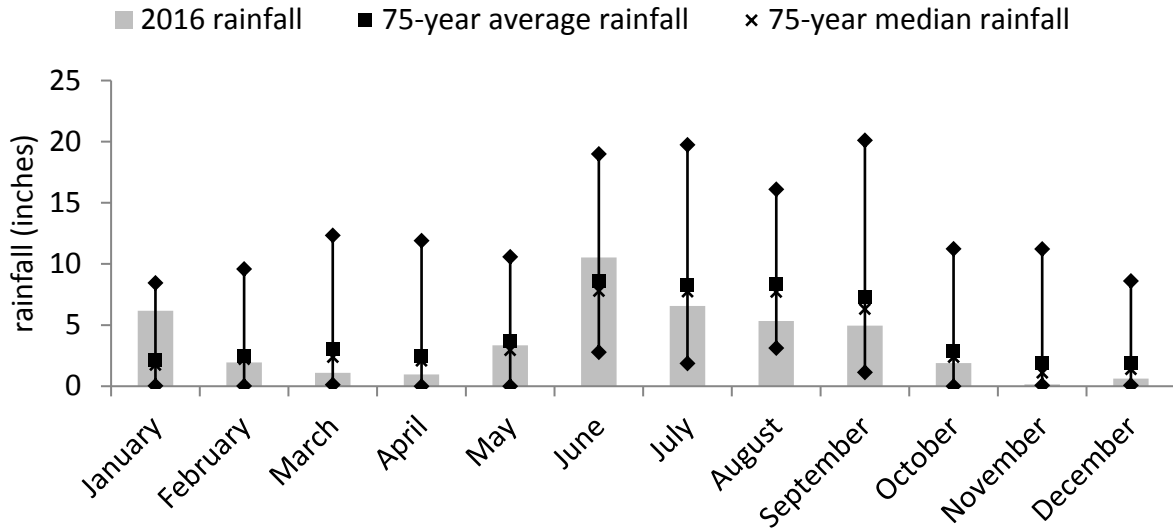
Daily rainfall equaled or exceeded 1 inch on ten separate occasions, with a daily total rainfall maximum of 1.94 inches on June 3 (Table 1). Annual rainfall for 2016 totaled 43.60 inches, which was 9.09 inches lower than the 75-year average of 52.69 inches (Table 2). The lowest annual total on record was observed in 2000 when 32.02 inches were measured, and the greatest annual rainfall total observed was in 1959 when 78.82 inches were recorded. Ten months of 2016 saw rainfall that fell below the 75-year average. Rainfall was 4.01 inches above the 75-year average in January, and nearly 2 inches greater in June. However, rainfall was below normal in all other months, with a 3.05 and 2.34 inch deficit in August and September, respectively. Monthly rainfall during 2016 is graphically compared to historical mean, median, maximum, and minimum rainfall in Figure 1.

**Table 2.** Summary of rainfall by months. Range Cattle REC, 2016.

Month	1942 to 2016		75-year average†	2016	Difference from 75-year average
	Maximum / month	Minimum / month		Total	
-----inches*-----					
January	8.45	0.03	2.16	6.17	4.01
February	9.59	0.02	2.48	1.95	- 0.53
March	12.34	0.13	3.03	1.09	- 1.94
April	11.91	0.00	2.22	0.97	- 1.25
May	10.58	0.00	3.70	3.35	- 0.35
June	18.99	2.79	8.61	10.53	1.92
July	19.74	1.87	8.31	6.56	- 1.75
August	16.10	3.13	8.39	5.34	- 3.05
September	20.11	1.14	7.29	4.95	- 2.34
October	11.23	0.00	2.92	1.90	- 1.02
November	11.22	0.07	1.86	0.16	- 1.70
December	8.61	0.07	1.72	0.63	- 1.09
<i>Year total</i>			<i>52.69</i>	<i>43.60</i>	<i>- 9.09</i>

\*Inches x 2.54 = cm.

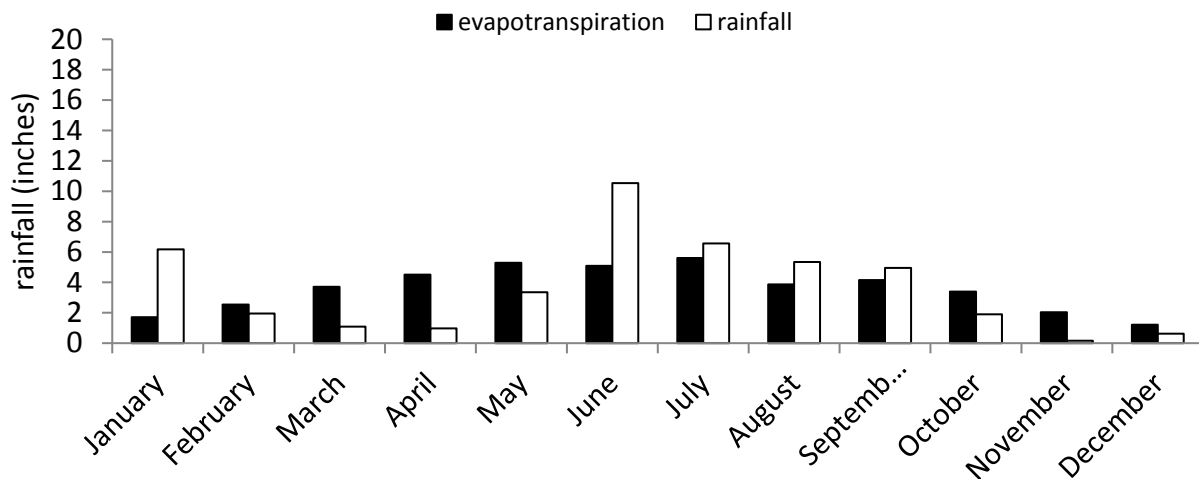
† Since rainfall records began in July 1942, means for January to June are 74-year means.



**Figure 1.** Monthly rainfall at the Range Cattle REC during 2016 relative to historical average, median, minimum, and maximum monthly rainfall. Current rainfall is indicated by the gray bars, historical average and median rainfall are indicated by squares (■) and “X’s” (x), respectively. Historical high and low rainfall are indicated by diamonds (◆).

### Evapotranspiration

Evapotranspiration is the total amount of water transferred from the earth to the atmosphere. Monthly evaporation was greater than the 11-year average during February, March, June, July, and September through December (Table 3). Evapotranspiration exceeded rainfall in February through May and October through December in 2016 (Figure 2). Historically, evapotranspiration generally exceeds rainfall in January to May and October to December, which are months with limited rainfall. Rainfall exceeded evapotranspiration by only 0.50 inches for the entire year.



**Figure 2.** Comparison of monthly evapotranspiration and rainfall at the Range Cattle REC during 2016.

### Solar Radiation

Total solar radiation for 2016 was 6955.60 MJ. Daily solar radiation is shown in Table 1, and 2016 total monthly solar radiation can be seen in Table 3. If soil water, temperature, and fertility are not limiting and vegetative cover is complete, 1 MJ results in about 14.3 lb/A of plant dry matter. Theoretically, enough solar radiation was received in April 2016 (715.52 MJ) to produce approximately 10,232 lb/A of plant dry matter.

**Table 3.** Monthly solar radiation and evapotranspiration at the Range Cattle REC in 2016.

Month	2006-2016	2016	2006-2016	2016
	Evapotranspiration		Solar radiation	
	-----inches-----		-----MJ/m <sup>2</sup> -----	
January	1.89	1.71	410.77	370.88
February	2.38	2.54	453.65	508.54
March	3.35	3.71	639.81	596.29
April	4.37	4.51	712.35	715.52
May	5.33	5.29	786.50	787.52
June	4.92	5.09	671.98	647.73
July	4.86	5.61	644.99	723.44
August	4.48	3.87	576.05	618.03
September	3.86	4.15	513.97	595.22
October	3.11	3.39	493.51	551.89
November	1.95	2.04	391.07	452.60
December	1.51	1.88	368.37	387.94
<i>Year total</i>	<i>42.01</i>	<i>43.79</i>	<i>6663.02</i>	<i>6955.60</i>

## Temperature

The highest temperature observed during 2016 was 96.67 °F on 13 July (Table 1). Monthly average-high temperatures exceeded the 73-year average in all months except January, February, and May (Table 4). Monthly average low temperatures were above the 73-year average in all months except February, May, and November (Table 5). Daily average low temperatures at or below 32 °F were not recorded in 2016 (Table 1). The extreme low temperature for 2016 occurred on 20 February when the temperature fell to 34.58 °F, with the temperature of the previous night falling to 35.32 °F. Scattered frost begins when air temperature drops to 35 °F. Air temperatures at or below 35°F were observed only on one day in 2016, resulting in widespread or scattered frost across the landscape (data not shown). Overall, mean low temperature for 2016 was 1.7 °F higher than the 73-year mean.

**Table 4.** Summary of maximum temperature\* during 2016 by month, Range Cattle REC.

Month	Shelter†					Ground level‡	
	1944-2016	2016	1944-2016	2016	2016		
	Avg. high	Avg. high	Extreme high	Year	Extreme high	Avg. high	Extreme high
	°F					°F	
January	73.2	69.9	90.0	1982	84.3	67.5	66.6
February	75.0	73.3	91.0	1962	85.6	64.8	64.5
March	79.1	82.0	94.0	1946	89.4	74.7	71.6
April	83.5	83.9	97.0	1945	91.9	81.4	77.3
May	88.1	87.4	103.0	1945	93.0	84.1	82.8
June	90.1	90.2	103.0	1945	96.0	86.1	84.7
July	90.9	93.3	101.0	1972	96.7	85.8	86.2
August	91.1	91.6	98.0	several	96.7	84.8	84.7
September	89.5	91.0	96.2	several	94.5	84.4	83.9
October	85.0	85.7	96.5	2015	93.1	78.9	78.0
November	79.2	80.0	94.0	1990	85.0	76.4	72.6
December	74.5	80.3	89.0	1945	87.9	75.2	72.3
<i>Average</i>	<i>83.3</i>	<i>84.1</i>				<i>78.7</i>	

\*°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 4 inches below the soil surface.



**Table 5.** Summary of minimum temperature\* for 2016 by month, Range Cattle REC.

Month	Shelter†					Ground level‡	
	1944-2016	2016	1944-2016	2016	2016		
	Avg. low	Avg. low	Extreme low	Year	Extreme low	Avg. low	Extreme low
	-----°F-----					-----°F-----	
January	49.1	50.2	18.0	1981	34.6	52.6	35.4
February	50.5	48.8	23.8	2009	35.9	60.6	54.8
March	54.3	58.1	26.0	1980	40.4	66.5	61.3
April	58.1	59.3	34.0	1971	46.9	70.4	65.3
May	63.3	63.2	43.0	1945	49.2	74.7	66.1
June	69.0	72.0	52.0	1984	64.7	79.3	76.8
July	71.3	73.1	62.0	several	70.1	80.7	77.0
August	72.0	74.0	61.0	1977	71.7	80.7	78.4
September	71.2	72.2	51.0	1962	69.2	79.1	76.6
October	64.7	66.5	37.5	2008	47.1	74.2	74.2
November	56.8	55.9	25.0	1970	37.0	67.5	59.9
December	51.6	58.6	20.0	1962	35.3	66.9	57.5
<i>Average</i>	<i>61.0</i>	<i>62.7</i>				<i>71.1</i>	

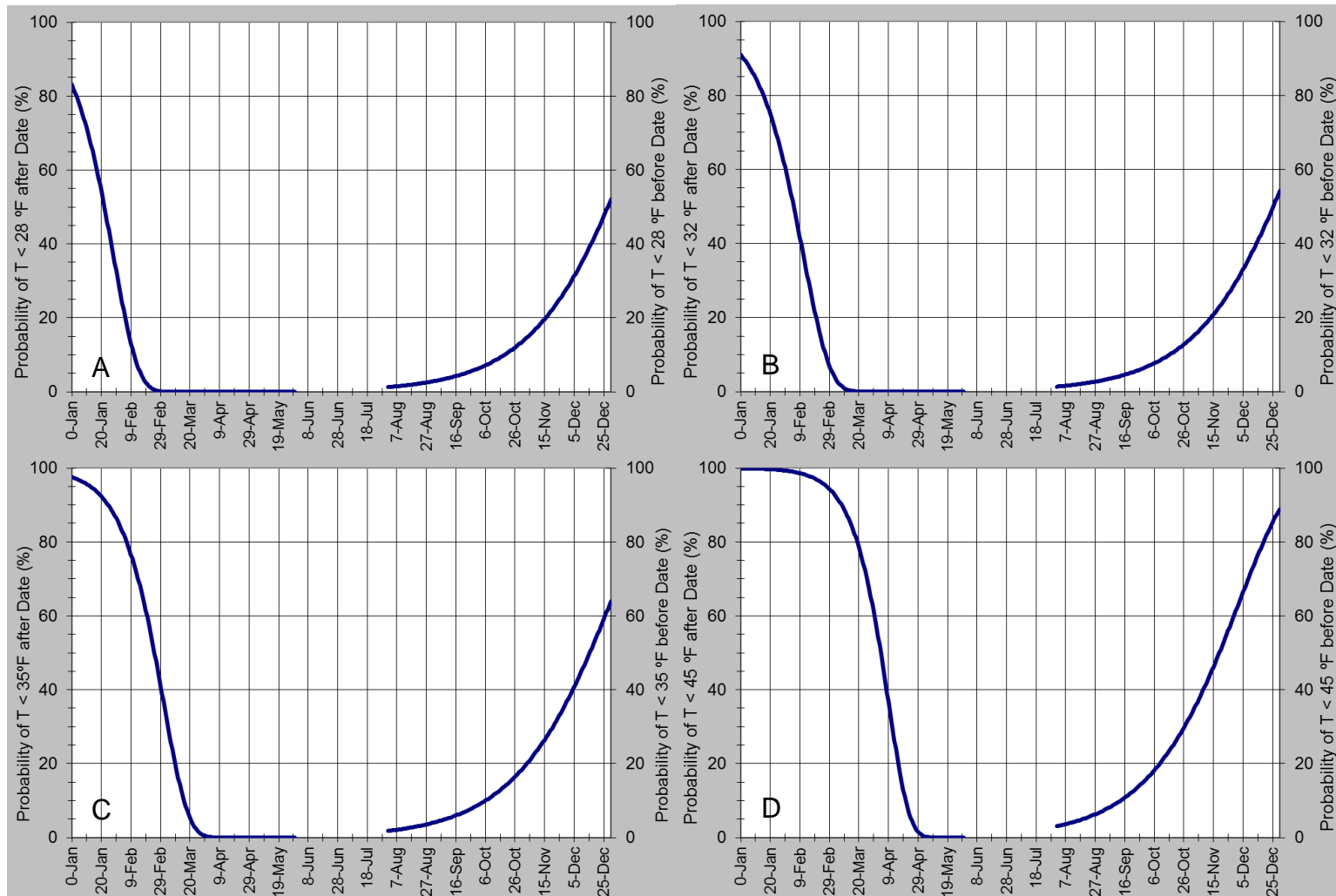
\*°C = (°F – 32) x 0.555

† 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 4 inches below the soil surface.

### Freeze hazard

The fall and spring freeze hazards for the Range Cattle REC are shown in Figure 3. The spring freeze hazard estimates the likelihood of temperatures reaching below the critical temperature after a selected date, while the fall freeze hazard estimates the likelihood of experiencing the first attainment of a critical temperature before a selected date. Based on records from 1964 to 2016, 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, one should expect approximately a 30% chance of a frost (assuming 35 °F) occurring before the 1<sup>st</sup> of March (Figure 4C). A grower has a significant likelihood of experiencing three frosts over ten years after the 1<sup>st</sup> of March; however, the likelihood drops to approximately 10% by March 20<sup>th</sup>.



**Figure 3.** Spring and fall freeze hazard showing temperature probabilities after a given spring date and before a given fall date. Trend lines for temperature probabilities <28 °F (A), <32 °F (B), <35 °F (C), and <45 °F (D). Graphs were constructed using minimum temperature data from 1960 – 2010 using FRISKNH as developed by R. Snyder and J. Paulo de Melo-Abreu.