

Range Cattle Research and Education Center

February 2016

Research Report RC-2016-1

CLIMATOLOGICAL REPORT 2015
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 2015 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). Accuracy of rainfall was measured by the Weather Watch 2000 or 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 74-year summary of rainfall data and a 72-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 2015, Range Cattle REC.

Day	January				February				March				April			
	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²
1	75.31	60.22	0.00	8.77	76.68	46.87	0.00	17.29	85.41	66.92	0.03	14.38	83.93	57.81	0.00	21.10
2	78.31	65.52	0.00	6.35	69.57	49.26	0.01	7.21	83.53	62.62	0.00	11.85	85.37	55.78	0.00	19.90
3	83.77	67.42	0.00	10.30	69.91	40.26	0.01	17.70	84.99	60.33	0.00	16.13	86.07	58.82	0.00	20.20
4	84.24	63.75	0.00	13.26	76.01	50.05	0.00	12.54	86.38	60.57	0.00	19.57	87.22	59.29	0.00	24.29
5	76.95	57.54	0.00	7.47	71.02	50.92	1.65	4.08	85.55	63.64	0.00	16.25	87.51	60.82	0.00	22.88
6	80.42	54.70	0.00	11.49	69.13	46.13	0.00	18.22	83.50	59.36	0.00	14.14	87.37	64.18	0.00	19.99
7	70.79	47.98	0.00	15.70	72.84	45.88	0.00	17.79	75.25	53.94	0.00	12.63	86.81	64.00	0.00	19.61
8	62.92	40.96	0.00	15.87	77.13	46.60	0.00	18.46	79.86	58.78	0.00	15.99	87.71	64.38	0.00	21.75
9	63.28	48.02	0.00	10.11	71.87	52.36	0.95	4.50	83.71	58.50	0.00	18.22	87.60	60.82	0.02	21.83
10	67.03	42.82	0.00	11.78	67.80	57.33	0.00	18.43	86.70	64.13	0.10	17.05	90.39	61.50	0.00	22.05
11	80.74	52.34	0.00	12.36	69.33	45.43	0.00	19.50	87.33	66.42	0.19	14.57	89.71	65.17	0.82	18.93
12	77.09	63.75	0.24	5.61	69.22	39.74	0.00	19.16	87.12	68.58	0.01	20.61	89.15	63.00	0.28	19.85
13	77.83	59.25	0.00	12.48	63.77	39.24	0.00	20.02	86.32	64.20	0.00	19.40	87.08	68.14	0.95	14.40
14	66.97	60.46	0.00	4.14	64.71	36.43	0.00	20.65	86.31	62.92	0.00	19.33	88.45	66.96	0.00	21.24
15	65.19	55.51	0.00	5.12	75.16	40.96	0.00	18.94	87.04	62.55	0.00	19.61	89.69	69.21	0.00	20.81
16	69.73	55.17	0.00	12.59	76.71	46.94	0.02	17.56	86.09	61.29	0.00	20.69	87.98	67.44	0.00	16.75
17	75.52	44.12	0.00	15.12	78.57	56.37	0.15	14.14	84.97	62.91	0.00	22.80	86.16	66.61	0.00	16.97
18	73.44	47.53	0.00	14.16	63.50	40.89	0.09	20.74	87.89	62.46	0.00	21.07	88.97	66.02	0.00	20.64
19	70.84	43.51	0.00	16.35	55.76	33.99	0.00	22.45	86.41	64.85	0.00	19.22	87.17	65.52	0.00	21.83
20	70.39	46.49	0.00	4.64	60.76	28.10	0.00	22.60	86.45	60.89	0.00	21.39	84.58	67.23	0.03	11.70
21	80.11	49.55	0.00	14.40	75.02	39.07	0.00	14.52	87.37	56.91	0.00	20.79	86.47	65.28	0.00	15.91
22	81.01	55.35	0.00	14.14	83.62	52.25	0.00	15.91	83.43	62.28	0.00	16.98	89.04	67.51	0.02	24.59
23	79.52	60.62	0.00	9.85	82.76	56.95	0.00	12.70	75.42	63.07	0.29	7.26	79.61	67.33	0.54	12.66
24	70.32	47.34	1.34	9.62	77.23	62.19	0.00	12.42	80.13	64.06	0.00	18.31	88.65	68.49	0.00	20.13
25	66.96	41.79	0.00	16.98	79.93	62.13	0.00	12.09	83.37	63.95	0.00	16.69	88.93	66.90	0.00	23.00
26	68.49	46.96	0.04	13.63	73.06	58.03	0.10	4.90	86.79	64.17	0.00	21.53	88.21	73.24	0.00	21.21
27	67.87	39.65	0.00	17.28	61.39	54.46	0.17	4.09	81.01	58.69	0.50	8.56	90.55	70.63	0.00	17.80
28	64.63	41.32	0.00	18.34	75.94	56.48	0.35	5.83	69.37	47.88	0.01	23.66	80.94	67.42	1.11	11.78
29	72.48	39.84	0.00	17.43					73.78	45.54	0.00	25.46	86.11	69.06	0.10	20.47
30	74.03	41.76	0.00	14.31					77.92	41.90	0.00	25.67	79.95	59.92	0.00	22.42
31	73.26	40.64	0.00	16.76					81.93	49.57	0.00	21.06				
<u>Avg</u>	73.21	51.03	0.05	12.14	71.73	47.69	0.13	14.80	83.27	60.13	0.04	18.09	86.91	64.95	0.13	19.56
<u>Max</u>	84.24	67.42	1.34	18.34	83.62	62.19	1.65	22.60	87.89	68.58	0.50	25.67	90.55	73.24	1.11	24.59
<u>Min</u>	62.92	39.65	0.00	4.14	55.76	28.10	0.00	4.08	69.37	41.90	0.00	7.26	79.61	55.78	0.00	11.70
<u>Total</u>			1.62	376.42			3.50	414.41			1.13	560.87			3.87	586.67

Table 1. Continued.

Day	May				June				July				August			
	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²
1	82.83	55.81	0.00	24.77	91.78	65.71	1.97	25.30	92.21	71.31	0.00	22.81	83.71	71.42	0.71	11.64
2	83.52	55.80	0.00	28.15	76.73	67.66	0.54	7.91	94.17	68.32	0.00	29.12	87.69	74.52	0.01	14.96
3	83.98	55.27	0.00	29.05	86.02	66.81	0.07	25.34	94.19	70.41	0.13	26.63	85.55	72.97	0.03	12.12
4	80.87	55.42	0.00	22.87	90.39	65.84	0.00	28.41	95.11	68.86	0.01	24.77	90.90	70.39	0.00	26.16
5	82.69	64.13	0.00	22.74	89.65	68.49	0.00	23.83	94.17	70.90	0.46	25.78	95.09	72.73	0.86	27.13
6	87.87	66.02	0.02	23.02	80.02	67.77	0.71	14.74	90.90	68.29	0.00	22.84	90.52	72.00	0.81	16.75
7	88.39	61.20	0.04	25.74	89.01	67.05	1.82	24.04	91.49	69.39	0.74	19.85	91.13	74.39	0.00	27.01
8	89.29	57.43	0.00	32.24	92.89	67.57	0.01	30.29	94.05	68.58	0.58	27.45	88.90	73.94	1.90	9.10
9	90.95	60.33	0.00	30.74	90.82	69.31	0.05	24.75	93.58	70.14	0.00	27.41	93.97	71.98	0.22	25.86
10	93.33	59.88	0.03	27.79	85.23	68.20	1.98	13.40	93.88	71.46	0.10	29.98	94.06	73.80	0.00	27.01
11	90.84	63.21	0.00	29.68	88.88	69.22	0.21	20.97	93.97	70.27	0.00	27.08	89.92	73.02	0.38	18.15
12	90.93	67.64	0.00	23.73	91.29	70.03	0.28	19.16	90.86	71.78	0.00	25.02	89.55	74.59	0.24	17.29
13	92.01	66.45	0.00	26.56	90.81	73.40	0.00	26.19	94.68	70.57	0.00	25.36	89.96	72.46	0.03	18.37
14	91.69	67.57	0.00	27.41	91.78	72.61	0.00	24.79	87.26	71.94	0.00	16.50	90.79	70.77	0.10	20.01
15	90.45	66.27	0.00	27.42	92.66	72.19	0.00	30.85	89.87	71.78	0.03	16.54	92.48	71.60	2.38	20.02
16	90.84	66.79	0.02	24.57	93.67	71.11	0.00	29.61	89.78	72.90	0.15	25.83	92.64	70.66	0.64	22.49
17	89.96	67.86	0.00	20.48	93.11	72.01	0.00	29.88	85.62	72.55	0.09	11.32	93.09	73.42	0.15	24.28
18	89.58	66.72	0.00	27.20	95.76	72.91	0.00	30.62	90.54	73.13	0.00	19.28	94.23	74.39	0.02	25.97
19	90.27	64.53	0.00	19.03	93.85	71.69	0.06	23.46	89.06	72.75	1.68	17.99	95.54	74.48	0.02	26.10
20	91.11	66.13	0.00	23.93	95.02	71.60	0.00	23.38	91.29	71.24	0.01	29.58	92.84	74.53	0.05	16.35
21	93.02	65.66	0.00	29.17	94.41	69.80	0.00	28.85	91.62	72.70	0.00	23.49	95.47	74.48	0.60	24.17
22	95.41	66.09	1.57	24.30	95.88	74.08	0.17	27.23	89.24	73.80	0.45	25.33	97.29	74.73	1.15	26.84
23	91.67	68.97	0.00	27.53	95.04	70.88	0.53	24.56	85.46	74.62	0.09	15.44	95.11	75.06	0.00	26.55
24	90.30	71.10	0.03	22.10	94.78	70.95	0.28	28.78	82.44	73.36	0.15	6.30	95.47	76.46	0.00	22.28
25	92.88	69.10	0.00	29.85	94.01	73.17	0.03	26.19	78.94	72.48	2.07	3.94	95.67	75.67	0.00	24.69
26	91.65	71.83	0.00	27.89	92.34	69.71	0.00	26.15	86.61	72.91	0.00	20.35	92.48	73.54	0.00	19.86
27	89.06	68.59	0.00	28.33	90.88	71.62	0.07	24.57	86.02	74.53	0.06	15.54	82.76	73.20	1.98	12.51
28	87.42	64.27	0.00	25.92	91.44	71.11	0.00	26.96	88.70	73.90	0.00	22.27	88.45	71.67	0.12	14.48
29	87.75	60.01	0.00	24.37	80.29	72.64	0.30	14.97	89.20	75.16	0.34	17.08	93.70	71.31	2.32	22.67
30	91.87	65.95	0.00	29.23	94.60	70.95	0.00	29.05	90.68	74.80	0.38	19.01	87.31	72.91	0.37	15.77
31	92.32	66.83	0.00	27.29					89.46	73.26	0.66	14.21	87.31	75.43	0.00	14.97
Avg	89.51	64.29	0.06	26.23	90.77	70.20	0.30	24.47	90.16	71.87	0.26	21.10	91.41	73.31	0.49	20.37
Max	95.41	71.83	1.57	32.24	95.88	74.08	1.98	30.85	95.11	75.16	2.07	29.98	97.29	76.46	2.38	27.13
Min	80.87	55.27	0.00	19.03	76.73	65.71	0.00	7.91	78.94	68.29	0.00	3.94	82.76	70.39	0.00	9.10
Total			1.71	813.12			9.08	734.23			8.18	654.08			15.09	631.58

Table 1. Continued.

Day	September				October				November				December			
	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²	Max °F	Min °F	Rain inch	S Rad MJ/m ²
1	92.64	74.34	0.00	22.98	96.48	70.90	0.00	21.90	89.51	72.64	0.26	14.45	85.37	65.88	0.00	14.47
2	95.81	75.43	0.00	25.68	94.71	71.82	0.00	19.48	89.69	71.29	0.00	16.29	85.53	67.82	0.00	11.99
3	94.59	75.47	0.00	23.67	85.98	66.88	0.00	16.84	90.07	68.77	0.00	17.86	75.11	59.88	1.21	4.10
4	89.33	75.40	0.14	16.18	86.22	65.71	0.06	16.21	91.15	69.98	0.00	14.79	73.26	60.84	0.25	5.09
5	92.88	72.45	1.45	22.60	88.27	65.82	0.00	14.69	88.95	71.51	0.00	18.92	81.28	66.92	0.00	11.41
6	91.90	71.42	0.27	21.95	91.71	65.50	0.00	18.55	89.31	68.09	0.00	17.83	81.32	64.89	0.00	12.63
7	87.94	71.74	0.06	14.13	91.99	67.10	0.00	18.93	93.36	67.75	0.57	16.12	75.25	55.83	0.00	14.65
8	90.84	74.41	0.02	21.11	94.64	68.74	0.00	12.55	88.68	68.45	0.01	15.02	78.12	53.98	0.00	16.44
9	93.76	73.35	0.00	23.50	95.23	69.03	0.00	19.09	89.31	71.55	0.00	13.91	76.64	61.66	0.17	11.60
10	89.89	75.87	0.00	15.52	89.49	69.15	0.74	13.81	85.33	69.76	0.04	11.81	80.29	58.24	0.00	12.81
11	93.99	74.44	0.06	23.19	90.01	66.81	0.09	19.97	87.82	66.34	0.00	12.29	79.47	57.06	0.00	14.33
12	89.40	72.16	0.01	13.97	88.34	62.74	0.00	21.93	89.24	66.31	0.00	14.89	85.01	60.39	0.00	15.49
13	86.77	73.24	0.07	17.46	87.28	62.53	0.00	13.66	87.49	67.57	0.00	14.05	82.81	62.20	0.01	12.75
14	90.99	71.94	0.00	19.90	92.21	63.12	0.00	19.35	79.47	60.73	0.00	12.66	83.88	68.29	0.01	11.16
15	86.02	73.81	0.00	16.18	92.44	67.93	0.00	20.59	77.72	64.22	0.00	7.29	85.21	65.64	0.00	11.28
16	84.04	73.98	0.35	8.65	89.24	66.18	0.00	14.83	85.35	64.60	0.00	17.25	85.60	62.71	0.00	14.05
17	85.19	73.78	0.29	10.76	89.69	62.15	0.00	20.73	84.79	66.09	0.00	13.79	84.94	66.90	0.00	12.37
18	87.31	73.31	0.01	13.65	88.39	63.55	0.00	14.15	87.69	69.66	0.00	14.57	73.44	57.90	0.41	3.55
19	91.35	73.17	0.01	17.82	85.30	62.24	0.00	18.82	85.23	69.80	0.00	9.22	70.20	44.04	0.00	16.77
20	92.71	72.09	0.00	24.14	87.76	62.15	0.00	19.85	83.59	70.74	0.15	11.18	76.89	51.06	0.00	16.05
21	91.58	72.10	0.00	24.07	86.32	65.26	0.07	17.32	80.55	67.95	0.03	4.52	82.40	56.75	0.00	12.16
22	90.07	71.24	0.00	21.44	89.96	66.54	0.00	17.89	79.09	64.98	0.11	9.29	84.49	68.40	0.03	10.46
23	91.13	71.15	0.00	22.14	90.23	67.44	0.00	19.12	70.48	49.01	0.00	19.20	86.68	69.87	0.00	8.23
24	89.78	70.57	0.00	17.64	90.12	61.30	0.00	18.16	74.97	58.44	0.00	17.06	85.35	68.85	0.00	11.90
25	90.91	72.03	0.03	18.17	90.09	64.98	0.00	16.45	77.58	58.87	0.03	13.07	85.55	66.29	0.00	11.06
26	88.20	71.69	0.56	13.89	88.23	66.13	0.02	14.28	82.13	62.78	0.00	15.64	85.91	65.35	0.00	13.24
27	87.03	73.27	0.45	12.51	79.23	71.38	0.43	4.73	80.98	63.59	0.00	15.71	85.32	66.83	0.00	15.04
28	86.74	73.45	0.10	11.64	80.15	69.69	0.30	6.84	81.19	60.28	0.00	17.58	86.56	67.21	0.00	12.83
29	84.45	73.35	0.66	12.19	87.49	69.49	0.00	15.74	81.52	60.24	0.00	15.85	88.09	66.47	0.00	13.29
30	95.68	72.23	0.00	21.75	86.76	63.23	0.00	17.26	82.78	60.84	0.00	14.35	85.96	65.39	0.05	12.96
31					87.40	62.58	0.00	15.72					85.08	69.80	0.01	11.44
<u>Avg</u>	90.10	73.10	0.15	18.28	89.08	66.07	0.06	16.76	84.50	65.76	0.04	14.22	81.97	62.69	0.07	12.12
<u>Max</u>	95.81	75.87	1.45	25.68	96.48	71.82	0.74	21.93	93.36	72.64	0.57	19.20	88.09	69.87	1.21	16.77
<u>Min</u>	84.04	70.57	0.00	8.65	79.23	61.30	0.00	4.73	70.48	49.01	0.00	4.52	70.20	44.04	0.00	3.55
<u>Total</u>			4.54	548.47			1.71	519.42			1.20	426.46			2.15	375.58

Rainfall

Daily rainfall equaled or exceeded 1 inch on sixteen separate occasions, with daily rainfall exceeding 2 inches on three of these occasions (Table 1). The single greatest daily rain event was 15 August when 2.38 inches were recorded. Annual rainfall for 2015 totaled 53.78 inches, which was 0.47 inches greater than the 74-year average of 53.31 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. Seven months of 2015 saw rainfall that fell below the 74-year average. Rainfall was one or more inches less than the 74-year average in March, September, and October, and greater than two inches less in October. Total rainfall was more than 6.5 inches greater than the 74-year average in August. Monthly rainfall during 2015 is graphically compared to historical mean, median, maximum, and minimum rainfall in Figure 1.

Table 2. Summary of rainfall by months. Range Cattle REC, 2015.

Month	1942 to 2015		74-year average†	2015	
	Maximum / month	Minimum / month		Total	Difference from 74-year average
-----inches*-----					
January	8.45	0.03	2.10	1.62	- 0.48
February	9.59	0.02	2.49	3.50	1.01
March	12.34	0.13	3.06	1.13	- 1.93
April	11.91	0.00	2.47	3.87	1.40
May	10.58	0.00	3.70	1.71	- 1.99
June	18.99	2.79	8.58	9.08	0.50
July	19.74	1.87	8.33	8.18	- 0.15
August	16.10	3.13	8.43	15.09	6.66
September	20.11	1.14	7.33	4.54	- 2.79
October	11.23	0.00	2.93	1.71	- 1.22
November	11.22	0.07	1.88	1.20	- 0.68
December	8.61	0.07	1.94	2.15	0.21
<i>Year total</i>			53.31	53.78	0.47

*Inches x 2.54 = cm.

† Since rainfall records began in July 1942, means for January to June are 72-year means.

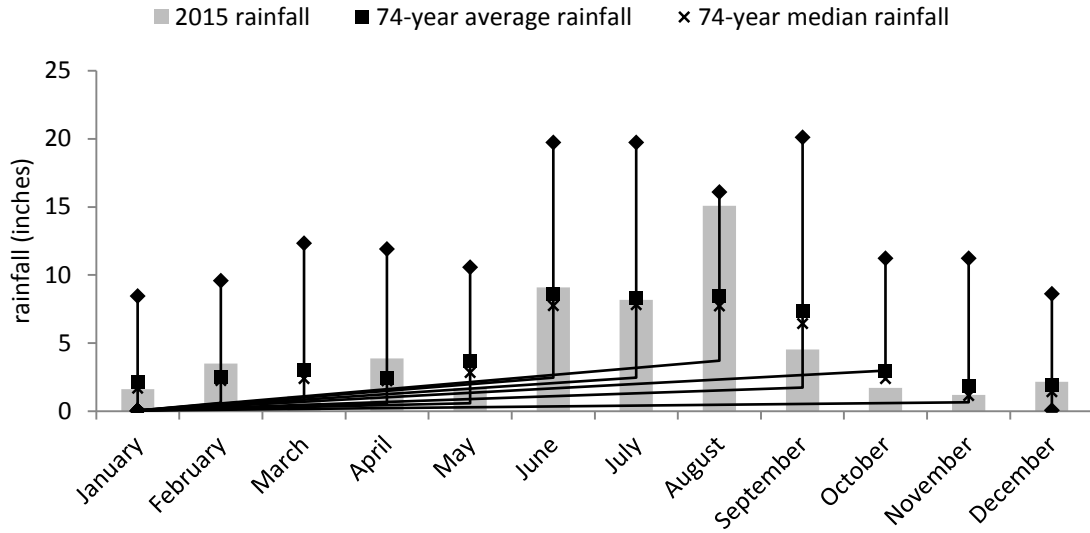


Figure 1. Monthly rainfall at the Range Cattle REC during 2015 relative to historical average, median, minimum, and maximum monthly rainfall. Current rainfall is indicated by the gray bars, historical average and median rainfall are indicated by squares (■) and “X’s” (x), respectively. Historical high 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 10-year average during March, May, June, and August through December (Table 3). Evapotranspiration exceeded rainfall in January, March through May, October, and November in 2015 (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 9.04 inches for the entire year.

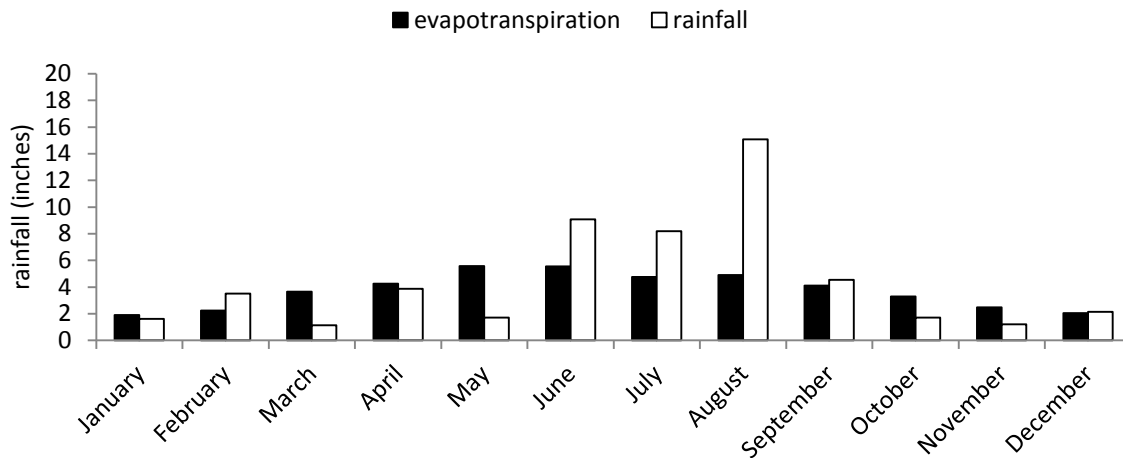


Figure 2. Comparison of monthly evapotranspiration and rainfall at the Range Cattle REC during 2015.

Solar Radiation

Total solar radiation for 2015 was 6641.31 MJ. Daily solar radiation is shown in Table 1, and 2015 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 2015 (586.67 MJ) to produce approximately 8,389 lb/A of plant dry matter.

Table 3. Monthly solar radiation and evapotranspiration at the Range Cattle REC in 2015.

Month	2006-2015	2015	2006-2015	2015
	Evapotranspiration		Solar radiation	
	-----inches-----		-----MJ/m ² -----	
January	1.91	1.90	419.02	376.42
February	2.38	2.23	451.91	414.41
March	3.28	3.65	653.42	560.87
April	4.37	4.25	725.95	586.67
May	5.30	5.58	783.43	813.12
June	4.83	5.54	667.76	734.23
July	4.79	4.76	638.23	654.08
August	4.51	4.89	565.22	631.58
September	3.79	4.12	501.10	548.47
October	3.05	3.30	484.14	519.42
November	1.88	2.48	380.30	426.46
December	1.41	2.04	365.39	375.58
<i>Year total</i>	<i>41.50</i>	<i>44.74</i>	<i>6635.87</i>	<i>6641.31</i>

Temperature

The highest temperature observed during 2015 was 97.3 °F on 22 August (Table 1). Monthly average-high temperatures exceeded the 72-year average in March through June and August through December (Table 4). Monthly average low temperatures were above the 72-year average in all months but February (Table 5). Daily average low temperatures at or below 32 °F occurred only one time in 2015 (Table 1). The extreme low temperature for 2015 occurred on 20 February when the temperature fell to 28.10 °F, with the temperature of the previous night falling to 33.99 °F. Scattered frost begins when air temperature drops to 35 °F. Air temperatures at or below 35°F were observed only on these two days in 2015, resulting in widespread or scattered frost across the landscape (data not shown). Overall, mean low temperature for 2015 was 2.0 °F higher than the 72-year mean.

Table 4. Summary of maximum temperature* during 2015 by month, Range Cattle REC.

Month	Shelter†				Ground level‡		
	1944-2015	2015	1944-2015	2015	2015		
	Avg. high	Avg. high	Extreme high	Year	Extreme high	Extreme high	
	°F				°F		
January	73.2	73.2	90.0	1982	84.2	67.5	73.4
February	75.1	71.7	91.0	1962	83.6	64.8	70.2
March	79.1	83.3	94.0	1946	87.9	74.7	79.0
April	83.5	86.9	97.0	1945	90.6	81.4	87.4
May	88.1	89.5	103.0	1945	95.4	84.1	88.1
June	90.1	90.8	103.0	1945	95.9	86.1	89.6
July	90.8	90.2	101.0	1972	95.1	85.8	88.7
August	91.1	91.4	98.0	several	97.3	84.8	88.4
September	89.5	90.1	96.2	several	95.8	84.4	87.0
October	85.0	89.1	96.5	2015	96.5	78.9	83.4
November	79.2	84.5	94.0	1990	93.4	76.4	80.0
December	74.5	82.0	89.0	1945	88.1	75.2	84.0
<i>Average</i>	<i>83.2</i>	<i>85.2</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 2015 by month, Range Cattle REC.

Month	Shelter†					Ground level‡	
	1944-2015	2015	1944-2015	2015	2015	2015	
	Avg. low	Avg. low	Extreme low	Year			Extreme low
-----°F-----					-----°F-----		
January	49.1	51.0	18.0	1981	39.7	61.1	54.3
February	50.5	47.7	23.8	2009	28.1	64.2	50.5
March	54.2	60.1	26.0	1980	41.9	66.2	61.9
April	58.1	64.9	34.0	1971	55.8	70.0	67.7
May	63.3	64.3	43.0	1945	55.3	74.5	71.0
June	69.0	70.2	52.0	1984	65.7	78.0	75.0
July	71.3	71.9	62.0	several	68.3	79.8	78.0
August	71.9	73.3	61.0	1977	70.4	80.7	78.9
September	71.1	73.1	51.0	1962	70.6	78.0	78.5
October	64.7	66.1	37.5	2008	61.3	73.9	72.2
November	56.9	65.8	25.0	1970	49.0	65.3	65.5
December	51.5	62.7	20.0	1962	44.0	62.9	63.4
<i>Average</i>	<i>61.0</i>	<i>64.3</i>				<i>71.2</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 2015, 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 1st of March (Figure 4C). A grower has a significant likelihood of experiencing three frosts over ten years after the 1st of March; however, the likelihood drops to approximately 10% by March 20th.

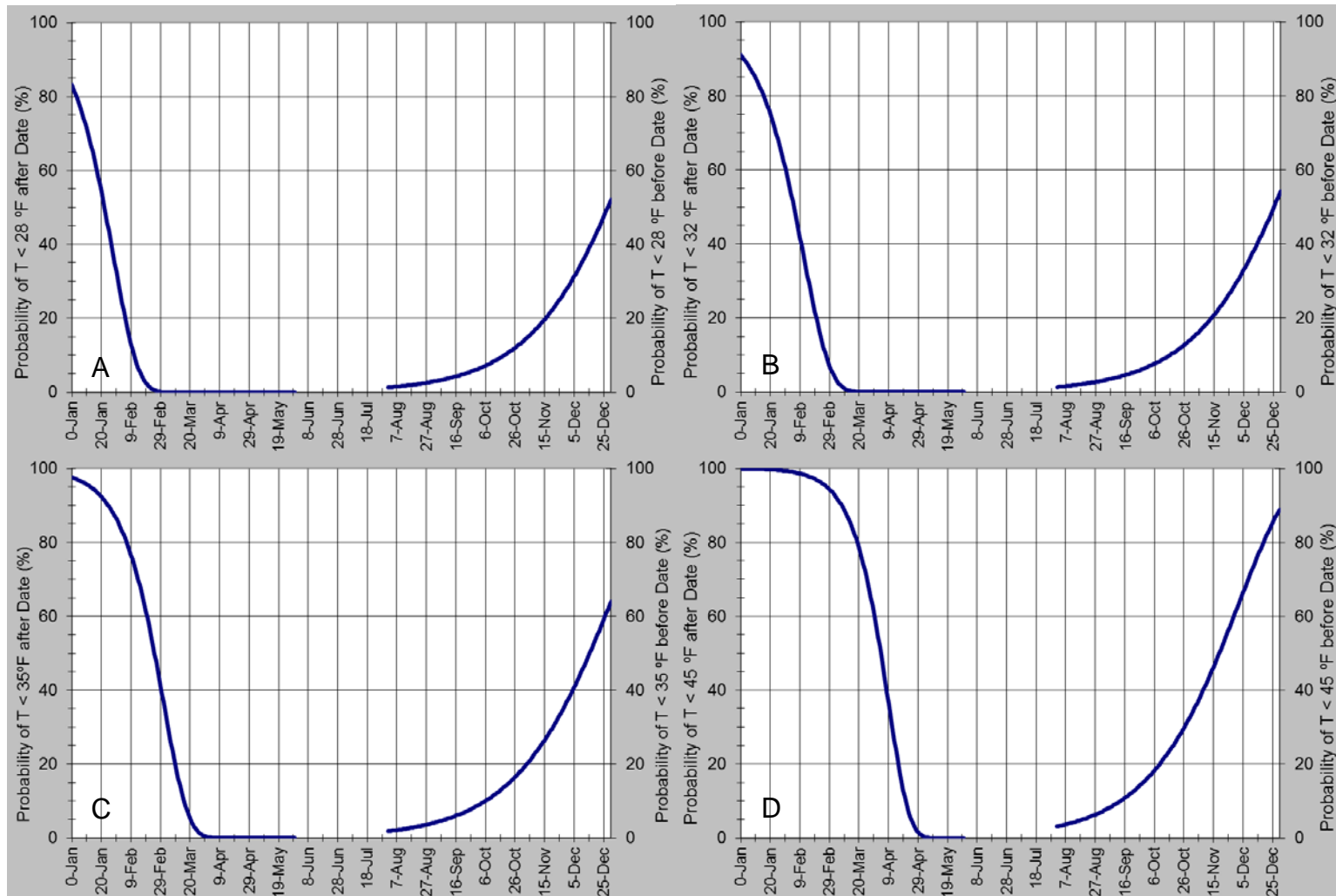


Figure 3. Spring and fall freeze hazard showing temperature probabilities after a given spring date and before a given fall date. Trend lines for temperature probabilities <28 °F (A), <32 °F (B), <35 °F (C), and <45 °F (D). Graphs were constructed using minimum temperature data from 1960 – 2010 using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