



2010 Meteorology Summary

New Jersey Department of Environmental Protection

AIR POLLUTION AND METEOROLOGY

Meteorology plays an important role in the distribution of pollution throughout the troposphere, the layer of the atmosphere closest to the earth's surface. Atmospheric processes such as wind speed and wind direction affect the transport and dispersion of air pollution. Weather phenomena, such as precipitation and solar radiation, influence chemical reactions and transformations in the atmosphere that affect air pollutants. By studying meteorological and air pollution data together, scientists and mathematicians have developed reasonably accurate models for predicting the fate of pollutants as they go through the stages of transport, dispersion, transformation and removal.

Scientists, engineers, and policy makers can use results of the air pollution models as a screening tool for comparison to the National Ambient Air Quality Standards (NAAQS), to determine the impacts of new and existing air pollution sources, and to design ambient air monitoring networks. The meteorological data collected by the New Jersey Department of Environmental Protection (NJDEP) can assist planners in preparing State Implementation Plans (SIPs), engineers in designing or evaluating air pollution permit applications and planners in locating air monitoring stations.

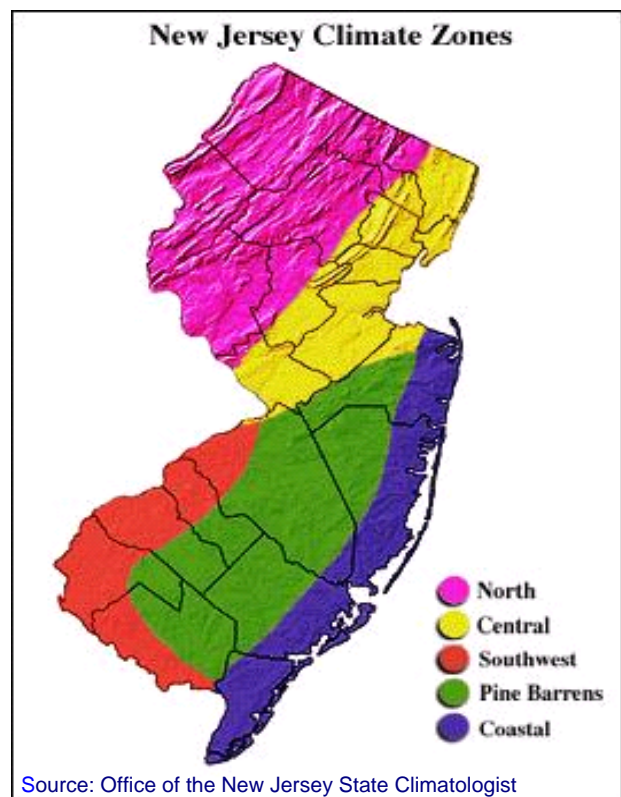
CLIMATOLOGY IN NEW JERSEY

New Jersey is located about halfway between the Equator and the North Pole, on the eastern coast of the United States. Its geographic location results in the State being influenced by wet, dry, hot, and cold airstreams, making for daily weather that is highly variable.

Although New Jersey is one of the smallest states in the Union, with a land area of 7,836 square miles, it has five distinct climate zones, which are classified as the Northern, Central, Pine Barrens, Southwest, and Coastal zones. The

topography of the zones, their distance from the Atlantic Ocean, and the prevailing atmospheric flow patterns affecting those zones produce distinct variations in the daily weather between each of the zones. These climate zones are shown in Figure 1.

Figure 1



MONITORING LOCATIONS

The NJDEP maintains a network of six meteorological monitoring locations. Not all meteorological parameters are measured at each site. These parameters are measured at Elizabeth Lab, East Orange, Chester, Newark Firehouse, Flemington, and Rider University. Figure 2 provides a map of the monitoring stations. In addition, total weekly precipitation is measured in Washington Crossing and Ancora State Hospital.

NORTHERN METEOROLOGICAL STATIONS

The Elizabeth Lab meteorological station monitors wind speed and wind direction. The East Orange meteorological station monitors temperature and relative humidity. The Chester meteorological station monitors solar radiation. In Table 1, the 2010 meteorological data are combined and presented for East Orange, Newark Firehouse, and Chester. Figure 3 shows the monthly maximum, mean and minimum temperatures in East Orange, and Figure 4 compares the monthly mean temperature with the 30-year mean temperatures measured at Newark airport. The Newark Firehouse meteorological station monitors barometric pressure, temperature, relative humidity, wind speed, wind direction, and solar radiation. This data is summarized in Table 1.

CENTRAL METEOROLOGICAL STATIONS

The Rider University and Flemington meteorological stations monitor barometric pressure, temperature, relative humidity, wind speed, wind direction, and solar radiation. This data is summarized in Table 2. Figure 5 shows the monthly maximum, mean and minimum temperatures at Flemington, and Figure 6 compares the monthly mean temperature with the 30-year mean temperatures measured at the Lehigh Valley International Airport in Allentown, PA. Figure 7 shows the monthly maximum, mean and minimum temperatures at Rider University, and Figure 8 compares the monthly mean temperature with the 30-year mean temperatures measured at Philadelphia International airport.

Figure 2
2010 Meteorological Monitoring Network

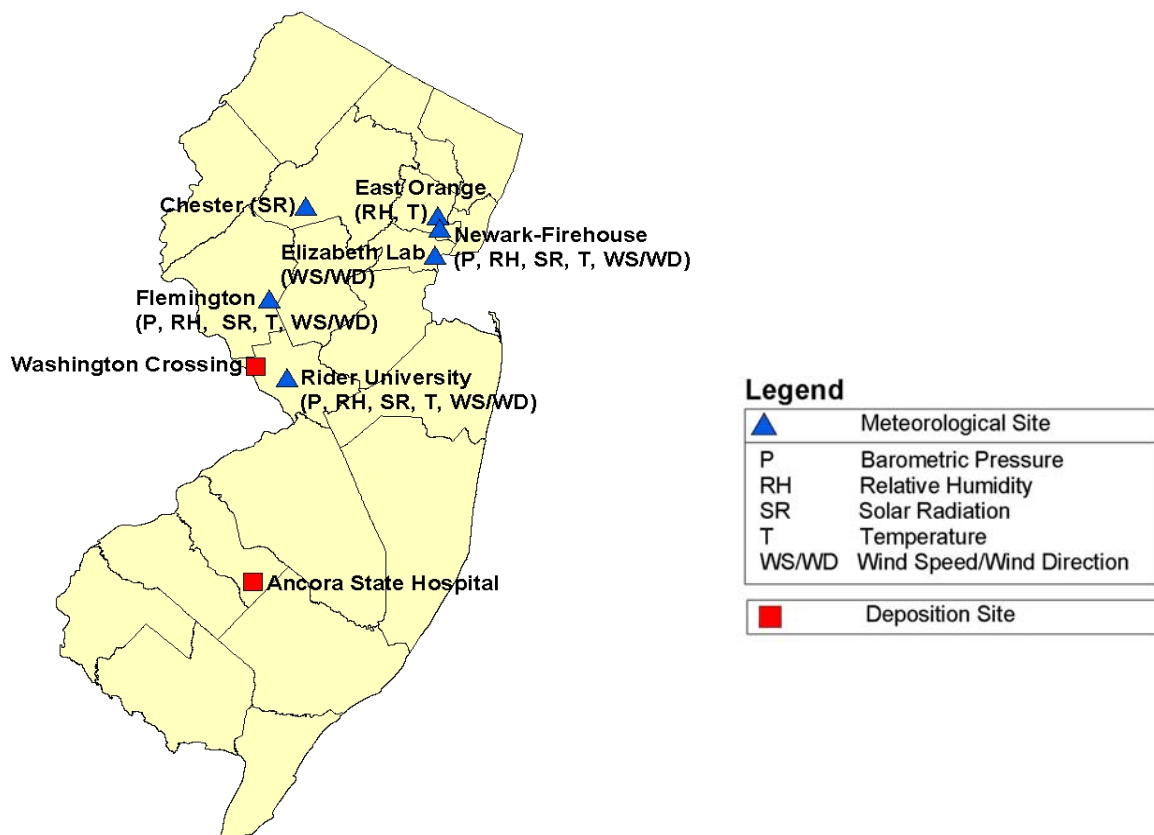


TABLE 1

SUMMARY OF METEOROLOGICAL MONITORING DATA - 2010
NORTHERN NEW JERSEYMONITORING
SITES

East Orange and Chester		<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUG</u>	<u>SEPT</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>YEAR</u>
Temperature: (°F)	Mean ¹	31/31	33/34	48/42	55/52	65/63	74/72	80/77	76/75	70/68	56/56	46/46	31/36	55/54
	Min	12	16	28	29	32	54	59	58	51	40	31	18	12
	Max	74	56	73	90	92	91	102	95	95	76	65	65	102
Relative Humidity: (%)	Mean	65.8	70.0	66.8	61.3	71.8	73.4	70.6	75.9	74.8	73.0	70.8	67.2	64.5
	Min	30.9	28.6	20.9	22.6	26.8	36.4	34.5	36.5	35.2	32.3	17.5	32.1	17.5
	Max	98.4	98.0	98.2	98.2	99.7	98.8	98.6	98.7	99.0	99.1	98.9	99.1	99.7
Solar Radiation: (Langleys)	Mean	0.097	0.151	0.223	0.333	0.348	0.388	0.388	0.299	0.250	0.165	0.108	0.080	0.229
	Max	0.866	1.073	1.314	1.497	1.554	1.550	1.522	1.534	1.361	1.147	0.921	0.625	1.554
Precipitation (inches)	Historical ²	3.98	2.96	4.21	3.92	4.46	3.40	4.68	4.02	4.01	3.16	3.88	3.57	46.25
	Observed ³	2.67	3.24	8.47	1.99	4.04	0.84	3.03	1.04	1.16	6.06	1.93	2.67	37.14
Newark Firehouse ⁴														
Temperature: (°F)	Mean ¹	/31	/34	/42	/52	/63	/72	/77	/75	/68	/56	47/46	32/36	/54
	Min	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	32	19
	Max	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	64	60
Relative Humidity: (%)	Mean	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	57.6
	Min	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	34.3
	Max	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	90.5
Solar Radiation: (Langleys)	Mean	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	0.112	0.092
	Max	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	0.741	0.641
Barometric Pressure (in of Hg)	Mean	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	30.00	29.74
	Min	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	29.39	29.02
	Max	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	No Data ⁴	30.45	30.30

1) Newark Airport 30-year mean shown to the right of the slash.

2) Historical monthly precipitation data for Newark Airport

3) Observed monthly precipitation collected by NJDEP at Washington's Crossing state park.

4) Newark Firehouse site commenced operation in November 2010.

Figure 3
2010 Maximum, Mean and Minimum Temperatures, East Orange

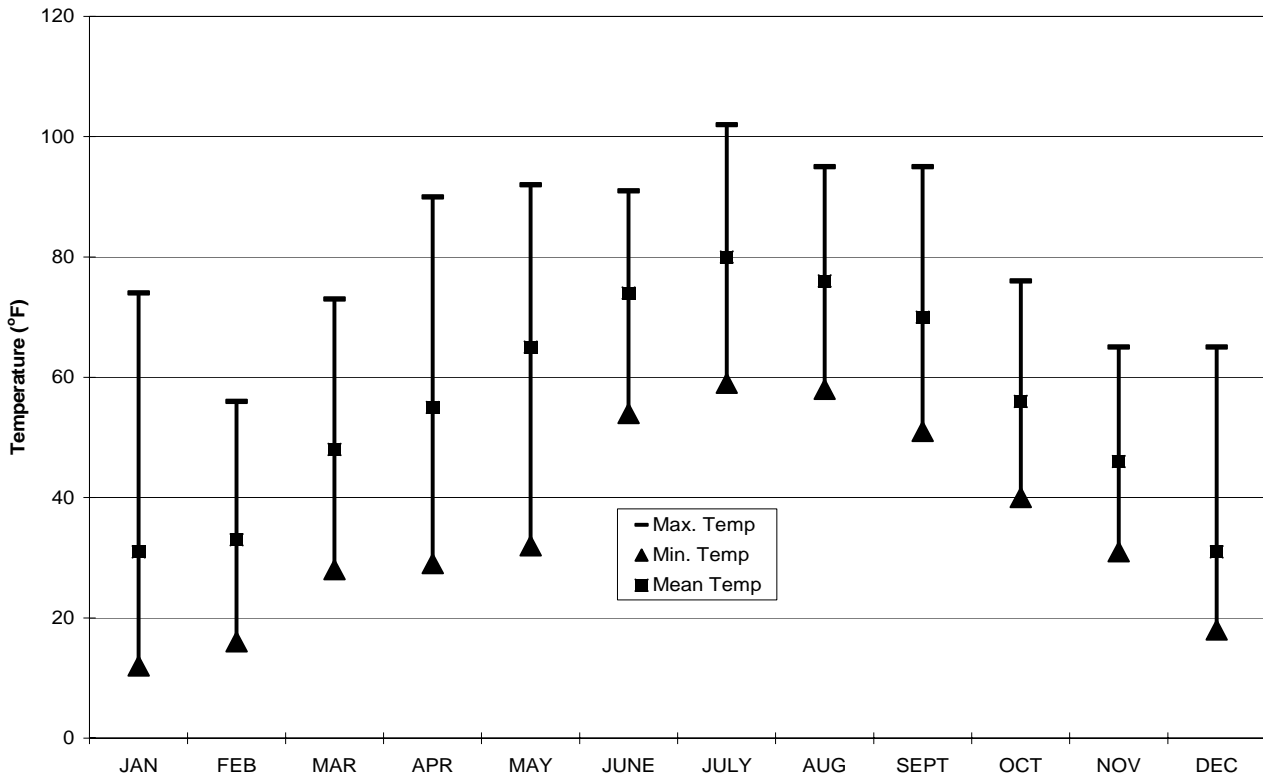


Figure 4
2010 Observed vs. 30-Year Mean Temperatures, East Orange

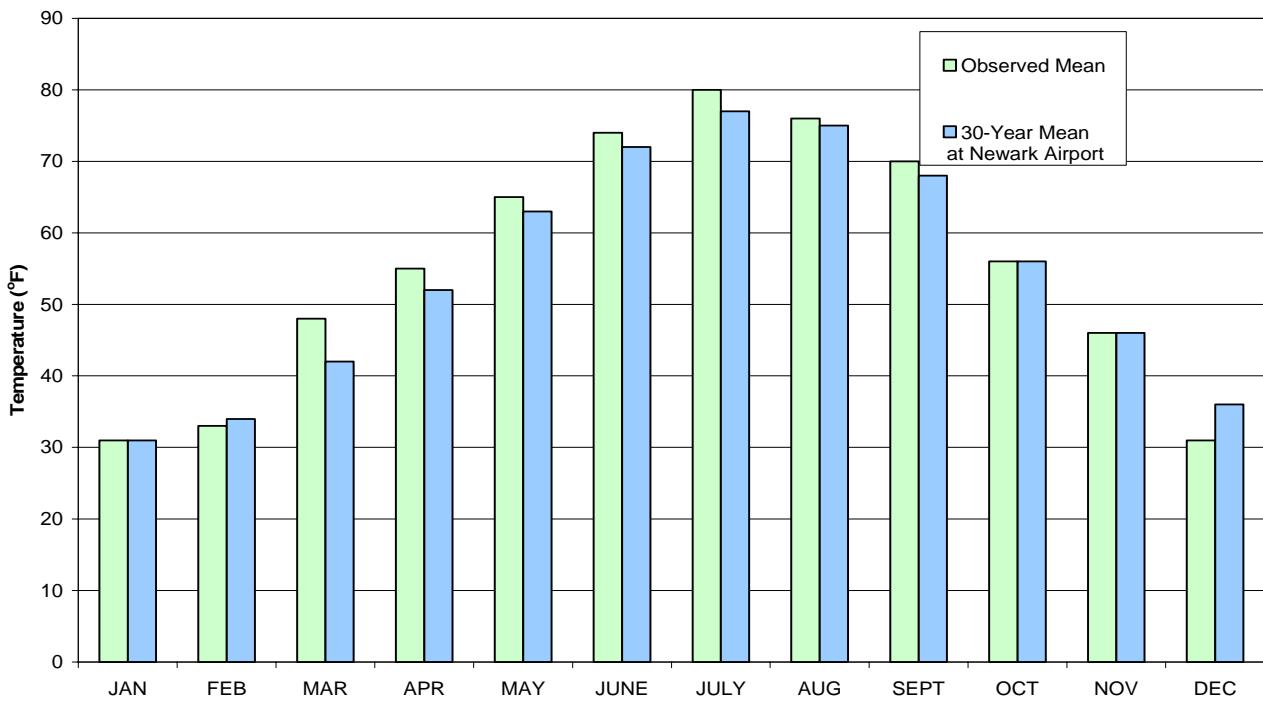


TABLE 2

SUMMARY OF METEOROLOGICAL MONITORING DATA - 2010
CENTRAL NEW JERSEYMONITORING
SITES

<u>Rider University</u>		<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUNE</u>	<u>JULY</u>	<u>AUG</u>	<u>SEPT</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>	<u>YEAR</u>
Temperature: (°F)	Mean ¹	29/32	30/35	45/43	54/53	62/64	72/72	76/78	73/76	68/69	53/57	43/47	29/37	53/55
	Min	11	12	26	34	32	48	52	52	44	35	23	13	11
	Max	59	44	74	88	89	92	99	93	95	76	63	61	99
Relative Humidity: (%)	Mean	63.3	66.9	64.2	58.7	67.4	66.9	65.0	67.5	66.5	71.8	68.1	63.0	65.8
	Min	25.8	27.7	13.8	17.5	19.2	22.6	17.3	19.4	15.1	21.5	10.6	33.5	10.6
	Max	100.0	99.8	98.6	99.5	98.8	98.9	98.0	98.3	98.4	99.5	99.9	98.3	100.0
Solar Radiation: (Langleys)	Mean	0.098	0.130	0.178	0.296	0.309	0.346	0.341	0.270	0.239	0.159	0.112	0.082	0.214
	Max	0.704	0.936	1.104	1.283	1.318	1.366	1.322	1.238	1.152	1.001	0.776	0.584	1.366
Barometric Pressure (in of Hg)	Mean	30.16	29.97	30.05	30.11	30.19	30.08	30.14	30.17	30.15	30.09	30.28	30.06	30.12
	Min	29.34	29.17	29.56	29.41	29.66	29.58	29.96	29.82	29.70	29.69	29.56	29.31	29.17
	Max	30.55	30.60	30.62	30.79	30.65	30.38	30.47	30.46	30.45	30.40	30.77	30.62	30.79
Precipitation (inches)	Historical ²	3.52	2.74	3.81	3.49	3.89	3.29	4.39	3.82	3.88	2.75	3.16	3.31	42.05
	Observed ³	2.87	4.03	8.83	2.28	3.57	2.51	2.50	2.83	2.96	5.71	3.04	2.36	43.49
<u>Flemington</u>														
Temperature: (°F)	Mean ⁴	29/27	30/30	45/39	55/49	64/60	74/69	78/73	74/71	68/63	54/52	42/42	29/32	54/51
	Min	11	12	24	31	31	45	50	50	40	32	19	10	10
	Max	60	47	78	89	98	95	107	100	100	81	68	62	107
Relative Humidity: (%)	Mean	75.0	77.0	76.3	71.6	80.7	82.1	81.4	83.6	80.7	81.7	79.6	74.4	78.7
	Min	36.6	38.7	28.6	33.4	35.3	43.5	44.8	44.8	38.7	37.9	23.9	44.2	23.9
	Max	100.0	100.0	100.0	100.0	100.0	100.0	99.0	99.0	99.0	99.0	99.1	99.1	100.0
Solar Radiation: (Langleys)	Mean	0.126	0.160	0.209	0.326	0.334	0.372	0.360	0.293	0.260	0.179	0.136	0.107	0.239
	Max	0.841	1.157	1.304	1.370	1.406	1.505	1.437	1.327	1.221	1.080	0.880	0.722	1.505
Barometric Pressure (in of Hg)	Mean	30.05	29.86	29.95	30.01	30.09	29.99	30.05	30.08	30.06	29.99	30.18	29.97	30.02
	Min	29.28	29.07	29.47	29.31	29.57	29.50	29.87	29.73	29.63	29.60	29.48	29.23	29.07
	Max	30.42	30.46	30.48	30.66	30.53	30.28	30.36	30.35	30.33	30.28	30.66	30.51	30.66

1) Philadelphia International Airport 30 year mean shown to the right of the slash.

2) Historical monthly precipitation data for Philadelphia International Airport

3) Observed monthly precipitation collected by NJDEP at Ancora State Hospital

4) Lehigh Valley International Airport (Allentown, PA) 30-year mean shown to the right of the slash.

Figure 5
2010 Maximum, Mean and Minimum Temperatures, Flemington

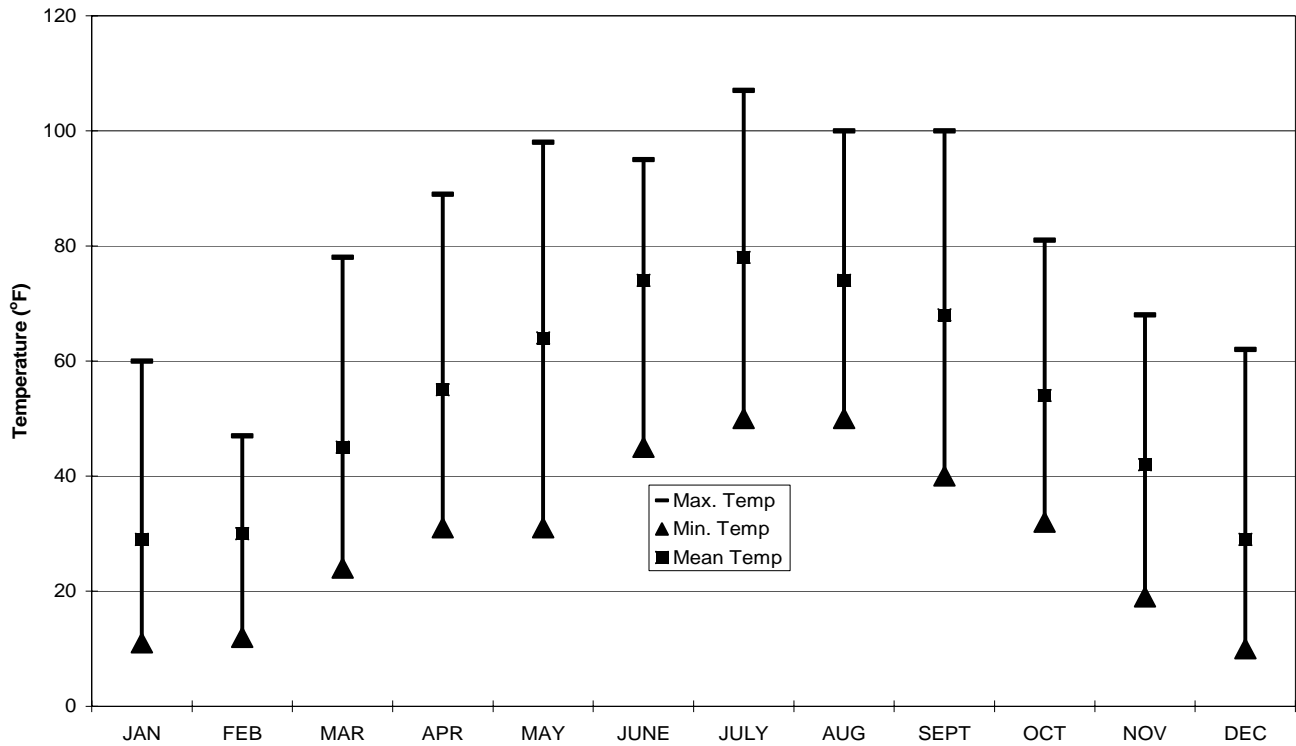


Figure 6
2010 Observed vs. 30-Year Mean Temperatures, Flemington

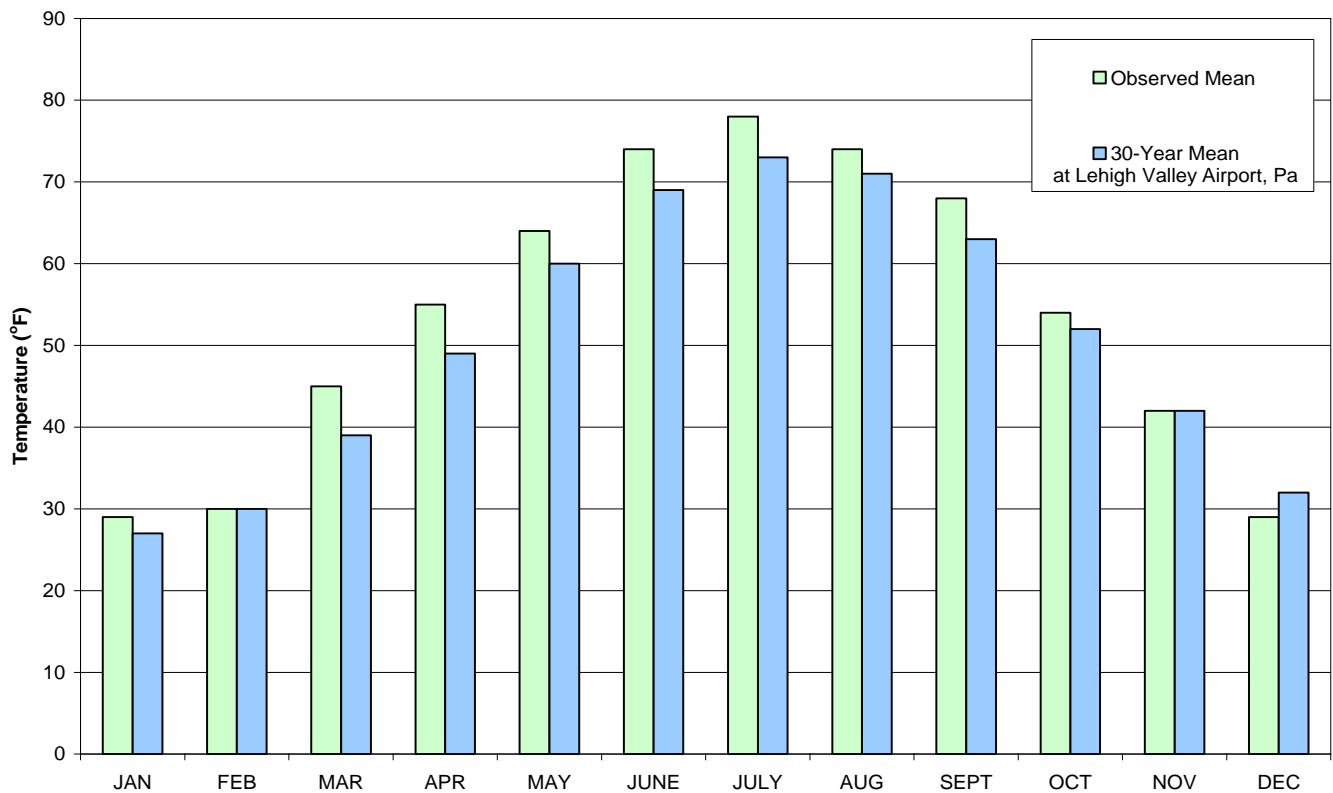


Figure 7
2010 Maximum, Mean and Minimum Temperatures, Rider University

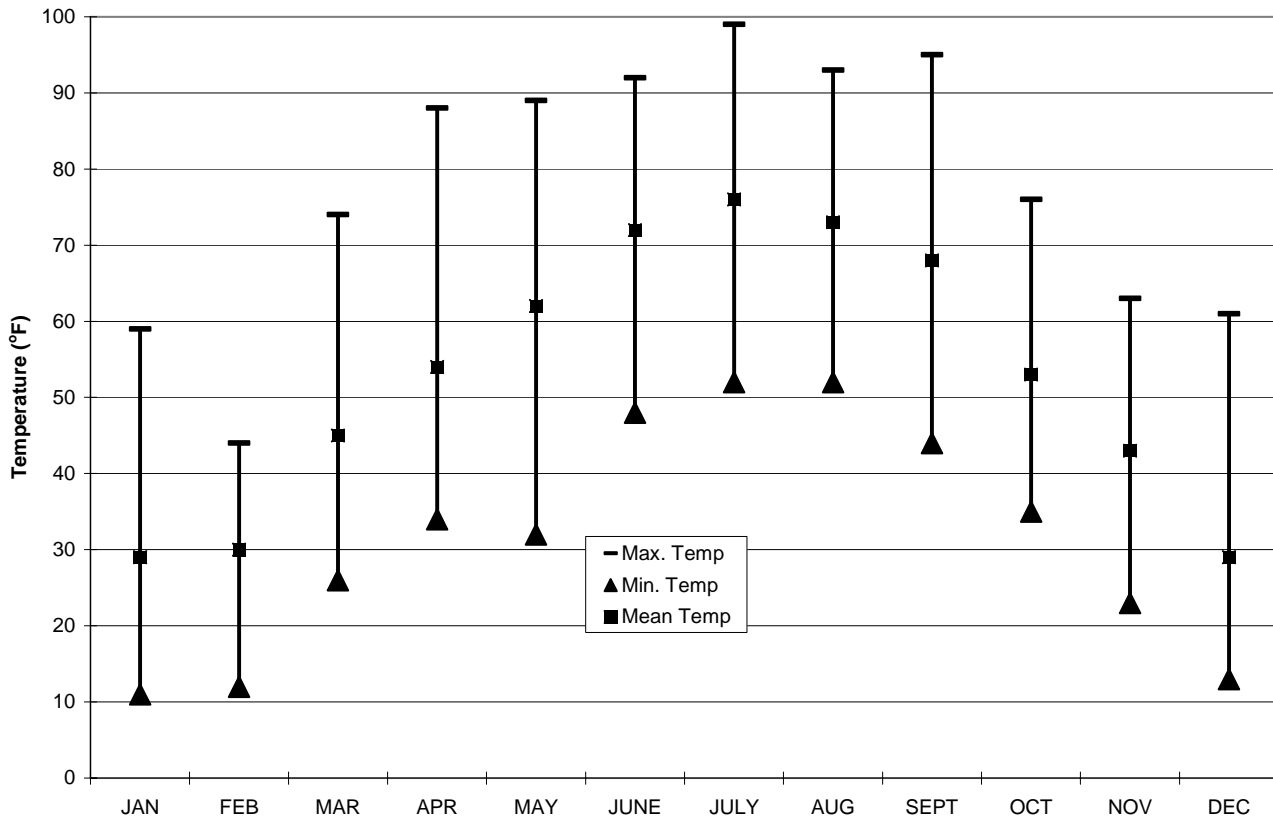
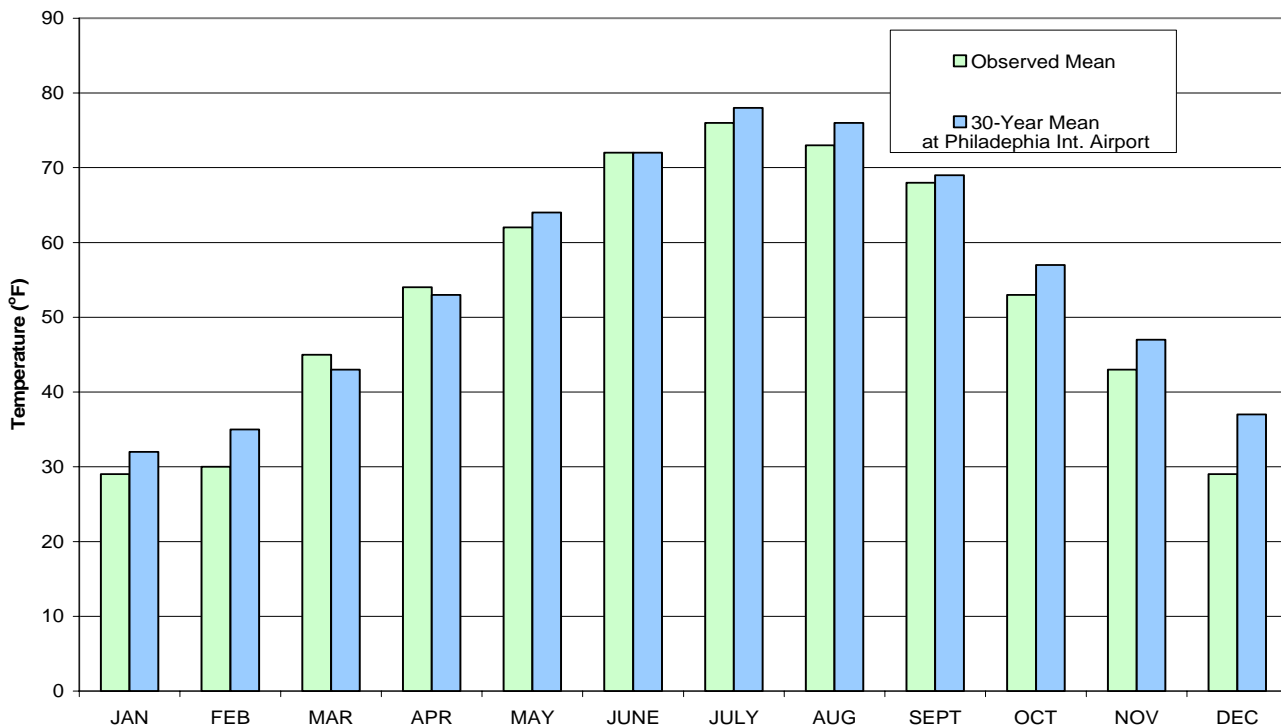


Figure 8
2010 Observed vs. 30-Year Mean Temperatures, Rider University



REFERENCES

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