



# 2012 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 scientists 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 different air streams at different times (wet, dry, hot, cold), 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 them. These climate zones are shown in Figure 1.

Figure 1  
New Jersey Climate Zones



Source: Office of the New Jersey State Climatologist

## MONITORING LOCATIONS

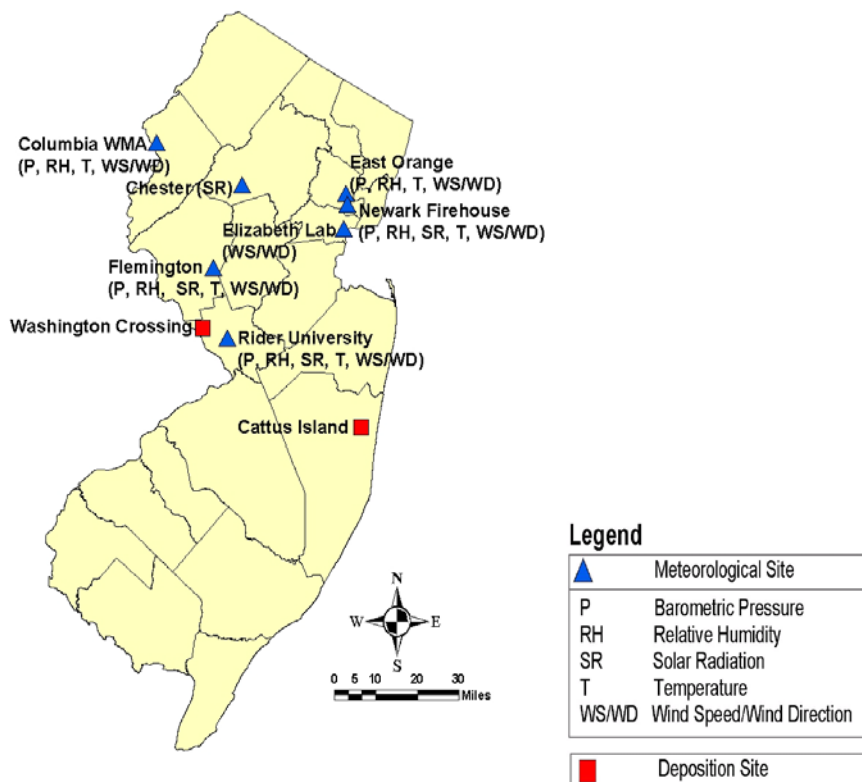
The NJDEP maintains a network of seven meteorological monitoring locations. In addition, total weekly precipitation is measured in Washington Crossing and Cattus Island Park. Not all meteorological parameters are measured at each site. Table 1 depicts the meteorological parameters measured at each site and Figure 2 depicts

the 2012 Meteorological Monitoring Network. In Table 2, the 2012 meteorological data is summarized by site. Figures 3, 5, 7, 9, and 11 show the monthly maximum, mean, and minimum temperatures at the East Orange, Newark Firehouse, Columbia, Flemington, and Rider University meteorological stations respectively. Figures 4, 6, 8, 10, and 12 depict the observed average monthly temperature difference from the 30-year average monthly temperature, as measured by the State Climatologist, at the East Orange, Newark Firehouse, Columbia, Flemington, and Rider University meteorological stations respectively. Figures 13 through 18 depict annual wind roses for Columbia, East Orange, Elizabeth Trailer, Flemington, Newark Firehouse, and Rider University respectively.

**Table 1**  
**2012 Meteorological Monitoring Network Parameter Summary**

Measured Parameters							
Site Name	Temperature	Relative Humidity	Wind Speed	Wind Direction	Barometric Pressure	Solar Radiation	Precipitation
Cattus Island							X
Chester						X	
Columbia	X	X	X	X	X		
East Orange	X	X	X	X	X		
Elizabeth lab			X	X			
Flemington	X	X	X	X	X	X	
Newark Firehouse	X	X	X	X	X	X	
Rider University	X	X	X	X	X		
Washington Crossing							X

Figure 2  
2012 Meteorological Monitoring Network



**Table 2**  
**Summary of Meteorological Monitoring Data - 2012**

MONITORING SITES		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEAR
<b>Chester</b>														
Solar Radiation: (Langleys)	Mean	0.090	0.156	0.226	0.339	0.294	0.364	0.357	0.317	0.218	0.130	0.099	0.063	0.224
	Max	0.851	1.088	1.346	1.609	1.556	1.559	1.560	1.404	1.292	1.124	0.825	0.592	1.609
<b>Columbia</b>														
Temperature: (°F)	Mean <sup>1</sup>	31/29	35/32	47/39	50/50	62/60	66/69	73/74	69/72	61/65	53/53	37/44	35/34	52/52
	Min	8	18	22	31	39	44	56	51	39	28	23	21	8
	Max	57	58	77	86	87	93	95	88	88	77	63	60	95
Relative Humidity: %	Mean	63.5	60.3	61.0	52.5	74.0	70.1	71.5	76.2	77.1	77.2	63.7	74.0	68.4
	Min	31.8	27.2	13.2	13.4	17.7	29.8	25.9	31.3	34.2	27.2	24.9	35.1	13.2
	Max	93.7	93.0	93.2	92.3	94.0	93.6	93.6	93.7	93.4	93.7	90.4	92.7	94.0
Barometric Pressure (in of Hg)	Mean	29.47	29.49	29.55	29.36	29.48	29.42	29.43	29.47	29.50	29.48	29.64	29.47	29.48
	Min	28.71	28.86	28.94	28.65	29.02	29.09	29.11	29.25	29.06	28.23	29.08	28.61	28.23
	Max	30.02	29.91	30.07	29.80	29.72	29.82	29.70	29.80	29.85	29.98	30.12	29.96	30.12
<b>East Orange</b>														
Temperature : (°F)	Mean <sup>1</sup>	36/29	39/32	49/39	54/50	65/60	70/69	78/74	75/72	67/65	57/53	41/44	39/34	56/52
	Min	12	19	25	36	48	50	63	59	49	34	27	26	12
	Max	65	61	75	86	91	96	99	92	89	78	64	61	99
Relative Humidity: %	Mean	68.2	64.2	69.2	56.9	81.0	76.5	73.5	71.3	65.9	69.3	59.3	69.1	68.8
	Min	32.8	28.3	14.3	20.1	28.5	40.4	34.4	25.5	30.6	26.9	29.1	32.9	14.3
	Max	99.0	98.7	99.8	99.6	100.0	100.0	100.0	100.0	94.8	95.7	94.3	94.8	100.0
Barometric <sup>4</sup> Pressure (in of Hg)	Mean	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	29.83	29.80	29.98	29.80	29.85
	Min	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	29.38	28.34	29.43	28.91	28.34
	Max	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	N/A <sup>4</sup>	30.18	30.33	30.47	30.32	30.47
Precipitation (inches)	Historical <sup>2</sup>	3.49	2.90	4.12	4.31	4.37	4.51	4.78	4.13	4.49	4.36	3.90	4.00	49.37
	Observed <sup>3</sup>	3.00	1.08	1.46	2.96	5.04	3.55	3.91	4.07	4.60	4.72	1.37	5.57	41.33

- 1) Office of the New Jersey State Climatologist Northern 30-year mean temperature data shown to the right of slash.
- 2) Office of the New Jersey State Climatologist Northern 30-year mean precipitation data.
- 3) Observed monthly precipitation collected by NJDEP at Washington's Crossing state park.
- 4) East Orange commenced monitoring of Barometric Pressure in the middle of August 2012
- 5) Office of the New Jersey State Climatologist Southern 30-year mean temperature data shown to the right of the slash.
- 6) Office of the New Jersey State Climatologist Southern 30-year mean precipitation data.
- 7) Observed monthly precipitation collected by NJDEP at Cattus Island State Park, commencing September 2012

**Table 2 (Continued)**  
**Summary of Meteorological Monitoring Data - 2012**

MONITORING SITES		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEAR
<b>Flemington</b>														
Temperature : (°F)	Mean <sup>5</sup>	33/33	37/35	49/42	53/52	65/62	71/71	78/76	74/74	66/67	55/56	38/47	38/37	55/54
	Min	6	16	21	28	38	45	59	53	37	26	19	19	6
	Max	62	63	83	91	97	100	102	98	96	82	70	67	102
Relative Humidity: %	Mean	76.0	75.1	76.5	66.6	86.2	82.5	82.6	87.4	87.6	89.1	80.1	87.3	81.4
	Min	43.1	38.8	22.4	26.9	38.1	50.3	40.7	52.6	51.6	39.8	41.4	48.5	22.4
	Max	99.2	99.1	99.1	99.1	99.1	99.0	99.0	99.0	99.1	99.1	99.1	99.2	99.2
Solar Radiation: (Langleys)	Mean	0.123	0.171	0.229	0.330	0.282	0.356	0.346	0.313	0.252	0.147	0.133	0.085	0.231
	Max	0.788	1.038	1.266	1.377	1.414	1.388	1.356	1.285	1.206	1.037	0.818	0.671	1.414
Barometric Pressure (in of Hg)	Mean	30.10	30.12	30.18	29.98	30.09	30.03	30.04	30.09	30.13	30.09	30.26	30.10	30.10
	Min	29.34	29.46	29.57	29.21	29.62	29.70	29.70	29.85	29.69	28.50	29.67	29.20	28.50
	Max	30.69	30.55	30.73	30.41	30.33	30.44	30.33	30.42	30.48	30.59	30.76	30.60	30.76
<b>Newark Firehouse</b>														
Temperature : (°F)	Mean <sup>1</sup>	36/29	40/32	50/39	55/50	66/60	72/69	79/74	77/72	68/65	58/53	43/44	41/34	57/52
	Min	12	20	26	38	50	52	63	62	50	36	31	27	12
	Max	62	63	77	88	91	97	99	93	90	79	66	63	99
Relative Humidity: %	Mean	56.7	52.4	56.5	43.2	66.1	57.8	54.6	60.2	62.9	66.5	56.0	66.7	58.4
	Min	22.2	21.0	8.7	10.4	16.0	21.7	17.0	20.9	27.4	25.7	25.3	26.3	8.7
	Max	95.1	94.7	95.4	94.5	94.3	92.8	88.8	90.3	90.7	94.1	93.5	94.1	95.4
Solar Radiation: (Langleys)	Mean	0.107	0.160	0.225	0.332	0.280	0.360	0.335	0.321	0.245	0.140	0.121	0.075	0.225
	Max	0.766	0.971	1.216	1.369	1.418	1.415	1.399	1.331	1.215	1.049	0.786	0.597	1.418
Barometric Pressure (in of Hg)	Mean	29.89	29.92	29.97	29.77	29.88	29.81	29.81	29.86	29.90	29.85	30.03	29.88	29.88
	Min	29.15	29.26	29.36	29.02	29.40	29.50	29.47	29.64	29.45	28.41	29.45	28.99	28.41
	Max	30.48	30.33	30.51	30.23	30.11	30.21	30.08	30.20	30.26	30.39	30.54	30.39	30.54

- 1) Office of the New Jersey State Climatologist Northern 30-year mean temperature data shown to the right of slash.
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- 3) Observed monthly precipitation collected by NJDEP at Washington's Crossing state park.
- 4) East Orange commenced monitoring of Barometric Pressure in the middle of August 2012
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- 6) Office of the New Jersey State Climatologist Southern 30-year mean precipitation data.
- 7) Observed monthly precipitation collected by NJDEP at Cattus Island State Park, commencing September 2012

**Table 2 (Continued)**  
**Summary of Meteorological Monitoring Data - 2012**

MONITORING SITES		JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	YEAR
<b>Rider University</b>														
Temperature: (F°)	Mean <sup>5</sup>	34/33	37/35	48/42	52/52	63/62	68/71	75/76	73/74	65/67	56/56	40/47	39/37	54/54
	Min	11	18	22	30	43	47	61	55	42	29	24	23	11
	Max	62	63	76	88	90	93	97	90	88	78	69	66	97
Relative Humidity: %	Mean	62.9	62.0	64.0	51.4	75.5	67.8	67.0	73.6	76.5	78.4	67.7	76.0	68.6
	Min	25.3	23.5	12.0	11.2	20.7	26.8	14.9	31.2	32.5	26.6	30.3	26.9	11.2
	Max	99.0	99.1	99.3	97.8	98.0	97.6	97.1	97.9	98.7	99.5	99.6	99.5	99.6
Solar Radiation: (Langleys)	Mean	0.094	0.140	0.197	0.293	0.255	0.339	0.324	0.313	0.232	0.133	0.110	0.070	0.202
	Max	0.645	0.880	1.115	1.263	1.286	1.299	1.291	1.249	1.098	0.971	0.670	0.601	1.299
Barometric Pressure (in of Hg)	Mean	30.23	30.25	30.31	30.11	30.22	30.15	30.15	30.20	30.25	30.19	30.38	30.22	30.22
	Min	29.44	29.56	29.69	29.31	29.73	29.81	29.79	29.95	29.79	28.45	29.78	29.31	28.45
	Max	30.84	30.70	30.88	30.56	30.47	30.57	30.45	30.55	30.63	30.76	30.90	30.73	30.90
Precipitation (Inches)	Historical <sup>6</sup>	3.35	2.91	4.10	3.75	3.49	3.14	3.87	4.06	3.37	3.57	3.33	3.66	42.59
	Observed <sup>7</sup>	N/A7	N/A7	N/A7	N/A7	N/A7	N/A7	N/A7	N/A7	N/A7	12.77	1.41	6.50	20.68

- 1) Office of the New Jersey State Climatologist Northern 30-year mean temperature data shown to the right of slash.
- 2) Office of the New Jersey State Climatologist Northern 30-year mean precipitation data.
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- 6) Office of the New Jersey State Climatologist Southern 30-year mean precipitation data.
- 7) Observed monthly precipitation collected by NJDEP at Cattus Island State Park, commencing September 2012

Figure 3  
2012 Maximum, Mean and Minimum Temperatures, East Orange

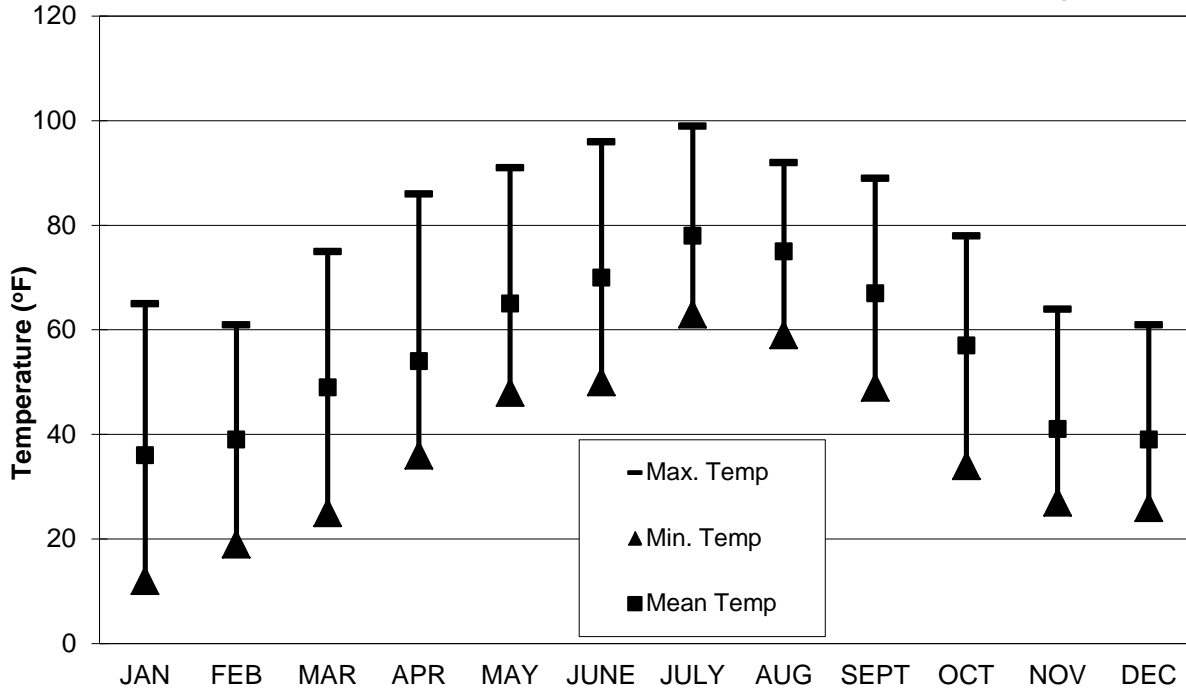


Figure 4  
East Orange 2012 Monthly Temperature Difference from New Jersey State Climatologist Northern 30-Year Temperature Average

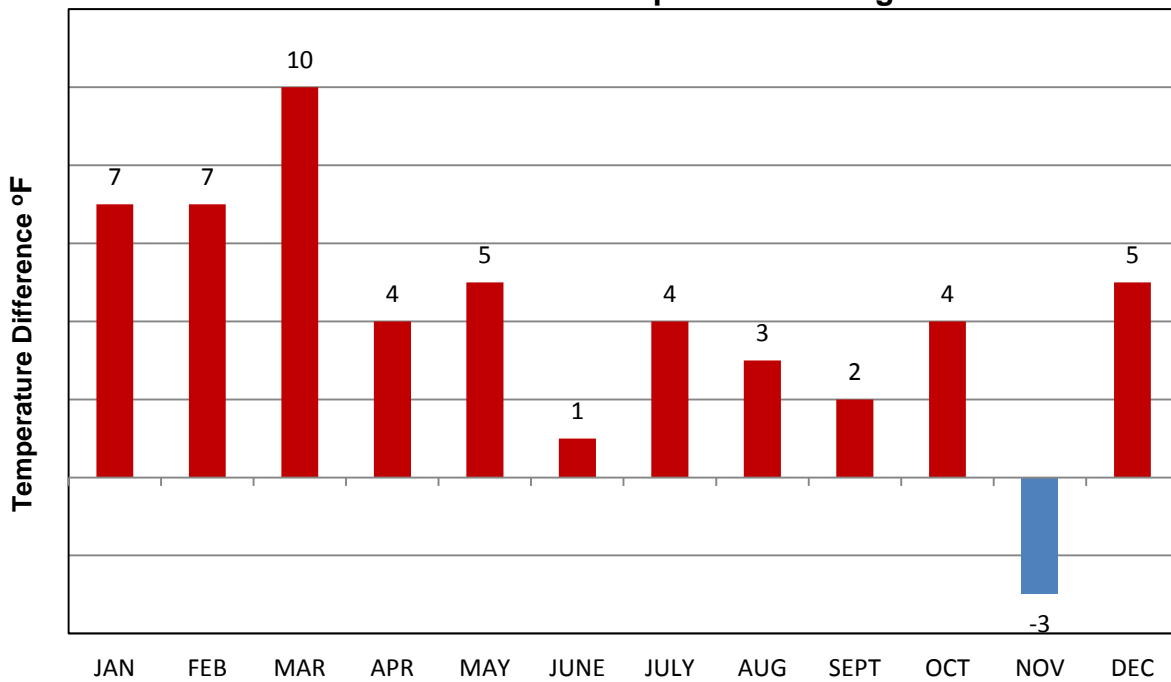


Figure 5  
2012 Maximum, Minimum and Mean Temperatures, Newark Firehouse

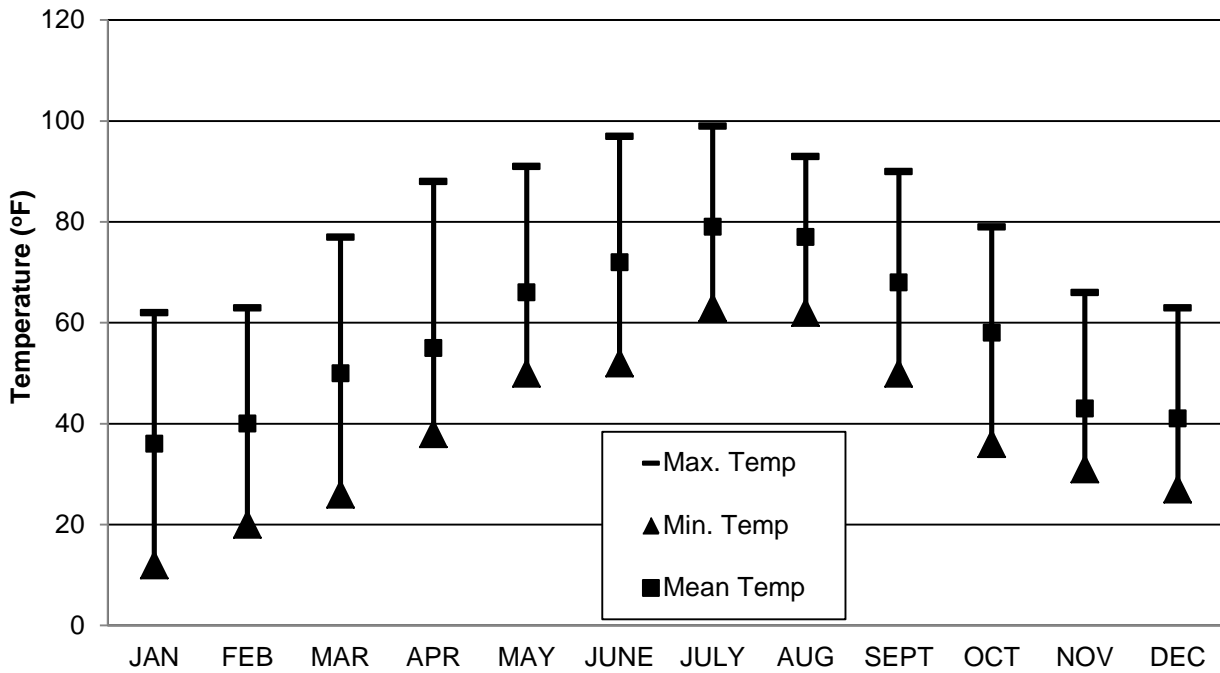


Figure 6  
Newark Firehouse 2012 Monthly Temperature Difference from New Jersey State Climatologist Northern 30-Year Temperature Average

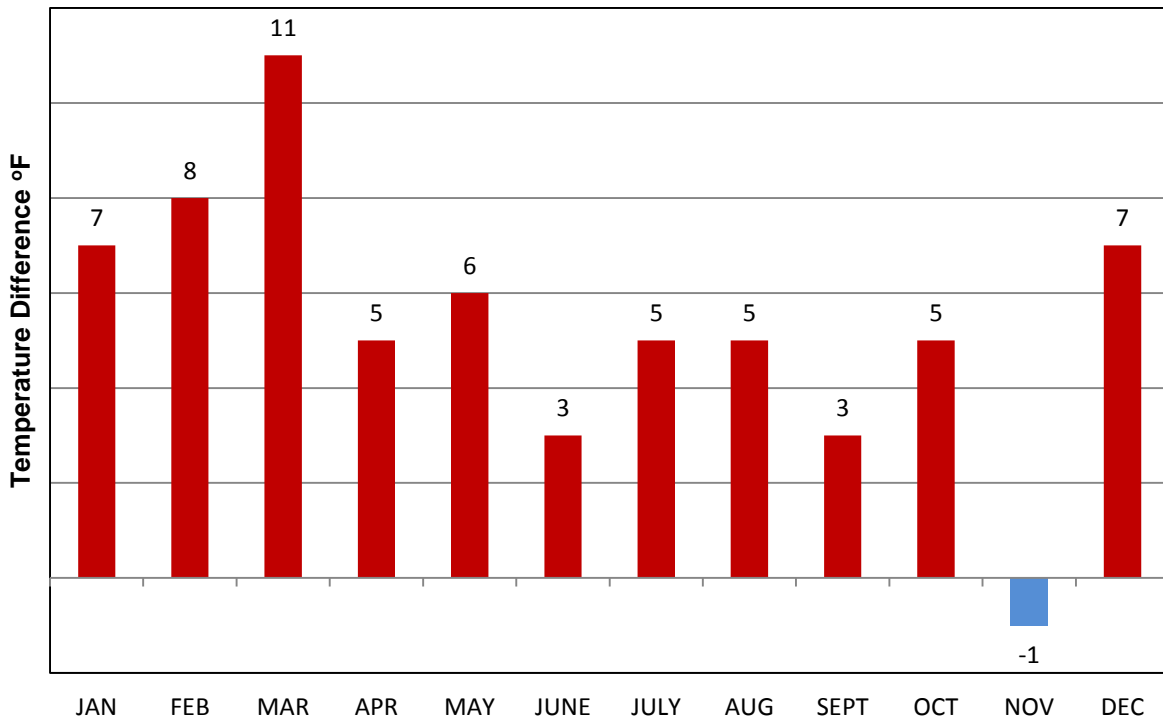


Figure 7  
2012 Maximum, Minimum and Mean Temperatures, Columbia

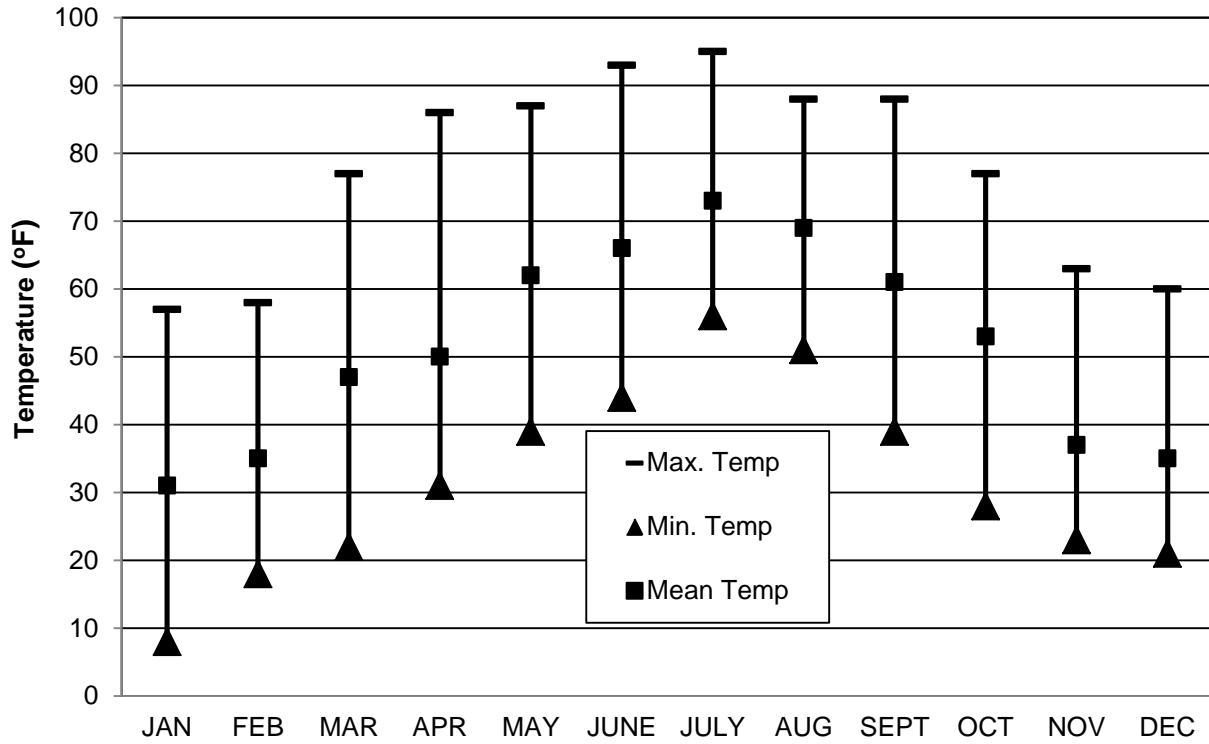


Figure 8  
Columbia 2012 Monthly Temperature  
Difference from New Jersey State Climatologist  
Northern 30-Year Temperature Average

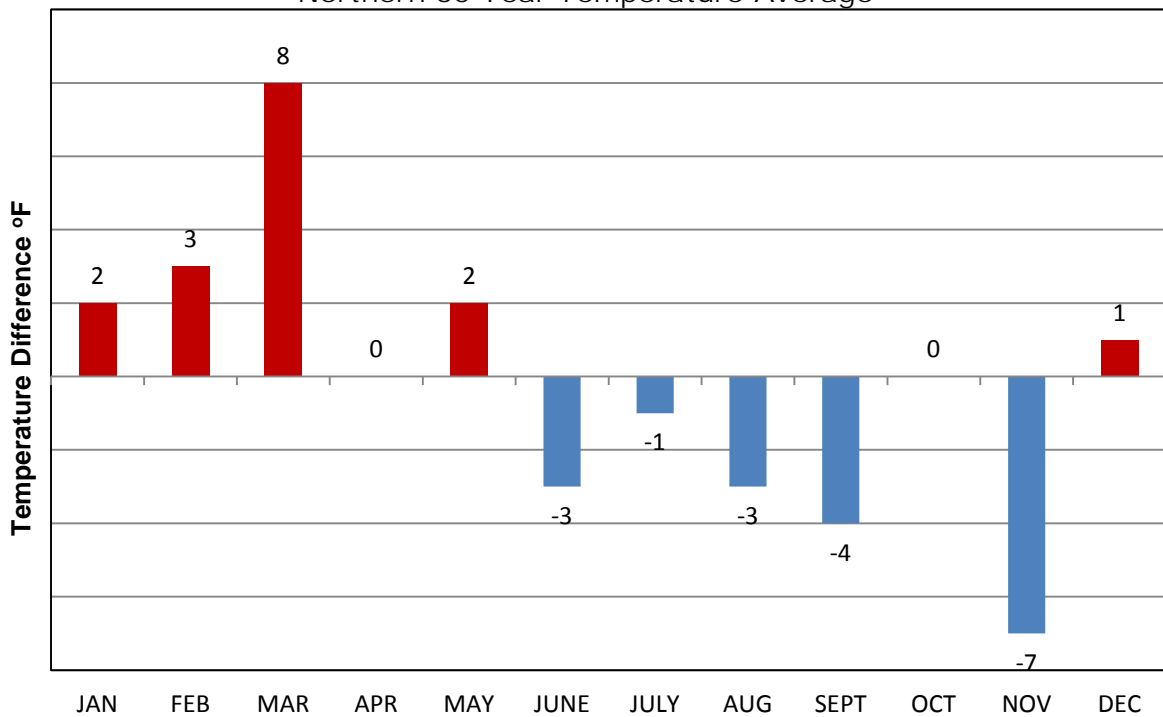




Figure 9  
2012 Maximum, Mean and Minimum Temperatures, Flemington

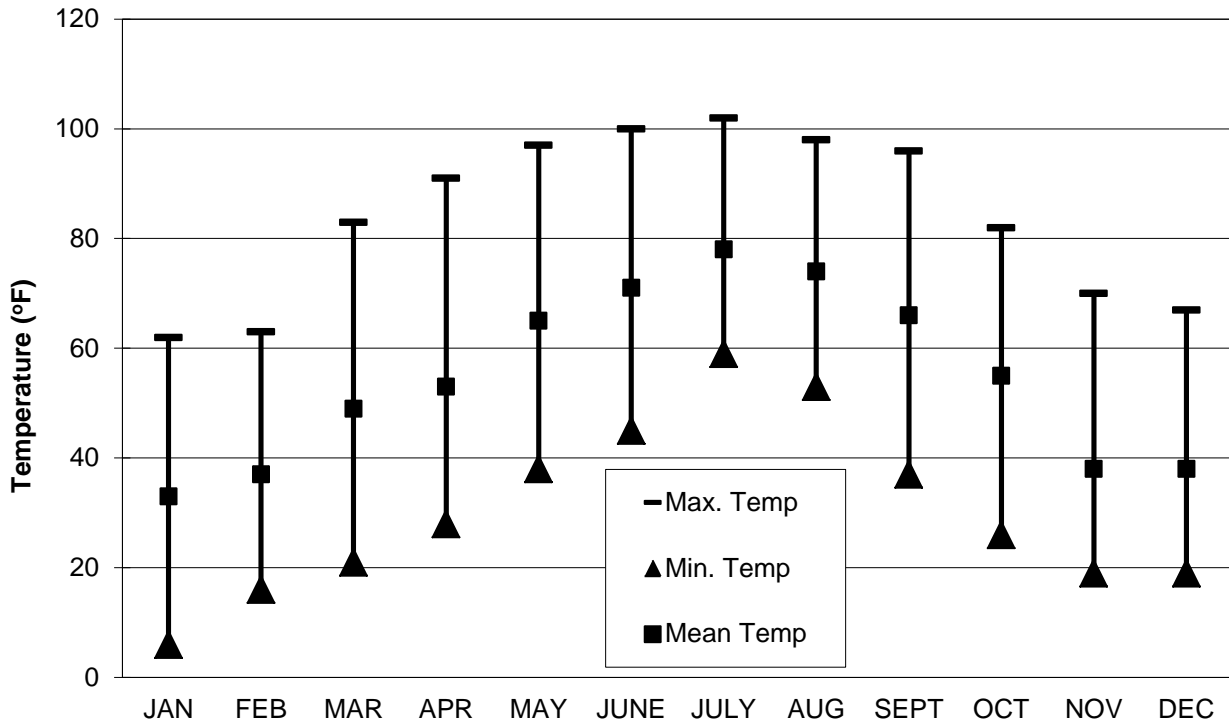


Figure 10  
Flemington 2012 Monthly Temperature  
Difference from New Jersey State Climatologist  
Southern 30-Year Temperature Average

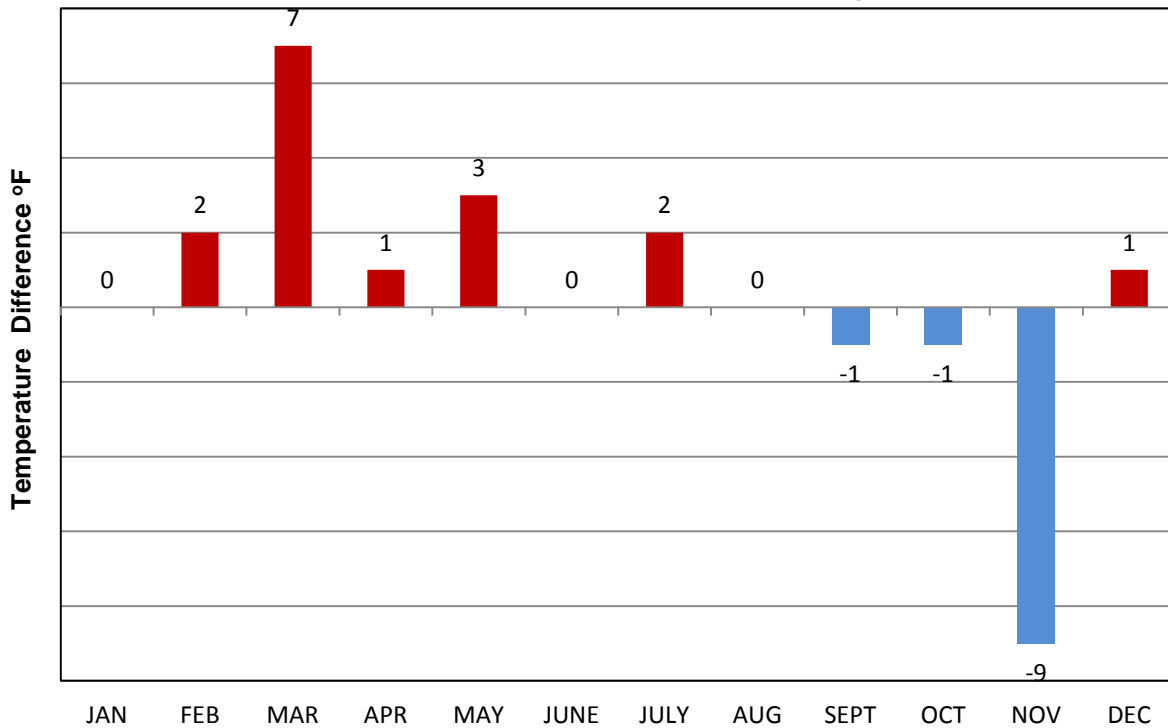


Figure 11  
2012 Maximum, Mean and Minimum Temperatures, Rider University

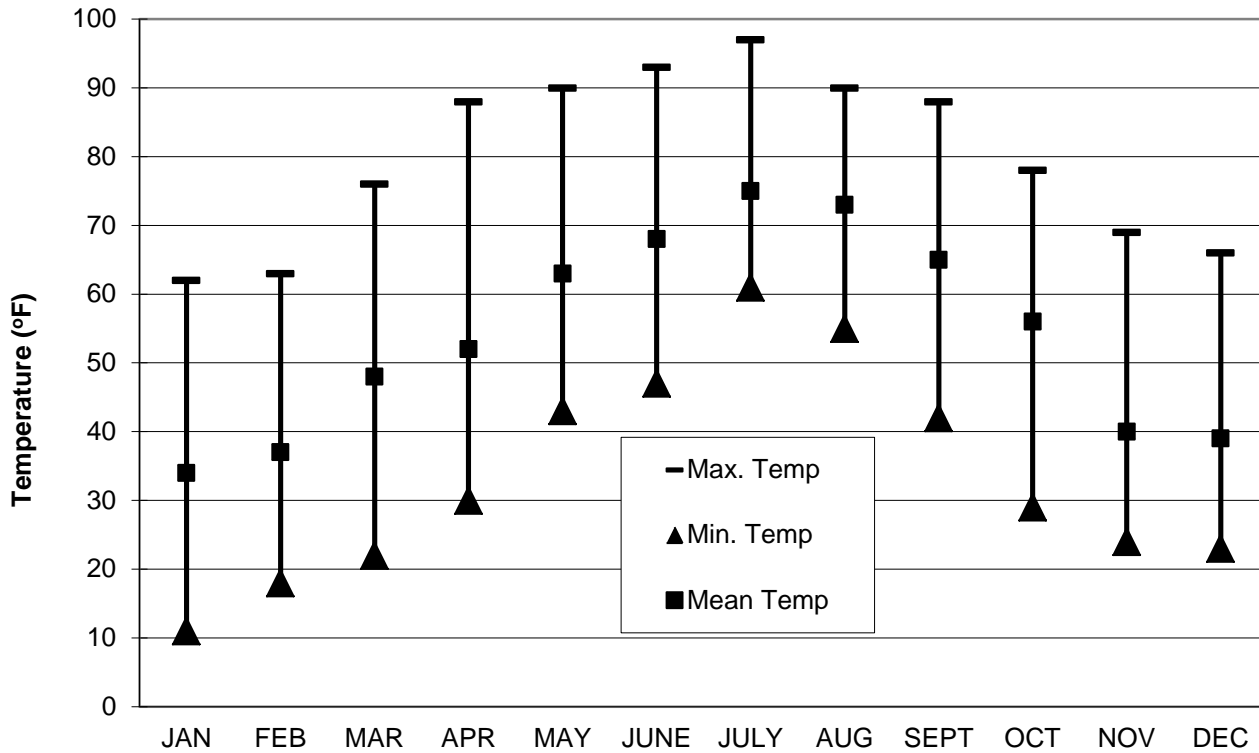


Figure 12  
Rider University 2012 Monthly Temperature  
Difference from New Jersey State Climatologist  
Southern 30-Year Temperature Average

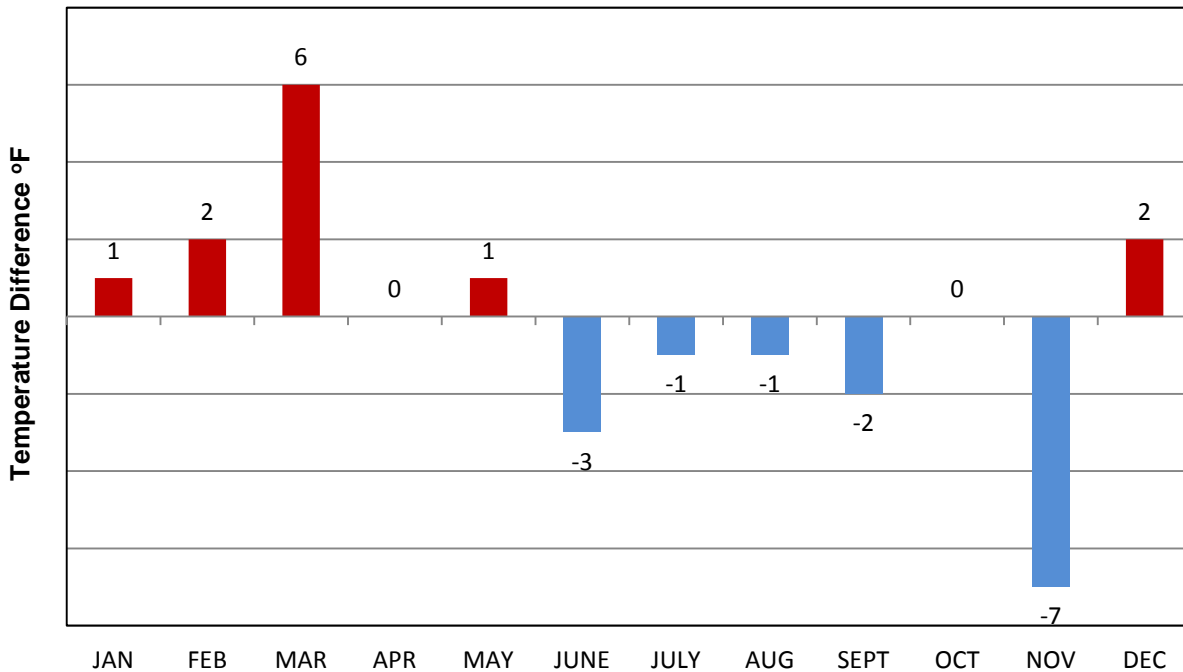


Figure 13  
 Annual Wind Rose for Columbia  
 Displaying Distribution of Wind Speed & Wind Direction

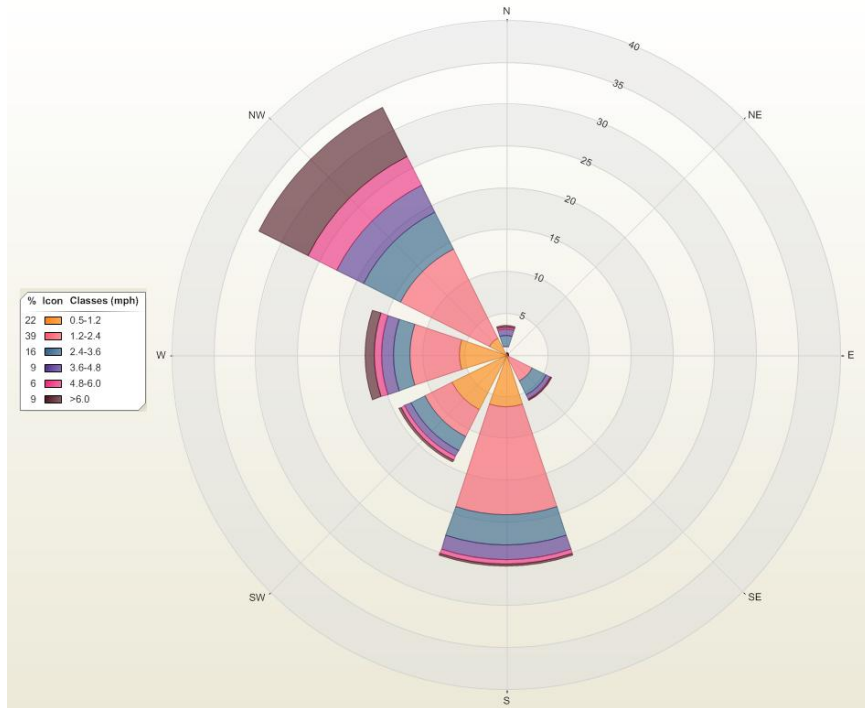


Figure 14  
 Annual Wind Rose for East Orange  
 Displaying Distribution of Wind Speed & Wind Direction

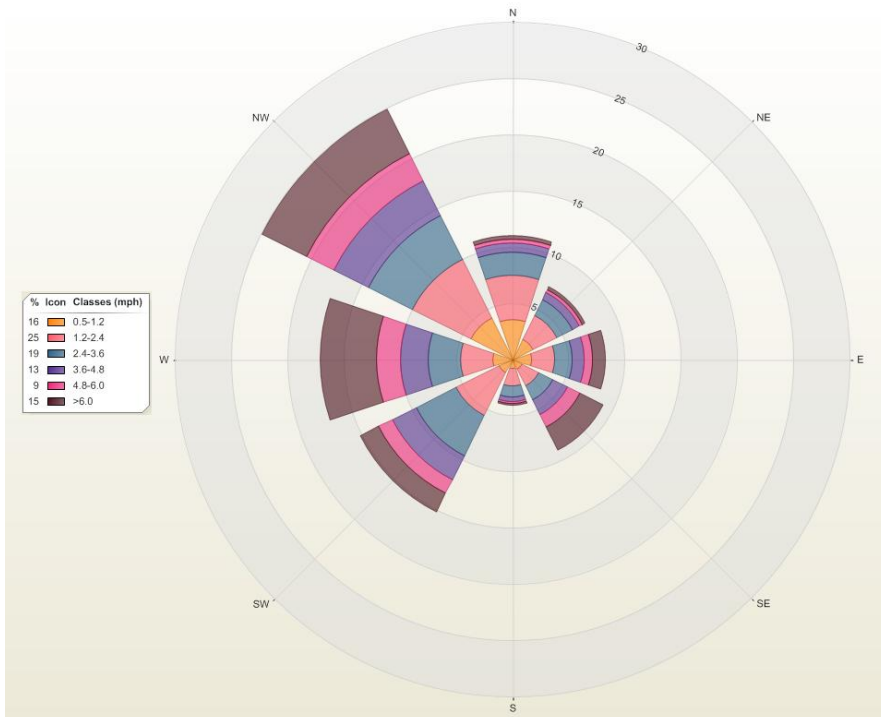


Figure 15  
 Annual Wind Rose for Elizabeth Trailer  
 Displaying Distribution of Wind Speed & Wind Direction

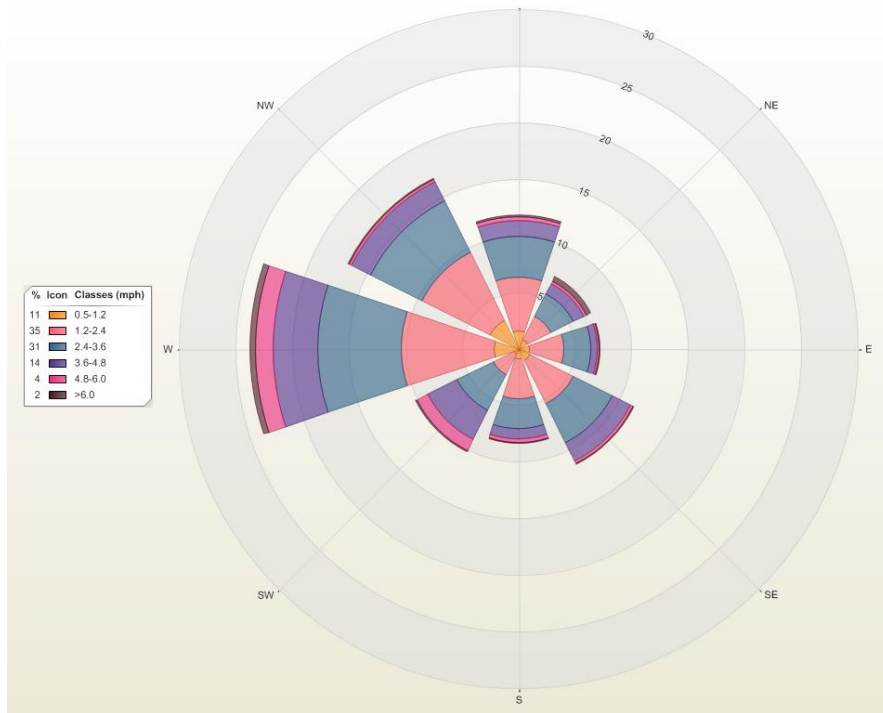


Figure 16  
 Annual Wind Rose for Flemington  
 Displaying Distribution of Wind Speed & Wind Direction

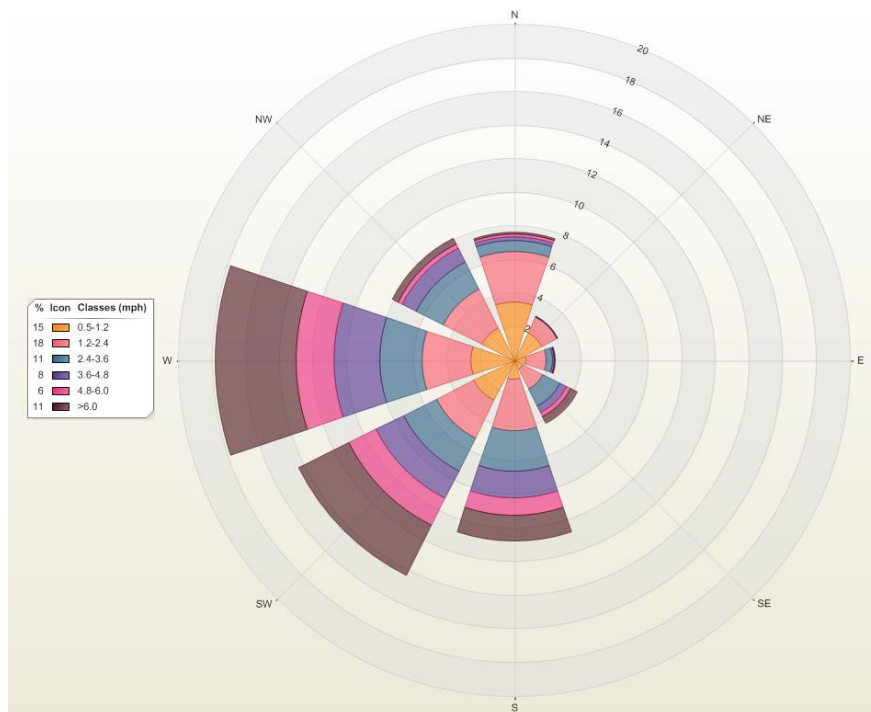


Figure 17  
 Annual Wind Rose for Newark Firehouse  
 Displaying Distribution of Wind Speed & Wind Direction

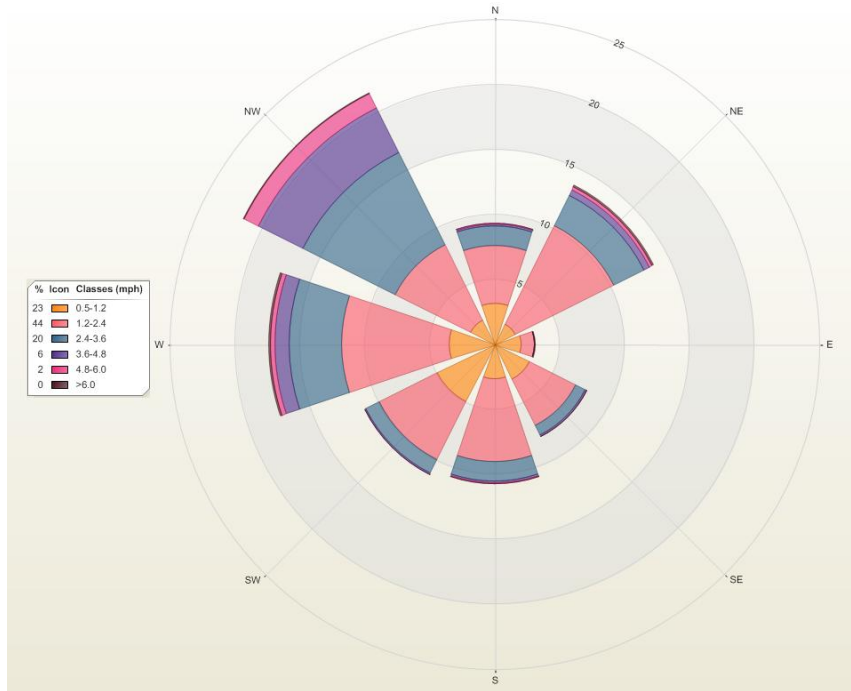
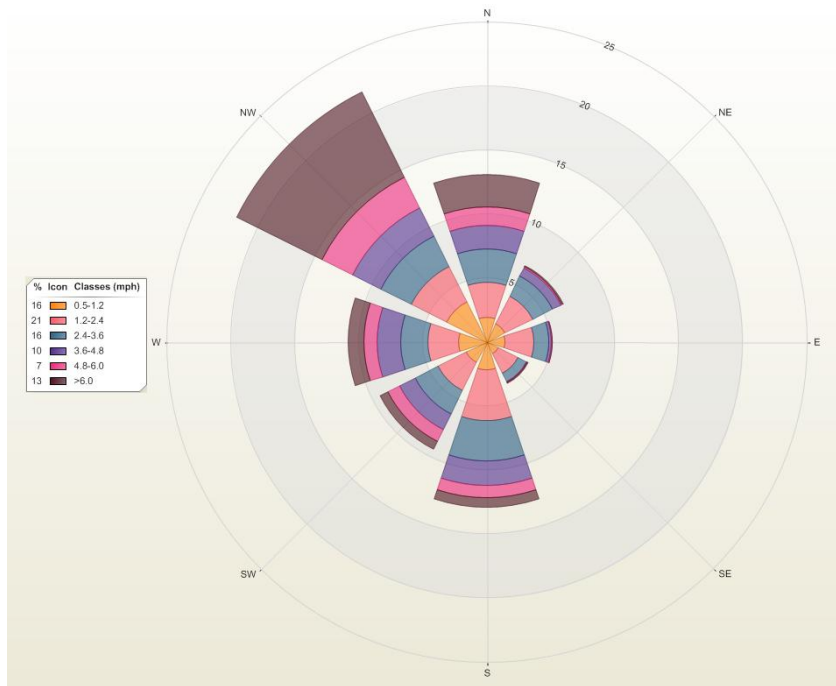


Figure 18  
 Annual Wind Rose for Rider University  
 Displaying Distribution of Wind Speed & Wind Direction



## REFERENCES

The Climate of New Jersey, Office of the New Jersey State Climatologist, URL:  
<http://climate.rutgers.edu/stateclim/?section=njcp&target=NJCoverview>

Basic Air Pollution Meteorology, United States Environmental Protection Agency (USEPA), URL:  
[http://yosemite.epa.gov/oaqps/eogtrain.nsf/DisplayView/SI\\_409\\_0-5?OpenDocument](http://yosemite.epa.gov/oaqps/eogtrain.nsf/DisplayView/SI_409_0-5?OpenDocument)