

**TR 94-02, A Climatological Summary of the 1994 World Cup Soccer
Tournament
Publication**

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1994 World Cup Soccer Tournament - A Climatological Summary

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May 1994

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Introduction

The U.S. is the host country for 1994 World Cup Soccer (WC 94) tournament held between June 17 and July 17, 1994. The games will be played at nine different sites across the country. One of the main concerns of tournament officials, athletes, fans and other participants is the expected weather during this period. The summer season is in full swing by the time mid-June rolls around - - hot and humid conditions are the norm for most of these sites, and weather can have a great impact. A few games will be played in indoor or partially domed stadiums, but the majority of the games will be outside. This report details the climatology for these host cities during June and July. Additional information on weather and climate are available from the National Climatic Data Center (NCDC), Climate Services Branch, Federal Building, Asheville, NC 28801-2696. You can also contact NCDC by telephone at 704-271-4800, FAX 704- 271-4876, or e-mail at orders@ncdc.noaa.gov. Information about WC94, teams, players and schedule is available using mosaic via the World Wide Web (WWW)-- to access, open a URL to <http://www.cedar.buffalo.edu/~khoub-s/WC94.html>

1994 World Cup Soccer Sites

Boston, Massachusetts
 Chicago, Illinois
 Dallas, Texas
 Detroit, Michigan
 East Rutherford, New Jersey
 Orlando, Florida
 Palo Alto, California
 Pasadena, California
 Washington, DC



Climatic Tables

The tables shown below were developed using information from NCDC's International Station Meteorological Climate Summary (ISMCS) CDROM and "Local Climatological Data" publication. The data are based on a period of record from the late 1940's through the early 1990's. All temperatures are in degrees Fahrenheit, and rainfall amounts are in inches and hundredths. The tables show:

Weather conditions by hour - The average percent occurrence of rain, thunderstorms, and fog for 5 different times during the day; e.g., Detroit shows fog to occur 20.8 percent of the June mornings at 7 AM. The average relative humidity is shown for the same hours.

Averages and Extremes - Climatic averages for maximum temperature, minimum temperature, monthly rainfall, and wind speed. Also, the extremes (lowest/highest reported) are shown for maximum temperature, minimum temperature, and monthly rainfall, along with the greatest 24-hour rainfall amount reported.

Average Number of Days With - Climatic averages for number of days with at least .01 rainfall, .50 rainfall, thunderstorms (with or without rainfall), fog, and temperatures of at least 90 degrees.

Boston, MA

Three important influences are responsible for the main features of the Boston climate. First, the latitude places the city in the zone of prevailing west to east atmospheric flow, so both polar and tropical air masses influence the region. Secondly, Boston is situated on or near several tracks frequently followed by low pressure storm systems. The weather fluctuates regularly from fair to cloudy to stormy conditions and assures an adequate amount of precipitation. The third factor is the moderating influence of the Atlantic ocean on temperature extremes. Hot summer afternoons are frequently cooled by the local sea breeze. This refreshing east wind is more common along and within a few miles of the coast than in the Foxboro area which is about 25 miles southwest of downtown Boston. Much of the rainfall from June to September comes from scattered afternoon and evening showers and thunderstorms.

WEATHER CONDITIONS BY HOUR:

PERCENT OCCURRENCE OF:						MEAN RELATIVE	
RAIN		T' STORM		FOG		HUMIDITY	
JUN	JUL	JUN	JUL	JUN	JUL	JUN	JUL

7 AM	11.0	8.6	.4	.2	17.0	16.5	73%	74%
10 AM	10.1	6.2	.2	.1	10.5	8.3	63%	61%
1 PM	9.7	7.1	.6	.5	8.0	5.5	58%	57%
4 PM	10.4	8.1	1.2	1.2	8.3	6.0	60%	58%
7 PM	10.3	6.9	1.2	1.4	9.5	7.9	66%	66%

AVERAGES AND EXTREMES:

	TEMPERATURES				RAINFALL				WIND SPD
	MEANS		EXTREMES		MONTHLY	EXTREMES			MEAN IN
	MAX	MIN	MAX	MIN	MEAN	MAX	MIN	24-HOUR	KNOTS
JUN	77	59	100	45	3.1	13.2	.5	3.0	11
JUL	82	65	102	50	2.9	8.1	.5	2.4	10

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T' STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	10	2	4	12	3
JUL	9	2	4	11	5

Chicago, IL

Chicago is located along the southwest shore of Lake Michigan with an average elevation of about 100 feet. Topography does not significantly affect air flow in or near the city although winds are frequently stronger along the lakeshore. Chicago is in a region of frequently changeable weather; in summer, air masses reaching the city from the north or east are cooler because of movement over the cooler Great Lakes. During the warm season, when the lake is cold relative to land, there is frequently a lake breeze that reduces daytime temperature near the shore, sometimes by 10 degrees F. or more below temperatures farther inland. The highest summer temperatures occur with a south or southwest flow which is not influenced by the lakes. Summer precipitation comes from scattered thunderstorms which are often locally heavy and variable -- parts of the city may receive substantial rainfall and other parts may receive none. Channeling of winds between tall buildings often causes locally stronger gusts in the central business area. However, the nickname windy city is a misnomer as the average wind speed is no higher than many other cities in the U.S.

WEATHER CONDITIONS BY HOUR:

	PERCENT OCCURRENCE OF:						MEAN RELATIVE	
	RAIN		T' STORM		FOG		HUMIDITY	
	JUN	JUL	JUN	JUL	JUN	JUL	JUN	JUL
6 AM	6.6	7.1	.5	1.2	14.0	16.2	78%	82%
9 AM	7.4	5.9	.4	.8	6.7	4.4	63%	66%
12 PM	6.0	5.1	.3	.2	2.2	2.1	55%	57%
3 PM	6.7	4.2	1.9	.6	1.9	2.0	52%	54%
6 PM	7.0	4.7	2.2	1.0	2.1	1.6	55%	58%

AVERAGES AND EXTREMES:

	TEMPERATURES				RAINFALL				WIND SPD
	MEANS		EXTREMES		MONTHLY	EXTREMES			MEAN IN
	MAX	MIN	MAX	MIN	MEAN	MAX	MIN	24-HOUR	KNOTS
JUN	79	57	104	36	3.7	7.9	1.0	3.1	9
JUL	84	63	102	40	3.7	8.3	1.2	2.8	8

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T' STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	10	3	6	8	4
JUL	10	2	6	8	7

Dallas, TX

Dallas is located in north central Texas, approximately 250 miles north of the Gulf of Mexico. It is near the headwaters of the Trinity River, which lies in the upper margins of the Coastal Plain. The rolling hills in the area range from 500 to 800 feet in elevation. The Dallas-Fort Worth climate is humid subtropical with hot summers. Highest temperatures of summer are associated with fair skies, westerly winds and low humidities. Characteristically, hot spells in summer are broken into three-to-five day periods by thunderstorm activity. There are only a few nights each summer with low temperature above 80 degrees F. Summer daytime temperatures frequently exceed 100 degrees F. Usually, periods of rainy weather last for only a day or two, and are followed by several days with fair skies. A large part of the annual precipitation results from thunderstorm activity, with occasionally heavy rainfall over brief periods of time. Thunderstorms occur throughout the year, but are most frequent in the spring. Hail falls on about two or three days a year, ordinarily with only slight and scattered damage. Windstorms occurring during thunderstorm activity are sometimes destructive.

WEATHER CONDITIONS BY HOUR:

	PERCENT OCCURRENCE OF:						MEAN RELATIVE HUMIDITY	
	RAIN		T' STORM		FOG		JUN	JUL
	JUN	JUL	JUN	JUL	JUN	JUL		
6 AM	5.8	3.1	3.0	1.1	7.7	4.6	85%	80%
9 AM	4.1	3.3	1.2	.4	2.4	1.1	68%	63%
12 PM	3.6	2.5	1.4	.7	.5	.3	54%	48%
3 PM	2.6	2.0	2.4	1.4	.4	.0	47%	42%
6 PM	2.9	2.3	2.2	1.4	.4	.1	50%	44%

AVERAGES AND EXTREMES:

	TEMPERATURES				RAINFALL				WIND SPD
	MEANS		EXTREMES		MONTHLY	EXTREMES			MEAN IN
	MAX	MIN	MAX	MIN	MEAN	MAX	MIN	24-HOUR	KNOTS
JUN	92	71	113	51	2.8	8.8	.0	3.1	11
JUL	96	75	110	59	2.1	11.1	.1	3.0	9

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T'STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	6	2	6	3	21
JUL	5	1	5	2	28

Detroit, MI

Detroit and the immediate suburbs, including nearby urban areas in Canada, occupy an area approximately 25 miles in radius. Northwest winds in the summer frequently help to weaken showers moving from the northwest and these sometimes dissipate as they approach Detroit. The climate of the metro area is influenced by its location with respect to major storm tracks and the influence of the Great Lakes. In summer, most storms pass to the north allowing for intervals of warm, humid, sunny skies with occasional thunderstorms, followed by days of mild, dry, and fair weather. Temperatures of 90 degrees F. or higher are reached occasionally during each summer. Local climatic variations are due largely to the immediate effect of Lake St. Clair and the urban heat island. On warm days in late spring or early summer, lake breezes often lower temperatures by 10 to 15 degrees F. in the eastern part of the city and the northeastern suburbs. The urban heat island effect shows up mainly at night where minimum temperatures at the Metropolitan Airport average 4 degrees lower than downtown Detroit. Air pollution comes primarily from heavy industry spread along both shores of the waterway from Port Huron to Toledo. However, wind dispersion is usually sufficient to keep it from becoming a major hazard.

WEATHER CONDITIONS BY HOUR:

	PERCENT OCCURRENCE OF:						MEAN RELATIVE HUMIDITY	
	RAIN		T'STORM		FOG		JUN	JUL
	JUN	JUL	JUN	JUL	JUN	JUL		
7 AM	7.4	5.8	.7	.9	20.8	25.7	79%	82%
10 AM	5.8	5.2	.3	.3	6.4	5.3	62%	63%
1 PM	7.9	5.6	1.4	.9	2.8	2.1	54%	53%
4 PM	7.5	5.7	2.0	1.9	2.6	1.4	52%	52%
7 PM	7.3	5.5	1.9	1.4	3.9	2.1	57%	58%

AVERAGES AND EXTREMES:

	TEMPERATURES				MONTHLY MEAN	RAINFALL			WIND SPD MEAN IN KNOTS
	MEANS		EXTREMES			EXTREMES	24-HOUR		
	MAX	MIN	MAX	MIN					
JUN	79	56	104	36	3.6	7.0	1.0	2.2	9
JUL	83	61	102	41	3.1	6.0	.6	3.2	8

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T'STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	10	2	6	11	3
JUL	9	2	6	13	5

East Rutherford, NJ

Terrain in the vicinity of the Meadowlands sports complex is flat and rather marshy. Ridges rise to an elevation of 200 to 600 feet to the west-northwest of the area. This low elevation along with the close proximity to water and urbanization mean warm and humid summer conditions. Prevailing westerly winds lead to a local downsloping effect. This downsloping effect can lead to warmer temperatures and inhibit precipitation. This drying effect of the downslope wind accounts for the relatively few local thunderstorms occurring in this area as compared to areas to the west. Easterly winds, particularly southeasterly, moderate the temperature because of the influence of the Atlantic Ocean. Periods of very hot weather with temperatures in the 90's and high humidity occasionally occur during the summer.

WEATHER CONDITIONS BY HOUR:

	PERCENT OCCURRENCE OF:						MEAN RELATIVE HUMIDITY	
	RAIN		T' STORM		FOG		JUN	JUL
	JUN	JUL	JUN	JUL	JUN	JUL		
7 AM	8.8	7.9	.2	.4	16.3	12.4	71%	72%
10 AM	8.1	6.1	.0	.4	7.3	5.0	57%	58%
1 PM	7.6	7.0	.6	.8	4.8	3.3	51%	51%
4 PM	8.0	6.8	1.1	1.9	3.9	2.7	52%	52%
7 PM	9.1	8.0	1.2	1.8	5.9	3.8	59%	60%

AVERAGES AND EXTREMES:

	TEMPERATURES				RAINFALL				WIND SPD
	MEANS		EXTREMES		MONTHLY	EXTREMES			MEAN IN
	MAX	MIN	MAX	MIN	MEAN	MAX	MIN	24-HOUR	KNOTS
JUN	81	62	102	41	3.3	6.4	.1	3.0	9
JUL	86	68	105	52	4.2	10.0	.9	3.3	9

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T' STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	10	2	9	10	5
JUL	10	3	11	9	9

Orlando, FL

Orlando is located in the central section of the Florida peninsula, surrounded by many lakes. Relative humidities remain high year-round, with summer values near 90 percent at night and 55 to 65 percent in the afternoon. The rainy season extends from June through September, and sometimes through October when tropical storms are near. During June/July, scattered afternoon thunderstorms are an almost daily occurrence, and these bring a drop in temperature to make the climate bearable. Hail is occasionally reported during thunderstorms. Summer temperatures above 95 degrees are rather rare. There is usually a breeze which contributes to the general comfort. Hurricanes are usually not considered a great threat to Orlando, since to

	RAIN		T' STORM		FOG		HUMIDITY	
	JUN	JUL	JUN	JUL	JUN	JUL	JUN	JUL
7 AM	1.0	1.0	.0	.0	4.3	14.6	74%	78%
10 AM	.9	.6	.0	.0	.7	1.3	60%	65%
1 PM	.3	.2	.0	.1	.0	.3	55%	58%
4 PM	.4	.1	.0	.0	.1	.1	55%	58%
7 PM	.5	.3	.0	.0	.0	.1	63%	67%

AVERAGES AND EXTREMES:

	TEMPERATURES				RAINFALL				WIND SPD
	MEANS		EXTREMES		MONTHLY	EXTREMES			MEAN IN
	MAX	MIN	MAX	MIN	MEAN	MAX	MIN	24-HOUR	KNOTS
JUN	77	52	107	42	.1	.5	.0	.4	10
JUL	78	54	105	42	T	.5	.0	.4	10

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T' STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	1	0	0	2	2
JUL	0	0	0	6	2

Pasadena, CA

Pasadena, known as the "city of Roses", is located just south of the foothills of the San Gabriel mountains. Elevation across the Pasadena area varies considerably, ranging from 1400 feet in the northern part of the city to about 600 feet in the south. The Pacific Ocean is about 22 miles west-south west of the area. Daily June/July high temperatures average 82-89 degrees F. with nighttime lows generally in the 57-61 degrees F. range. Afternoon temperatures reach 90 or better 5 times in June and about 13 times in July. Areas closer to the coast are usually cooler due to a local sea breeze effect. In a hot spell, temperatures can exceed 100 degree F. accompanied by gusty dry "Santa Ana" northeasterly wind and humidities as low as 5%. Rainfall during June/July is light with less than .10 in. expected each month.

WEATHER CONDITIONS BY HOUR:

	PERCENT OCCURRENCE OF:						MEAN RELATIVE	
	RAIN		T' STORM		FOG		HUMIDITY	
	JUN	JUL	JUN	JUL	JUN	JUL	JUN	JUL
7 AM	2.3	1.0	.0	.1	11.0	10.0	78%	78%
10 AM	.8	.1	.0	.0	.7	.6	59%	54%
1 PM	.2	.5	.0	.1	.0	.0	56%	53%
4 PM	.1	.0	.0	.0	.0	.0	56%	53%
7 PM	.2	.1	.0	.0	.5	.5	69%	69%

AVERAGES AND EXTREMES:

	TEMPERATURES				RAINFALL				WIND SPD
	MEANS		EXTREMES		MONTHLY	EXTREMES			MEAN IN
	MAX	MIN	MAX	MIN	MEAN	MAX	MIN	24-HOUR	KNOTS
JUN	82	57	106	43	.1	.4	.0	.4	5
JUL	89	61	106	48	T	.2	.0	.2	5

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T'STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	0	0	0	6	5
JUL	0	0	0	6	13

Washington, DC

Washington lies at the western edge of the mid Atlantic Coastal Plain, about 50 miles east of the Blue Ridge Mountains and 35 miles west of Chesapeake Bay. Elevations range from a few feet above sea level to about 400 feet in parts of the northwest section of the city. RFK stadium is located in the urban heat island which results in somewhat warmer temperatures. Summers are hot and humid as daytime highs are near 90 degrees F., and the combination of heat and humidity can make it uncomfortable at times. Precipitation is rather uniformly distributed, usually occurring as thunderstorms. These storms are most often accompanied by downpours and gusty winds, but are not usually severe.

WEATHER CONDITIONS BY HOUR:

	PERCENT OCCURRENCE OF:						MEAN RELATIVE	
	RAIN		T'STORM		FOG		HUMIDITY	
	JUN	JUL	JUN	JUL	JUN	JUL	JUN	JUL
7 AM	7.1	5.5	.0	.1	13.3	15.3	76%	77%
10 AM	5.2	5.4	.1	.1	4.7	3.4	61%	62%
1 PM	6.2	5.9	.3	.7	2.7	1.3	53%	53%
4 PM	7.1	7.1	1.9	2.8	1.9	1.5	52%	53%
7 PM	7.6	8.9	2.5	3.3	2.4	1.9	60%	62%

AVERAGES AND EXTREMES:

	TEMPERATURES				RAINFALL				WIND SPD
	MEANS		EXTREMES		MONTHLY	EXTREMES			MEAN IN
	MAX	MIN	MAX	MIN	MEAN	MAX	MIN	24-HOUR	KNOTS
JUN	84	65	101	47	3.4	11.5	.9	6.1	8
JUL	88	70	104	54	4.1	12.9	.9	4.7	8

AVERAGE NUMBER OF DAYS WITH:

	AT LEAST .01 RAIN	AT LEAST .50 RAIN	T'STORM	FOG	TEMPERATURE AT LEAST 90 DEG.
JUN	10	2	6	9	7
JUL	10	3	7	9	12



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