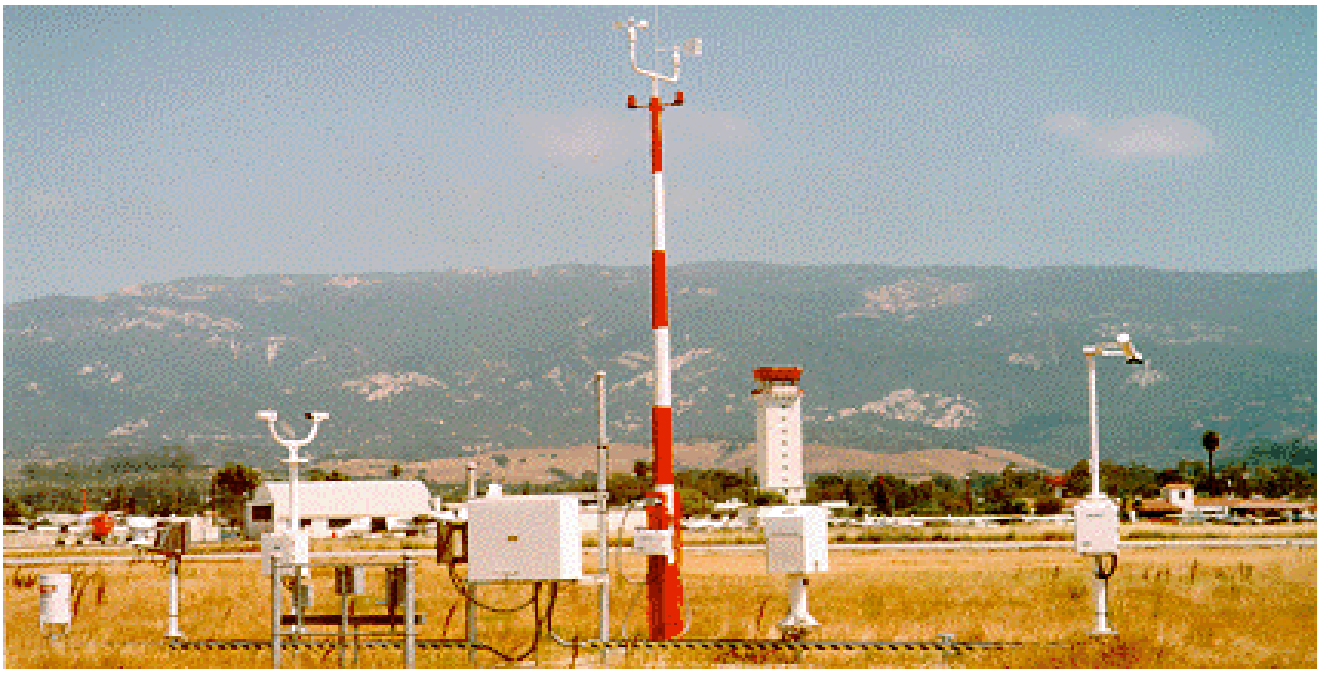
CLIMATOGRAPHY OF THE UNITED STATES NO. 81

Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971 - 2000



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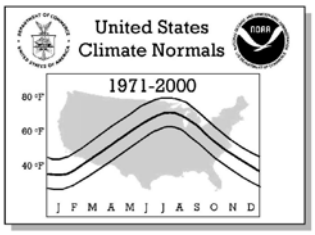
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL ENVIRONMENTAL SATELLITE, DATA, AND INFORMATION SERVICE
NATIONAL CLIMATIC DATA CENTER
ASHEVILLE, NC



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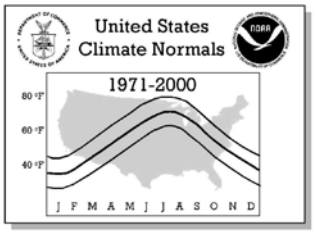

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NOTES

Product Description:
This Climatography includes 1971-2000 normals of monthly and annual maximum, minimum, and mean temperature (degrees F), monthly and annual total precipitation (inches), and heating and cooling degree days (base 65 degrees F). Normals stations include both National Weather Service Cooperative Network and Principal Observation (First-Order) locations in the 50 states, Puerto Rico, the Virgin Islands, and Pacific Islands.

Abbreviations:

No. = Station Number in State Map
COOP ID = Cooperative Network ID (1:2=State ID, 3:6=Station Index)
WBAN ID = Weather Bureau Army Navy ID, if assigned
Elements = Input Elements (X=Maximum Temperature, N=Minimum Temperature, P=Precipitation)
Call = 3-Letter Station Call Sign, if assigned
MAX = Normal Maximum Temperature (degrees Fahrenheit)
MEAN = Average of MAX and MIN (degrees Fahrenheit)
MIN = Normal Minimum Temperature (degrees Fahrenheit)
HDD = Total Heating Degree Days (base 65 degrees Fahrenheit)
CDD = Total Cooling Degree Days (base 65 degrees Fahrenheit)
Latitude = Latitude in degrees, minutes, and hemisphere (N=North, S=South)
Longitude = Longitude in degrees, minutes, and hemisphere (W=West, E=East)
Elev = Elevation in feet above mean sea level
Flag 1 = * if a published *Local Climatological Data* station
Flag 2 = + if WMO Fully Qualified (see *Note* below)

HIGHEST MEAN/YEAR = Maximum Mean Monthly Value/Year, 1971-2000
MEDIAN = Median Mean Monthly Value/Year, 1971-2000
LOWEST MEAN/YEAR = Minimum Mean Monthly Value/Year, 1971-2000
MAX OBS TIME ADJUSTMENT = Add to MAX to Get Midnight Obs. Schedule
MIN OBS TIME ADJUSTMENT = Add to MIN to Get Midnight Obs. Schedule

Note: In 1989, the World Meteorological Organization (WMO) prescribed standards of data completeness for the 1961-1990 WMO Standard Normals. For full qualification, no more than three consecutive year-month values can be missing for a given month or no more than five overall values can be missing for a given month (out of 30 values). Stations meeting these standards are indicated with a '+' sign in Flag 2. Otherwise, stations are included in the normals if they have at least 10 year-month values for each month and have been active since January 1999 or were a previous normals station.

Map Legend: Numbers correspond to 'No.' in Station Inventory; Shaded Circles indicate Temperature and Precipitation Stations, Triangles (Point Up) indicate Precipitation-Only Stations, Triangles (Point Down) indicate Temperature-Only Stations, and Hexagons indicate stations with Flag 1 = *.

Computational Procedures:

A climate normal is defined, by convention, as the arithmetic mean of a climatological element computed over three consecutive decades (WMO,1989). Ideally, the data record for such a 30-year period should be free of any inconsistencies in observational practices (*e.g.*, changes in station location, instrumentation, time of observation, *etc.*) and be serially complete (*i.e.*, no missing values). When present, inconsistencies can lead to a non-climatic bias in one period of a station's record relative to another, yielding an "inhomogeneous" data record. Adjustments and estimations can make a climate record "homogeneous" and serially complete, and allow a climate normal to be calculated simply as the average of the 30 monthly values.

The methodology employed to generate the 1971-2000 normals is not the same as in previous normals, as it addresses inhomogeneity and missing data value problems using several steps. The technique developed by Karl *et al.* (1986) is used to adjust monthly maximum and minimum temperature observations of conterminous U.S. stations to a consistent midnight-to-midnight schedule. All monthly temperature averages and precipitation totals are cross-checked against archived daily observations to ensure internal consistency. Each monthly observation is evaluated using a modified quality control procedure (Peterson *et al*.,1998), where station observation departures are computed, compared with neighboring stations, and then flagged and estimated where large differences with neighboring values exist. Missing or discarded temperature and precipitation observations are replaced using a weighting function derived from the observed relationship between a candidate's monthly observations and those of up to 20 neighboring stations whose observations are most strongly correlated with the candidate site. For temperature estimates, neighboring stations were selected from the U.S. Historical Climatology Network (USHCN; Karl *et al.* 1990). For precipitation estimates, all available stations were potential neighbors, maximizing station density for estimating the more spatially variable precipitation values.

Peterson and Easterling (1994) and Easterling and Peterson (1995) outline the method for adjusting temperature inhomogeneities. This technique involves comparing the record of the candidate station with a reference series generated from neighboring data. The reference series is reconstructed using a weighted average of first difference observations (the difference from one year to the next) for neighboring stations with the highest correlation with the candidate. The underlying assumption behind this methodology is that temperatures over a region have similar tendencies in variation. If this assumption is violated, the potential discontinuity is evaluated for statistical significance. Where significant discontinuities are detected, the difference in average annual temperatures before and after the inhomogeneity is applied to adjust the mean of the earlier block with the mean of the latter block of data. Such an evaluation requires a minimum of five years between discontinuities. Consequently, if multiple changes occur within five years or if a change occurs very near the end of the normals period (*e.g.,* after 1995), the discontinuity may not be detectable using this methodology.

The monthly normals for maximum and minimum temperature and precipitation are computed simply by averaging the appropriate 30 values from the 1971-2000 record. The monthly average temperature normals are computed by averaging the corresponding monthly maximum and minimum normals. The annual temperature normals are calculated by taking the average of the 12 monthly normals. The annual precipitation and degree day normals are the sum of the 12 monthly normals. Trace precipitation totals are shown as zero. Precipitation totals include rain and the liquid equivalent of frozen and freezing precipitation (*e.g*., snow, sleet, freezing rain, and hail). For many NWS locations, indicated with an '*' next to 'HDD' and 'CDD' in the degree day table, degree day normals are computed directly from daily values for the 1971-2000 period. For all other stations, estimated degree day totals are based on a modification of the rational conversion formula developed by Thom (1966), using daily spline-fit means and standard deviations of average temperature as inputs.

References:

Easterling, D.R, and T.C. Peterson, 1995: A new method for detecting and adjusting for undocumented discontinuities in climatological time series. *Intl. J. Clim*., **15**, 369-377.
Karl, T.R., C.N. Williams, Jr., P.J. Young, and W.M. Wendland,1986: A model to estimate the time of observation bias associated with monthly mean maximum, minimum, and mean temperatures for the United States, *J. Clim. Appl. Met*., **25**, 145-160.
Peterson, T.C., and D.R. Easterling, 1994: Creation of homogeneous composite climatological reference series. *Intl. J. Clim*., **14**, 671-679.
Peterson,T.C., R. Vose, R. Schmoyer, and V. Razuvaev, 1998: Global Historical Climatology Network (GHCN) quality control of monthly temperature data. *Intl. J. Clim.*, **18**, 1169-1179.
Thom, H.C.S., 1966: Normal degree days above any base by the universal truncation coefficient, *Month. Wea. Rev*., **94**, 461-465.
World Meteorological Organization, 1989: Calculation of Monthly and Annual 30-Year Standard Normals, WCDP-No. 10, WMO-TD/No. 341, Geneva: World Meteorological Organization.

Release Date: Revised 01/2002 **National Climatic Data Center/NESDIS/NOAA, Asheville, North Carolina**

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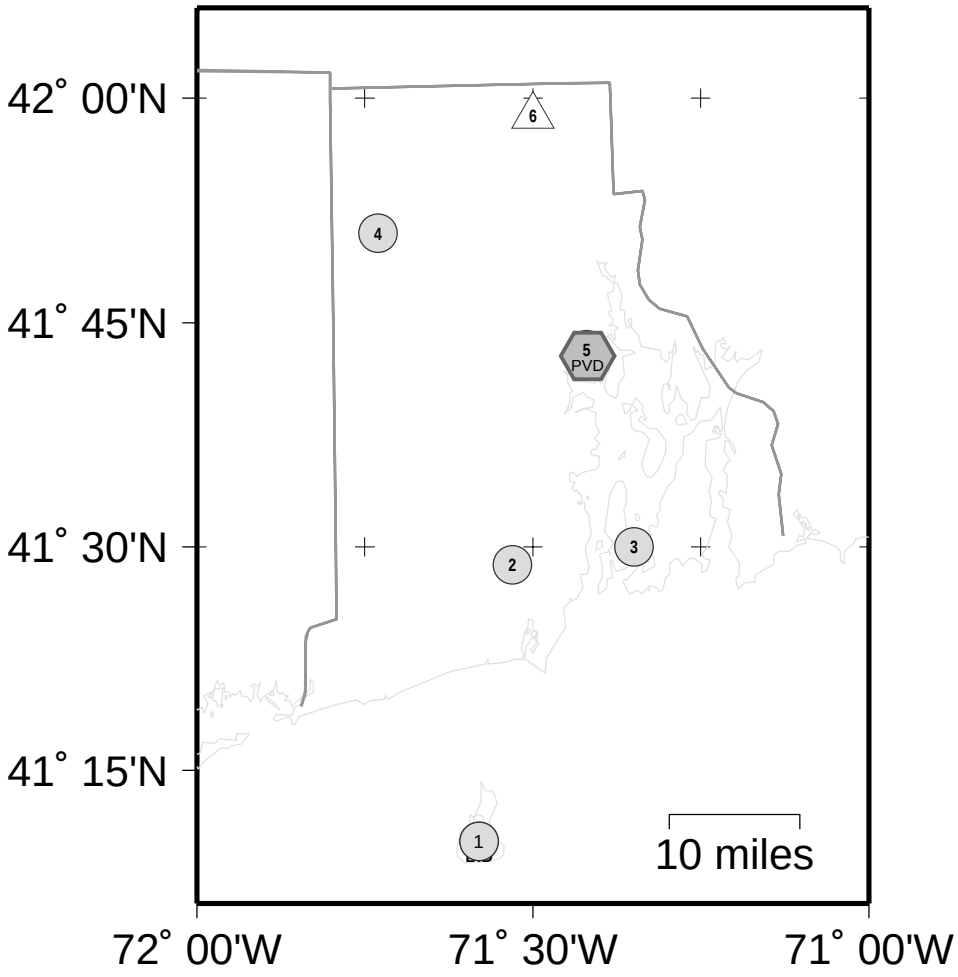
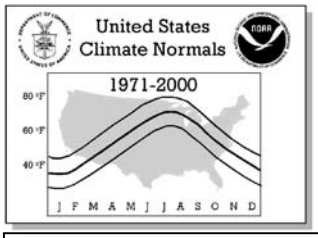
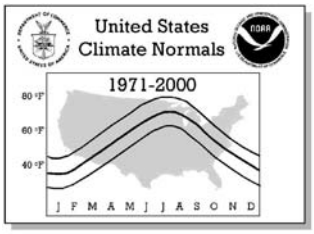




RHODE ISLAND

STATION INVENTORY

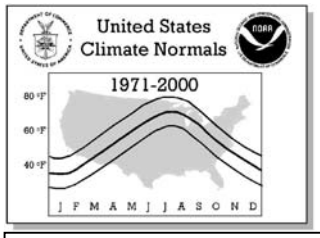
No.	COOP ID	WBAN ID	Elements	Station Name	Call	Latitude	Longitude	Elev	Flag 1	Flag 2
1	370896	94793	XNP	BLOCK ISLAND STATE AP	BID	41 10 N	71 35 W	110		
2	374266		XNP	KINGSTON		41 29 N	71 32 W	100		+
3	375215		XNP	NEWPORT ROSE		41 30 N	71 21 W	15		+
4	375270		XNP	NORTH FOSTER 1 E		41 51 N	71 44 W	630		+
5	376698	14765	XNP	PROVIDENCE GREEN AP	PVD	41 43 N	71 26 W	51	*	+
6	379423		P	WOONSOCKET		41 59 N	71 30 W	115		+



RHODE ISLAND

TEMPERATURE NORMALS (Degrees Fahrenheit)

No.	Station Name	Element	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
001	BLOCK ISLAND STATE AP	MAX	38.9	39.6	45.0	53.2	62.3	71.3	77.4	77.2	70.8	61.7	52.9	44.1	57.9
		MEAN	32.8	33.9	39.1	46.9	55.8	64.6	70.7	70.6	64.1	55.2	46.9	37.8	51.5
		MIN	26.7	28.1	33.2	40.5	49.2	57.8	63.9	63.9	57.4	48.7	40.8	31.5	45.1
002	KINGSTON	MAX	38.2	40.0	47.4	57.3	67.6	76.0	81.2	80.1	73.5	63.5	52.8	42.7	60.0
		MEAN	28.6	30.4	37.7	46.6	56.5	65.3	70.7	69.7	62.6	51.9	43.0	33.6	49.7
		MIN	19.0	20.7	28.0	35.9	45.3	54.5	60.2	59.2	51.7	40.2	33.1	24.4	39.4
003	NEWPORT ROSE	MAX	38.4	38.9	45.7	54.2	63.5	71.7	77.6	77.1	71.3	62.0	52.4	43.4	58.0
		MEAN	30.5	31.1	38.1	46.6	55.9	64.6	71.0	70.8	64.8	54.9	45.3	36.1	50.8
		MIN	22.6	23.3	30.5	38.9	48.3	57.5	64.3	64.5	58.2	47.7	38.1	28.7	43.6
004	NORTH FOSTER 1 E	MAX	35.0	37.7	46.7	57.5	68.8	76.2	81.1	79.2	71.8	61.3	50.0	39.3	58.7
		MEAN	25.8	28.3	36.7	46.7	57.3	65.5	70.8	69.1	61.4	50.6	40.8	30.6	48.6
		MIN	16.5	18.8	26.6	35.9	45.8	54.7	60.5	59.0	50.9	39.9	31.6	21.9	38.5
005	PROVIDENCE GREEN AP	MAX	37.1	39.3	47.7	58.1	68.5	77.3	82.6	80.9	73.4	62.9	52.4	42.1	60.2
		MEAN	28.7	30.9	38.8	48.6	58.7	67.6	73.3	71.9	64.0	53.0	43.8	33.8	51.1
		MIN	20.3	22.5	30.0	39.1	48.8	57.9	64.1	62.8	54.5	43.1	35.1	25.6	42.0



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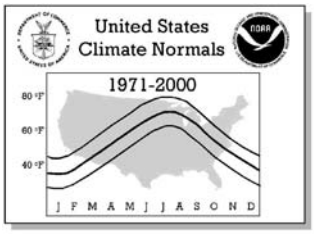
PRECIPITATION NORMALS (Total in Inches)

No.	Station Name	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
001	BLOCK ISLAND STATE AP	3.68	3.04	3.99	3.72	3.40	2.77	2.62	3.00	3.19	3.04	3.77	3.57	39.79
002	KINGSTON	4.72	3.83	4.92	4.71	4.14	3.98	3.31	4.40	4.16	3.92	5.11	4.62	51.82
003	NEWPORT ROSE	4.23	3.54	4.51	4.29	3.52	3.11	3.01	3.72	3.57	3.71	4.47	4.32	46.00
004	NORTH FOSTER 1 E	4.97	4.00	5.09	4.49	4.00	4.04	3.84	4.51	3.99	4.61	4.97	4.66	53.17
005	PROVIDENCE GREEN AP	4.37	3.45	4.43	4.16	3.66	3.38	3.17	3.90	3.70	3.69	4.40	4.14	46.45
006	WOONSOCKET	4.54	3.43	4.63	4.50	3.64	3.62	3.62	4.25	4.05	4.36	4.71	4.48	49.83



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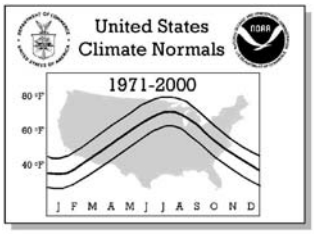
DEGREE DAYS (Total)

No.	Station Name	Element	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
001	BLOCK ISLAND STATE AP	HDD	999	872	803	545	289	64	9	4	74	309	545	843	5356
		CDD	0	0	0	0	1	51	184	177	48	5	0	0	466
002	KINGSTON	HDD	1128	971	846	553	272	61	5	8	104	408	662	975	5993
		CDD	0	0	0	0	6	67	183	153	31	1	0	0	441
003	NEWPORT ROSE	HDD	1070	949	834	554	283	59	1	5	60	318	593	898	5624
		CDD	0	0	0	0	1	47	186	185	53	3	0	0	475
004	NORTH FOSTER 1 E	HDD	1217	1029	879	550	246	55	6	12	130	447	727	1066	6364
		CDD	0	0	0	0	9	69	184	139	19	1	0	0	421
005	PROVIDENCE GREEN AP	HDD*	1125	965	817	494	221	44	3	9	101	377	637	961	5754
		CDD*	0	0	0	3	25	122	265	223	71	5	0	0	714



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No.	Station Name	Element	NORMALS STATISTICS JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
001	BLOCK ISLAND	HIGHEST MEAN	39.4	39.8	43.5	52.4	59.5	68.8	75.3	74.5	67.7	60.0	51.5	44.2	75.3
		MEDIAN	33.8	33.8	39.1	46.8	55.5	64.2	70.6	70.4	64.1	54.9	46.6	38.6	51.3
		LOWEST MEAN	23.2	23.0	34.7	43.4	52.8	61.9	67.3	67.7	60.8	50.9	40.1	26.9	23.0
		HIGHEST MEAN YEAR	1990	1998	2000	1976	1991	1999	1994	1990	1998	1971	1979	1984	1994
		LOWEST MEAN YEAR	1977	1979	1978	1975	1997	1972	1978	1982	1978	1976	1976	1989	1979
		MIN OBS TIME ADJUSTMENT	-1.0	-1.2	-0.8	-0.8	-0.7	-0.6	-0.4	-0.7	-0.7	-1.0	-1.1	-0.8	
		MAX OBS TIME ADJUSTMENT	-0.6	-1.0	-0.5	-0.7	-0.6	-0.6	-0.4	-0.8	-0.6	-0.7	-0.8	-0.5	
002	KINGSTON	HIGHEST MEAN	36.1	37.1	43.1	49.7	61.4	68.3	75.1	72.8	65.8	56.9	47.2	39.3	75.1
		MEDIAN	29.8	29.7	38.2	47.3	56.3	65.6	70.8	69.9	62.5	51.6	43.1	34.0	49.5
		LOWEST MEAN	19.4	20.2	31.9	41.4	53.2	61.2	67.8	66.9	59.1	47.7	36.9	19.9	19.4
		HIGHEST MEAN YEAR	1990	1998	2000	1976	1991	1999	1994	1988	1971	1990	1994	1990	1994
		LOWEST MEAN YEAR	1981	1978	1984	1972	1971	1985	1978	1986	1978	1988	1976	1989	1981
		MIN OBS TIME ADJUSTMENT	-1.2	-1.4	-0.9	-0.9	-0.7	-0.7	-0.5	-0.7	-0.9	-1.3	-1.4	-0.9	
		MAX OBS TIME ADJUSTMENT	-1.6	-2.2	-1.5	-2.0	-1.7	-1.6	-1.1	-1.7	-1.7	-1.8	-2.0	-1.3	
003	NEWPORT ROSE	HIGHEST MEAN	36.6	37.7	42.8	50.0	58.7	67.4	73.3	73.9	68.2	59.5	50.0	41.8	73.9
		MEDIAN	31.1	30.6	38.3	46.6	56.0	64.6	71.1	70.8	64.6	55.0	45.1	36.4	50.6
		LOWEST MEAN	22.9	22.4	33.7	42.8	52.4	61.4	67.7	66.6	62.0	50.8	40.8	23.7	22.4
		HIGHEST MEAN YEAR	1990	1998	1973	1976	1991	1999	1999	1990	1999	1990	1975	1998	1990
		LOWEST MEAN YEAR	1981	1979	1984	1972	1994	1982	1978	1982	1978	1988	1976	1989	1979
		MIN OBS TIME ADJUSTMENT	0.4	0.9	-0.1	-0.6	-0.7	-0.6	-0.5	-0.6	-0.8	-0.6	0.4	0.2	
		MAX OBS TIME ADJUSTMENT	0.2	0.4	0.3	0.3	0.2	0.2	0.1	0.0	-0.1	0.0	0.1	0.0	
004	NORTH FOSTER	HIGHEST MEAN	34.3	35.2	42.0	50.7	62.4	68.5	74.5	72.5	65.0	56.1	46.0	36.2	74.5
		MEDIAN	26.5	27.9	36.7	46.7	57.4	65.9	70.7	69.1	61.0	50.5	40.5	31.2	48.3
		LOWEST MEAN	17.8	18.7	30.7	42.3	53.4	61.8	67.2	65.9	58.5	45.6	35.9	17.5	17.5
		HIGHEST MEAN YEAR	1990	1984	2000	1976	1991	1976	1994	1988	1999	1971	1975	1998	1994
		LOWEST MEAN YEAR	1981	1979	1984	1972	1997	1985	1992	1982	1978	1974	1976	1989	1989
		MIN OBS TIME ADJUSTMENT	-0.1	-0.3	0.0	0.0	0.1	0.0	0.0	-0.1	0.1	0.0	-0.2	-0.1	
		MAX OBS TIME ADJUSTMENT	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	
005	PROVIDENCE GR	HIGHEST MEAN	36.3	37.4	43.7	52.6	63.9	70.5	76.6	75.3	69.6	59.2	48.5	39.5	76.6
		MEDIAN	29.6	30.6	38.9	48.4	58.3	68.0	73.5	71.7	64.0	53.0	43.5	34.2	50.8
		LOWEST MEAN	20.3	19.7	33.8	44.3	55.4	63.9	70.0	69.2	59.5	48.2	37.9	21.8	19.7
		HIGHEST MEAN YEAR	1990	1981	1973	1976	1991	1999	1983	1988	1983	1971	1994	1990	1983
		LOWEST MEAN YEAR	1981	1979	1984	1972	1997	1982	1976	1982	1978	1974	1976	1989	1979
		MIN OBS TIME ADJUSTMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
		MAX OBS TIME ADJUSTMENT	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	