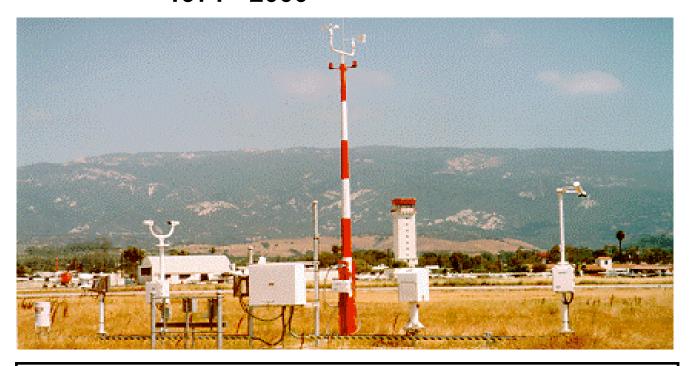


Monthly Station Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971 - 2000

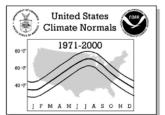




07 DELAWARE



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



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

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United States Climate Normals 1971-2000 J F M A M J J A S O N D

CLIMATOGRAPHY OF THE UNITED STATES NO. 81

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

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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

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) COOP ID = Cooperative Network ID (1:2=State ID, 3:6=Station Index) 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 nonclimatic 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.

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.

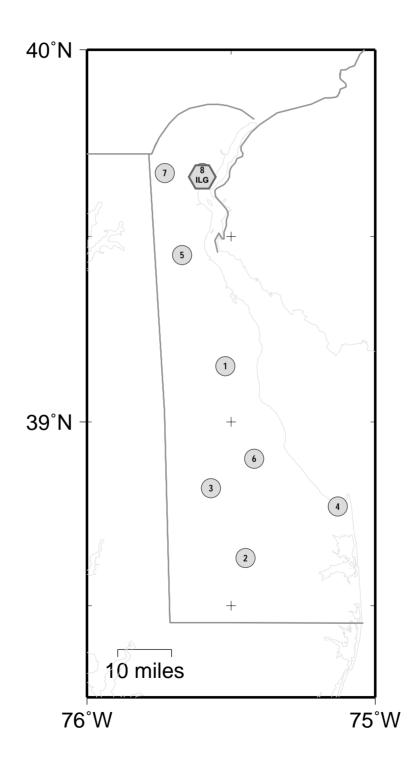
Peterson, T.C., and D.R. Easterling, 1994: Creation of homogeneous composite climatological reference series. Intl. J. Clim., 14, 671-679.

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 02/2002* National Climatic Data Center/NESDIS/NOAA, Asheville, North Carolina

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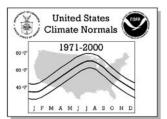
Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days
1971-2000

				STATION II	NVENTORY					
No.	COOP ID	WBAN ID	Elements	Station Name	Call	Latitude	Longitude	Elev	Flag 1	Flag 2
1	072730		XNP	DOVER		39 09 N	75 31 W	30		+
	073570 073595		XNP XNP	GEORGETOWN 5 SW GREENWOOD 2 NE		38 38 N 38 49 N	75 27 W 75 35 W	45 45		+
4	075320		XNP	LEWES		38 46 N	75 08 W	15		+
5	075852		XNP	MIDDLETOWN 3 E		39 27 N	75 40 W	55		
	075915 076410		XNP XNP	MILFORD 2 SE NEWARK UNIVERSITY FARM		38 54 N	75 26 W 75 44 W	35 90		+
		13781	XNP	WILMINGTON NEW CASTLE AP	ILG	39 40 N	75 36 W	74		+



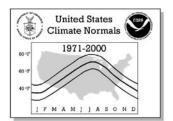
Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000

		<u> </u>				4.00						s Fahrer		DE0	
	tation Name	Element		FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV		ANNUAL
001 D		MAX MEAN MIN	43.7 35.3 26.9	46.8 37.7 28.5	55.2 45.4 35.6	65.4 54.6 43.8	74.8 64.3 53.8	82.9 72.9 62.8	87.4 77.8 68.2	85.5 76.2 66.9	79.5 69.9 60.3	69.1 58.8 48.5	58.7 49.2 39.7	48.4 39.9 31.4	66.5 56.8 47.2
002 G	EORGETOWN 5 SW	MAX MEAN MIN	43.6 34.3 24.9	45.8 36.2 26.6	54.3 43.9 33.5	64.2 52.7 41.1	73.2 62.2 51.1	81.9 70.9 59.9	86.9 75.8 64.7	84.9 74.3 63.6	78.9 68.0 57.0	68.2 56.7 45.2	58.2 47.7 37.1	48.3 38.7 29.1	65.7 55.1 44.5
003 G	REENWOOD 2 NE	MAX MEAN MIN	42.2 33.1 24.0	44.3 34.3 24.3	53.7 43.3 32.8	63.2 52.2 41.1	72.5 61.8 51.1	81.0 70.7 60.3	85.7 75.7 65.7	83.7 73.9 64.0	77.4 66.9 56.3	67.2 56.0 44.7	56.9 46.5 36.1	46.7 37.3 27.8	64.5 54.3 44.0
004 L	EWES	MAX MEAN MIN	44.6 36.4 28.2	46.9 38.3 29.6	54.7 45.6 36.4	64.9 54.6 44.3	73.9 64.0 54.1	81.9 72.5 63.0	86.3 77.3 68.3	84.5 75.9 67.2	78.9 70.2 61.5	68.5 59.2 49.8	58.9 50.0 41.1	49.5 41.1 32.7	66.1 57.1 48.0
005 M	IDDLETOWN 3 E	MAX MEAN MIN	41.5 32.9 24.3	44.9 35.5 26.0	54.7 44.0 33.2	65.1 53.4 41.6	74.8 63.4 52.0	83.2 72.1 61.0	87.1 76.2 65.2	85.5 74.6 63.7	79.6 68.2 56.8	67.6 56.4 45.2	56.8 46.7 36.6	46.2 37.6 28.9	65.6 55.1 44.5
006 M	ILFORD 2 SE	MAX MEAN MIN	42.8 33.6 24.4	44.9 34.9 24.9	54.2 43.8 33.4	64.0 53.1 42.2	73.3 62.8 52.3	81.7 71.8 61.8	86.7 76.7 66.7	84.6 74.8 64.9	78.3 67.7 57.1	68.0 56.9 45.8	57.5 47.0 36.4	47.9 38.7 29.4	65.3 55.2 44.9
007 N	EWARK UNIVERSITY FARM	MAX MEAN MIN	41.5 32.5 23.5	45.2 35.2 25.2	54.6 43.4 32.1	65.7 53.1 40.5	75.9 63.3 50.7	83.7 71.8 59.8	87.6 76.4 65.1	85.5 74.5 63.5	78.7 67.7 56.6	67.7 56.1 44.4	56.6 46.3 36.0	46.0 37.1 28.1	65.7 54.8 43.8
008 W	ILMINGTON NEW CASTLE A		39.3 31.5 23.7	42.5 34.2 25.8	51.9 42.7 33.4	62.6 52.4 42.1	72.5 62.5 52.4	81.1 71.5 61.8	86.0 76.6 67.3	84.1 75.0 65.8	77.2 67.7 58.1	65.9 55.8 45.6	55.0 45.9 36.9	44.4 36.4 28.4	63.5 54.4 45.1
		PILIN	23.7	23.0	33.4	12.1	J2.4	01.0	07.3	03.0	30.1	45.0	30.9	20.1	43.1



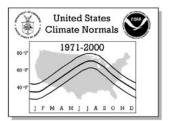
Monthly Normals of Temperature, Precipitation, and Heating and Cooling Degree Days 1971-2000

No. Station Name	JAN	FEB	MAR	APR	PREC MAY	JUN	JUL	AUG	(Total in SEP	Inches) OCT	NOV	DEC	ANNUAL
001 DOVER 002 GEORGETOWN 5 SW 003 GREENWOOD 2 NE 004 LEWES 005 MIDDLETOWN 3 E 006 MILFORD 2 SE 007 NEWARK UNIVERSITY FARM 008 WILMINGTON NEW CASTLE A	3.94 3.92 4.01 3.17 4.08 3.47	3.17 3.18 3.22 2.50 3.17 2.73	4.57 4.67 4.45 3.71 4.51 4.04	3.44 3.45 3.54 3.48 3.50 3.53	3.91 4.31 3.91 4.04 4.03 4.41	3.32 3.56 3.15 3.59 3.31 4.06	3.47 4.84 4.19 3.96 3.69 4.49	5.59 4.07 5.34 3.21 4.61 4.01	3.99 4.11 3.77 3.80 4.08 4.28	3.42	3.26 3.13 3.33 3.31 3.32 3.39	3.32 3.60 3.67 3.31 3.59 3.56	45.34 45.99 46.00 41.58 45.37 45.35



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

-		DEGREE DAYS (Total)												
No. Station Name	Elemen	t JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
001 DOVER	HDD CDD	920 0	767 0	608 0	316 4	100 77	7 243	0 396	0 348	16 162	223 31	476 1	779 0	4212 1262
002 GEORGETOWN 5 SW	HDD CDD	953 0	806	654 0	370 1	129 40	14 192	0 335	0 287	28 116	275 18	521 0	817	4567 989
003 GREENWOOD 2 NE	HDD	988	859	674	386	141	14	0	2	40	295	556	861	4816
004 LEWES	CDD HDD	0 887	748	603	319	41 103	182	332	276	15	14 216	0 452	741	943 4098
005 MIDDLETOWN 3 E	CDD	996	0 828	0 652	7 351	71 107	238	382	336	170 25	35 282	550	0 851	1240 4648
006 MILFORD 2 SE	CDD HDD	974	0 842	0 658	2 359	57 119	220 10	347 0	297 2	121 30	17 268	0 542	0 818	1061 4622
007 NEWARK UNIVERSITY FARM	CDD HDD	0 1008	0 834	0 670	2 359	50 111	213 10	361 0	304 0	111 33	17 294	0 560	0 867	1058 4746
008 WILMINGTON NEW CASTLE A	CDD A HDD*	0 1029	0 864	0 687	2 376	59 132	213 15	351 1	294 2	112 49	16 297	0 564	0 872	1047 4888
	CDD*	0	0	2	9	62	215	368	317	135	16	1	0	1125
		<u> </u>												



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

No. C	Station Name		IANI	FED	MAD	4 D.D.	NANA			TATISTI		OCT	NOV	DEC	A N I N I I A I
	Station Name	Element	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV		ANNUAL
001 D	DOVER	HIGHEST MEAN MEDIAN	42.9	45.3 38.2	51.1 46.2	59.1 54.4	70.9 64.0	76.8 72.9	81.5 77.8	79.4 76.2	73.6	64.9 58.2	55.6 49.0	46.3	81.5 56.6
		LOWEST MEAN	25.2	26.2	39.8	49.5	60.4	68.4	72.8	72.6	67.1	53.1	43.2	27.8	25.2
		HEST MEAN YEAR	1998	1990	1977	1994	1991	1987	1987	1980	1980	1971	1985	1984	1987
		WEST MEAN YEAR IME ADJUSTMENT	1977	1979 -1.2	1984 -0.7	1975	1992 -0.7	1979 -0.6	2000	1992 -0.6	2000	1988 -0.9	1996 -1.2	1989 -0.9	1977
		'IME ADJUSTMENT	-0.9	-1.5	-1.2	-1.6	-1.7	-1.5	-1.0	-1.0	-1.6	-1.2	-1.3	-0.9	
002 G	GEORGETOWN 5	HIGHEST MEAN	42.9	42.5	48.6	57.3	67.6	74.7	79.1	77.4	71.9	63.0	54.7	44.9	79.1
		MEDIAN LOWEST MEAN	34.5	36.1 24.3	44.5 38.8	52.7 47.9	61.5 58.0	71.2 66.5	75.7 72.9	74.3 71.3	67.6 65.4	56.5 51.8	47.7 40.0	39.4 25.8	55.0 22.7
	HIG	HEST MEAN YEAR	1990	1976	2000	1994	1991	1989	1999	1988	1998	1971	1985	1984	1999
		WEST MEAN YEAR	1977	1979	1984	1975	1992	1992	2000	1982	1990	1976	1976	1989	1977
		'IME ADJUSTMENT 'IME ADJUSTMENT	0.5	0.9	0.0	-0.5 0.3	-0.6 0.3	-0.5 0.3	0.1	-0.5 0.0	-0.4	-0.4	0.4	0.2	
003 G	GREENWOOD 2 N	HIGHEST MEAN	41.8	41.2	48.5	57.3	67.3	73.7	78.2	78.8	70.8	61.9	52.0	43.2	78.8
		MEDIAN	33.5	34.6	44.2	52.2	61.4	70.7	75.7	73.5	66.5	55.9	46.1	38.3	54.2
	итс	LOWEST MEAN HEST MEAN YEAR	22.6 1990	22.6 1990	37.5 2000	46.9 1994	57.9 1991	67.0 1994	72.9 1987	70.4 1988	63.9 1998	51.0 1984	40.4 1999	24.5 1984	22.6 1988
		WEST MEAN YEAR	1977	1979	1984	1975	1992	1972	2000	1992	1975	1988	1976	1989	1977
		IME ADJUSTMENT	1.0	1.6	1.0	0.0	0.0	0.0	-0.1	-0.2	0.5	0.5	1.0	0.8	
004 L		'IME ADJUSTMENT HIGHEST MEAN	0.2	0.4 47.5	0.3	0.4	0.3	0.3 76.5	0.1	0.0 79.1	-0.1 74.3	0.0	0.1 57.3	0.1	81.2
UU4 L	O∃M ⊞C	HIGHESI MEAN MEDIAN	36.7	37.9	45.5	54.5	63.9	73.1	77.6	76.1	70.0	59.8	50.0	49.1	56.9
		LOWEST MEAN	24.1	26.0	40.1	48.7	59.7	68.1	73.3	72.5	67.2	53.8	41.7	29.2	24.1
	_	HEST MEAN YEAR WEST MEAN YEAR	1990 1977	1997 1978	1997 1984	1994 1975	1991 1978	1994 1972	1999 1978	1988 1981	1998 1976	1990 1976	1985 1976	1982 1989	1999 1977
		'IME ADJUSTMENT	-0.9	-1.2	-0.7	-0.8	-0.8	-0.6	-0.4	-0.5	-0.8	-0.9	-1.2	-0.9	19//
		IME ADJUSTMENT	-1.0	-1.5	-1.3	-1.7	-1.8	-1.5	-1.0	-1.0	-1.6	-1.2	-1.3	-0.9	
005 M	MIDDLETOWN 3	HIGHEST MEAN	41.2	42.7	49.1	58.2	69.1	75.9	79.8	77.9	71.8	62.4	51.8	42.9	79.8
		MEDIAN LOWEST MEAN	33.6	35.8 23.0	44.6 37.5	53.0 48.7	62.9 60.1	72.6 68.7	76.1 72.4	74.5 71.2	68.2 65.0	56.5 51.4	46.3 40.7	38.3	54.9 22.8
	HIG	HEST MEAN YEAR	1998	1990	1977	1994	1991	1994	1999	1980	1980	1971	1985	1984	1999
		WEST MEAN YEAR	1977	1979	1984	1975	1992	1979	2000	1992	1984	1988	1976	1989	1977
		'IME ADJUSTMENT 'IME ADJUSTMENT	-1.0 -1.0	-1.2 -1.5	-0.7 -1.3	-0.8 -1.7	-0.7 -1.7	-0.6 -1.5	-0.4 -1.0	-0.6 -1.1	-0.8 -1.6	-0.9 -1.2	-1.2 -1.3	-0.9 -0.9	
006 M	MILFORD 2 SE	HIGHEST MEAN	41.8	42.7	50.3	57.6	68.4	75.0	78.9	78.6	72.3	62.7	53.7	44.8	78.9
		MEDIAN	33.9	34.8	43.9	52.6	62.2	72.0	76.8	74.9	67.4	56.6	46.5	39.5	54.9
	нтс	LOWEST MEAN HEST MEAN YEAR	22.7 1990	23.1 1976	38.6 1977	48.2 1994	59.1 1991	67.7 1994	73.3	70.8 1980	65.4 1980	51.9 1984	40.1 1985	25.5 1984	22.7 1999
		WEST MEAN YEAR	1977	1978	1984	1975	1992	1972	2000	1992	1984	1988	1976	1989	1977
		IME ADJUSTMENT	1.0	1.7	1.0	0.0	0.0	0.0	-0.1	-0.2	0.5	0.5	1.0	0.7	
007 N	MAX OBS T NEWARK UNIVER	'IME ADJUSTMENT HIGHEST MEAN	0.2	0.4	0.3	0.4	0.3	0.3 76.5	0.1	0.0 78.0	-0.1 71.9	0.0	0.1	0.0	81.1
00, 1		MEDIAN	33.1	35.1	44.1	52.9	63.0	72.1	76.2	74.4	67.6	56.3	46.7	38.1	54.6
		LOWEST MEAN	21.9	23.5	37.2	47.9	59.7	67.9	73.1	71.3	64.3	50.8	40.0	25.2	21.9
		HEST MEAN YEAR WEST MEAN YEAR	1998	1990 1979	2000 1984	1994	1991 1973	1994 1972	1999	1980 1982	1980 1984	1971 1988	1975 1976	1984	1999 1977
		IME ADJUSTMENT		-1.2				-0.6		-0.6			-1.2		1 17,7
000 -		'IME ADJUSTMENT			-1.3							-1.2			00.0
008 W	WILMINGTON NE	HIGHEST MEAN MEDIAN			48.4 43.2			75.8 71.7	1	78.2 75.0		62.2 55.6	50.7 46.4		80.0 54.2
		LOWEST MEAN	1	21.7		ı	58.6	67.7	1	72.0		50.7	40.1	24.7	20.5
		HEST MEAN YEAR	1	1998	1973	1	1991	1994			1980	1971	1985	1984	1999
		WEST MEAN YEAR IME ADJUSTMENT	1	1979 0.0	1984	1975	1997 0.0	1979 0.0	2000	1982	0.0	1988	1996 0.0	1989	1977
		IME 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	