

**HOLISTIC WATERSHED MANAGEMENT FOR EXISTING AND FUTURE LAND
USE DEVELOPMENT ACTIVITIES: OPPORTUNITIES FOR ACTION FOR LOCAL
DECISION MAKERS: PHASE 1 – MODELING AND DEVELOPMENT OF FLOW
DURATION CURVES (FDC 1 PROJECT)**

**SUPPORT FOR SUTHEAST NEW ENGLAND PROGRAM (SNEP)
COMMUNICATIONS STRATEGY AND TECHNICAL ASSISTANCE**

FINAL REPORT. APPENDIX A
WADING RIVER WATERSHED – AVAILABLE DATA
SEPTEMBER 30, 2021

Prepared for:

U.S. EPA Region 1



Prepared by:

Paradigm Environmental



Great Lakes Environmental Center



Blanket Purchase Agreement: BPA-68HE0118A0001-0003
Requisition Number: PR-R1-20-00322
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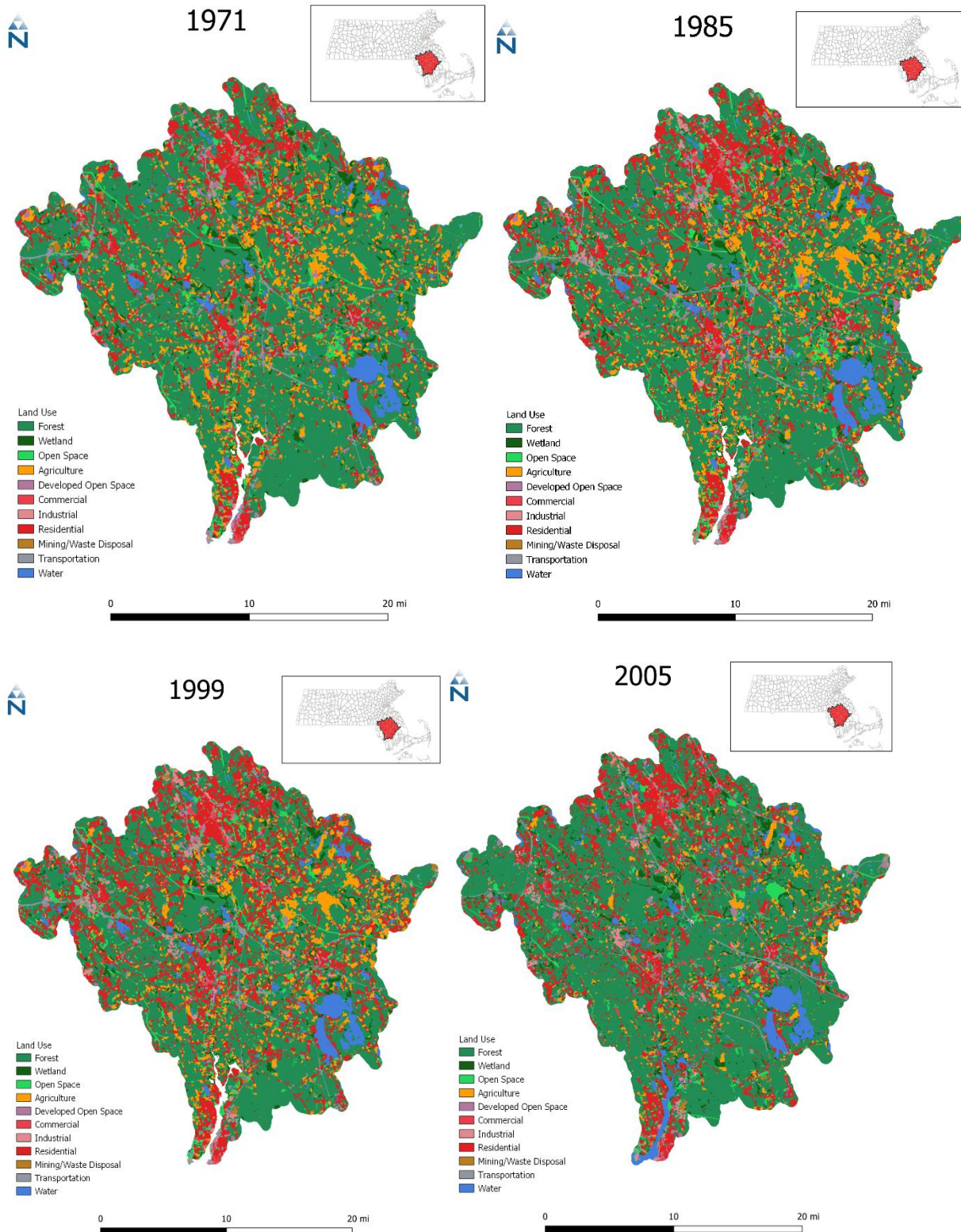


Figure 1. Historical land use for the Taunton basin, Massachusetts.

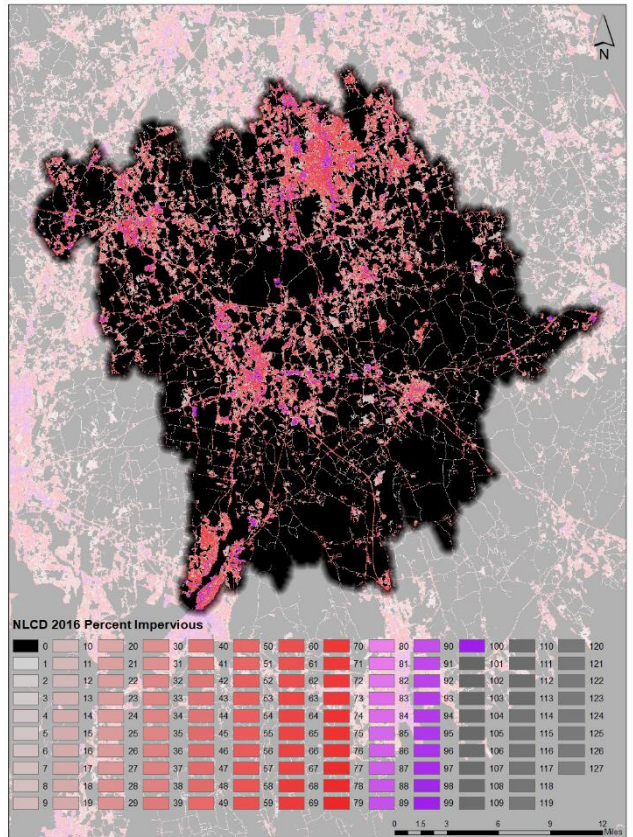
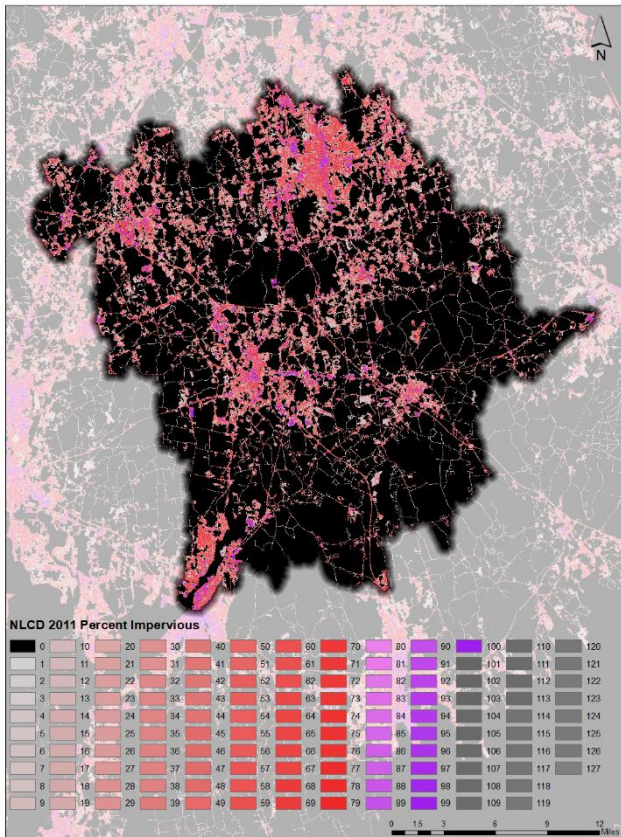
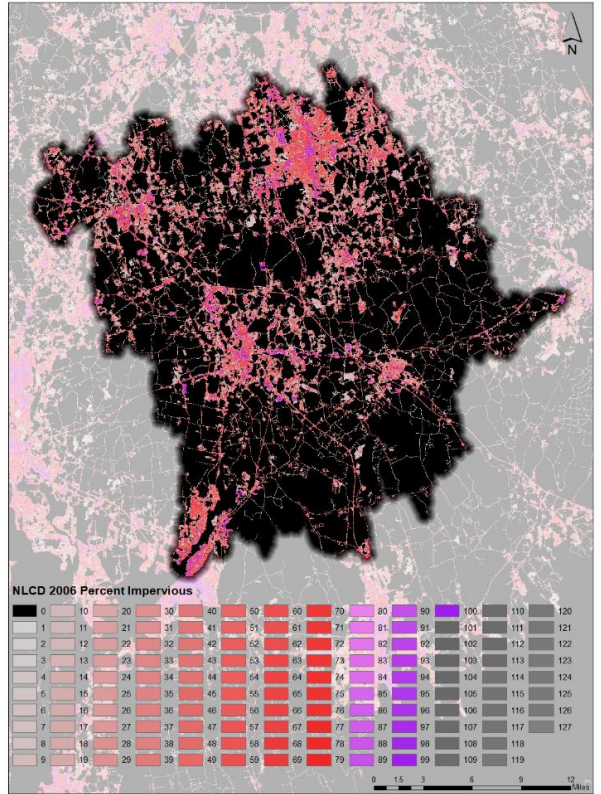
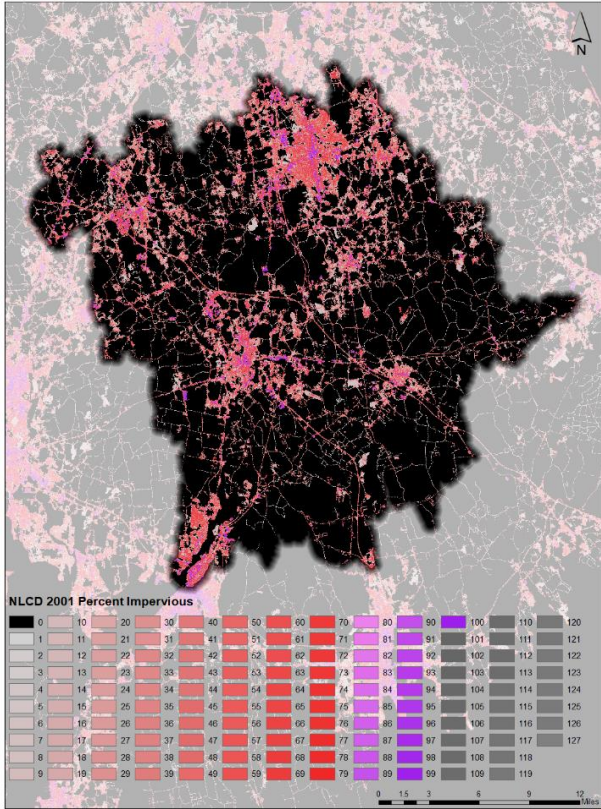


Figure 2. NLCD impervious surface data for the Taunton basin, 2001, 2006, 2011, and 2016.

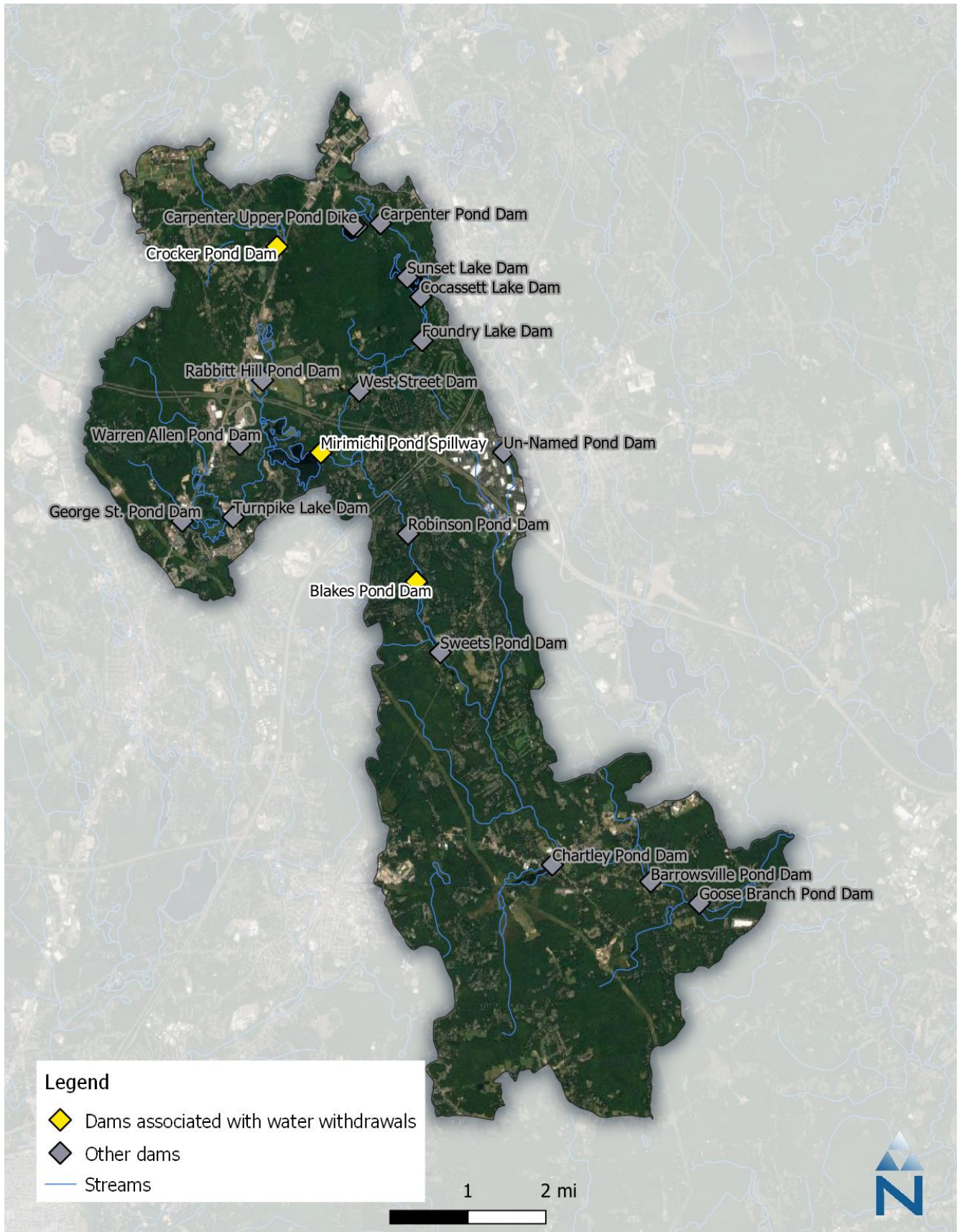


Figure 3. Dam locations in the Wading River watershed

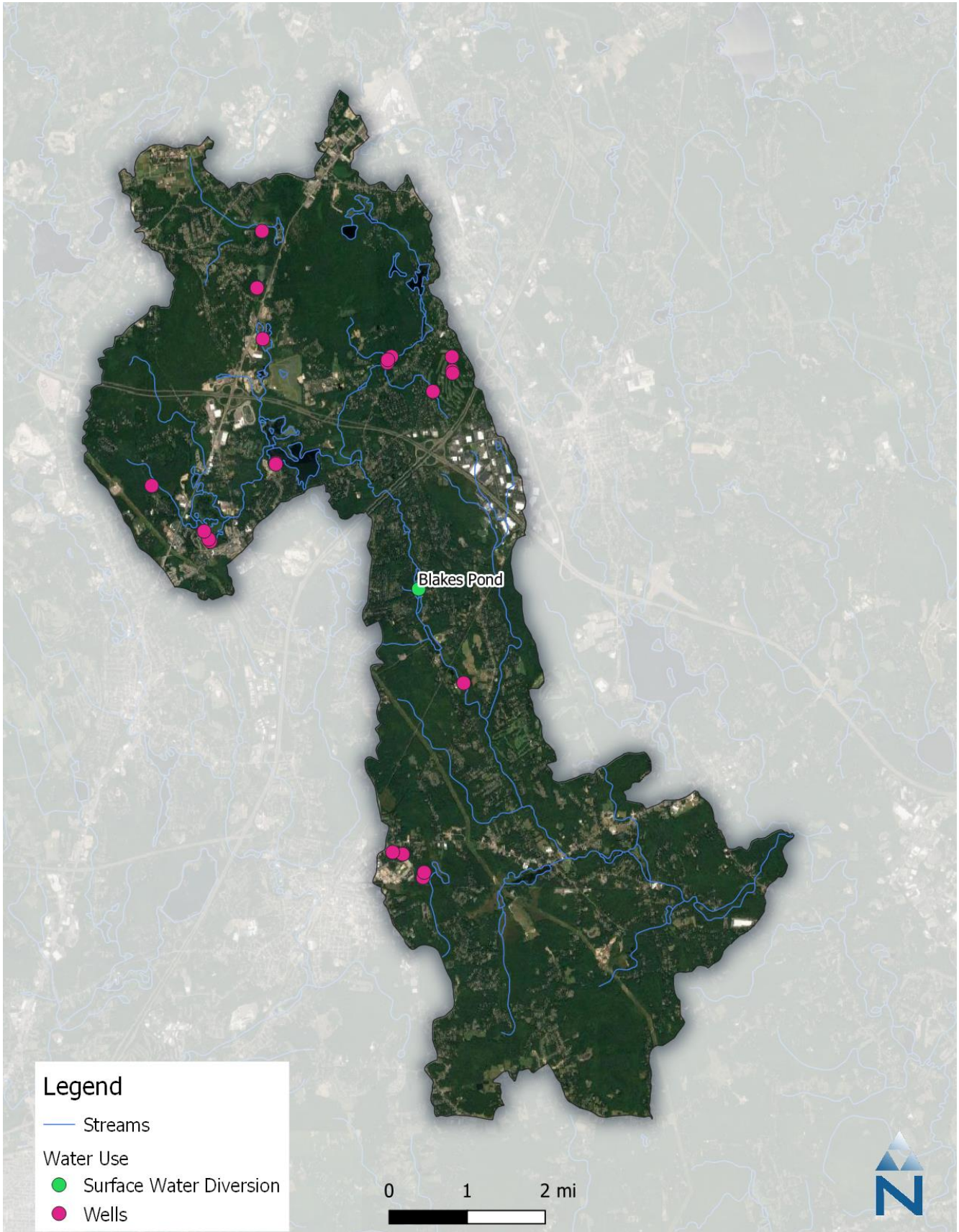


Figure 4. Water use in the Wading River watershed

Table 1. Water supply facilities in the Wading River

Type	Name/User	Source Name	Town
Public Water Supply	PLAINVILLE WATER DEPARTMENT	LAKE MIRIMICHI WELL #1	PLAINVILLE
		LAKE MIRIMICHI WELL #2	
		LAKE MIRIMICHI WELL #3	
		WELL 1 AND 1A	
		WELL 2 AND 2A	
	PLAINVILLE ATHLETIC LEAGUE	WELL 1	
	ATTLEBORO WATER DEPT	WADING RIVER (BLAKES POND)	ATTLEBORO
	MANSFIELD WATER DIVISION	WALSH PROPERTY WELLFIELD	MANSFIELD
	WRENTHAM WATER DIVISION	CROCKER POND WELL6	WRENTHAM
		WELL 4	
FOXBORO WATER DEPARTMENT	WELL 4	FOXBOROUGH	
FOXBORO WATER DEPARTMENT	WELL 5		
FOXBORO WATER DEPARTMENT	WELL 6		
Non-public water supply	Golf	WELL #1(IRRIGATION)	FOXBOROUGH
		WELL #2(#16 Well)	
		WELL #3(#15 Well)	
		PUMP #4 @ 7 TEE PONDS	
	Manufacturing	WRENTHAM BOG	WRENTHAM
		WELL #11	ATTLEBORO
		WELL #1	
		WELL #3	
WELL #7			

Table 2. Summary of active, long-term USGS gages located in the Taunton River basin

Location	USGS-ID	Drainage Area (mi ²)	Start Date	End Date	Percent Complete ²	Percent Estimated
Segreganset River near Dighton, MA ¹	01109070	10.6	7/1/1966	Present	96.2%	3.0%
Wading River near Norton, MA	01109000	43.3	6/1/1925	Present	98.4%	1.6%
Threemile River at North Dighton, MA	01109060	84.3	7/1/1966	Present	97.0%	3.0%

1. The Segreganset River location is missing approximately five months of data in 1992.
2. Records flagged as provisional ("P") and revised ("A:R") are considered complete for this summary.

Table 3. Subbasin and reach representation in HSPF for the Wading River watershed (Barbaro and Sorenson, 2013b)

Subbasin/ Reach Number	HSPF subbasin description	Description of reach	Direct drainage area (acres)	Total drainage area (acres)	Upstream reach numbers	Method used to develop FTABLE	Wetlands simulated as virtual reach
1	Wading River headwaters above Lake Mirimichi outlet	Wading River headwaters above Lake Mirimichi outlet	7,732	7,732	--	S	no
2	Wading River above stream gage at West Mansfield (01108500)	Wading River above stream gage at West Mansfield (01108500)	4,727	12,459	1	S	no
3	Wading River above stream gage at Charley (01108700)	Wading River above stream gage at Chartley (01108700)	6,257	18,716	2	S	no
4	Wading River above stream gage near Norton (01109000)	Wading River above stream gage near Norton (01109000)	8,883	27,598	3	S	yes

S: reach was simulated as a stream and an open-channel flow equation was used to compute flow from the reach. No reaches in the Wading River watershed were simulated as reservoirs.

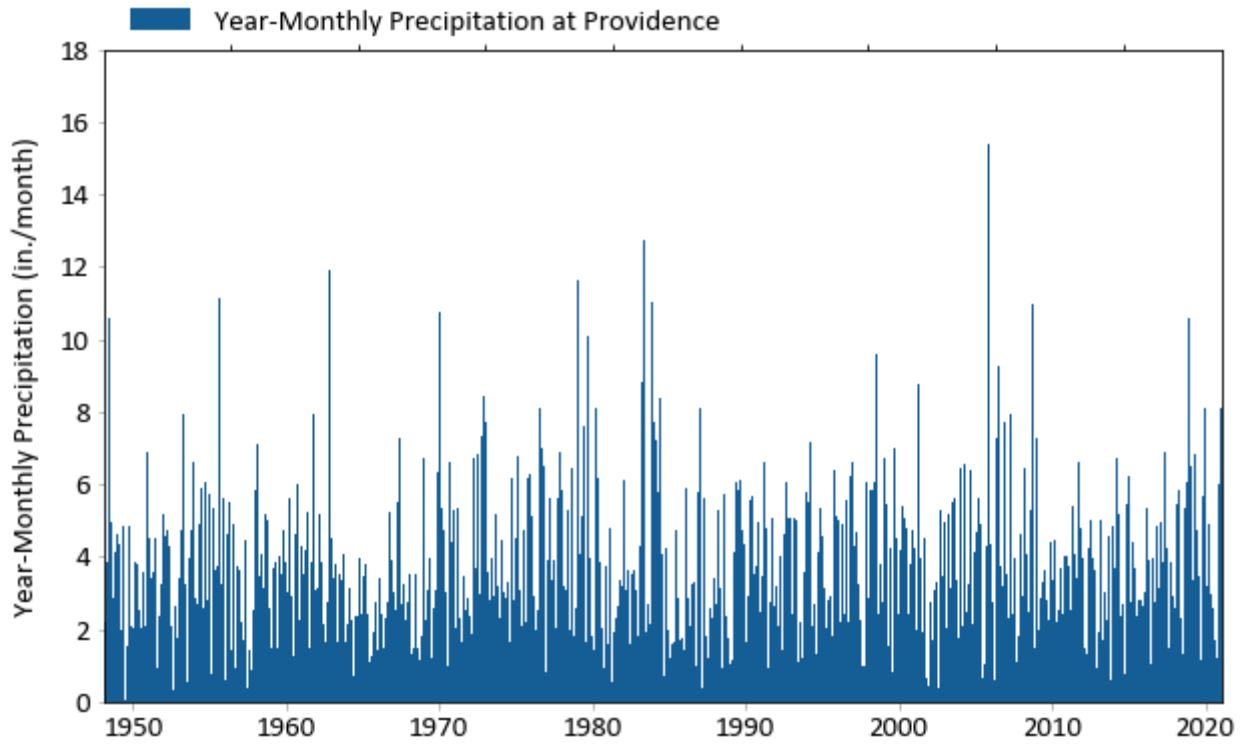


Figure 5. Monthly rainfall.

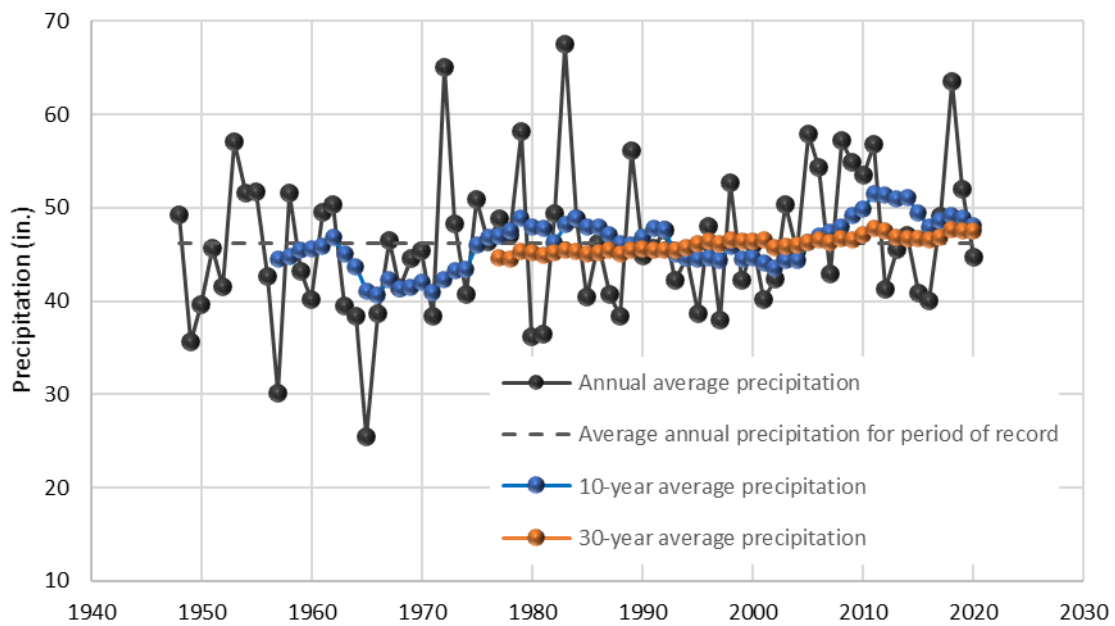


Figure 6. Precipitation trends (T.F. Green Airport).

Table 4. Precipitation depths for 24-hour events based on analysis of historical data

Description		Return Period	24-hour Rainfall Depth (in)
1	Small	1-yr	2.1
2		2-yr	2.8
3	Medium	5-yr	3.3
4		10-yr	3.9
5	Large	25-yr	5.1
6		50-yr	6.5
7	Extreme	100-yr	8.4
8		500-yr	16.63

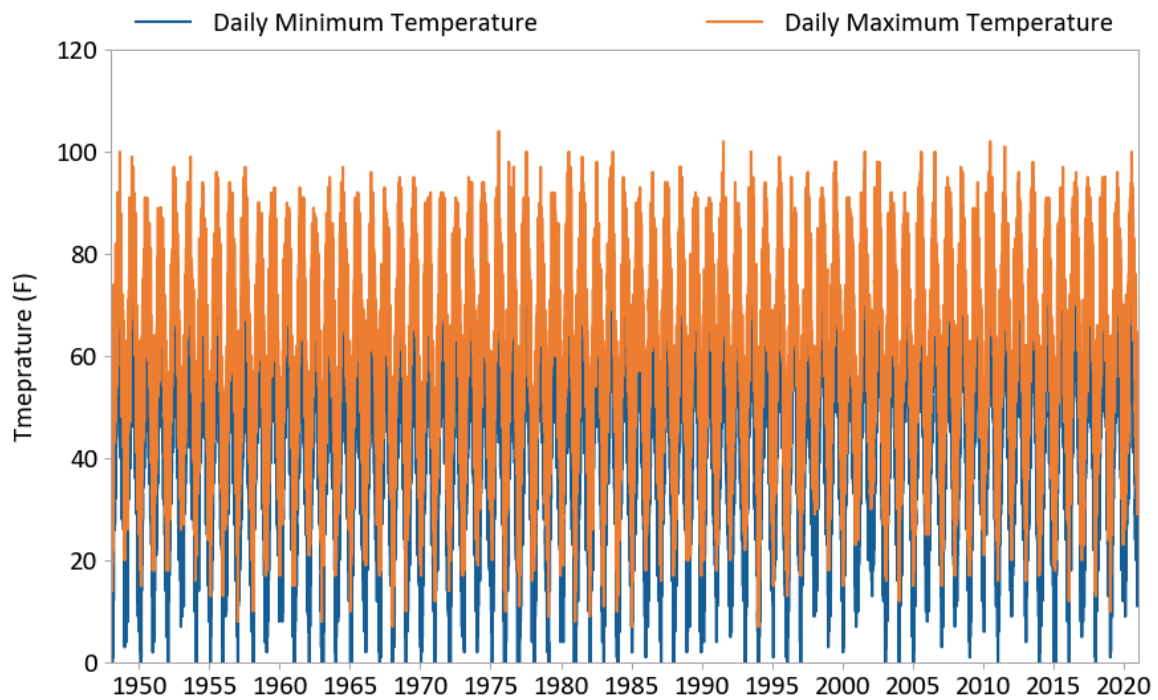


Figure 7. Daily minimum and maximum temperatures (T.F. Green Airport).

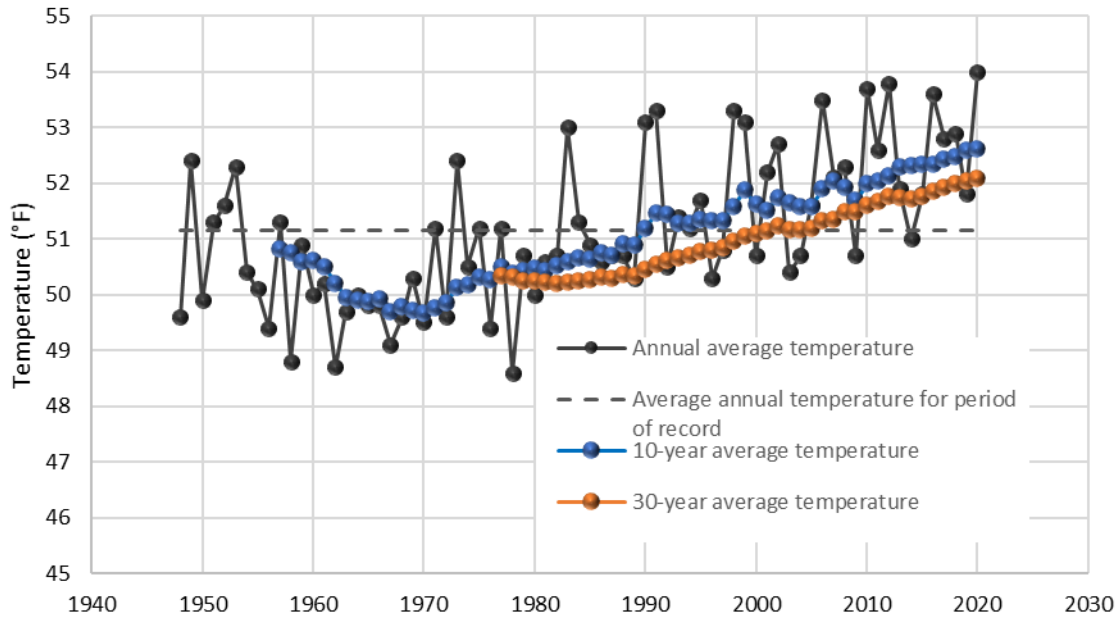


Figure 8. Annual average temperature trends (T.F. Green Airport).

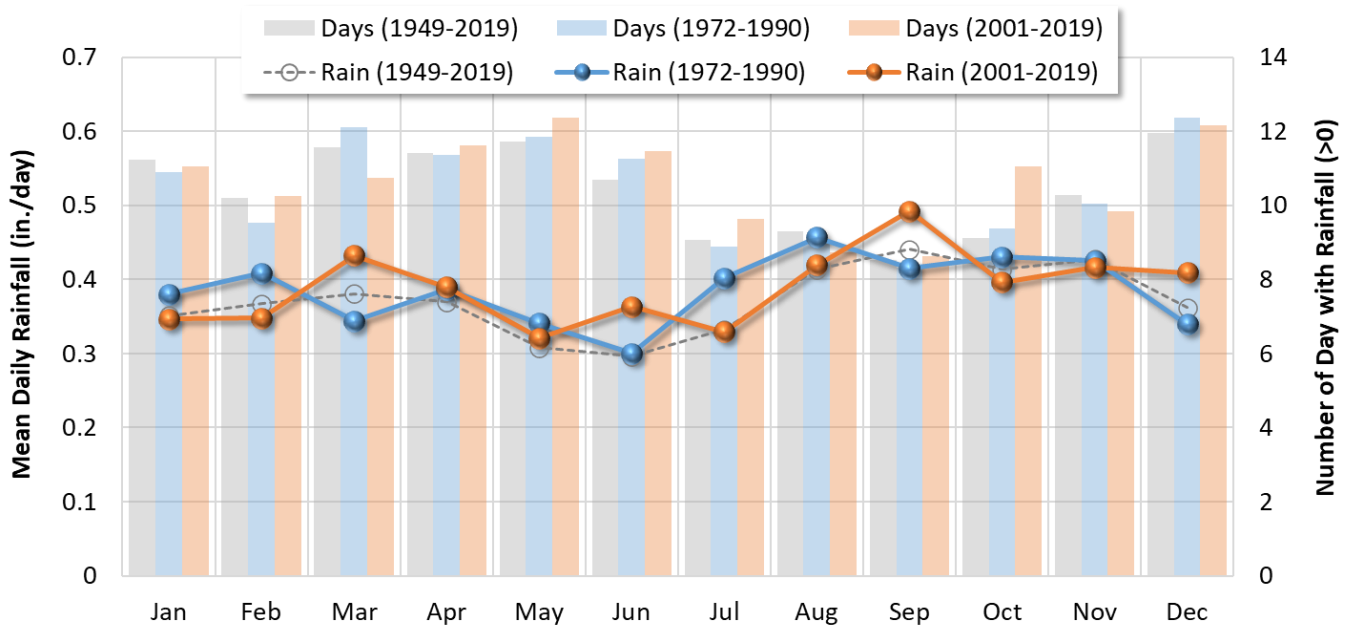


Figure 9. Average monthly rainfall and number of wet days for the long-term average (1949-2019), historical (1972-1990), and most recent (2001-2019) periods.

Wind Speed

Table 5. Summary of the missing wind speed data at gage 72506814765.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
1942	3672	26	0.71	3672	26	0.71
1943	8760	8760	100	8760	8760	100
1944	8784	8784	100	8784	8784	100
1945	8760	8760	100	8760	8760	100
1946	8760	8760	100	8760	8760	100
1947	8760	8760	100	8760	8760	100
1948	8784	8784	100	8784	8784	100
1949	8760	8760	100	8760	8760	100
1950	8760	8760	100	8760	8760	100
1951	8760	8760	100	8760	17	0.19
1952	8784	8784	100	8784	23	0.26
1953	8760	8760	100	8760	26	0.3
1954	8760	8760	100	8760	18	0.21
1955	8760	8760	100	8760	6	0.07
1956	8784	8784	100	8784	17	0.19
1957	8760	8760	100	8760	9	0.1
1958	8760	8760	100	8760	0	0
1959	8760	8760	100	8760	3	0.03
1960	8784	8784	100	8784	3	0.03
1961	8760	8760	100	8760	5	0.06
1962	8760	8760	100	8760	2	0.02
1963	8760	8760	100	8760	39	0.45
1964	8784	8784	100	8784	0	0
1965	8760	8760	100	8760	5840	66.67
1966	8760	8760	100	8760	5840	66.67
1967	8760	8760	100	8760	5841	66.68
1968	8784	8784	100	8784	5858	66.69
1969	8760	8760	100	8760	5840	66.67
1970	8760	8760	100	8760	0	0
1971	8760	8760	100	8760	8760	100
1972	8784	8780	99.95	8784	8784	100
1973	8760	1378	15.73	8762	1378	15.73
1974	8760	1376	15.71	8760	1380	15.75
1975	8760	1521	17.36	8760	1525	17.41
1976	8784	1906	21.7	8784	1910	21.74
1977	8760	2100	23.97	8760	2104	24.02
1978	8760	1727	19.71	8760	1727	19.71
1979	8760	1352	15.43	8760	1356	15.48
1980	8784	1368	15.57	8784	1372	15.62
1981	8760	1315	15.01	8760	1319	15.06

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
1982	8760	0	0	8760	5	0.06
1983	8760	4	0.05	8763	9	0.1
1984	8784	4	0.05	8791	9	0.1
1985	8760	7	0.08	8764	12	0.14
1986	8760	8	0.09	8762	10	0.11
1987	8760	1	0.01	8761	6	0.07
1988	8784	2	0.02	8787	7	0.08
1989	8760	59	0.67	8760	64	0.73
1990	8760	0	0	8760	5	0.06
1991	8760	0	0	8760	5	0.06
1992	8784	0	0	8784	5	0.06
1993	8760	0	0	8760	0	0
1994	8760	167	1.91	8760	167	1.91
1995	8760	465	5.31	8789	469	5.34
1996	8784	1355	15.43	9008	1360	15.1
1997	8760	1512	17.26	9061	1516	16.73
1998	8760	1550	17.69	9126	1555	17.04
1999	8760	1256	14.34	9208	1261	13.69
2000	8784	180	2.05	9140	185	2.02
2001	8760	175	2	8987	179	1.99
2002	8760	264	3.01	9123	269	2.95
2003	8760	442	5.05	9216	447	4.85
2004	8784	364	4.14	9214	364	3.95
2005	8760	8	0.09	8760	13	0.15
2006	8760	4	0.05	8760	4	0.05
2007	8760	8	0.09	8761	8	0.09
2008	8784	3	0.03	8789	3	0.03
2009	8760	3	0.03	8760	3	0.03
2010	8760	1	0.01	8760	1	0.01
2011	8760	2	0.02	8765	7	0.08
2012	8784	2	0.02	8785	2	0.02
2013	8760	17	0.19	8760	22	0.25
2014	8760	21	0.24	8760	26	0.3
2015	8760	9	0.1	8761	11	0.13
2016	8784	1	0.01	8785	1	0.01
2017	8760	37	0.42	8767	37	0.42
2018	8760	10	0.11	8765	10	0.11
2019	8760	14	0.16	8760	14	0.16
2020	8784	16	0.18	8787	21	0.24
2021	1752	23	1.31	120	0	0

Table 6. Summary of the missing wind speed data at gage 72506854777

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
2005	24	19	79.17			
2006	8760	8	0.09	8762	8	0.09
2007	8760	88	1	8760	88	1
2008	8784	26	0.3	8784	26	0.3
2009	8760	67	0.76	8760	67	0.76
2010	8760	33	0.38	8760	33	0.38
2011	8760	21	0.24	8760	26	0.3
2012	8784	33	0.38	8784	33	0.38
2013	8760	44	0.5	8760	49	0.56
2014	8760	34	0.39	8760	39	0.45
2015	8760	91	1.04	8760	91	1.04
2016	8784	44	0.5	8784	44	0.5
2017	8760	71	0.81	8760	71	0.81
2018	8760	55	0.63	8760	55	0.63
2019	8760	85	0.97	8760	85	0.97
2020	8784	49	0.56	8784	54	0.61
2021	1680	26	1.55	120	8	6.67

Table 7. Summary of the missing wind speed data at gage 7250689999

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1942	2184	416	19.05
1943	8760	13	0.15
1944	8784	5918	67.37
1945	8760	8760	100
1946	8760	8760	100
1947	8760	8760	100
1948	8784	7657	87.17
1949	8760	0	0
1950	8760	25	0.29
1951	8760	4	0.05
1952	8784	3	0.03
1953	8760	0	0
1954	8760	2	0.02
1955	8760	3	0.03
1956	8784	3	0.03
1957	8760	0	0
1958	8760	0	0
1959	8760	0	0
1960	8784	0	0
1961	8760	0	0
1962	8760	0	0
1963	8760	0	0
1964	8784	0	0
1965	8760	0	0
1966	8760	1	0.01
1967	8760	0	0
1968	8784	1	0.01
1969	8760	0	0
1970	8760	100	1.14
1971	8760	939	10.72
1972	8784	8784	100
1973	8760	8760	100
1974	8760	8760	100
1975	8760	8760	100
1976	8784	8784	100
1977	8760	8760	100
1978	8760	8760	100
1979	8760	8760	100
1980	8784	8784	100
1981	8760	8760	100

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1982	8760	8760	100
1983	8760	8760	100
1984	8784	8784	100
1985	8760	8760	100
1986	8760	8760	100
1987	8760	8760	100
1988	8784	8784	100
1989	8760	8760	100
1990	8760	8760	100
1991	8760	8760	100
1992	8784	8784	100
1993	8760	8760	100
1994	8760	8760	100
1995	8760	8760	100
1996	8784	8784	100
1997	8760	8760	100
1998	8760	3410	38.93
1999	8760	541	6.18
2000	8784	443	5.04
2001	8760	1835	20.95
2002	8760	1227	14.01
2003	8760	1862	21.26
2004	8784	2549	29.02
2005	8736	7970	91.23

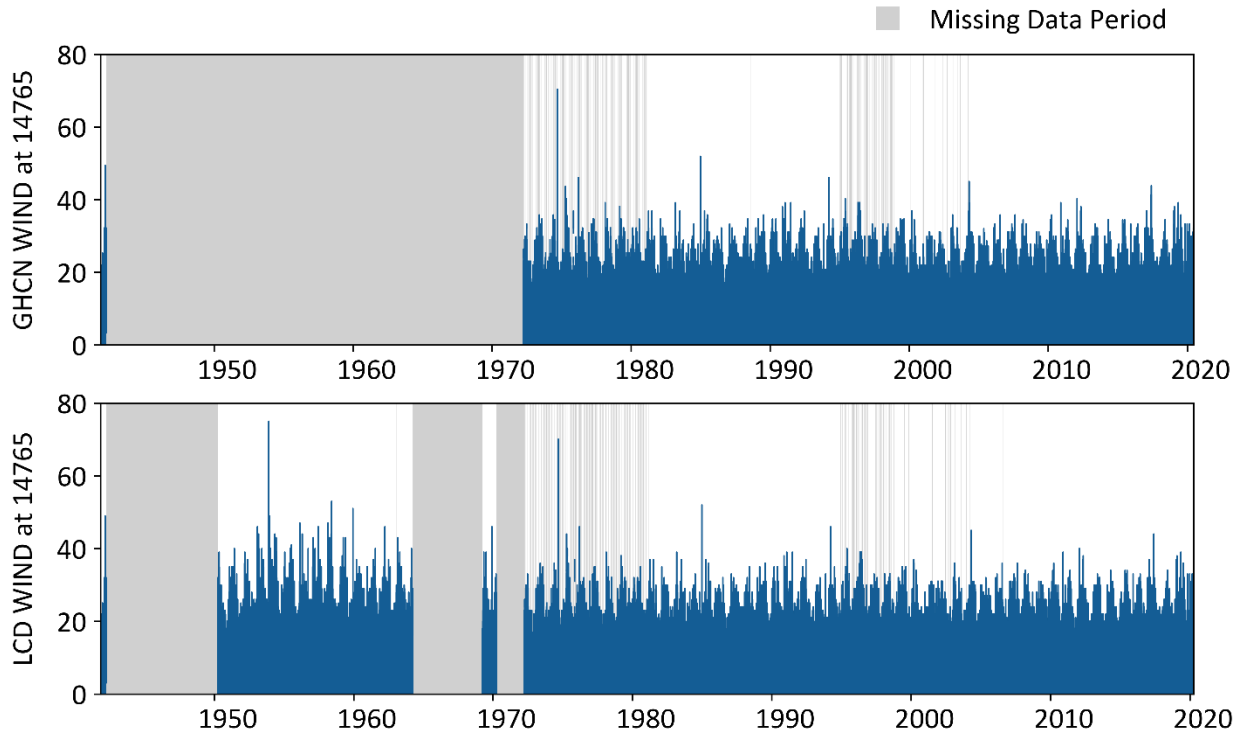


Figure 10. The wind speed data at gage 72506814765.

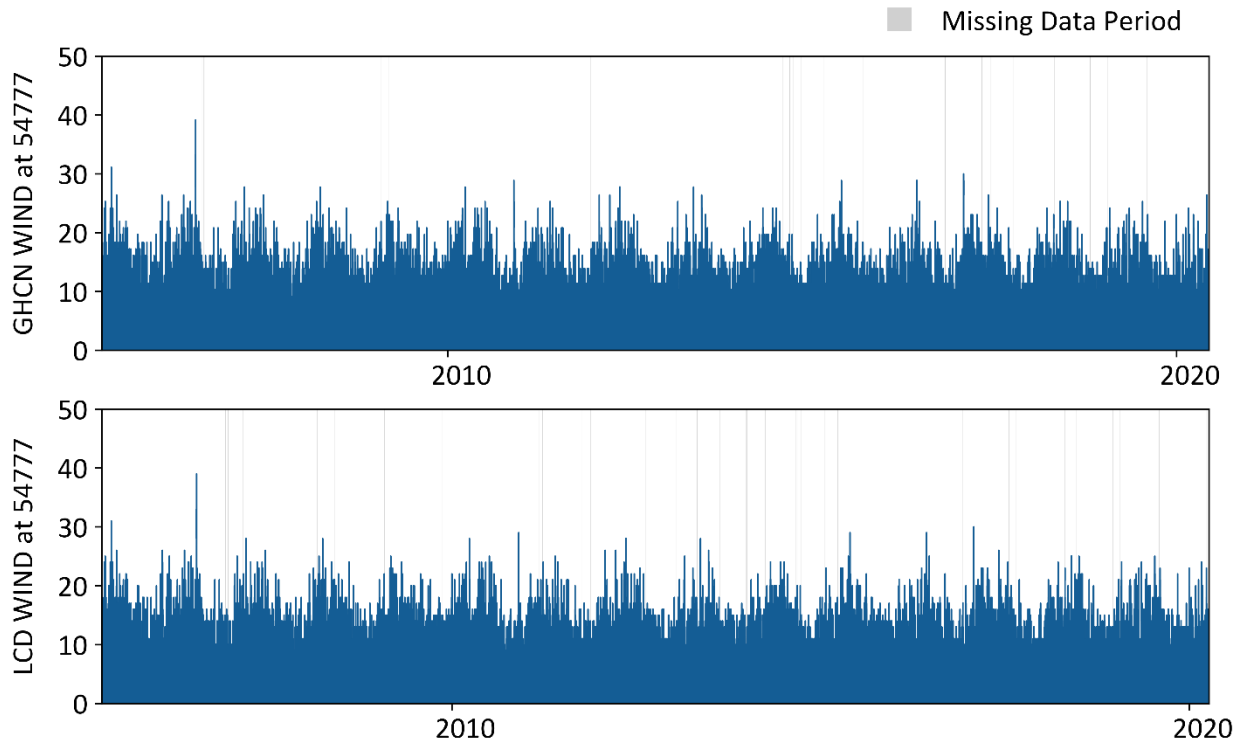


Figure 11. The wind speed data at gage 72506854777.

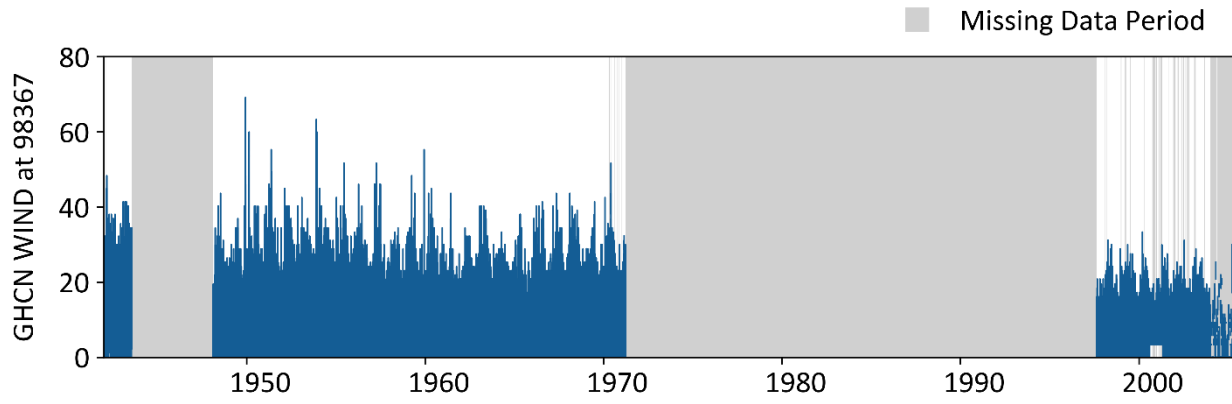


Figure 12. The wind speed data at gage 72506899999.

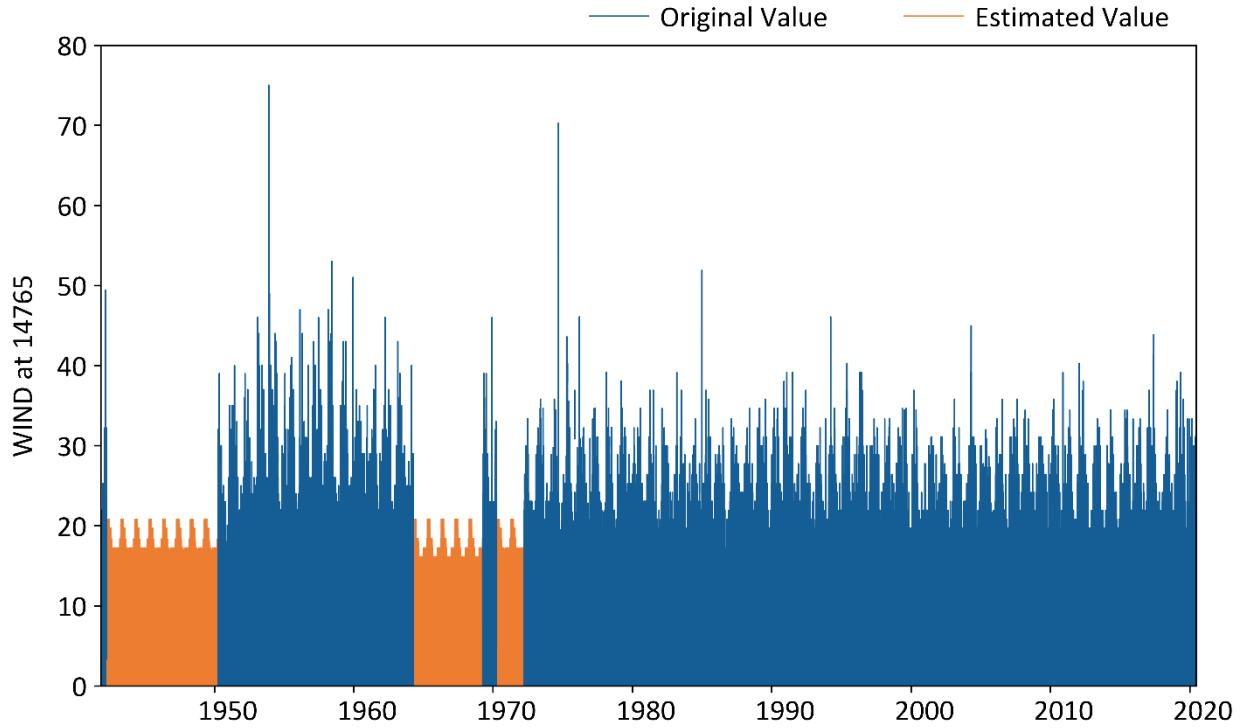


Figure 13. The filled wind speed data at gage 72506814765.

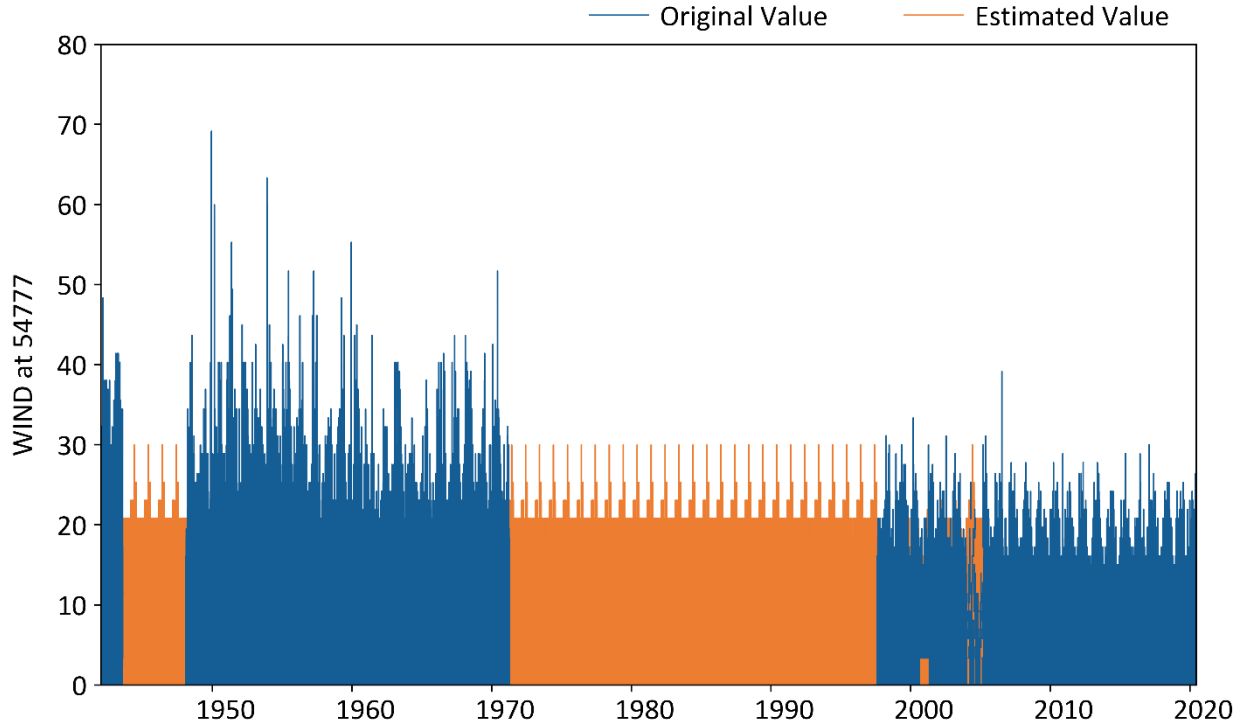


Figure 14. The filled wind speed data at gage 72506854777.

Temperature

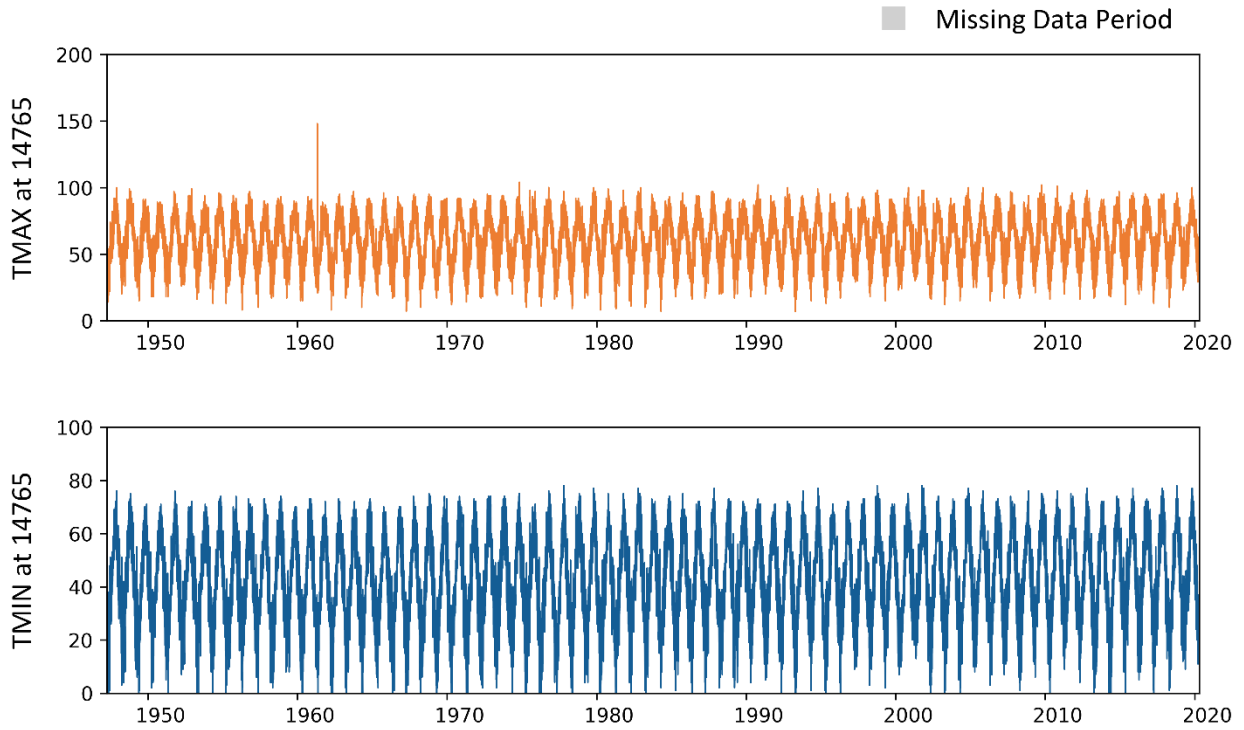


Figure 15. The original daily temperature data at gage 72506814765.

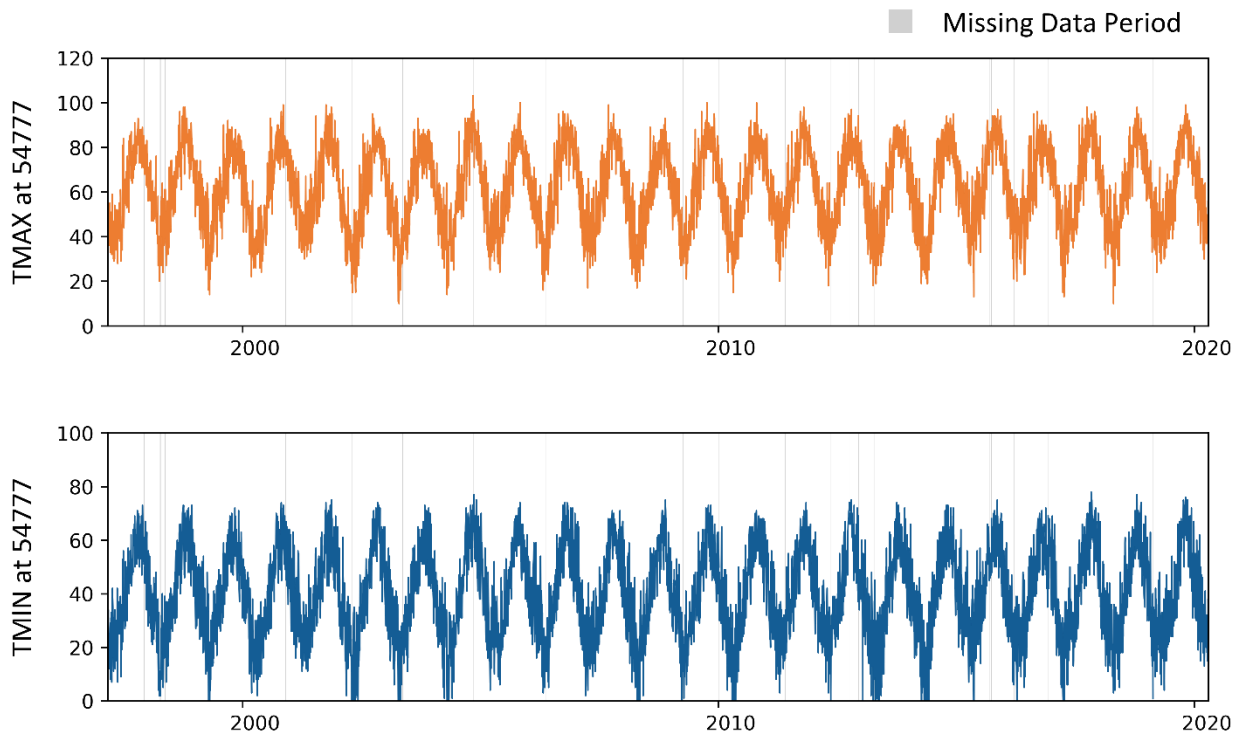


Figure 16. The original daily temperature data at gage 72506854777.

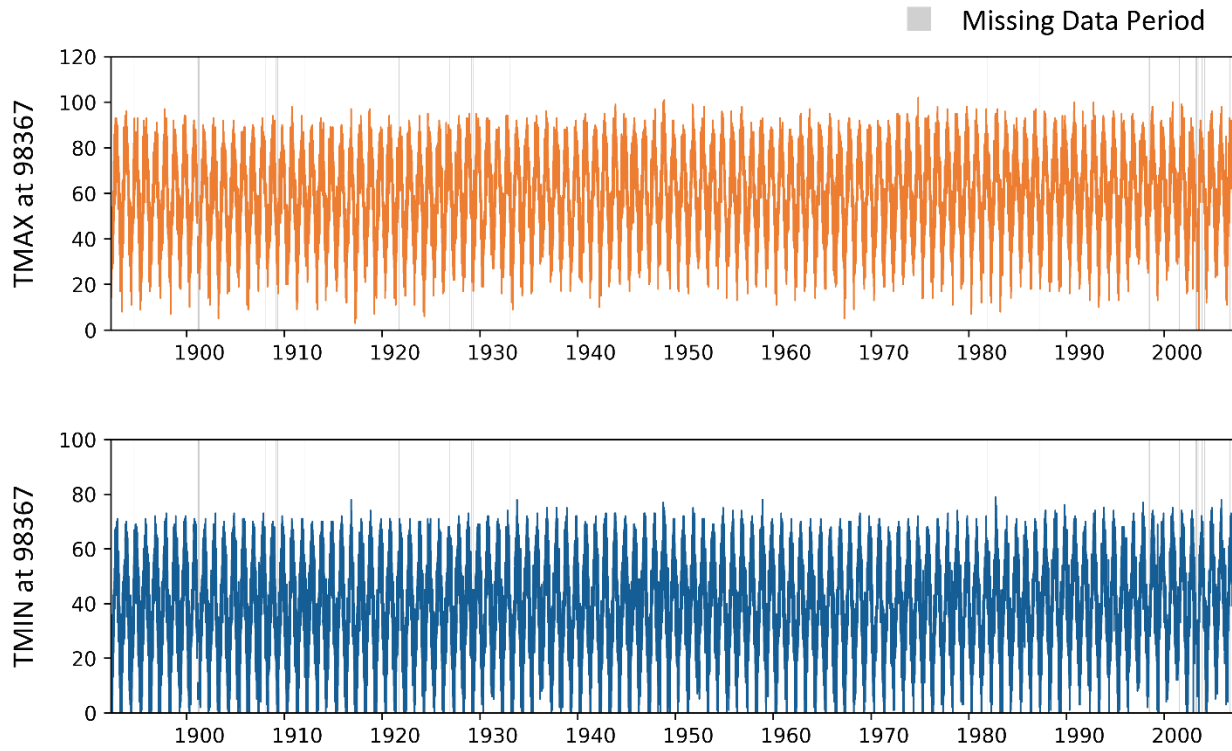


Figure 17. The original daily temperature data at gage 72506899999.

Table 8. Summary of the missing daily temperature data at gage 72506814765

Year	TMAX Count Total	TMAX Count of Missing	TMAX Percent of Missing	TMIN Count Total	TMIN Count of Missing	TMIN Percent of Missing
1948	366	0	0	366	0	0
1949	365	0	0	365	0	0
1950	365	0	0	365	0	0
1951	365	0	0	365	0	0
1952	366	0	0	366	0	0
1953	365	0	0	365	0	0
1954	365	0	0	365	0	0
1955	365	0	0	365	0	0
1956	366	0	0	366	0	0
1957	365	0	0	365	0	0
1958	365	0	0	365	0	0
1959	365	0	0	365	0	0
1960	366	0	0	366	0	0
1961	365	0	0	365	0	0
1962	365	0	0	365	0	0
1963	365	0	0	365	0	0
1964	366	0	0	366	0	0
1965	365	0	0	365	0	0
1966	365	0	0	365	0	0
1967	365	0	0	365	0	0
1968	366	0	0	366	0	0
1969	365	0	0	365	0	0
1970	365	0	0	365	0	0
1971	365	0	0	365	0	0
1972	366	0	0	366	0	0
1973	365	0	0	365	0	0
1974	365	0	0	365	0	0
1975	365	0	0	365	0	0
1976	366	0	0	366	0	0
1977	365	0	0	365	0	0
1978	365	0	0	365	0	0
1979	365	0	0	365	0	0
1980	366	0	0	366	0	0
1981	365	0	0	365	0	0
1982	365	0	0	365	0	0
1983	365	0	0	365	0	0
1984	366	0	0	366	0	0
1985	365	0	0	365	0	0
1986	365	0	0	365	0	0
1987	365	0	0	365	0	0

Year	TMAX Count Total	TMAX Count of Missing	TMAX Percent of Missing	TMIN Count Total	TMIN Count of Missing	TMIN Percent of Missing
1988	366	0	0	366	0	0
1989	365	0	0	365	0	0
1990	365	0	0	365	0	0
1991	365	0	0	365	0	0
1992	366	0	0	366	0	0
1993	365	0	0	365	0	0
1994	365	0	0	365	0	0
1995	365	0	0	365	0	0
1996	366	3	0.819672	366	3	0.819672
1997	365	0	0	365	0	0
1998	365	0	0	365	0	0
1999	365	0	0	365	0	0
2000	366	0	0	366	0	0
2001	365	0	0	365	0	0
2002	365	0	0	365	0	0
2003	365	0	0	365	0	0
2004	366	0	0	366	0	0
2005	365	0	0	365	0	0
2006	365	0	0	365	0	0
2007	365	0	0	365	0	0
2008	366	0	0	366	0	0
2009	365	0	0	365	0	0
2010	365	0	0	365	0	0
2011	365	0	0	365	0	0
2012	366	0	0	366	0	0
2013	365	0	0	365	0	0
2014	365	0	0	365	0	0
2015	365	0	0	365	0	0
2016	366	0	0	366	0	0
2017	365	0	0	365	0	0
2018	365	0	0	365	0	0
2019	365	0	0	365	0	0
2020	366	0	0	366	0	0
2021	18	0	0	18	0	0

Table 9. Summary of the missing daily temperature data at gage 725068154777.

Year	TMAX Count Total	TMAX Count of Missing	TMAX Percent of Missing	TMIN Count Total	TMIN Count of Missing	TMIN Percent of Missing
1997	31	0	0	31	0	0
1998	365	2	0.547945	365	2	0.547945
1999	365	9	2.465753	365	9	2.465753
2000	366	0	0	366	0	0
2001	365	2	0.547945	365	2	0.547945
2002	365	1	0.273973	365	1	0.273973
2003	365	3	0.821918	365	3	0.821918
2004	366	5	1.36612	366	5	1.36612
2005	365	2	0.547945	365	2	0.547945
2006	365	0	0	365	0	0
2007	365	1	0.273973	365	1	0.273973
2008	366	0	0	366	0	0
2009	365	0	0	365	0	0
2010	365	2	0.547945	365	2	0.547945
2011	365	0	0	365	0	0
2012	366	2	0.546448	366	2	0.546448
2013	365	4	1.09589	365	4	1.09589
2014	365	1	0.273973	365	1	0.273973
2015	365	0	0	365	0	0
2016	366	5	1.36612	366	5	1.36612
2017	365	1	0.273973	365	1	0.273973
2018	365	0	0	365	0	0
2019	365	2	0.547945	365	2	0.547945
2020	366	0	0	366	0	0
2021	18	0	0	18	0	0

Table 10. Summary of the missing daily temperature speed data at gage 7250689999.

Year	TMAX Count Total	TMAX Count of Missing	TMAX Percent of Missing	TMIN Count Total	TMIN Count of Missing	TMIN Percent of Missing
1945	365	0	0	365	0	0
1946	365	0	0	365	0	0
1947	365	1	0.273973	365	1	0.273973
1948	366	0	0	366	0	0
1949	365	1	0.273973	365	1	0.273973
1950	365	1	0.273973	365	1	0.273973
1951	365	0	0	365	0	0
1952	366	0	0	366	0	0
1953	365	0	0	365	0	0
1954	365	2	0.547945	365	2	0.547945
1955	365	0	0	365	0	0
1956	366	1	0.273224	366	1	0.273224
1957	365	1	0.273973	365	1	0.273973
1958	365	0	0	365	0	0
1959	365	2	0.547945	365	2	0.547945
1960	366	0	0	366	0	0
1961	365	0	0	365	0	0
1962	365	2	0.547945	365	2	0.547945
1963	365	0	0	365	0	0
1964	366	0	0	366	0	0
1965	365	0	0	365	0	0
1966	365	0	0	365	0	0
1967	365	0	0	365	0	0
1968	366	0	0	366	0	0
1969	365	0	0	365	0	0
1970	365	0	0	365	0	0
1971	365	1	0.273973	365	1	0.273973
1972	366	0	0	366	0	0
1973	365	0	0	365	0	0
1974	365	0	0	365	0	0
1975	365	0	0	365	0	0
1976	366	0	0	366	0	0
1977	365	0	0	365	0	0
1978	365	0	0	365	0	0
1979	365	5	1.369863	365	5	1.369863
1980	366	0	0	366	0	0
1981	365	2	0.547945	365	2	0.547945
1982	365	1	0.273973	365	1	0.273973
1983	365	0	0	365	0	0

Year	TMAX Count Total	TMAX Count of Missing	TMAX Percent of Missing	TMIN Count Total	TMIN Count of Missing	TMIN Percent of Missing
1984	366	0	0	366	0	0
1985	365	0	0	365	0	0
1986	365	0	0	365	0	0
1987	365	0	0	365	0	0
1988	366	1	0.273224	366	1	0.273224
1989	365	0	0	365	0	0
1990	365	1	0.273973	365	1	0.273973
1991	365	0	0	365	0	0
1992	366	1	0.273224	366	1	0.273224
1993	365	1	0.273973	365	1	0.273973
1994	365	0	0	365	0	0
1995	365	1	0.273973	365	1	0.273973
1996	366	1	0.273224	366	1	0.273224
1997	365	0	0	365	0	0
1998	365	0	0	365	0	0
1999	365	31	8.493151	365	31	8.493151
2000	366	0	0	366	0	0
2001	365	0	0	365	0	0
2002	365	30	8.219178	365	30	8.219178
2003	365	31	8.493151	365	31	8.493151
2004	366	126	34.42623	366	126	34.42623
2005	365	3	0.821918	365	3	0.821918
2006	365	4	1.09589	365	4	1.09589
2007	273	1	0.3663	273	1	0.3663

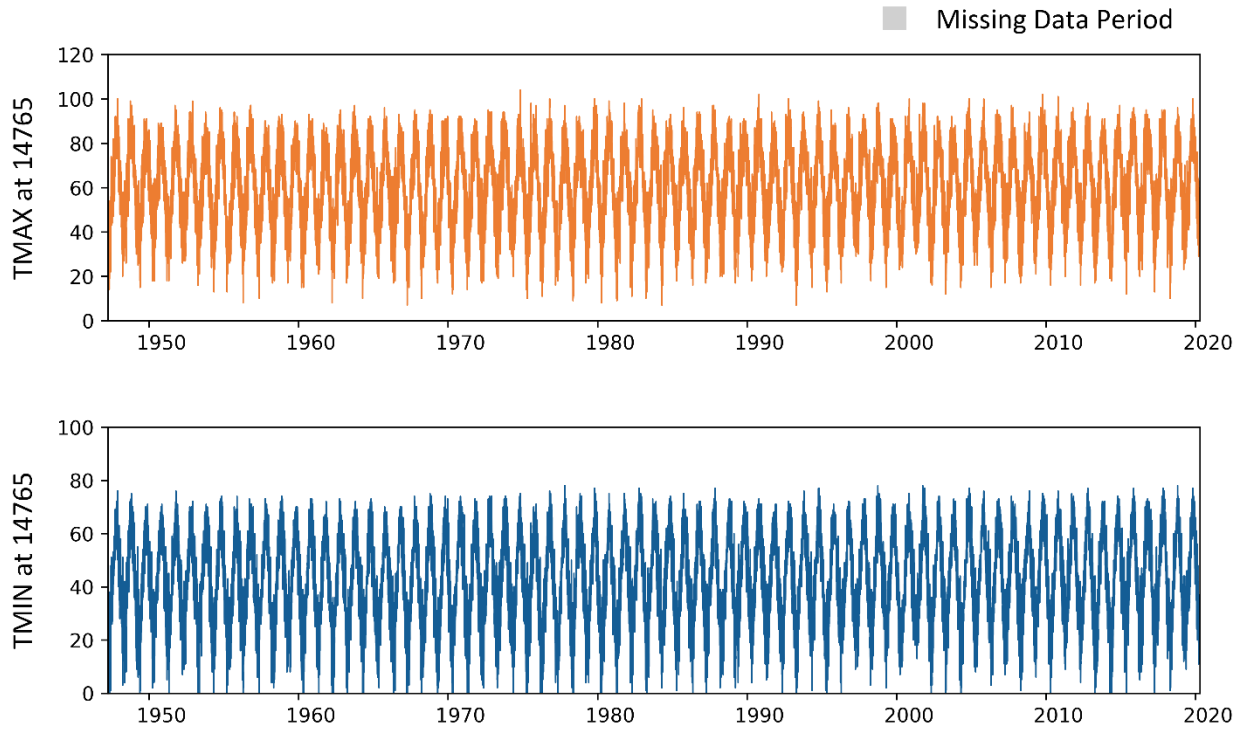


Figure 18. The revised daily temperature data at gage 72506814765.

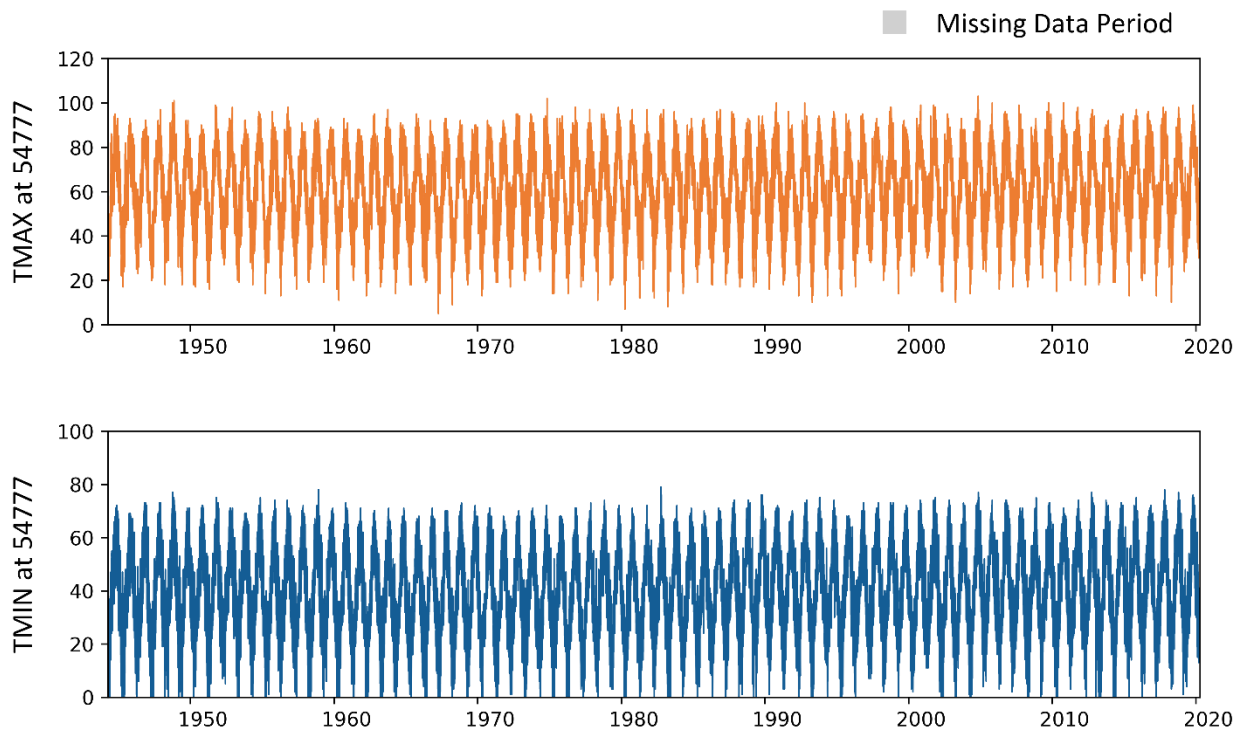


Figure 19. The revised daily temperature data at gage 72506814765.

Table 11. Summary of the missing temperature data at gage 72506814765.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
1942	3672	27	0.0074	3672	27	0.0074
1943	8760	8760	1	8760	8760	1
1944	8784	8784	1	8784	8784	1
1945	8760	8760	1	8760	8760	1
1946	8760	8760	1	8760	8760	1
1947	8760	8760	1	8760	8760	1
1948	8784	8784	1	8784	8784	1
1949	8760	8760	1	8760	8760	1
1950	8760	8760	1	8760	8760	1
1951	8760	8760	1	8760	18	0.0021
1952	8784	8784	1	8784	23	0.0026
1953	8760	8760	1	8760	27	0.0031
1954	8760	8760	1	8760	18	0.0021
1955	8760	8760	1	8760	6	0.0007
1956	8784	8784	1	8784	17	0.0019
1957	8760	8760	1	8760	9	0.001
1958	8760	8760	1	8760	0	0
1959	8760	8760	1	8760	3	0.0003
1960	8784	8784	1	8784	3	0.0003
1961	8760	8760	1	8760	5	0.0006
1962	8760	8760	1	8760	2	0.0002
1963	8760	8760	1	8760	39	0.0045
1964	8784	8784	1	8784	0	0
1965	8760	8760	1	8760	5840	0.6667
1966	8760	8760	1	8760	5840	0.6667
1967	8760	8760	1	8760	5841	0.6668
1968	8784	8784	1	8784	5858	0.6669
1969	8760	8760	1	8760	5840	0.6667
1970	8760	8760	1	8760	0	0
1971	8760	8760	1	8760	8760	1
1972	8784	8780	0.9995	8784	8784	1
1973	8760	1379	0.1574	8760	1379	0.1574
1974	8760	1376	0.1571	8760	1380	0.1575
1975	8760	1520	0.1735	8760	1524	0.174
1976	8784	1904	0.2168	8784	1908	0.2172
1977	8760	2097	0.2394	8760	2101	0.2398
1978	8760	1718	0.1961	8760	1718	0.1961
1979	8760	1352	0.1543	8760	1356	0.1548
1980	8784	1368	0.1557	8784	1372	0.1562

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
1981	8760	1315	0.1501	8760	1319	0.1506
1982	8760	0	0	8760	5	0.0006
1983	8760	4	0.0005	8763	9	0.001
1984	8784	4	0.0005	8789	9	0.001
1985	8760	7	0.0008	8763	12	0.0014
1986	8760	8	0.0009	8763	10	0.0011
1987	8760	1	0.0001	8762	6	0.0007
1988	8784	2	0.0002	8787	7	0.0008
1989	8760	59	0.0067	8760	64	0.0073
1990	8760	0	0	8760	5	0.0006
1991	8760	0	0	8761	5	0.0006
1992	8784	0	0	8784	5	0.0006
1993	8760	0	0	8760	0	0
1994	8760	167	0.0191	8760	167	0.0191
1995	8760	465	0.0531	8770	469	0.0535
1996	8784	1397	0.159	8949	1402	0.1567
1997	8760	1512	0.1726	9002	1516	0.1684
1998	8760	1551	0.1771	9087	1556	0.1712
1999	8760	1252	0.1429	9124	1257	0.1378
2000	8784	160	0.0182	9080	165	0.0182
2001	8760	77	0.0088	8948	81	0.0091
2002	8760	251	0.0287	9056	256	0.0283
2003	8760	452	0.0516	9129	457	0.0501
2004	8784	372	0.0423	9124	372	0.0408
2005	8760	8	0.0009	8760	19	0.0022
2006	8760	4	0.0005	8760	4	0.0005
2007	8760	8	0.0009	8761	8	0.0009
2008	8784	3	0.0003	8788	3	0.0003
2009	8760	3	0.0003	8761	3	0.0003
2010	8760	1	0.0001	8760	1	0.0001
2011	8760	2	0.0002	8766	7	0.0008
2012	8784	2	0.0002	8787	2	0.0002
2013	8760	8	0.0009	8762	13	0.0015
2014	8760	2	0.0002	8761	7	0.0008
2015	8760	6	0.0007	8761	7	0.0008
2016	8784	0	0	8784	0	0
2017	8760	31	0.0035	8764	31	0.0035
2018	8760	6	0.0007	8763	6	0.0007
2019	8760	12	0.0014	8760	12	0.0014
2020	8784	10	0.0011	8785	18	0.002

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
2021	1752	23	0.0131	120	0	0

Table 12. Summary of the missing temperature data at gage 72506854777.

Year	Count_T otal_GH CN	Count_of_Missi ng_GHCN	Percent of Missing_GHCN	Count_Tot al_LCD	Count_of_Mis sing_LCD	Percent of Missing_LCD
2005	24	19	0.7917			
2006	8760	1	0.0001	8761	1	0.0001
2007	8760	21	0.0024	8760	21	0.0024
2008	8784	13	0.0015	8784	13	0.0015
2009	8760	60	0.0068	8761	60	0.0068
2010	8760	22	0.0025	8761	22	0.0025
2011	8760	11	0.0013	8760	16	0.0018
2012	8784	22	0.0025	8784	22	0.0025
2013	8760	45	0.0051	8760	50	0.0057
2014	8760	24	0.0027	8760	29	0.0033
2015	8760	1	0.0001	8760	1	0.0001
2016	8784	68	0.0077	8784	68	0.0077
2017	8760	39	0.0045	8760	39	0.0045
2018	8760	9	0.001	8760	9	0.001
2019	8760	68	0.0078	8760	68	0.0078
2020	8784	12	0.0014	8784	17	0.0019
2021	1680	22	0.0131	120	8	0.0667

Table 13. Summary of the missing temperature data at gage 7250689999.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1942	2184	416	0.1905
1943	8760	20	0.0023
1944	8784	5921	0.6741
1945	8760	8760	1
1946	8760	8760	1
1947	8760	8760	1
1948	8784	7657	0.8717
1949	8760	4	0.0005
1950	8760	33	0.0038
1951	8760	4	0.0005
1952	8784	15	0.0017
1953	8760	0	0
1954	8760	3	0.0003
1955	8760	2	0.0002
1956	8784	0	0
1957	8760	1	0.0001
1958	8760	0	0
1959	8760	0	0
1960	8784	0	0
1961	8760	0	0
1962	8760	0	0
1963	8760	0	0
1964	8784	0	0
1965	8760	0	0
1966	8760	1	0.0001
1967	8760	0	0
1968	8784	1	0.0001
1969	8760	0	0
1970	8760	100	0.0114
1971	8760	928	0.1059
1972	8784	8784	1
1973	8760	8760	1
1974	8760	8760	1
1975	8760	8760	1
1976	8784	8784	1
1977	8760	8760	1
1978	8760	8760	1
1979	8760	8760	1
1980	8784	8784	1
1981	8760	8760	1

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1982	8760	8760	1
1983	8760	8760	1
1984	8784	8784	1
1985	8760	8760	1
1986	8760	8760	1
1987	8760	8760	1
1988	8784	8784	1
1989	8760	8760	1
1990	8760	8760	1
1991	8760	8760	1
1992	8784	8784	1
1993	8760	8760	1
1994	8760	8760	1
1995	8760	8760	1
1996	8784	8784	1
1997	8760	8760	1
1998	8760	3407	0.3889
1999	8760	533	0.0608
2000	8784	443	0.0504
2001	8760	493	0.0563
2002	8760	1052	0.1201
2003	8760	1864	0.2128
2004	8784	2543	0.2895
2005	8736	7972	0.9125

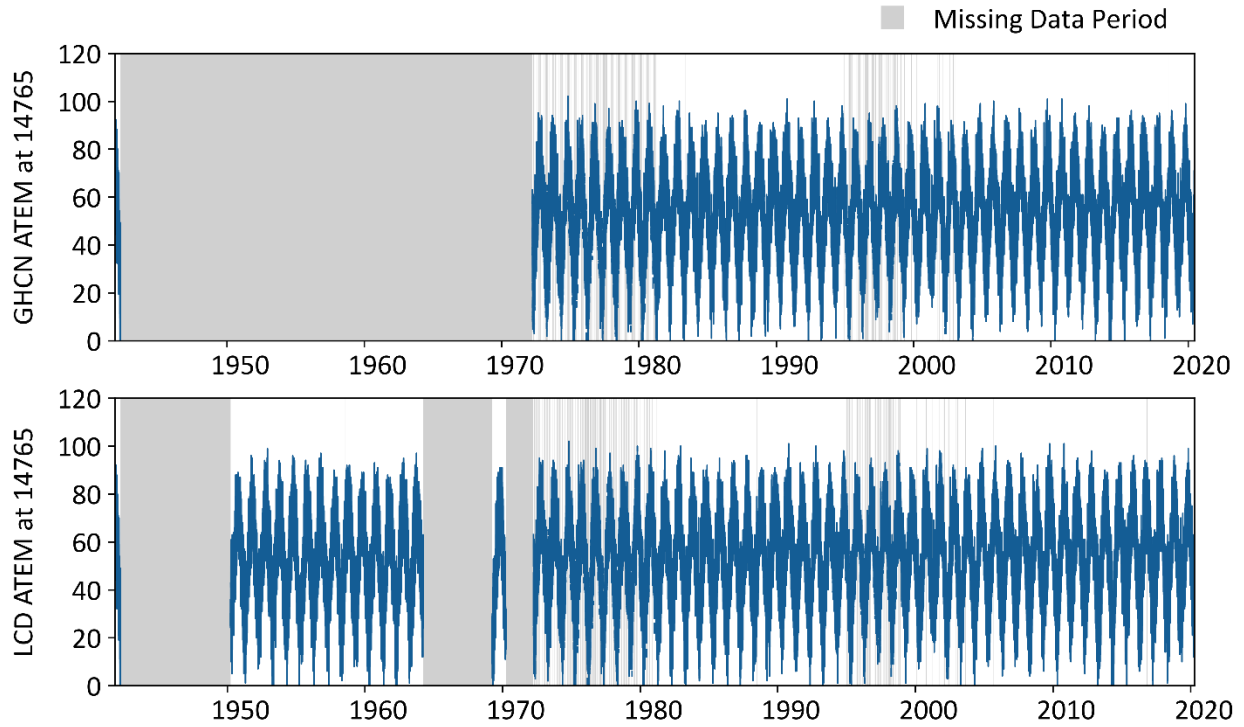


Figure 20. The hourly temperature data at gage 72506814765.

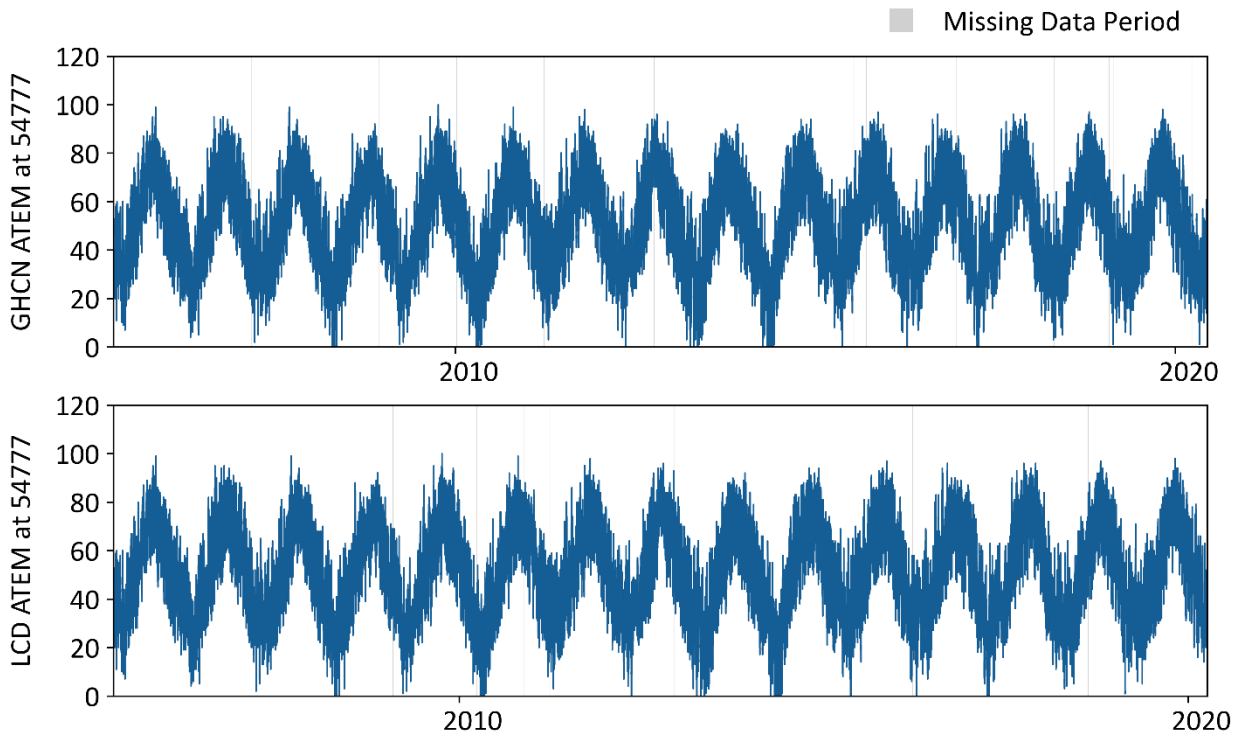


Figure 21. The hourly temperature data at gage 72506854777.

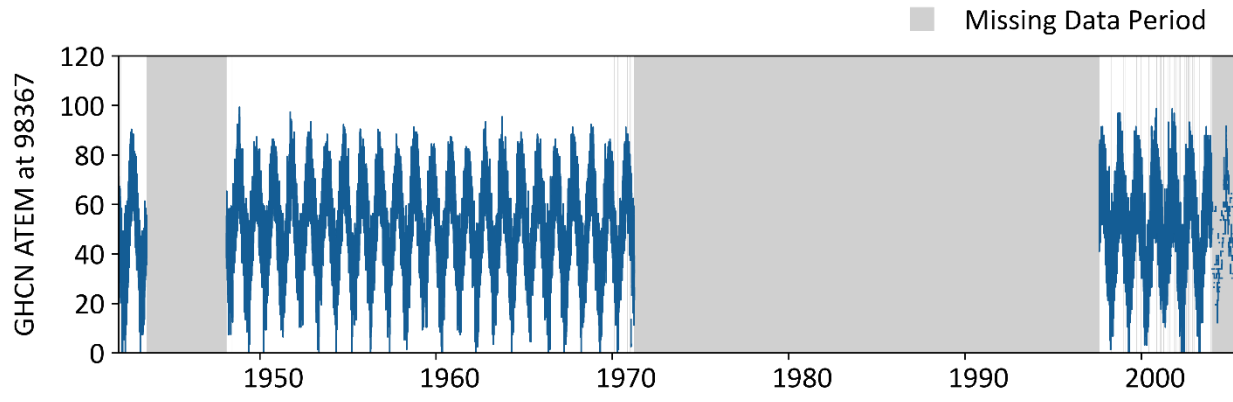


Figure 22. The hourly temperature data at gage 72506899999.

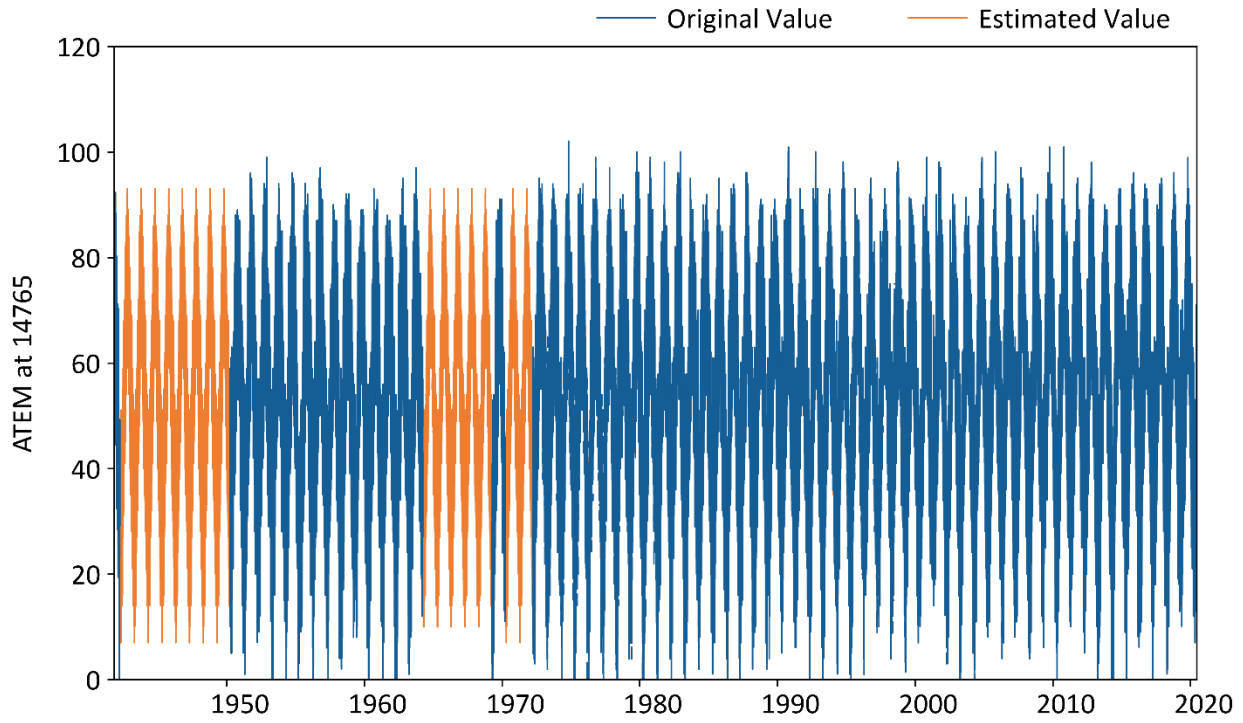


Figure 23. The filled hourly temperature data at gage 72506814765.

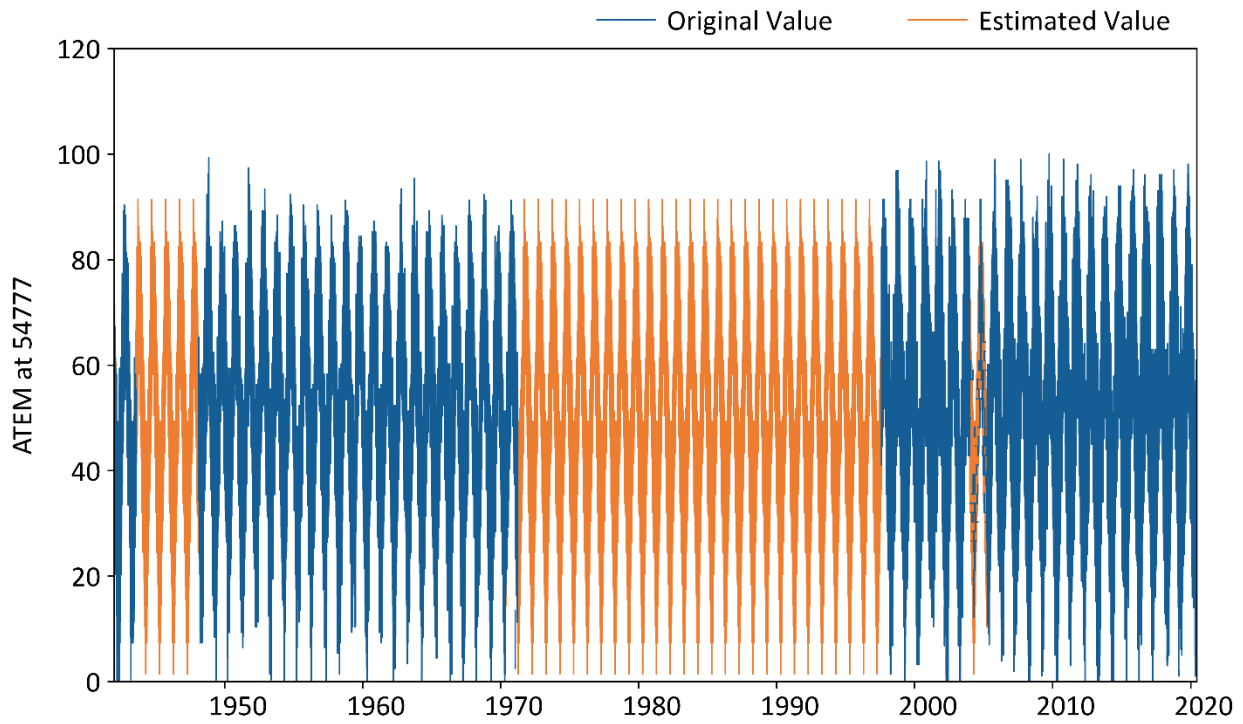


Figure 24. The filled hourly temperature data at gage 72506854777.

Dew Point Temperature

Table 14. Summary of the missing dew point temperature data at gage 72506814765.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent_of_Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent_of_Missing_LCD
1942	3672	30	0.0082	3672	30	0.0082
1943	8760	8760	1	8760	8760	1
1944	8784	8784	1	8784	8784	1
1945	8760	8760	1	8760	8760	1
1946	8760	8760	1	8760	8760	1
1947	8760	8760	1	8760	8760	1
1948	8784	8784	1	8784	8784	1
1949	8760	8760	1	8760	8760	1
1950	8760	8760	1	8760	8760	1
1951	8760	8760	1	8760	17	0.0019
1952	8784	8784	1	8784	23	0.0026
1953	8760	8760	1	8760	26	0.003
1954	8760	8760	1	8760	18	0.0021
1955	8760	8760	1	8760	7	0.0008
1956	8784	8784	1	8784	18	0.002
1957	8760	8760	1	8760	9	0.001
1958	8760	8760	1	8760	0	0
1959	8760	8760	1	8760	3	0.0003
1960	8784	8784	1	8784	4	0.0005
1961	8760	8760	1	8760	5	0.0006
1962	8760	8760	1	8760	2	0.0002
1963	8760	8760	1	8760	39	0.0045
1964	8784	8784	1	8784	0	0
1965	8760	8760	1	8760	5840	0.6667
1966	8760	8760	1	8760	5840	0.6667
1967	8760	8760	1	8760	5841	0.6668
1968	8784	8784	1	8784	5858	0.6669
1969	8760	8760	1	8760	5840	0.6667
1970	8760	8760	1	8760	1	0.0001
1971	8760	8760	1	8760	8760	1
1972	8784	8780	0.9995	8784	8784	1
1973	8760	1380	0.1575	8760	1380	0.1575
1974	8760	1376	0.1571	8760	1380	0.1575
1975	8760	1526	0.1742	8760	1530	0.1747
1976	8784	1909	0.2173	8784	1913	0.2178
1977	8760	2100	0.2397	8760	2104	0.2402
1978	8760	1722	0.1966	8760	1722	0.1966
1979	8760	1352	0.1543	8760	1356	0.1548
1980	8784	1368	0.1557	8784	1372	0.1562
1981	8760	1315	0.1501	8760	1319	0.1506

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent_of_Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent_of_Missing_LCD
1982	8760	0	0	8760	5	0.0006
1983	8760	4	0.0005	8762	9	0.001
1984	8784	4	0.0005	8789	9	0.001
1985	8760	9	0.001	8760	14	0.0016
1986	8760	9	0.001	8762	11	0.0013
1987	8760	1	0.0001	8762	6	0.0007
1988	8784	2	0.0002	8786	7	0.0008
1989	8760	59	0.0067	8760	64	0.0073
1990	8760	1	0.0001	8760	6	0.0007
1991	8760	0	0	8761	5	0.0006
1992	8784	0	0	8784	5	0.0006
1993	8760	0	0	8760	0	0
1994	8760	167	0.0191	8760	167	0.0191
1995	8760	468	0.0534	8774	472	0.0538
1996	8784	1411	0.1606	8945	1416	0.1583
1997	8760	1521	0.1736	8971	1525	0.17
1998	8760	1562	0.1783	9057	1567	0.173
1999	8760	1252	0.1429	9098	1257	0.1382
2000	8784	160	0.0182	9049	165	0.0182
2001	8760	77	0.0088	8936	81	0.0091
2002	8760	253	0.0289	9028	258	0.0286
2003	8760	453	0.0517	9127	458	0.0502
2004	8784	372	0.0423	9108	372	0.0408
2005	8760	9	0.001	8760	20	0.0023
2006	8760	4	0.0005	8760	4	0.0005
2007	8760	10	0.0011	8763	10	0.0011
2008	8784	4	0.0005	8788	4	0.0005
2009	8760	3	0.0003	8763	3	0.0003
2010	8760	1	0.0001	8761	1	0.0001
2011	8760	2	0.0002	8765	7	0.0008
2012	8784	2	0.0002	8787	2	0.0002
2013	8760	12	0.0014	8761	17	0.0019
2014	8760	3	0.0003	8761	8	0.0009
2015	8760	6	0.0007	8761	7	0.0008
2016	8784	0	0	8785	0	0
2017	8760	36	0.0041	8764	36	0.0041
2018	8760	24	0.0027	8763	24	0.0027
2019	8760	15	0.0017	8760	15	0.0017
2020	8784	11	0.0013	8784	19	0.0022
2021	1752	31	0.0177	120	0	0

Table 15. Summary of the missing dew point temperature data at gage 72506854777.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
2005	24	19	0.7917			
2006	8760	1	0.0001	8763	1	0.0001
2007	8760	21	0.0024	8760	21	0.0024
2008	8784	14	0.0016	8784	14	0.0016
2009	8760	72	0.0082	8761	72	0.0082
2010	8760	56	0.0064	8761	56	0.0064
2011	8760	30	0.0034	8760	35	0.004
2012	8784	51	0.0058	8784	51	0.0058
2013	8760	46	0.0053	8760	51	0.0058
2014	8760	25	0.0029	8760	30	0.0034
2015	8760	1	0.0001	8760	1	0.0001
2016	8784	68	0.0077	8784	68	0.0077
2017	8760	39	0.0045	8760	39	0.0045
2018	8760	29	0.0033	8760	29	0.0033
2019	8760	74	0.0084	8760	74	0.0084
2020	8784	11	0.0013	8784	16	0.0018
2021	1680	23	0.0137	120	8	0.0667

Table 16. Summary of the missing dew point temperature data at gage 7250689999.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1942	2184	772	0.3535
1943	8760	29	0.0033
1944	8784	5922	0.6742
1945	8760	8760	1
1946	8760	8760	1
1947	8760	8760	1
1948	8784	7658	0.8718
1949	8760	371	0.0424
1950	8760	50	0.0057
1951	8760	10	0.0011
1952	8784	23	0.0026
1953	8760	1	0.0001
1954	8760	2	0.0002
1955	8760	4	0.0005
1956	8784	31	0.0035
1957	8760	106	0.0121
1958	8760	119	0.0136
1959	8760	5	0.0006
1960	8784	32	0.0036
1961	8760	2	0.0002
1962	8760	1	0.0001
1963	8760	0	0
1964	8784	3	0.0003
1965	8760	0	0
1966	8760	1	0.0001
1967	8760	1	0.0001
1968	8784	10	0.0011
1969	8760	0	0
1970	8760	101	0.0115
1971	8760	975	0.1113
1972	8784	8784	1
1973	8760	8760	1
1974	8760	8760	1
1975	8760	8760	1
1976	8784	8784	1
1977	8760	8760	1
1978	8760	8760	1
1979	8760	8760	1
1980	8784	8784	1
1981	8760	8760	1

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1982	8760	8760	1
1983	8760	8760	1
1984	8784	8784	1
1985	8760	8760	1
1986	8760	8760	1
1987	8760	8760	1
1988	8784	8784	1
1989	8760	8760	1
1990	8760	8760	1
1991	8760	8760	1
1992	8784	8784	1
1993	8760	8760	1
1994	8760	8760	1
1995	8760	8760	1
1996	8784	8784	1
1997	8760	8760	1
1998	8760	3407	0.3889
1999	8760	533	0.0608
2000	8784	443	0.0504
2001	8760	493	0.0563
2002	8760	1054	0.1203
2003	8760	1865	0.2129
2004	8784	2546	0.2898
2005	8736	7972	0.9125

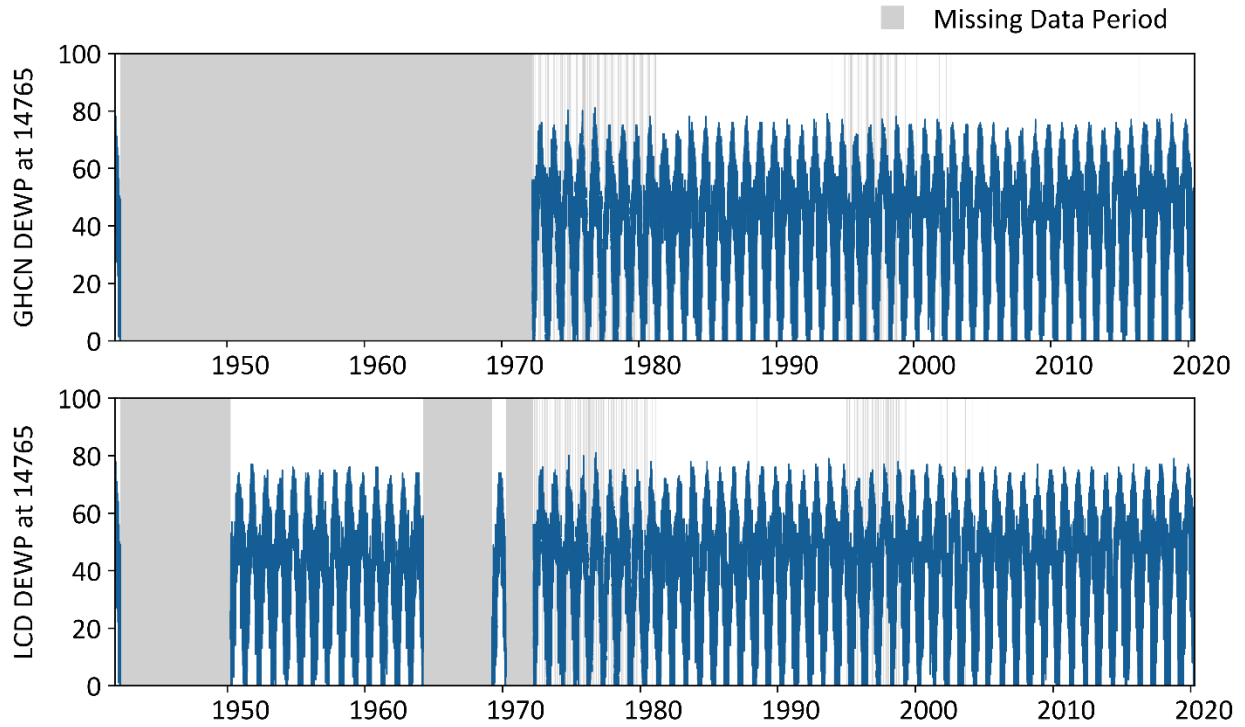


Figure 25. The dew point temperature data at gage 72506814765.

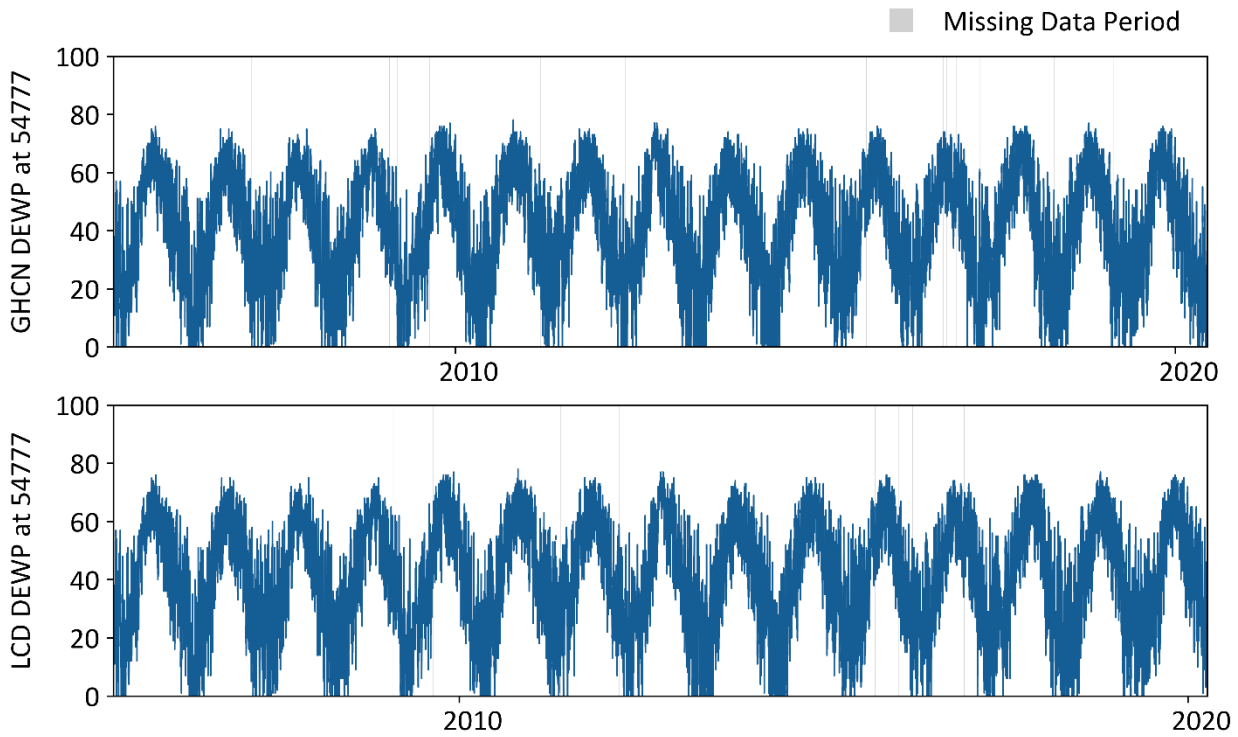


Figure 26. The dew point temperature data at gage 72506854777.

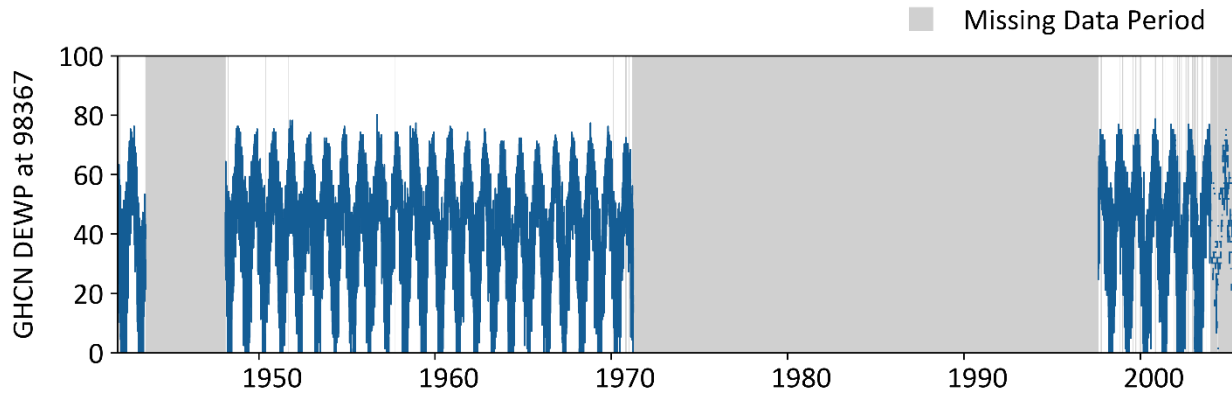


Figure 27. The dew point temperature data at gage 72506899999.

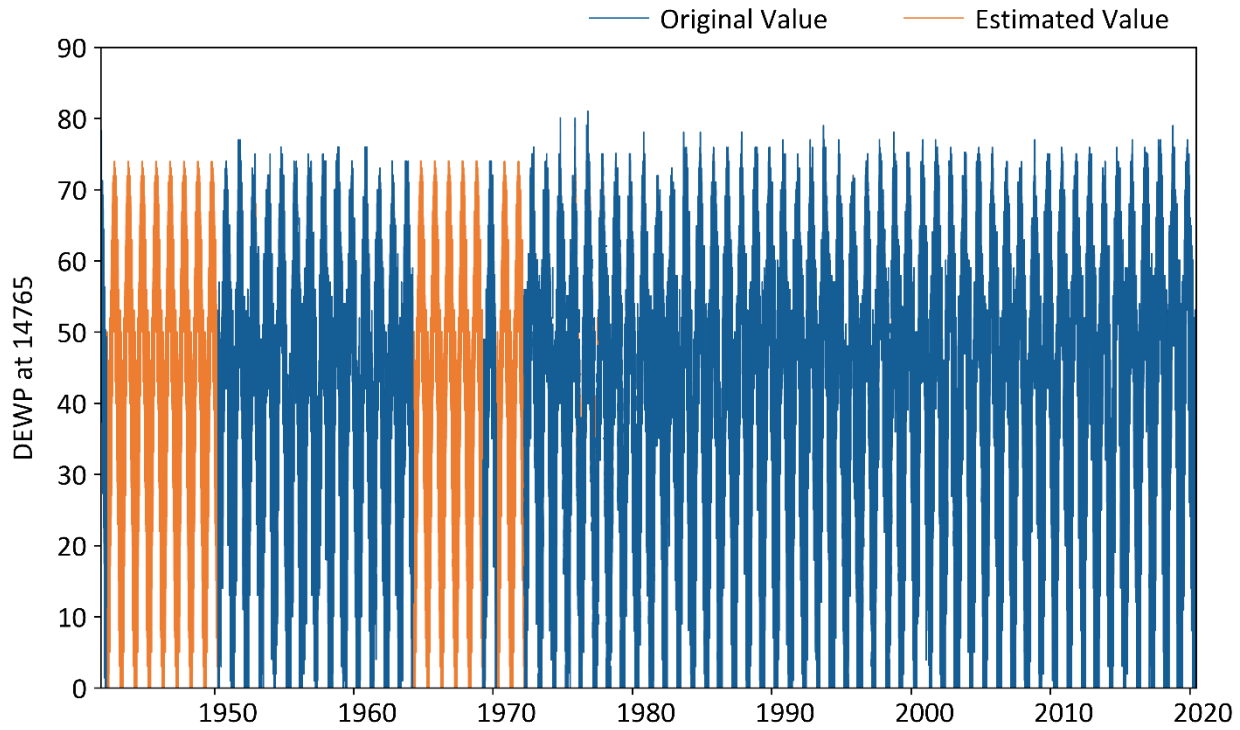


Figure 28. The filled dew point temperature data at gage 72506814765.

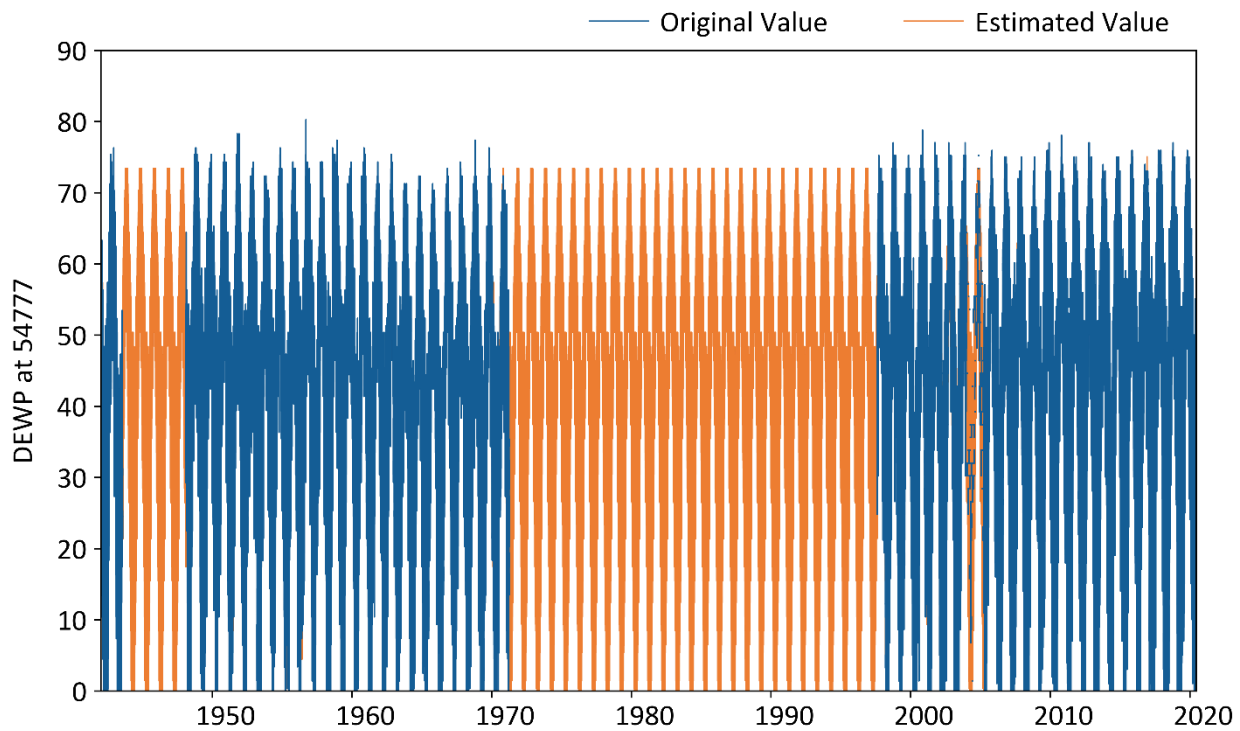


Figure 29. The filled dew point temperature data at gage 72506854777.

Cloud Cover

Table 17. Summary of the missing cloud cover data at gage 72506814765.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent_of_Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent_of_Missing_LCD
1942	3672	968	0.2636	3672	968	0.2636
1943	8760	8760	1	8760	8760	1
1944	8784	8784	1	8784	8784	1
1945	8760	8760	1	8760	8760	1
1946	8760	8760	1	8760	8760	1
1947	8760	8760	1	8760	8760	1
1948	8784	8784	1	8784	8784	1
1949	8760	8760	1	8760	8760	1
1950	8760	8760	1	8760	8760	1
1951	8760	8760	1	8760	8760	1
1952	8784	8784	1	8784	8784	1
1953	8760	8760	1	8760	8760	1
1954	8760	8760	1	8760	8760	1
1955	8760	8760	1	8760	8760	1
1956	8784	8784	1	8784	8784	1
1957	8760	8760	1	8760	8760	1
1958	8760	8760	1	8760	8760	1
1959	8760	8760	1	8760	8760	1
1960	8784	8784	1	8784	8784	1
1961	8760	8760	1	8760	8760	1
1962	8760	8760	1	8760	8760	1
1963	8760	8760	1	8760	8760	1
1964	8784	8784	1	8784	8784	1
1965	8760	8760	1	8760	8760	1
1966	8760	8760	1	8760	8760	1
1967	8760	8760	1	8760	8760	1
1968	8784	8784	1	8784	8784	1
1969	8760	8760	1	8760	8760	1
1970	8760	8760	1	8760	8760	1
1971	8760	8760	1	8760	8760	1
1972	8784	8784	1	8784	8784	1
1973	8760	8760	1	8760	8760	1
1974	8760	8760	1	8760	8760	1
1975	8760	8760	1	8760	8760	1
1976	8784	8784	1	8784	8784	1
1977	8760	8760	1	8760	8760	1
1978	8760	8760	1	8760	8760	1
1979	8760	8760	1	8760	8760	1
1980	8784	8784	1	8784	8784	1
1981	8760	8760	1	8760	8760	1

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
1982	8760	8760	1	8760	8760	1
1983	8760	8760	1	8760	8760	1
1984	8784	8784	1	8784	8784	1
1985	8760	8760	1	8760	8760	1
1986	8760	8760	1	8760	8760	1
1987	8760	8760	1	8760	8760	1
1988	8784	8784	1	8784	8784	1
1989	8760	8760	1	8760	8760	1
1990	8760	8760	1	8760	8760	1
1991	8760	8760	1	8760	8760	1
1992	8784	8784	1	8784	8784	1
1993	8760	8760	1	8760	8760	1
1994	8760	8760	1	8760	8760	1
1995	8760	8760	1	8760	8760	1
1996	8784	6904	0.786	8905	6904	0.7753
1997	8760	4968	0.5671	8925	4968	0.5566
1998	8760	3139	0.3583	8959	3139	0.3504
1999	8760	8760	1	8760	8760	1
2000	8784	8784	1	8784	8784	1
2001	8760	8760	1	8760	8760	1
2002	8760	8760	1	8760	8760	1
2003	8760	8760	1	8760	8760	1
2004	8784	8779	0.9994	8784	8779	0.9994
2005	8760	1215	0.1387	8760	1220	0.1393
2006	8760	1097	0.1252	8761	1097	0.1252
2007	8760	1025	0.117	8761	1025	0.117
2008	8784	1028	0.117	8784	1008	0.1148
2009	8760	887	0.1013	8764	887	0.1012
2010	8760	1023	0.1168	8761	1023	0.1168
2011	8760	1016	0.116	8761	1017	0.1161
2012	8784	924	0.1052	8784	924	0.1052
2013	8760	384	0.0438	8760	389	0.0444
2014	8760	17	0.0019	8760	22	0.0025
2015	8760	15	0.0017	8760	16	0.0018
2016	8784	6	0.0007	8784	6	0.0007
2017	8760	187	0.0213	8760	187	0.0213
2018	8760	10	0.0011	8760	10	0.0011
2019	8760	153	0.0175	8760	153	0.0175
2020	8784	13	0.0015	8784	36	0.0041
2021	1752	25	0.0143	120	120	1

Table 18. Summary of the missing cloud cover data at gage 72506854777.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN	Count_Total_LCD	Count_of_Missing_LCD	Percent of Missing_LCD
2005	24	19	0.7917			
2006	8760	4352	0.4968	8762	4352	0.4967
2007	8760	4516	0.5155	8760	4516	0.5155
2008	8784	4492	0.5114	8784	4492	0.5114
2009	8760	4183	0.4775	8760	4183	0.4775
2010	8760	4459	0.509	8761	4459	0.509
2011	8760	4150	0.4737	8760	4153	0.4741
2012	8784	4247	0.4835	8784	4247	0.4835
2013	8760	1297	0.1481	8760	1302	0.1486
2014	8760	8	0.0009	8760	13	0.0015
2015	8760	3	0.0003	8760	3	0.0003
2016	8784	85	0.0097	8784	85	0.0097
2017	8760	48	0.0055	8760	48	0.0055
2018	8760	51	0.0058	8760	51	0.0058
2019	8760	202	0.0231	8760	202	0.0231
2020	8784	45	0.0051	8784	59	0.0067
2021	1680	22	0.0131	120	120	1

Table 19. Summary of the missing cloud cover data at gage 7250689999.

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1942	2184	839	0.3842
1943	8760	2171	0.2478
1944	8784	6851	0.7799
1945	8760	8760	1
1946	8760	8760	1
1947	8760	8760	1
1948	8784	7893	0.8986
1949	8760	1989	0.2271
1950	8760	1877	0.2143
1951	8760	1690	0.1929
1952	8784	2231	0.254
1953	8760	2190	0.25
1954	8760	2021	0.2307
1955	8760	2559	0.2921
1956	8784	2365	0.2692
1957	8760	2300	0.2626
1958	8760	4107	0.4688
1959	8760	6453	0.7366
1960	8784	6554	0.7461
1961	8760	6481	0.7398
1962	8760	6580	0.7511
1963	8760	6614	0.755
1964	8784	6547	0.7453
1965	8760	7640	0.8721
1966	8760	8760	1
1967	8760	8760	1
1968	8784	8784	1
1969	8760	8760	1
1970	8760	8760	1
1971	8760	8760	1
1972	8784	8784	1
1973	8760	8760	1
1974	8760	8760	1
1975	8760	8760	1
1976	8784	8784	1
1977	8760	8760	1
1978	8760	8760	1
1979	8760	8760	1
1980	8784	8784	1
1981	8760	8760	1

Year	Count_Total_GHCN	Count_of_Missing_GHCN	Percent of Missing_GHCN
1982	8760	8760	1
1983	8760	8760	1
1984	8784	8784	1
1985	8760	8760	1
1986	8760	8760	1
1987	8760	8760	1
1988	8784	8784	1
1989	8760	8760	1
1990	8760	8760	1
1991	8760	8760	1
1992	8784	8784	1
1993	8760	8760	1
1994	8760	8760	1
1995	8760	8760	1
1996	8784	8784	1
1997	8760	8760	1
1998	8760	6253	0.7138
1999	8760	8760	1
2000	8784	8784	1
2001	8760	8760	1
2002	8760	8760	1
2003	8760	8760	1
2004	8784	8784	1
2005	8736	8193	0.9378

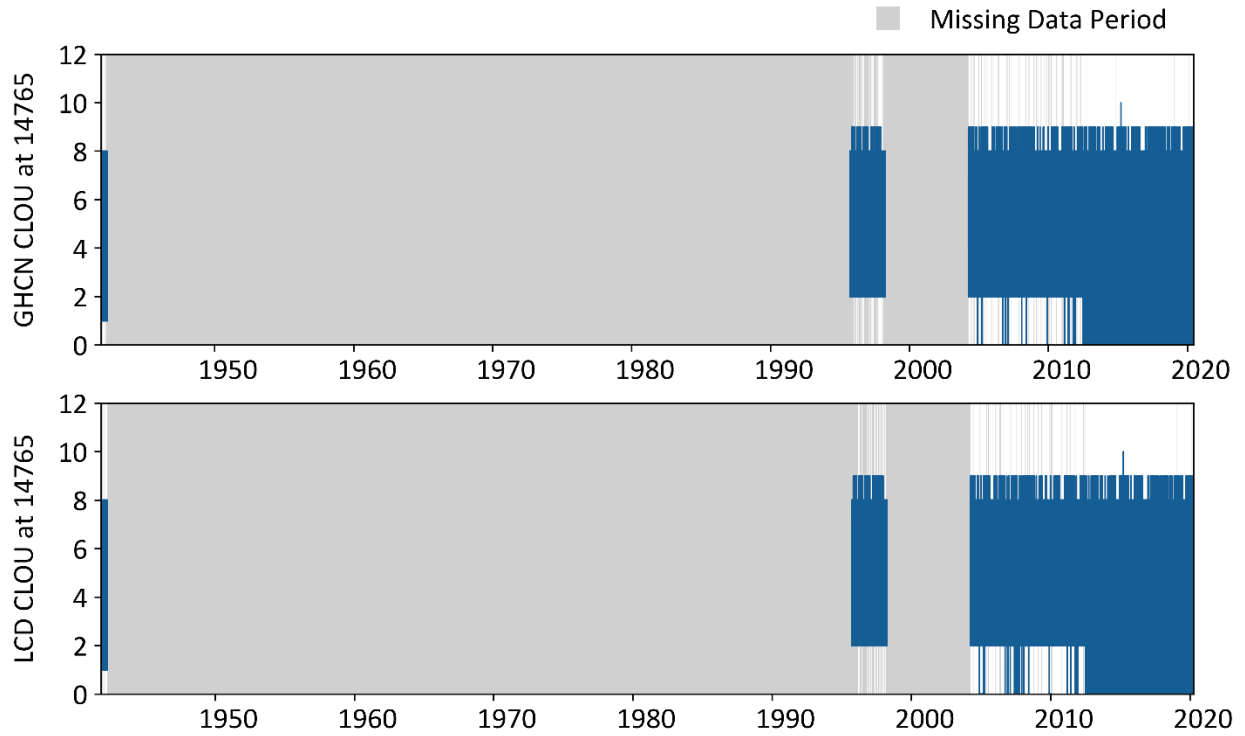


Figure 30. The cloud cover data at gage 72506814765.

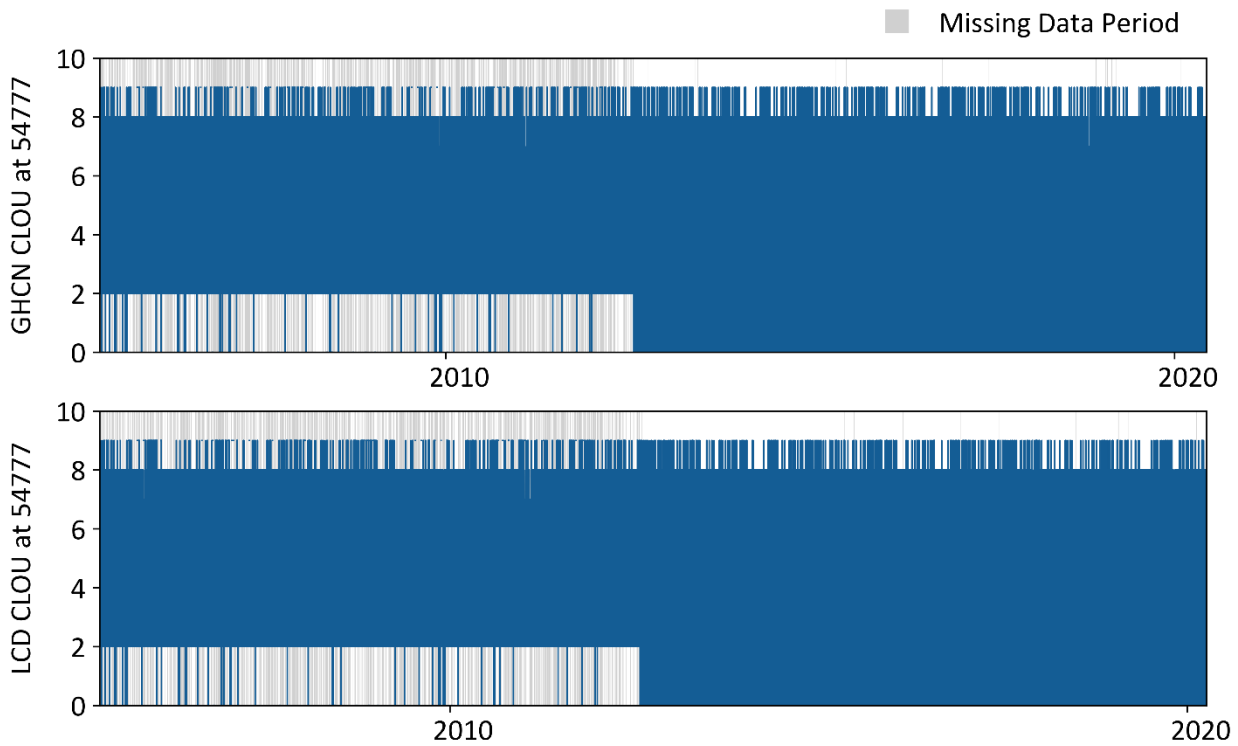


Figure 31. The cloud cover data at gage 72506854777.

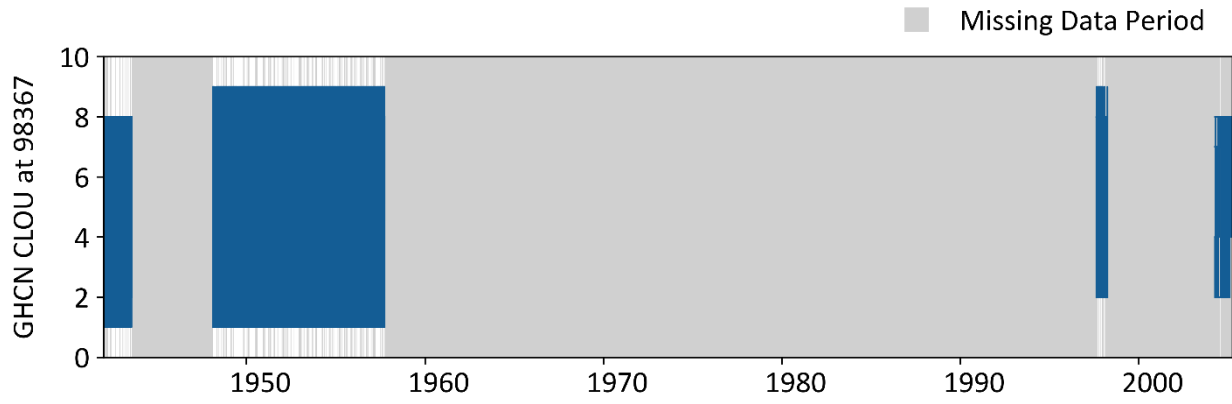


Figure 32. The cloud cover data at gage 72506899999.

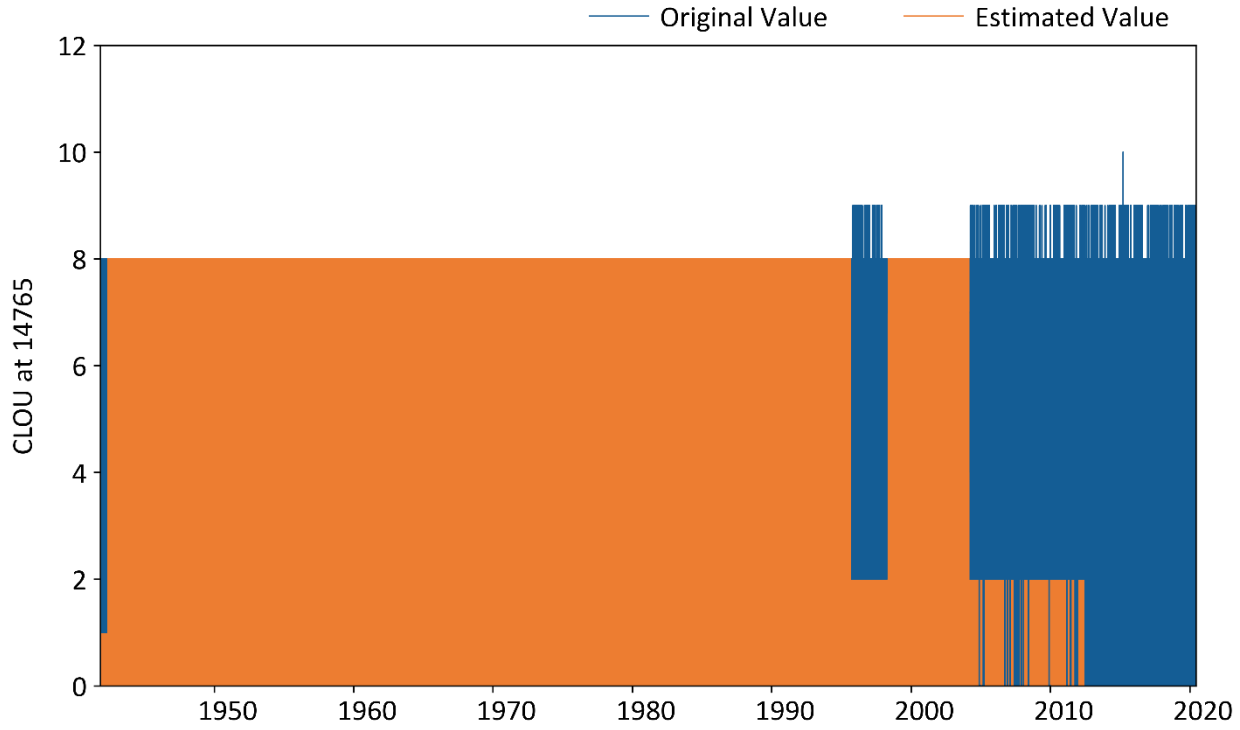


Figure 33. The filled cloud cover data at gage 72506814765.

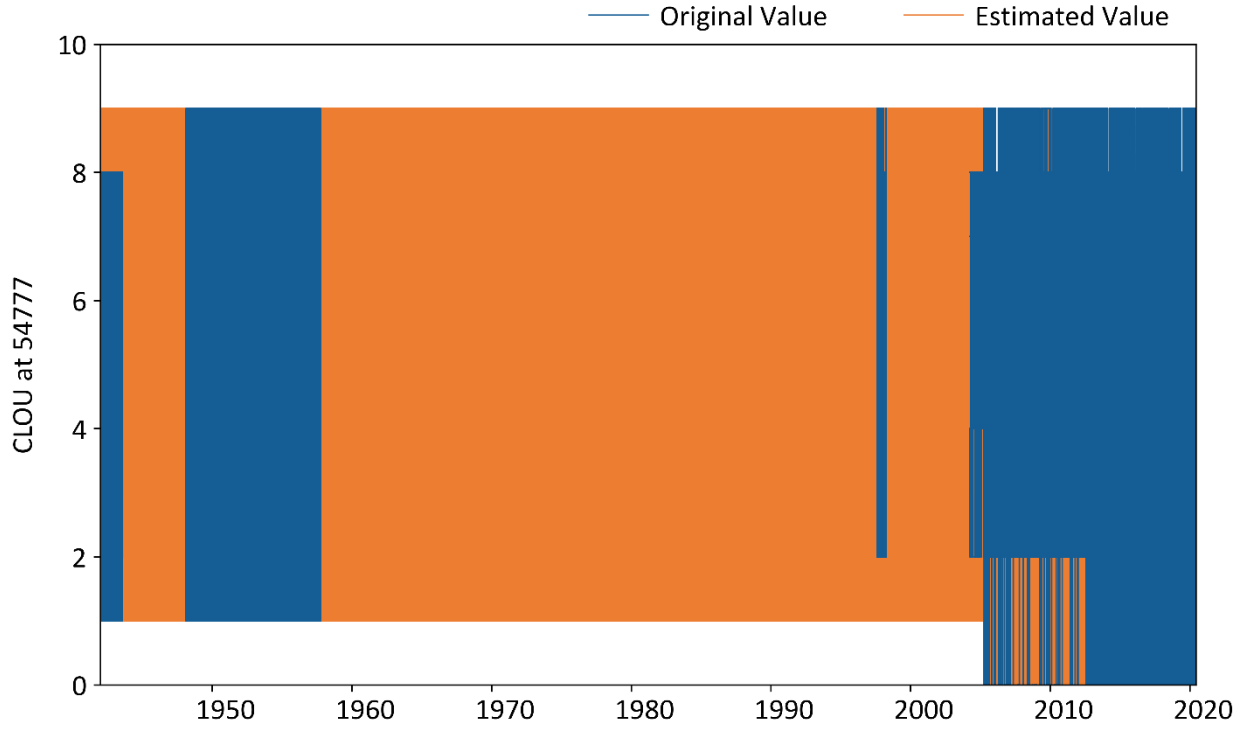


Figure 34. The filled cloud cover data at gage 72506854777.

Solar Radiation

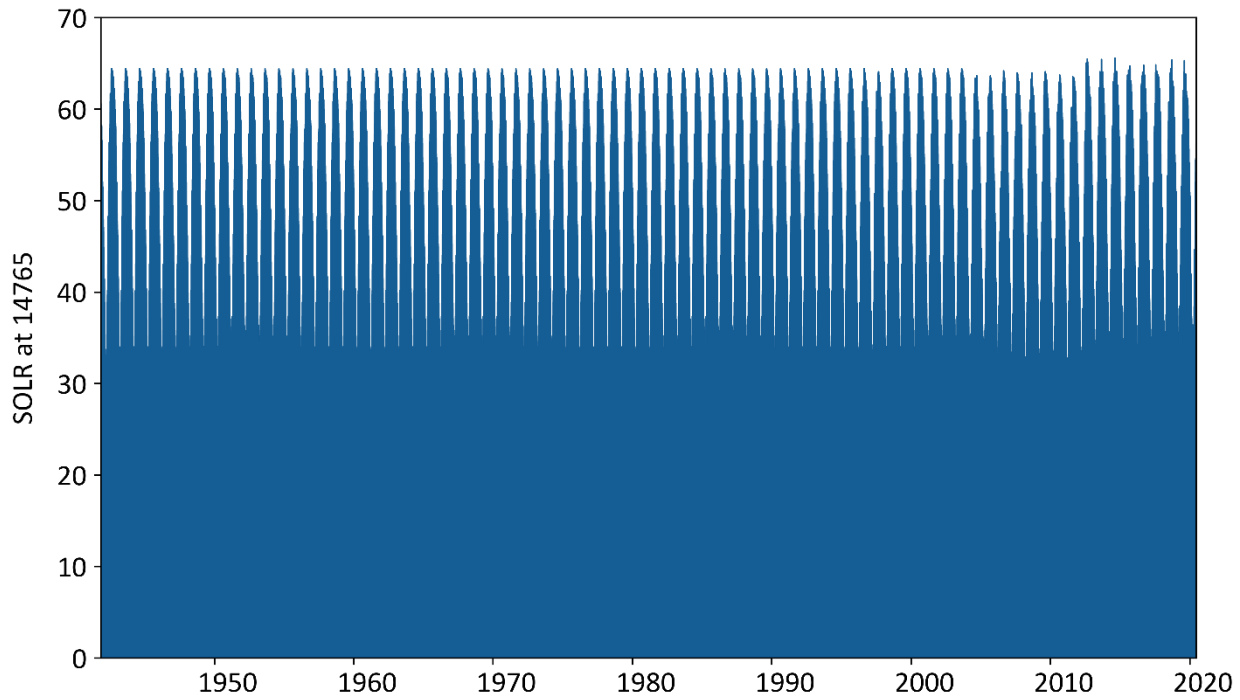


Figure 35. The computed solar radiation data at gage 72506814765 using WDM Utility.

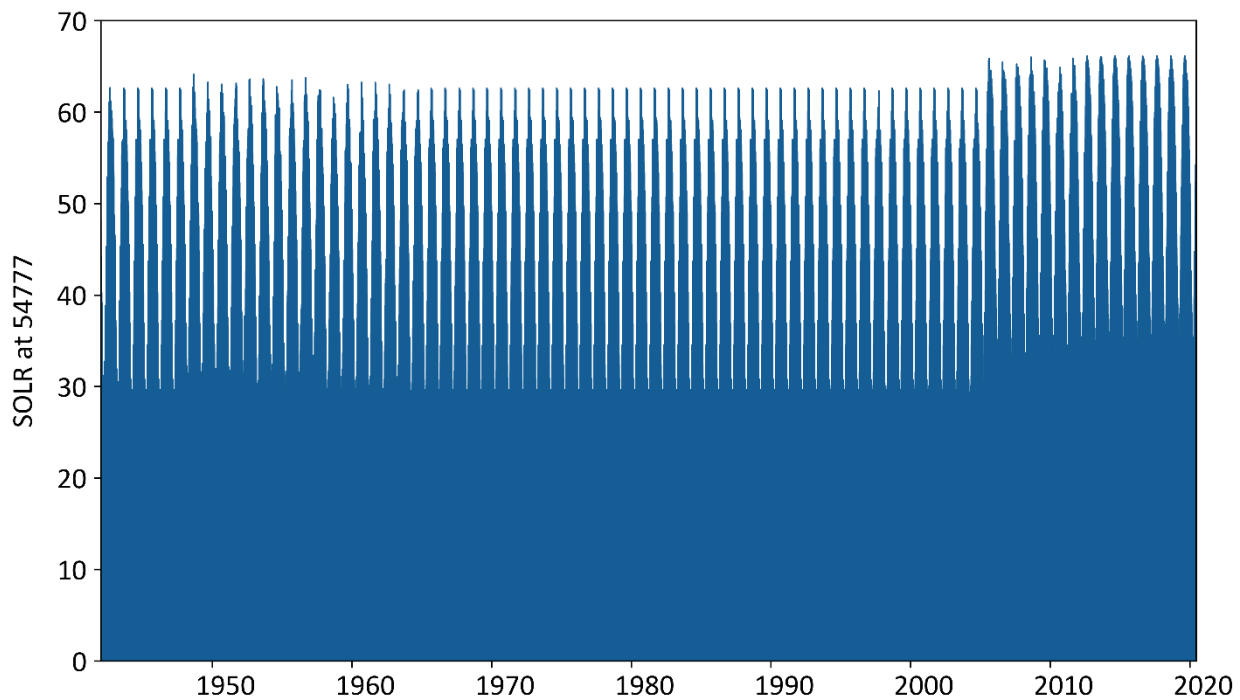


Figure 36. The computed solar radiation data at gage 72506854777 using WDM Utility.

Potential Evapotranspiration

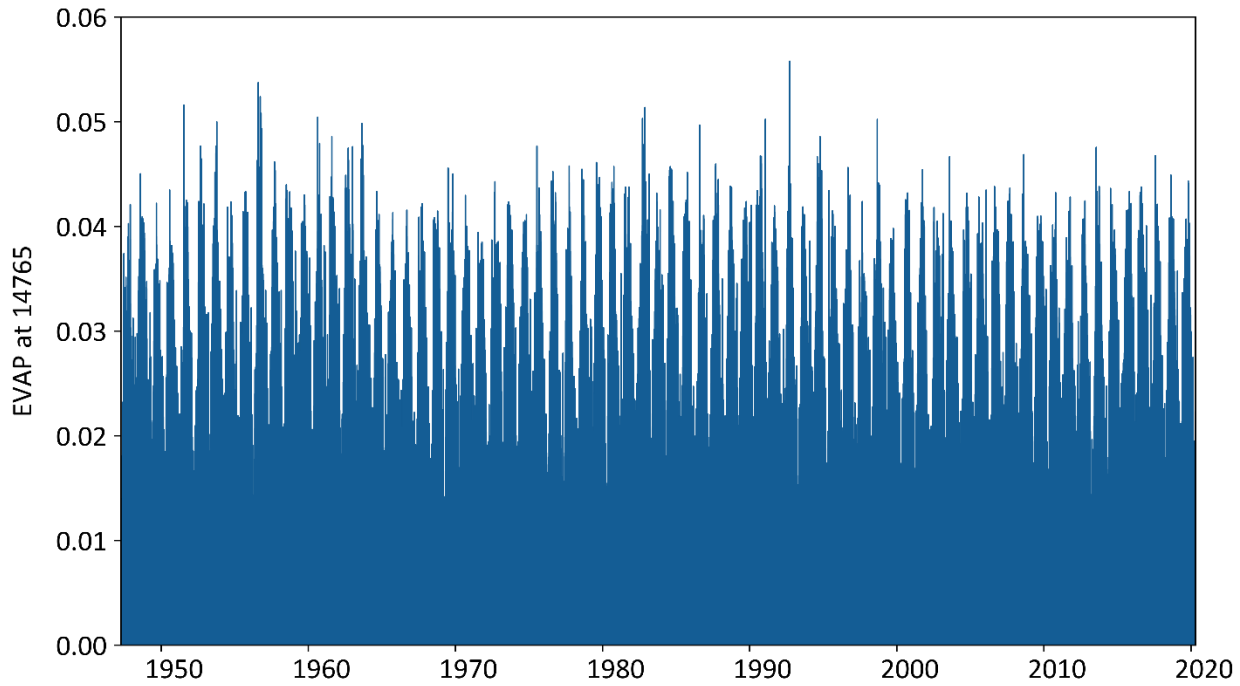


Figure 37. The computed potential evapotranspiration data at gage 72506814765 using WDM Utility.

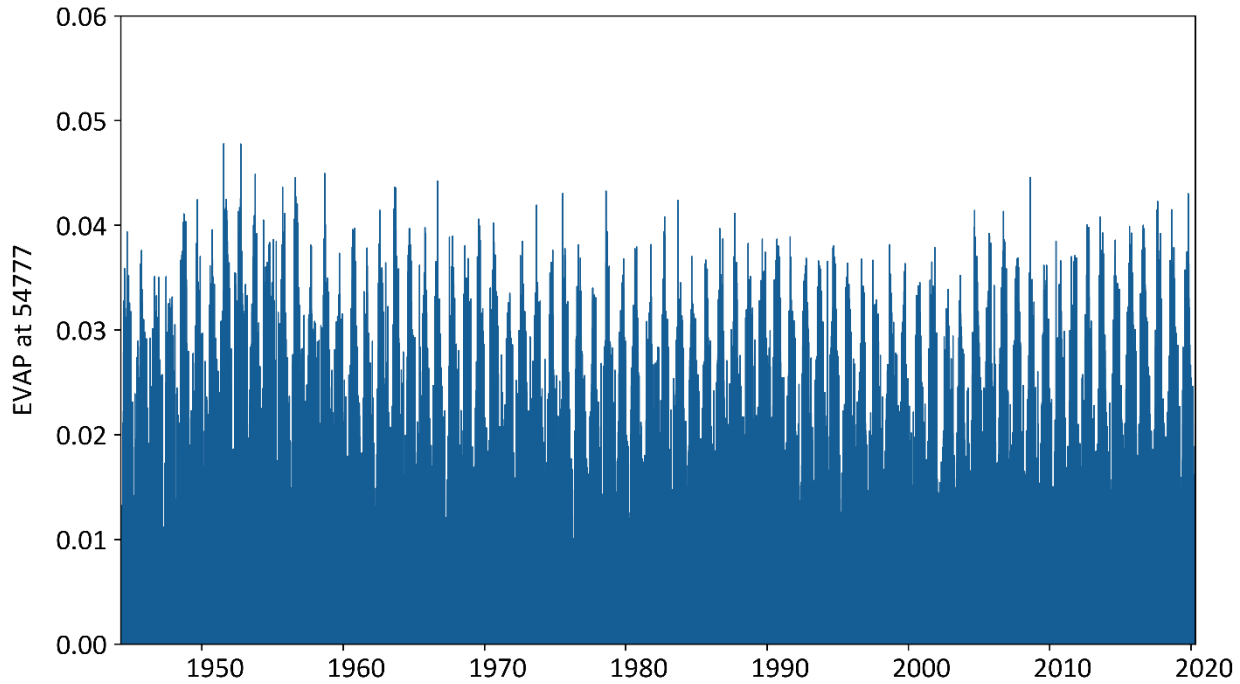


Figure 38. The computed potential evapotranspiration data at gage 72506854777 using WDM Utility.