A Community Guide to Researching Missouri Climate and Weather History

January 2016

This material is based upon work supported by the National Science Foundation under Award Number IIA-1355406. Any opinions, findings, and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.
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Preface

Climate data is information, predominantly measurements of weather or weather patterns, that can be used to understand patterns in weather, the current climate, and climate change. These data may be as simple as the temperature on a given day in a given location or may be as complex as a mathematical indicator for drought conditions.

The sites on this page are intended to give an overview of the historical climate of Missouri and are only sites that are available to the public and have scientific-type data: standardized, repeated, and traceable. For information on Missouri’s climate prior to the mid-19th century, non-data information sources have to be used: newspapers, personal journals, travel diaries, and the like.

The sites on this page are broken down into three groups: those that track climate information on a large scale - state or region - and encompass Missouri as a whole; those that track climate information on a mid- or small scale and are specific to certain localities; and those that are specific to the St. Louis area.

Because climate data is tracked by many governmental and other institutions, there may be some overlap between data sources (more than one federal bureau has historically tracked rainfall, for instance). Each source has a brief explanation of what kind of information it provides.

The major source of climate data in the United States in the 21st century is NOAA, the National Oceanic and Atmospheric Association, and many of these sites are part of that larger government agency (and which is itself part of the Department of Commerce). The National Weather Service is part of NOAA.
Data: Missouri

General

- Missouri Climate Center
  http://climate.missouri.edu/
  Much historical weather data specific to Missouri can be accessed through the website of the Missouri Climate Center. Its section on Missouri Climate Data (http://climate.missouri.edu/modata.php) contains several links to state-level data including a list of Significant Weather Events of the Century.

Temperature Data

- US Climate Divisional Dataset (1895-present, monthly)
  This data tracks climate data within states, which are broken into divisions. Missouri has six divisions: the Northwest Prairie (1), Northeast Prairie (2), West Central Plains (3), West Ozarks (4), East Ozarks (5), and the Bootheel (6). St. Louis is in region 2.

  The temperature data for each region for the years 1931-2013 is an average of the temperature data from all the reporting stations within that region. Temperature data for each region for the years 1895-1930 was only published as an average and more specific station-level data doesn’t exist. This dataset includes temperature, precipitation (rain, sleet, snow, etc.) and drought conditions.
The dataset itself is very large and difficult to interpret without computerized help, but there is also an interactive page to compare past and current climate temperature and drought conditions. You can compare data by month, season, or year in graph form.


(Note: This may not work on all browsers.)

➢ National Climate Data Center Image and Publications System
http://www.ncdc.noaa.gov/IPS/index.jsp
This site includes image scans of historic printed climate publications as well as modern renderings covering a wide variety of conditions, areas, and years.
The Climatological Data page ([http://www.ncdc.noaa.gov/IPS/cd/cd.html](http://www.ncdc.noaa.gov/IPS/cd/cd.html)) covers monthly temperature and precipitation, by month. Each month’s data is available in a separate PDF file and must be downloaded separately. Annual reviews are available for some but not all years. This site allows for the download of weather publications in Missouri dating back to 1884.

- **Heat Index and Wind Chill maps, 1981-present (heat index invented in 1971)**

This site shows nation-wide maps by season and by month for the affected times of year: June, July, August for heat index; January-April for wind chill; “winter” includes data for December. This can be helpful for determining the historic risk of heat deaths; a breezy or windy day with a very high temperature and low humidity may be less risky than a muggy day with slightly lower temperature.
Midwestern Regional Climate Center (MRCC)
http://mrcc.isws.illinois.edu/

The Midwestern Regional Climate Center is a joint project of the National Climate Data Center (part of NOAA) and the Illinois State Water Survey. This site has historic and current climate data from nine states including Missouri and Illinois. (Because it is an aggregator, this site may or may not include all severe weather events. Their tornado data comes from the Storm Prediction Center.)

Their new data site, cli-MATE, requires registration (with a valid email) but is free. http://mrcc.isws.illinois.edu/CLIMATE/

cli-MATE has interactive tools, including maps, for data going back various years (depending on the recording station). You can choose an individual station (for instance, St. Louis Lambert International Airport) as your default data source and see what data is available. Each station has a list of the years that it covers. The oldest Missouri recording station is ST LOUIS EADS BRG, 1873-1968; the second oldest is Columbia, 1889-present. See the
The MRCC also includes the Climate Database Modernization Project
http://mrcc.isws.illinois.edu/research/cdmp/cdmp.html
The Climate Database Modernization Program (CDMP) is working to preserve
and place online a wide range of observations about the climate from the last
three centuries. The data is digitized and the status of the digitization is available
on this page; the data itself is included in cli-MATE. This project includes a
history of data from Harrisonville, MO, 1859-1984, which predates any data
available in cli-MATE.

Precipitation
(see also: other sources above)

- Regional Snowfall Index Historic Storms page
  http://www.ncdc.noaa.gov/snow-and-ice/hsi/historic-storms
  This site has simple descriptions of major snowstorms, 1940s-present. Missouri
  is in the “Ohio Valley” region for this project’s data

Floods

- Mississippi River Flood History, 1543-present
http://www.srh.noaa.gov/lix/?n=ms_flood_history
This site’s data is specific to the Lower Mississippi (New Orleans and environs) but some floods listed are documented as starting much further north. It may be useful for people looking to chart the long-term history of floods of the Mississippi.

➤ The National Weather Service River Forecast Office/Advanced Hydrological Prediction Service
This site tracks river levels, including flood stages, for US rivers. This is the link to the St. Louis Forecast Office and has links for individual rivers at various locations. Each historical crest is location-based and each must be searched separately.
Note that the St. Louis Forecast Office also covers much of southern Illinois and rivers may be listed without having any relevant Missouri data.

Tornadoes (may include Severe Thunderstorms/Lightning Storms)

- **NOAA Storm Prediction Center Severe Events Archive**
  
  [http://www.spc.noaa.gov/exper/archive/events/](http://www.spc.noaa.gov/exper/archive/events/)

  The Severe Events Archive has a listing of “severe storm events” that can be searched by year and state. Each event has its own page (for instance, the event of January 3, 2000: [http://www.spc.noaa.gov/exper/archive/event.php?date=20000103](http://www.spc.noaa.gov/exper/archive/event.php?date=20000103)) which lists all reported incidents for that severe event. The events themselves aren’t confined to a given state, so each event must be viewed individually to see its effect on Missouri. To view the warnings or information put out by the National Weather Service for each event, navigate to that event’s page and click on “Click for discussions issued on [date]”

- **Midwest Climate Center, Tornado Tracks Tool**
  
  [http://mrcc.isws.illinois.edu/gismaps/cntytorn.htm](http://mrcc.isws.illinois.edu/gismaps/cntytorn.htm)

  This website offers functionality similar to the previous, with a few additional search delimiters such as fatalities and deaths.
NCDC Storm Events Database
http://www.ncdc.noaa.gov/stormevents/
This site also has an archive of storm events, which you can search by county or by type of event. The earliest data is from January 1950. The database can be searched by area or by “narrative text search” which allows you to do searches such as “Missouri drought.” The data includes information on deaths, injury, and property damage caused by each storm.

National Climate Data Center Image and Publications System
The Climatological Data page (http://www.ncdc.noaa.gov/IPS/cd/cd.html) includes downloadable reports from the National Weather Bureau’s Missouri Section that include narrative and statistical information on extreme weather events dating back to 1884.
Data: Missouri Localities

Temperature and Precipitation

- **High Plains Regional Climate Center**
  This website aims to disseminate weather data pertinent to the High Plains region of the United States. Among its features is an interactive map of individual states that allows users to access historical data from individual weather stations. Missouri’s map can be accessed through [http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps](http://www.hprcc.unl.edu/maps.php?map=ACISClimateMaps)
  By selecting precipitation and HPRCC – Missouri, users are able to local data on temperature and precipitation over various temporal intervals ranging back to 2003.

Floods

- **Missouri Climate Center, River Information for Missouri**
  [http://agebb.missouri.edu/weather/river.htm](http://agebb.missouri.edu/weather/river.htm)
Follow the links to “observed river conditions” for major rivers in Missouri and then look for links in the right hand column under the “Climate and History” heading. Here you will find archival data and information on major flood events.

Water Resources of Missouri
http://mo.water.usgs.gov/
This site provides information on Missouri’s rivers and streams. Here, you can find real-time information on stream stages, streamflow, water quality, and groundwater levels for over 200 Missouri sites. The left hand menu offers options for exploring historical data for streamflow, groundwater, water quality, annual data reports, and the Instantaneous Data Archive (IDA).

Data: St. Louis
Many of the Missouri data sources above contain within them data specific to the St. Louis metro area or to St. Louis City or County in particular. Below are sources that are specific to St. Louis and do not as a rule cover the rest of the state.

National Weather Service Events Archive
http://www.weather.gov/lsx/recentevents
This site covers significant weather events for St. Louis as tracked by the National Weather Service. Data is year-by-year from 1999 and there are descriptions of six “historic” events back to 1896. Note that this is the St. Louis regional office of the National Weather Service, so there is some data for southern Illinois as well.

Temperature

  This page is specific to data for St. Louis, Columbia, and Quincy, Illinois. Information is downloadable as numerical data in Microsoft Excel spreadsheet format. Dataset options include temperature, precipitation, and snowfall.

Floods

  This site archives Army Corps of Engineers historic flood stage data for the St. Louis station, which covers ten rivers. Each river must be searched separately, and data are in tables in PDF format. Flood stage measurements date back to
1861. Data is available for downtown St. Louis and the Chain of Rocks station, among others.

The National Weather Service River Forecast Office/Advanced Hydrological Prediction Service Historical Crests of the Mississippi River at St. Louis


This page features the raw data for Mississippi crests, in order of flood height, dating back to 1785.
General Weather Data and History Resources

These additional resources contain some information about historical climate conditions in the region, the country, or the world that may be useful for making comparisons.

- **Library of Congress Chronicling America**
  [http://chroniclingamerica.loc.gov/](http://chroniclingamerica.loc.gov/)
  This site showcases digitized historical newspapers 1836-1922, including the St. Louis Republic; the Evening Missourian and the University Missourian (Columbia); the Iron County Register, and more.

- **World Bank Climate Change Knowledge Portal**
  [http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisRegion=North%20America&ThisCCode=USA](http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisRegion=North%20America&ThisCCode=USA)
  This site includes an interactive map with temperature and rainfall data going back to 1900, in 30-year increments. Can narrow to a given Latitude/Longitude.

- **The National Map Small-Scale Collection**
  [http://nationalmap.gov/small_scale/printable/clatemap.html#list](http://nationalmap.gov/small_scale/printable/clatemap.html#list)
The National Map Small-Scale Collection, which was previously part of the National Atlas, includes an archive of printable climate maps from the 1997-2014 edition. This edition was previously available digitally but has been taken offline as of October 2014. Print copies of this and prior editions should be available in any major public or research library.

Statistical Atlas of the United States

This first edition of the National Atlas included demographic, topographical, and climate data from the early 1870s. Relevant maps include precipitation, temperature, barometric pressure, and major storm centers. This version is a compiled PDF that can be downloaded in full by clicking on “Get” and then “Document (PDF)” in the right-hand menu. For individual map images (with higher resolution), visit the Library of Congress site:
http://memory.loc.gov/cgi-bin/query/h?ammem/gmd:@field(NUMBER+@band(g3701gm+gct00008))
Aerial Data

- The State Historical Society of Missouri
  
  http://statehistoricalsocietyofmissouri.org/cdm/search/collection/aerial/searchterm/louis/field/descri/mode/all/conn/and/order/nosort/ad/asc/cosuppress/0

  The State Historical Society of Missouri possesses aerial photographs of St. Louis County in 1958 and 1965 that can be viewed online.

- Historic Aerials
  

- **St. Louis County Interactive Maps**  

- **National Archives, Aerial Photography of the Soil Conservation Service, 1934-1954**  
  [http://research.archives.gov/description/305849](http://research.archives.gov/description/305849)  
  Images are not available online, but can be requested through the National Archives. The photographs primarily cover the Southwest. Coverage is of watersheds, soil erosion districts, and other areas relating to soil conservation projects. St. Louis County images from 1937; 17 indexes.
cli-MATE User Start Guide

- If you don’t already have a cli-MATE account, you will have to register for one. In your web browser, go to [http://mrcc.isws.illinois.edu/CLIMATE/index.jsp](http://mrcc.isws.illinois.edu/CLIMATE/index.jsp) and click on “Register Here” at the top right hand corner of the page.

- Once you’ve filled out the form, you should be redirected to the login page. **Note:** make sure that if you have more than one email, you remember which one you’ve used to register for the site. The password reset will produce an error page if your information does not match what’s in the cli-MATE database.

- Log in with your email and cli-MATE password.

- Once you’re logged in, you will be taken to your home page, which should display the information for your current weather station. This will default to cli-MATE’s home station.

- You can change the default and current station manually. At the top of the left-hand menu, under “Hi, [Your name],” it should say “Select Station.” This will take you to a new page.

  - If you know the name of the weather station you can enter it here.
  - If you need to look up the name of the weather station, you can do it by location.
Clicking “Next” takes you to a new page. You can then narrow the station list by county, or choose by name.

Select a station by County:

Choose a County and click "Next" ▼

Once you’ve chosen a county, click “Next.” All the weather station locations for that county will be listed on the next page.

Select a station in
ST. LOUIS CITY COUNTY, MO
(click the 'go' button next to the station you want)

<table>
<thead>
<tr>
<th>City/Name</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Elevation</th>
<th>Period of Record</th>
</tr>
</thead>
<tbody>
<tr>
<td>ST LOUIS UNIV</td>
<td>38.63</td>
<td>-90.23</td>
<td>561</td>
<td>1911 - 1973</td>
</tr>
<tr>
<td>ST. LOUIS 1.0 SW</td>
<td>38.63</td>
<td>-90.26</td>
<td>490</td>
<td>2011 - 2011</td>
</tr>
<tr>
<td>ST. LOUIS 1.5 S</td>
<td>38.61</td>
<td>-90.25</td>
<td>511</td>
<td>2009 - 2013</td>
</tr>
<tr>
<td>ST. LOUIS 2.4 S</td>
<td>38.60</td>
<td>-90.25</td>
<td>504</td>
<td>2009 - 2010</td>
</tr>
<tr>
<td>ST. LOUIS 4.9 SW</td>
<td>38.60</td>
<td>-90.29</td>
<td>486</td>
<td>2010 - 2012</td>
</tr>
<tr>
<td>ST. LOUIS 5.7 SW</td>
<td>38.58</td>
<td>-90.29</td>
<td>490</td>
<td>2013 -</td>
</tr>
<tr>
<td>ST. LOUIS 6.3 SW</td>
<td>38.57</td>
<td>-90.29</td>
<td>463</td>
<td>2014 -</td>
</tr>
</tbody>
</table>

Choose your preferred station by pressing “Go” next to the appropriate name. Note that the last column gives dates of recording at that station, so make sure the dates match the period you’re attempting to research. Pressing “Go” will take you back to the home page, but you will have a new default station. All the links in the left-hand navigation will now default to the Station, County, and State you have chosen.

CURRENT STATION INFORMATION:
Station Name: ST LOUIS UNIV
County: ST. LOUIS CITY
State: MO

More Info

From here, you can research any number of climate events or statistics. To find data on a different part of the state, simply select another station.
Using cli-MATE to Find Warmest/Coldest Periods

1. After selecting the desired station per the directions above, select “Station Data” from the menu on the left hand side. From the station data menu, select “Annual” and then click on “Summary by Month.”

2. On the Annual Climate Summary by Month page, mark “Period of Record” to see the station’s entire history. Under Climate Elements, select “Average Mean Temperature.”

3. Click “Get Climate Data” to see results. The results will be arranged in a table:
4. To find the coldest periods, use the arrows next to each month to rank by lowest temperatures (I did this for January, February, and December). Only one month can be ranked at a time. For example, here's January:
5. Similarly, to find warmest months, rank June, July, and August by highest temperature.

| Jun |  
|-----|-----
| 84.1 |
| 82.5 |
| 82.4 |
| 81.7 |
| 81.1 |
| 80.5 |
| 79.6 |
| 79.6 |
| 79.3 |
| 79.3 |
| 79.1 |
| 78.9 |
| 78.6 |
| 78.5 |
| 78.3 |
| 78.3 |
| 78.2 |
| 78.0 |
| 77.9 |
| 77.8 |
| 77.8 |
| 77.6 |
| 77.5 |
| 77.3 |
| 77.3 |
| 77.2 |
| 77.1 |
| 77.1 |
| 77.3 |

6. Once you have noted the coldest and warmest months you want to track, select “station data” from the menu on the left side. From the station data menu, select “daily” and then “between two dates.”
7. Choose “custom” under date, and then input the desired dates. Begin with a month-long period.

8. Under variables, select Mean Temperature.

9. Click “Get Tabular Data” to see results.
10. To find the coldest/warmest period within that month, note which period of about 10-14 consecutive days had the lowest/highest temperatures. For example, in the image above, a cold period extends from January 17 to January 28.

11. Calculate the average temperature for that period. This can also be done by returning to the previous page and updating the beginning and ending dates.

By clicking “Get Tabular Data,” you can use the average included at the bottom of the page.
The cold period of January 17-28 1940 could be recorded as average temp. 9°/12 days.

In addition to this method, I also found the lowest/highest recorded average daily temperatures and looked up those months for more cold/warm periods. I used http://www.crh.noaa.gov/lsx/?n=cli_archive to find these.

**Climatology and Weather Records**

NOTE: In an effort to transcribe data from old hand written records, text files and spreadsheets, errors may have been made. We have done our best to quality control the data, but it's entirely possible that some data entry errors were made. If you find errors, please write us a note. The record for St. Louis is considered unofficial prior to the year 1874.

The files listed below are Excel spreadsheet files and may be downloaded for your personal use. Right click over the link to save the file to your computer.

- Monthly and Seasonal Temperatures
- Annual Average Temperatures
- Ranked Warmest and Coldest Annual Average Temperature
- Ranked Warmest and Coldest Seasonal Average Temperatures
- Ranked Warmest Monthly Average Temperatures
- Ranked Coolest Monthly Average Temperatures
- Daily Record Maximum, Minimum, Lo High and Hi Low Temperatures
- Ranked Extreme Temperatures (1893-present)
- Ranked Occurrences of Temperatures >= 90 and 100 Degrees (1893-present)
- Ranked Occurrences of Temperatures <= 32 and 0 Degrees (1893-present)
- All Time Record Temperatures
- Heating Degree Days (since 1960)
- Cooling Degree Days (since 1960)
- Froze ClimaticWiz (since 1873)
- Growing Season Information

13. Select Ranked Extreme Temperatures (1893-present) to download the Excel spreadsheet.
14. Use the “Highest Average Temp” and “Lowest Average Temp” sections to note the highest and lowest daily temperatures.

15. Return to cli-MATE to look up the months in which these record temperatures occurred, if they weren’t included in the lowest/highest monthly average temperatures.