

# Climate Data API/GUI Walk Through

July 7, 2017

The screenshot shows the 'The SPI and NOAA API GUI' window. It includes a list of weather stations, checkboxes for downloading station data and calculating SPI, input fields for a NOAA key, SPI years, and interval, and folder selection buttons for precipitation data and SPI output. Callouts provide detailed instructions for each section.

**Available weather stations for download or calculating SPI**

Check this box if you want to download or update precipitation data from the selected weather stations

Prior to running this program, obtain a personal NOAA key from: <https://www.ncdc.noaa.gov/cdo-web/token>

Check this box if you want to download or update precipitation data from the selected weather stations

Min/Max SPI Year allow the user to dynamically adjust which years are used when computing SPI.

There are a variety of intervals that SPI can be computed at. Included in the Climate Data API/GUI are SPI 1:12, 24, and 48. These are denoted as "SPI#" from a drop-down menu. Each are aggregates of a series of months starting at 1, where "SPI1" is one month SPI, "SPI2" is two month SPI, and so on. When SPI is computed for more than 1 month, a kernel is used to smooth the values between aggregated months.

As daily accumulated precipitation is downloaded for each station, the total coverage for each month is computed and appended to the dataset. i.e., if a month only had 15 days with precipitation data, then the percent coverage for that month would be approximately 50%. This field is utilized in the Climate Data API/GUI by allowing the user to define criteria for months used in the SPI calculation. If a month's coverage falls below the desired cut-off, then it will not be used in computing SPI.

Available weather stations for download or calculating SPI

Check this box if you want to download or update precipitation data from the selected weather stations

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## 1 SUMMARY OF FEATURES

- Downloads precipitation data from the National Climate Data Center (NCDC) Climate Data Online Web Services.
  - If the precipitation data has already been downloaded, it checks the last download date and appends the dataset
  - Computes the percent precipitation coverage for each month and appends it to the dataset
  - Saves National Climatic Data Center (NCDC) plots to "NCDCPlots" folder

- Computes SPI based on the SPEI R package
  - Saves raster plot of SPI values by year and month
  - Saves filled contour plot of SPI values by year and month
  - Saves time series plot of SPI values by year
- All precipitation and SPI data are saved as CSV files

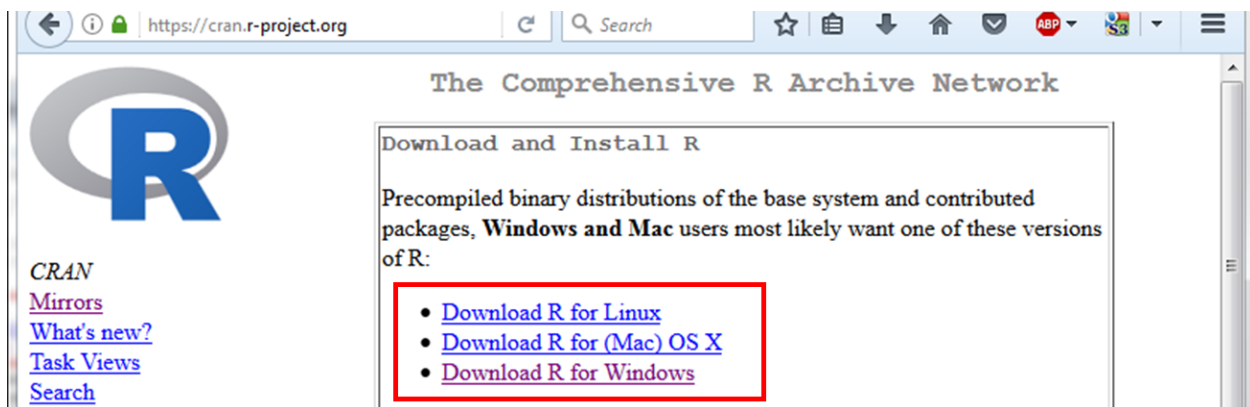
## 2 SETUP

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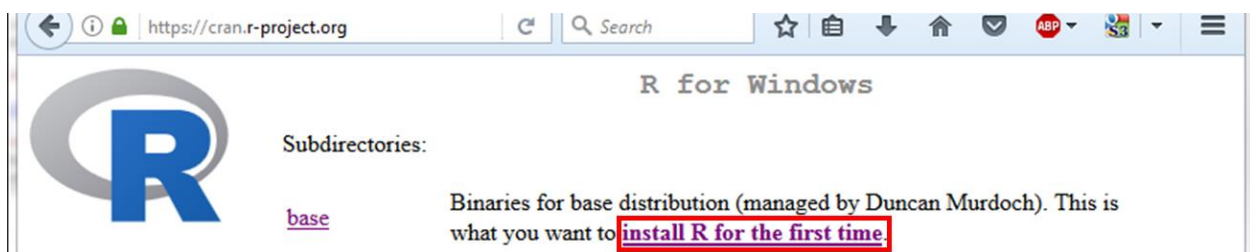
### 2.1 DOWNLOAD OR UPDATE R AND RSTUDIO TO VERSIONS:

#### A. At least R version 3.4.0

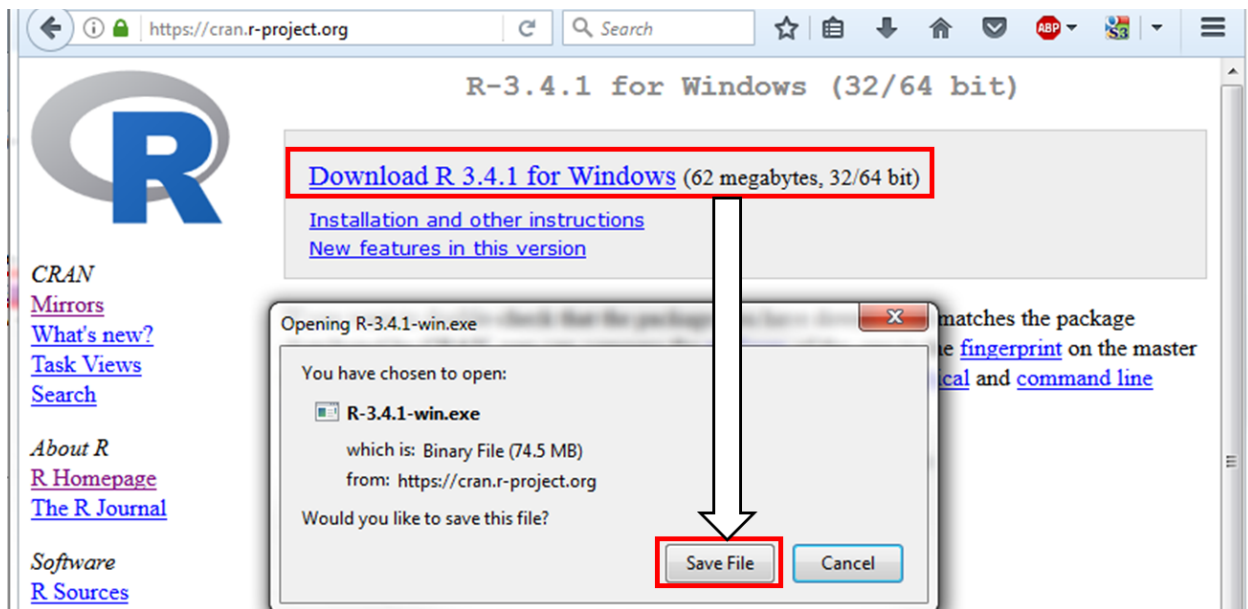
- i. <https://cran.r-project.org/>
- ii. “Download R for Windows”
  1. If you have a Mac, select the Mac download options



#### iii. “Install R for the first time”



#### iv. “Download R x.x.x for Windows”



**B. At least RStudio version 1.0.143**

- i. <https://www.rstudio.com/products/rstudio/download/>
- ii. Download the “RStudio Desktop Open Source License”

RStudio Desktop  
Open Source License

FREE

Integrated Tools for R

Priority Support

Access via Web Browser

Enterprise Security

Project Sharing

Manage Multiple R Sessions & Versions

Admin Dashboard

Load Balancing

Push-Button Publishing

Self-Managed Content

Scheduled Updates & Distribution

License: AGPL

Pricing: FREE

**DOWNLOAD**

LEARN MORE

### RStudio Desktop 1.0.143 — Release Notes


RStudio requires R 2.11.1+. If you don't already have R, download it [here](#).

### Installers for Supported Platforms

Installers	Size	Date	MD5
<b>RStudio 1.0.143 - Windows Vista/7/8/10</b>	81.9 MB	2017-04-19	76bb8
RStudio 1.0.143 - Mac OS X 10.6+ (64-bit)	71.2 MB	2017-04-19	c7f1e
RStudio 1.0.143 - Ubuntu 12.04+/Debian 8+ (32-bit)	85.5 MB	2017-04-19	21ca1
RStudio 1.0.143 - Ubuntu 12.04+/Debian 8+ (64-bit)	92.1 MB	2017-04-19	75761
RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (32-bit)	84.7 MB	2017-04-19	2c356
RStudio 1.0.143 - Fedora 19+/RedHat 7+/openSUSE 13.1+ (64-bit)	85.7 MB	2017-04-19	7ab5f

Opening RStudio-1.0.143.exe

You have chosen to open:

 **RStudio-1.0.143.exe**

which is: Binary File (81.9 MB)

from: <https://download1.rstudio.org>

Would you like to save this file?

**Save File** Cancel

## 2.2 OBTAIN A NOAA API KEY

A. <https://www.ncdc.noaa.gov/cdo-web/token>



## Request Web Services Token

To gain access to [NCDC CDO Web Services](#), register with your email address. An email will be sent with a unique token which will allow access RESTful services. For more information about CDO Web Services [read the documentation for CDO Web Services guide](#).

Please enter your email address

SUBMIT




- B. Navigate to your email account for your NOAA key after requesting a NOAA “Web Service Token”

### 2.3 PLACE THE FOLLOWING R FILES IN THE SAME FOLDER

- "gWidgets\_GUI\_Functions.R"
- "ClimateData\_SPI\_GUI\_Functions.R"
- "ClimateData\_API\_GUI\_daily\_Script.R"

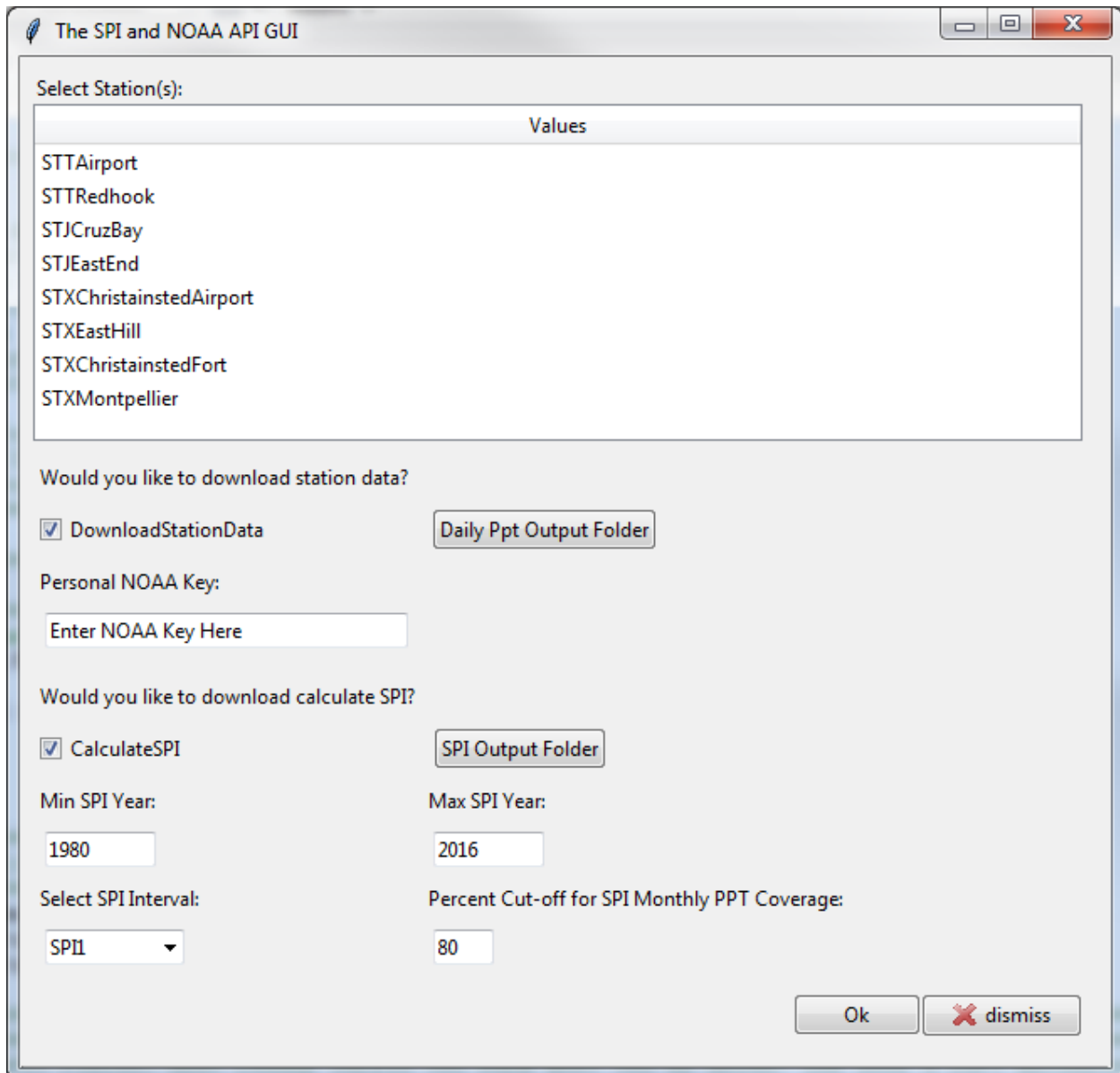
Name	Date modified	Type	Size
ClimateData_API_GUI_daily_Script.R	6/27/2017 5:44 PM	R File	24 KB
ClimateData_SPI_GUI_Functions.R	6/29/2017 3:55 PM	R File	14 KB
gWidgets_GUI_Functions.R	6/28/2017 4:52 PM	R File	13 KB

## 2.4 OPEN "CLIMATEDATA\_API\_GUI\_DAILY\_SCRIPT.R" IN RSTUDIO

Name	Date modified	Type	Size
 ClimateData_API_GUI_daily_Script.R	6/27/2017 5:44 PM	R File	24 KB
 ClimateData_SPI_GUI_Functions.R	6/29/2017 3:55 PM	R File	14 KB
 gWidgets_GUI_Functions.R	6/28/2017 4:52 PM	R File	13 KB

## 2.5 HOLD CTRL+A THEN CTRL+R

A. The SPI and NOAA API GUI will open in a new window:



The SPI and NOAA API GUI

Select Station(s):

Values
STTAirport
STTRedhook
STJCruzBay
STJEastEnd
STXChristainstedAirport
STXEastHill
STXChristainstedFort
STXMontpellier

Would you like to download station data?

☒ DownloadStationData

Personal NOAA Key:

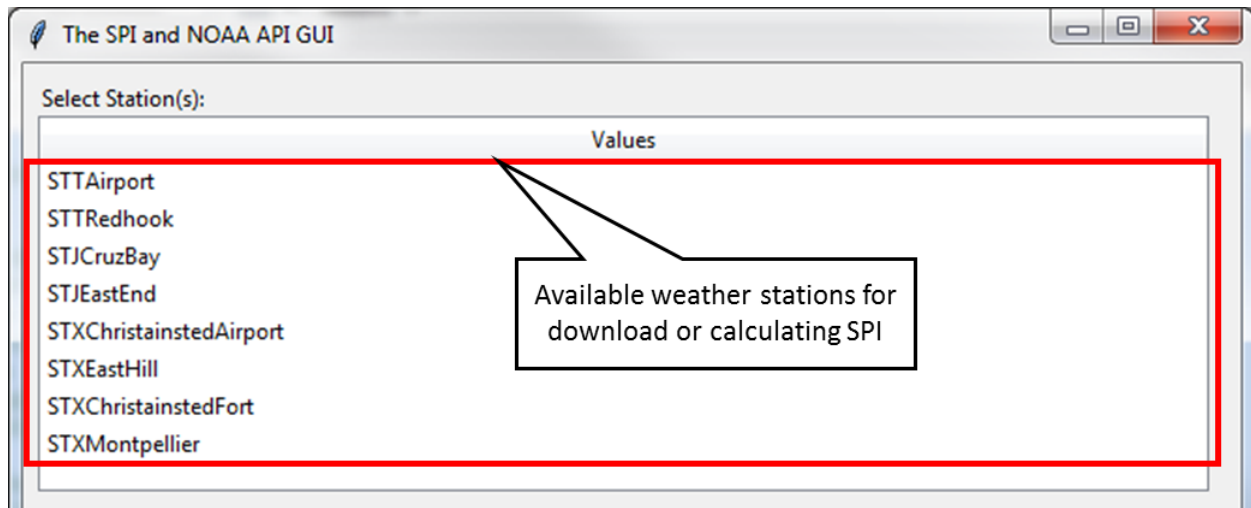
Would you like to download calculate SPI?

☒ CalculateSPI

Min SPI Year:  Max SPI Year:

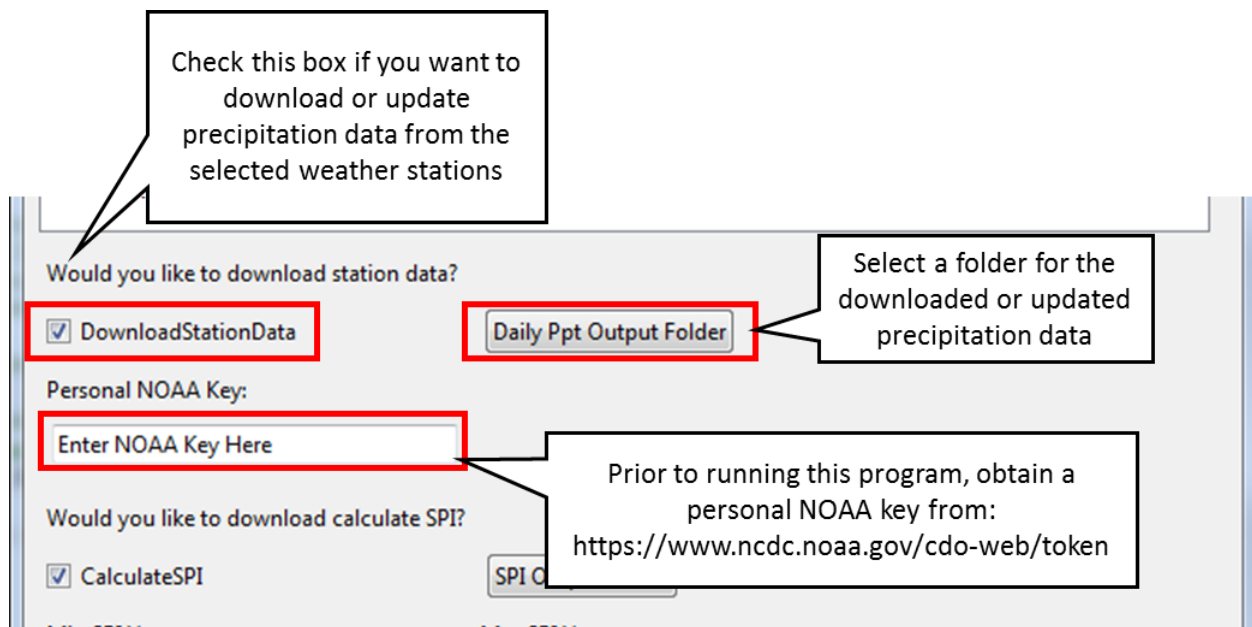
Select SPI Interval:  Percent Cut-off for SPI Monthly PPT Coverage:

## 2.6 SELECT STATIONS FROM THE AVAILABLE OPTIONS



## 2.7 TO UPDATE/DOWNLOAD & PLOT PRECIPITATION DATA FOR SELECTED STATIONS

- A. Check "DownloadStationData"
- B. Click the "Daily Ppt Output Folder" button
  - i. Select the Output Folder for weather station Ppt data (saved as CSVs)
- C. Enter personal NOAA key that was sent to your email



## 2.8 TO CALCULATE & PLOT SPI

- A. Check "CalculateSPI"
- B. Click the "SPI Output Folder"
  - i. Select the Output Folder for SPI plots and CSVs

### C. Select the Min SPI Year and Max SPI Year (Year range for running SPI)

### D. Select the SPI Interval

Would you like to download calculate SPI?

☒ CalculateSPI

Min SPI Year: 1980

Max SPI Year: 2016

Select SPI Interval: SPI1

Percent Cut-off for SPI Monthly PPT Coverage: 80

SPI Output Folder

Ok dismiss

Check this box if you want to download or update precipitation data from the selected weather stations

Min/Max SPI Year allow the user to dynamically adjust which years are used when computing SPI.

There are a variety of intervals that SPI can be computed at. Included in the Climate Data API/GUI are SPI 1:12, 24, and 48. These are denoted as "SPI#" from a drop-down menu. Each are aggregates of a series of months starting at 1, where "SPI1" is one month SPI, "SPI2" is two month SPI, and so on. When SPI is computed for more than 1 month, a kernel is used to smooth the values between aggregated months.

Select a folder for output SPI calculations and plots

As daily accumulated precipitation is downloaded for each station, the total coverage for each month is computed and appended to the dataset. i.e., if a month only had 15 days with precipitation data, then the percent coverage for that month would be approximately 50%. This field is utilized in the Climate Data API/GUI by allowing the user to define criteria for months used in the SPI calculation. If a month's coverage falls below the desired cut-off, then it will not be used in computing SPI.

### 2.9 CLICK THE "OK" BUTTON WHEN THE ABOVE HAS BEEN COMPLETED

Ok dismiss

## 3 APPENDIX

### 3.1 DOWNLOADING PRECIPITATION DATA

#### 3.1.1 Personal NOAA Key

A personal NOAA key must be obtained from <https://www.ncdc.noaa.gov/cdo-web/token> to use the API in the rnoaa R package. Simply enter your email address into the prompt and a key will be sent to you to use in the Climate Data API/GUI.

#### 3.1.2 Downloading Station Data - rnoaa R Package

Rnoaa a package in R that operates as the API used to download daily accumulated precipitation for each station. The Climate Data API/GUI sends a request to the Global Historical Climatology Network, which sends back metadata on each requested station. The metadata is used to determine if current precipitation records are up-to-date. If they are not, a request is sent to download the precipitation data, which is then updated to a file in the user specified directory. If the user is starting a new dataset, all historic and current precipitation data will be downloaded for each requested station and written to a new file.



### 3.1.3 USVI Stations

Table 1. Global Historical Climatology Network station summary information and GUI abbreviation. The % coverage field refers to daily coverage from 1980-2015.

GHCN Station	Station Name	Abbreviation	Record Range	% Coverage 1980 to 2015
GHCND:VQC00671740	CHRISTIANSTED FORT	STXChristianstedFort	1921-Present	71.53%
GHCND:VQC00671980	CRUZ BAY	STJCruzBay	1972-Present	93.29%
GHCND:VQC00672551	EAST END	STJEastEnd	1972-Present	84.26%
GHCND:VQC00672560	EAST HILL	STXEastHill	1972-Present	92.82%
GHCND:VQC00674900	MONTPELLIER	STXMontpellier	1979-Present	93.98%
GHCND:VQC00677600	REDHOOK BAY ST THOMAS	STTRedhook	1980-Present	82.41%
GHCND:VQW00011624	CHRISTIANSTED HAMILTON FIELD AIRPORT	STXChristianstedAirport	1951-Present	98.38%
GHCND:VQW00011640	CHARLOTTE AMALIE CYRIL E KING AIRPORT	STTAirport	1953-Present	91.67%

## 3.2 CALCULATING SPI

### 3.2.1 Min SPI Year / Max SPI Year

Based on feedback from the National Drought Monitor, the desired duration of precipitation data for computing SPI is thirty years, but SPI can be computed at a minimum of fifteen years. These fields allow the user to dynamically adjust which years are used when computing SPI.

### 3.2.2 Percent Cut-off for SPI Monthly PPT Coverage

As daily accumulated precipitation is downloaded for each station, the total coverage for each month is computed and appended to the dataset. i.e., if a month only had 15 days with precipitation data, then the percent coverage for that month would be approximately 50%. This field is utilized in the Climate Data API/GUI by allowing the user to define criteria for months used in the SPI calculation. If a month's coverage falls below the desired cut-off, then it will not be used in computing SPI.

### 3.2.3 Selected SPI Interval

There are a variety of intervals that SPI can be computed at. Included in the Climate Data API/GUI are SPI 1:12, 24, and 48. These are denoted as "SPI#" from a drop-down menu. Each are aggregates of a series of months starting at 1, where "SPI1" is one month SPI, "SPI2" is two month SPI, and so on. When SPI is computed for more than 1 month, a user specified kernel is used to smooth the values between aggregated months.

### 3.2.4 Interpreting SPI

Table 2. Arbitrarily defined drought categories by SPI value from McKee et al. (1993).

SPI	CATEGORY
0 to -0.99	Mild drought
-1.00 to -1.49	Moderate drought
-1.50 to -1.99	Severe drought
$\leq -2.00$	Extreme drought

Table 3. Arbitrarily defined categories by SPI values from the Caribbean Regional Climate Centre (2011).

SPI Value	Category	SPI Value	Impact
-0.50 to -0.01	Normal	0.50 to 0.01	Normal
-0.80 to -0.51	Slightly dry	0.80 to 0.51	Slightly wet
-1.30 to -0.81	Moderately dry	1.30 to 0.81	Moderately wet
-1.60 to -1.31	Severely dry	1.60 to 1.31	Very wet
-2.00 to -1.61	Extremely dry	2.00 to 1.61	Extremely wet
$= -2.01$	Exceptionally dry	$= -2.01$	Exceptionally wet

## 4 CONTACT INFORMATION

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