

South Florida/Caribbean Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure WT09

Report, Graphing and Web Page Data—Version 2.1

Please cite this as:

South Florida/Caribbean Network. 2025. Reports, graphing, and web page data—Version 2.1. South Florida/Caribbean Network Standard Operating Procedure NPS/SFCN/SOP—WT09. South Florida/Caribbean Network, Palmetto Bay, Florida.

Purpose

This SOP describes how to export water temperature data from Aquarius into Excel graphing templates. These templates are used to generate summary graphs and tables for use with the Coral Reef Monitoring Protocol data summary reports. They provide users with visualizations that are easy to interpret and helpful for park managers. An R-script is used to export the data from Aquarius into CSV files that can then be used with the graphing templates. The SFCN Data Manager or Assistant Data Manager should be contacted for assistance with this script. This CSV file contains all the daily average temperature data for the chosen park, not just the most recent data that were added to Aquarius. This SOP outlines the steps to bring these data into the park's graphing template and then update the appropriate worksheets to accommodate the entire data set.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
4/23/2020	Lee Richter and Mario Londoño	Procedures to export files from Access were removed. Procedures were added to export files from Aquarius to Excel graphing templates using R-script.	Database platform changed from MS Access to Aquarius.	2.0
9/27/22	Lee Richter	New steps for an updated R-script	R script updated	2.1

Contents

	Page
Procedures.....	3
Confirm that QA/QC is Complete.....	3
Create Park Daily Average Temperature CSV Files in R	3
Copy a Daily Average Temperature CSV file into the Excel Graphing Template	7
Updating, Using and Exporting the Graphing Templates	9
Updating the IRMA Data Store and the SFCN web page	10

Procedures

Confirm that QA/QC is Complete

1. First check that all water temperature data for the park or sites in question are up to date and QA/QC is complete. Visit the Aquarius web data portal link in a web browser: <https://irma.nps.gov/aqwebportal/>.
2. From the menu at the left-hand side of the window, select “Data Set” and type the site name into the “Search for a Location” field (Figure 1).

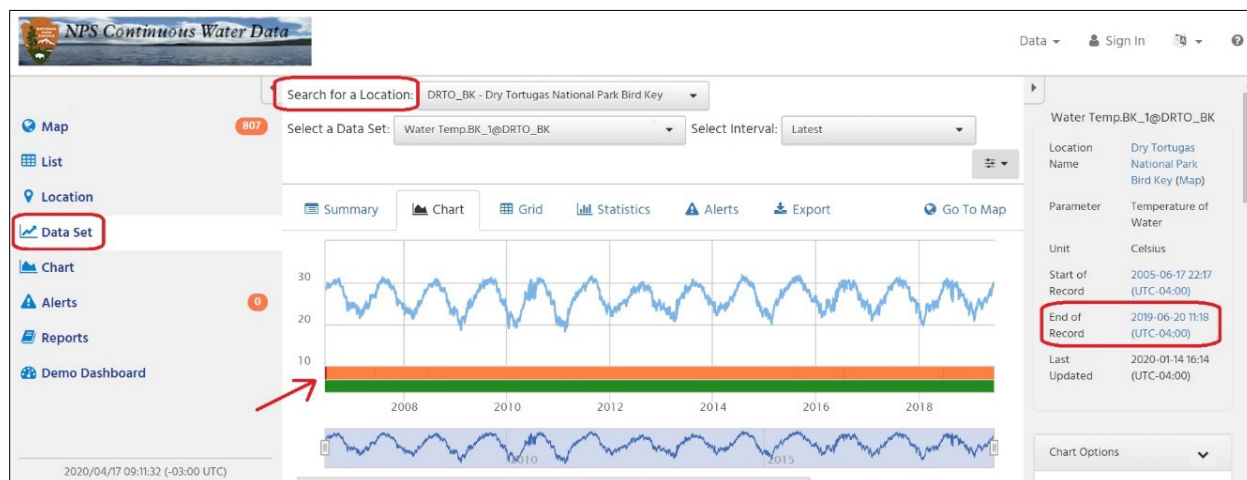


Figure 1. A screenshot showing the Aquarius Web Portal in Data Set View. The Chart tab is selected with Search for a Location and the End of Record information highlighted.

3. At the right-hand side of the window, find the “End of Record” section. The date of the End of Record should be the most recent day the temperature loggers were downloaded. If this date is not the date of last temperature logger download, the most recent data still need to be reviewed and approved in Aquarius. If the data were reviewed and approved recently, the Aquarius server may not have had time to sync with the web portal, in which case you will have to be patient.
4. In the chart, there should be two bars along the bottom: orange (approval is set to “approved”) and green (data grade is set to “good”). If different color bars are present in the dataset, this signifies that there are erroneous data that were rejected by a reviewer. These data are not exported in the CSV file.

Create Park Daily Average Temperature CSV Files in R

The R script created for this procedure has two separate phases. Phase 1 downloads the full period of record for each logger dataset and saves each dataset to a separate CSV file in the folder:

X:\Files\Vital_Signs\Coral_Reef_Water_Temperature\analysis\Aquarius_to_Excel\temp\YYYYMMDD_hhmm. A date/timestamp subfolder is automatically created for the date and time the R-script is

run. Remember, there are two co-located loggers recording water temperature data at each site within a park.

New datasets will need to be added to this Excel document in order to be included in Phase 1:

X:\Files\Vital_Signs\Coral_Reef_Water_Temperature\analysis\Aquarius_to_Excel\NG_identifiers.xlsx

Phase 2 takes the folder of downloaded CSV files (the logger datasets for each site at a park) and processes them by park. For each dataset the script drops records that do not have an Approval code of 3 (i.e. Approved). It also drops records with a Quality code less than 11 (e.g. Gap, Unusable, Unverified, or Suspect). The remaining records (including both sensor 1 and sensor 2) are averaged using the aggregate function into daily averages by dataset, and everything is added to new file named PARK_dailyaverage.csv. The specific steps for running this script are included below:

1. Open the file RStudio file “daily_averages.R” located here:
X:\Files\Vital_Signs\Coral_Reef_Water_Temperature\analysis\Aquarius_to_Excel
2. Upon opening the file, there will be a script of R code appearing on the Source pane as shown below. In line 8 of the code, in the area circled in red, type in the park(s) you want to generate daily averages for (BISC - Biscayne NP, DRTO - Dry Tortugas National Park, VIIS – Virgin Islands National Park, BUIS – Buck Island Reef National Monument, SARI – Salt River Bay National Historical Park and Ecological Preserve). Only change the park name inside the quotation marks. Press Ctrl+A to select all code, then click on the Run icon in the Source pane (Figure 2). This process will take time (5 – 30 minutes), so be patient while script runs.

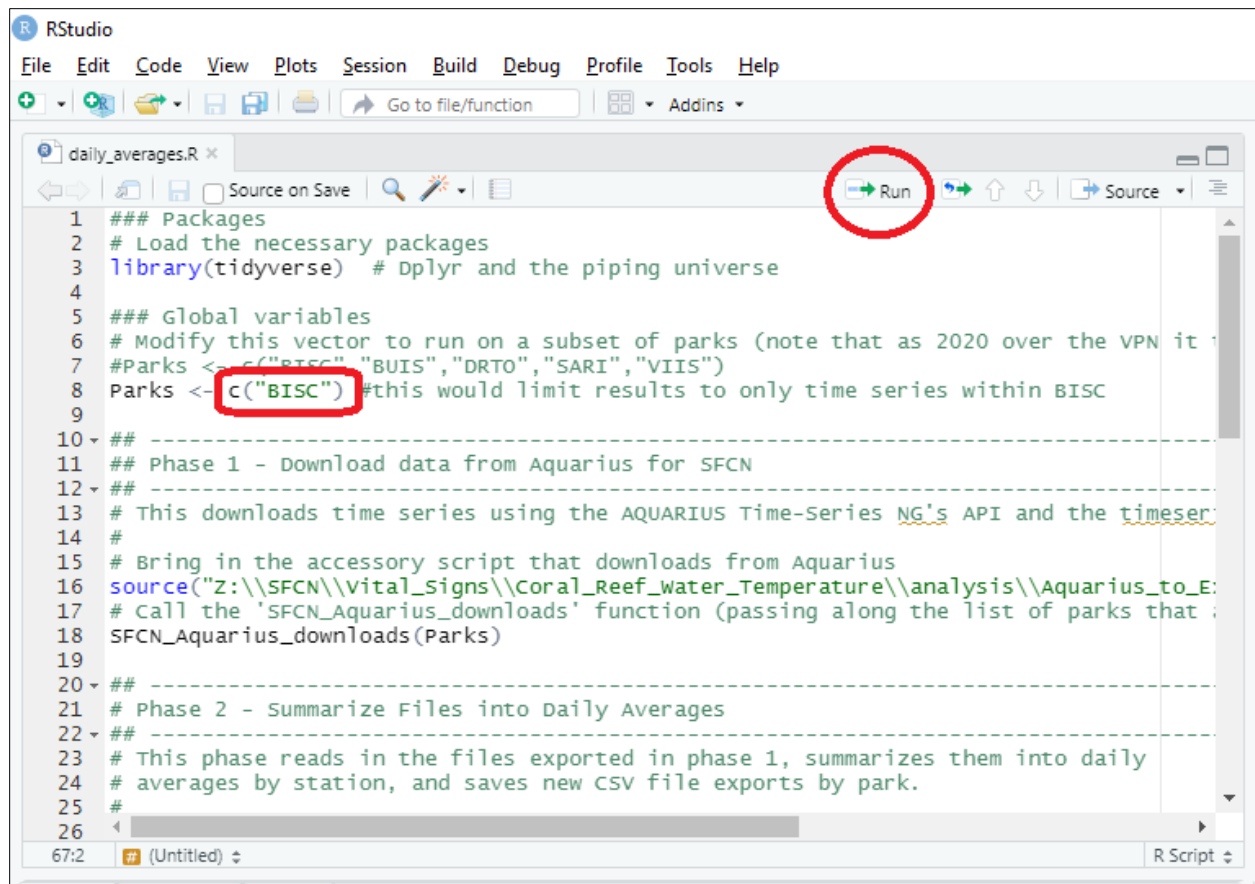


Figure 2. A screenshot of RStudio with the script displayed in the highlighted Source pane.

3. The script will begin by installing (if necessary) and then loading the necessary packages. A small stop-sign icon appears at the top right of the Console pane when script is actively running (Figure 3).

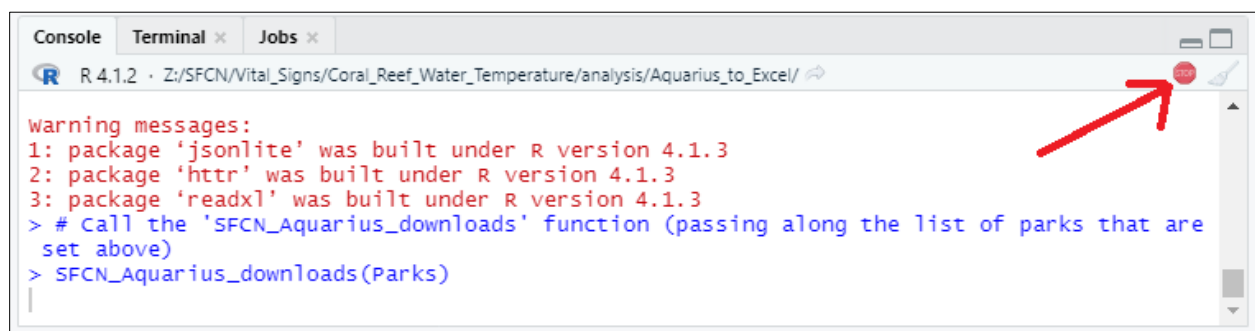


Figure 3. A screenshot of RStudio Console pane, with a stop sign icon indicating that the script is actively running.

4. All lines of code from the script will appear in the Console pane beneath the Source pane as they are executed. If an error appears, the code will show up in red in the Console pane and

the script will stop. When the script has completed there will be a blue “>” on the last line of the Console pane.

5. Navigate to the following server address:

X:\Files\Vital_Signs\Coral_Reef_Water_Temperature\analysis\Aquarius_to_Excel\temp.

Here there will be a folder created by the R script with the name of “YYYYMMDD_hhmm,” referencing the date and time when the script began to run. Double-click the folder to explore its contents.

6. This folder contains two types of CSV file outputs generated by the R-script (Figure 4).

- a. *Complete water temperature datasets for each logger.* These outputs follow the naming convention of “(two letter site code)(logger 1 or 2)@(four letter park code)_(two letter site code).” For example, the dataset for the first logger at Amanda’s Reef in Biscayne National Park will be named “AM_1@BISC_AM.csv”.
- b. *Daily average water temperature datasets for each park.* These summary files are created by averaging all valid data (including both sensor 1 and sensor 2) from a site using the aggregate function in R. These outputs follow the naming convention of “(four letter park code) dailyaverage.”, but contain daily average datasets for each site or location. For example, the dataset for Biscayne National Park will be named “BISC_dailyaverage.csv”, but will include separate daily average temperature datasets for two sites (Amanda’s and Ball Buoy). These dataset outputs are the ones needed in the next section (Section C).

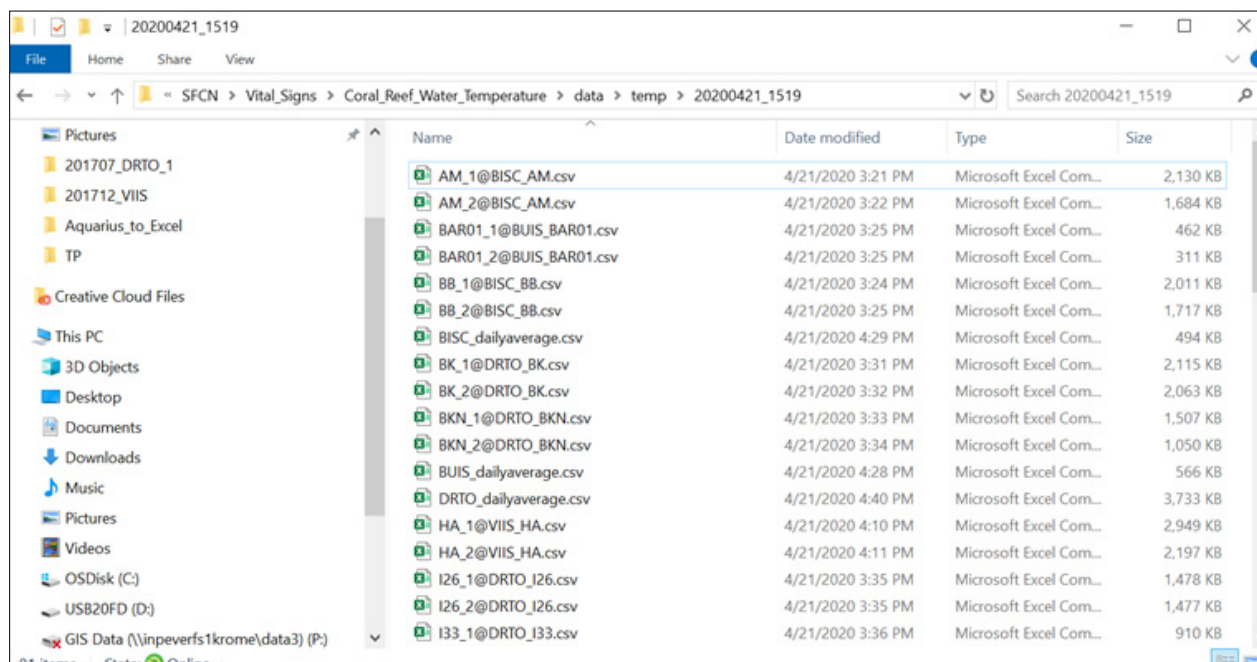


Figure 4. A screenshot of an example folder of CSV files generated by the R-script.

Copy a Daily Average Temperature CSV file into the Excel Graphing Template

1. Open the park unit daily water temperature average.csv file created by the R-script in Excel. If it appears, select the “Enable Content” button. This workbook has one sheet with 5 columns. The column headers are:

- a. StationName
- b. Date
- c. Year
- d. AvgOfTemp_C
- e. Month

2. Open the graphing template of the same park as the CSV file. The graphing template workbooks are located here:

X:\Files\Vital_Signs\Coral_Reef_Water_Temperature\data\graphs

3. If it appears, select the “Enable Content” button. The graphing template workbooks have many worksheets.
 - a. qry_rpt_GraphingTemplate_PARK: this is where the CSV data are pasted.
 - b. *PARK_Graphs*: displays two general trend graphs and three bar graphs with days above bleaching thresholds.
 - c. *PARK_HiLo*: displays an annual range of temperature for selected years, then plots a selected year for selected site or location to display among that range data.
 - i. NOTE: VIIS_2005_Present: This is a worksheet only found in the VIIS park graphing template and uses the data contained in the 2005PresentPivot.
 - d. *PARK_TbIs*: Pivot table using data from the data worksheet (see item a above). This table is useful to see what data are being used for the reporting and several threshold metrics.
 - e. YearCompare: displays a graph plotting site or location and years. Note that the X-axis label (months) is actually a text box and not a chart element (see explanation to the right of the chart).
 - f. FlexibleChart: displays the sites or location and years selected by the user.
 - g. *PARK*: data sheet of pivot tables that produce the figures in the second worksheet (see item b above), *PARK_Graphs*.

- h. HiLoPivot: contains pivot tables that produce the figure in the third worksheet (see item c above), *PARK_HiLo*.
 - i. YearComparePivot: contains the pivot table that produce the figure in the fourth worksheet (see item d above), YearCompare.
 - j. FlexibleChartPivot: contains the pivot table that produces the figure in the fifth worksheet (see item e above), FlexibleChart.
 - k. ExportingCharts: provides information on options for exporting the figures to various platforms (Microsoft Word, Powerpoint, etc.).
4. Copy and paste the CSV data into the qry_rpt_GraphingTemplate_*PARK*.
- a. Select all the data (not headers) for all the rows in the CSV file. Edit copy, or Ctrl-C.
 - b. Select cell A2 in the “qry_rpt_GraphingTemplate_*PARK*” worksheet. Edit Paste, or Ctrl-V. This will paste in all the data from the CSV file. It will include past data, and the newly collected temperature data.
 - c. It is important to verify that the contents of columns F-O of this worksheet are correct throughout the data just pasted in. Described below are these columns and the contents of **row 2** for those columns.
 - i. Threshold: this is the estimated bleaching threshold. VI = 29.5, FL = 30.5.
 - ii. GtrThreshold: contains the formula, “=IF(D2>F2,1,0)”. Counts the daily average above the bleaching threshold.
 - iii. DiffThreshold: contains the formula, “=IF(D2>F2,D2-F2,0)”. Displays the value above the threshold.
 - iv. ColdThreshold: this is the estimated cold stress threshold. The value 16 is used for VI and FL sites.
 - v. LessThreshold: contains the formula, “=IF(D2<I2,1,0)”. Counts the daily average below the cold threshold.
 - vi. ColdMonths: contains the formula, “=IF(E2<4,D2,IF(E2=12,D2,“”))”. Returns the daily average daily temperature during December to March.
 - vii. WarmMonths: contains the formula, “=IF(OR(E2=7,E2=8,E2=9,E2=10),D2,“”))”. Returns the average daily temperature during July to October.

- viii. SeasonRptYear: contains the formula, “=IF(E2=12,C2+1,C2)”. Returns the YEAR for the warm and cold months. For example, December 2018 returns the value 2019 as that represents that year’s “cold season”.
 - ix. RunDayAbvThrshld: contains the formula, “=IF(G2=0,0,N1+G2)”. Counter of the run of days above the bleaching threshold.
 - x. JulianDate: contains the formula, “=IF(B2>0,B2-DATE(C2,1,0),””)”. Returns the Julian date (counted number of the day of the year).
- d. The values of columns F and I need to be pasted down the length of the data set. As additional rows of data were just pasted in, the easiest way is to go to column F and copy 29.5 (VI) or 30.5 (FL) through the entire length of the data set. Do the same for column I with the value 16.0.
 - e. The formulas (columns G, H, J-O) need to also be pasted down the entire length of the data set. Scroll to the bottom entry for these columns and verify they contain the formulas as described above (but linked to the appropriate data row). Then select those bottom row of cells and paste special, formula, down to the bottom of the data set.
 - f. Once this is done, check the contents of the bottom cells to assure the appropriate values or formulas linked to the proper rows. Then save the worksheet.
5. **The pivot tables and pivot charts need to be refreshed to include the newest data.** This can be done by closing the sheet, then reopening it; an auto-refresh should take place. It can also be done by clicking on any pivot table (i.e., one of the three threshold bar graphs in the *PARK_Graphs* worksheet). Select Analyze from the Pivot Chart Tools, Refresh (arrow), and **Refresh All**.

Updating, Using and Exporting the Graphing Templates

Many of the graphs displayed are based on the selections made by the user.

PARK_Graphs – These graphs are manipulated in the *PARK* worksheet.

1. In the *PARK* worksheet, go to cell B2 (yellow highlight), using the filter, select the most recent two years for display. This will update the top left graph, displaying the water temperature (last 2 years).
2. The bottom left graph of “all data” is updated automatically. If it is incomplete, check that all the data are appearing in columns F-I.
3. The bar graphs are also updated automatically when the pivot tables are refreshed. The data for those graphs are found in columns L-P.

4. NOTE: if text boxes are within the graphs to mark the significant events (e.g: Hurricanes), they will need to be moved as more data are displayed.

PARK_HiLo – This graph is manipulated in the HiLoPivot worksheet

1. In the HiLoPivot worksheet, go to cell B3 (yellow highlighted) to select the years without bleaching to be used for the background range.
2. In cell E3, select the year that will be displayed for comparison to that non-bleaching range.

VIIS_2005_Present – this sheet is only found in the VIIS Graphing Template. This figure changes based on selections by the user. Follow instructions provided in the worksheet beginning on cell N1 on how to display data. Alternatively the display can be modified using the 2005Present Pivot worksheet. Cell B2 changes the Station Name, and Cell B4 selects the years to display.

PARK_Tbls – these should automatically update with the Refresh All command. It is important to note that this “table” is two pivot tables closely displayed together. Columns A-I is the result of one pivot table design, and columns J-M (with columns J-K, minimized to not display), are the result of a second pivot table design. Occasionally there is a problem where some of the second pivot table doesn’t display properly. Check the pivot table fields StationName filter to assure the correct park sites are selected.

YearCompare – this figure changes based on selections by the user. Follow the instructions in the worksheet beginning on cell L1. Alternatively, the display can be modified using the YearComparePivot worksheet. One advantage of using the tables to make the selection, is you can see if there are data for the years or site or location that you’ve selected. (For example, if you add a year and no data appears, there isn’t data for that year at that site or location.)

1. In cell B2, use the filter icon to select the site or location to display.
2. In cell B4, use the filter icon to select the years to display.

Remember, resizing this figure will complicate the display of the text box for the X-axis legend.

FlexibleChart – this figure also changes based on selections by the user. Follow the instructions in the worksheet beginning on cell J1. Unlike the previous figure, you can alter the size of this graph and the display will remain consistent. Although similar to the YearCompare graph, you can also manipulate the contents of this figure by making selections in the FlexibleChartPivot worksheet.

1. In cell B1, use the filter icon to select the years you want to display.
2. In cell B3, use the filter icon to select the sites you want to display.

Updating the IRMA Data Store and the SFCN web page

At the end of the year, water temperature data are updated and made publicly available on IRMA Data Store (e.g. Figure 5).

NPS DataStore
Integrated Resource Management Applications
Data Store-2.10.3.23239-20230926-105412

National Park Service
U.S. Department of the Interior
Natural Resource Stewardship and Science

Home Search Reports Create My Content Help Contact Us

mikefeeley

SFCN Water Temperature Dataset (1988 - 2020)

Description The South Florida Caribbean/Network reef-depth water temperature dataset is available via these csv files. Includes are sites in BISC, BUIS, DRTO, SARI, and VIIS. Data ranges vary by site, but the entire period of record is January 10, 1988 through 2020.

Citation NPS South Florida/Caribbean Network. SFCN Water Temperature Dataset (1988 - 2020). <https://mink.cloudacus.com/>

Visibility Internal

Citation with All NPS South Florida/Caribbean Network. SFCN Water Temperature Dataset (1988 - 2020). <https://mink.cloudacus.com/>

Authors

Reference Type Tabular Dataset (Code: 2282146)

Digital Files and Links (2)

Type	Download Link	Size	Description
Digital File	20201207_SFCN_WaterTe...	13.6 MB	CSV file with all water temperature data 1988-2020
External Link	https://irma.nps.gov/aqw...		Aquarius Web Data Portal

Figure 5. A screenshot of the NPS IRMA Data Store web page, showing the complete SFCN Coral Reef Water Temperature Dataset from 1988 to 2020.

The link to the dataset in IRMA DataStore will be updated on the SFCN webpage once this process is completed (Figure 6):

Coral Reef Water Temperature publications

Find all monitoring reports, protocols, and resource briefs below.

Datasets

Davis A and Others. 2011. [Coral Reef Water Temperature Monitoring Protocol Data](#)

NPS SFCN. 2018. [SFCN Coral Reef Water Temperature Dataset \(1988 - 2018\)](#)

Source: [Data Store Saved Search 3522](#) (results presented are a subset). To search for additional information, visit the [Data Store](#).

Figure 6. A screenshot of the datasets widget on the SFCN Coral Reef Water Temperature webpage (<https://www.nps.gov/im/sfcn/coral-reef-water-temp.htm>).