

National Ground-Water Monitoring Network Tip Sheet on viewing NGWMN water-level statistics

Water-Level Statistics

Monthly and summary statistics are computed for National Groundwater Monitoring Network (NGWMN) sites that meet certain criteria. These statistics are displayed on the site page for each well or spring. The monthly statistics are also used to produce a map layer showing the status of wells. These statistics allow the most recent water-levels to be placed in a historical context regardless of measurement frequency.

Water-Level Data Used in Computations of Statistics

All available continuous and periodic water-level measurements in the National Ground-Water Monitoring Network (NGWMN) are used to compute summary statistics and monthly percentiles. Data in the NGWMN Data Portal come from both USGS and from other NGWMN data provider agencies.

Water-level data provided by the USGS comes from the USGS National Water Information System database. This database contains the approval status of each water-level measurement or daily value computation. Data that have not been reviewed for accuracy according to USGS policies are considered Provisional. Data that have been reviewed for accuracy by the collecting Water Science Center are considered Approved. For USGS sites, only approved discrete and daily values are used in the computation of summary and monthly statistics.

In contrast to USGS data, water-level data provided by non-USGS data providers do not contain an indication of the review status of the water-level measurement. All data provider contributed water-levels are assumed to be approved and are used in calculations of statistics. Information on the data collection and data review methods for each data provider can be accessed from the providers Data Provider Page at:

<https://cida.usgs.gov/ngwmn/learnmore.jsp#dataProviders>.

Statistics

Water-level measurements are evaluated within a monthly statistical framework. This process permits a uniform approach across the Nation for both wells with frequent data collection and wells with infrequent data collection. The percentile provides the underpinning of a statistical framework. A percentile is a value on a scale of 0 to 100 that indicates the cumulative percentage of a distribution that is equal to or below that value. For example, a water-level greater than the 90th percentile value indicates that the water-level is equal to or greater than 90 percent of the monthly median groundwater levels in that month over the period of record at the well.

Sites must have at least 10 years of data for the month for the monthly percentiles to be calculated.

Additional details on the NGWMN statistics and methods used to calculate the statistics are available through the NGWMN Data Portal at: <https://cida.usgs.gov/ngwmn/provider/statistics-methods/>.

Statistics for each NGWMN site can be viewed by going to the Site Page and opening the Water-Level Statistics section. An example of the statistics for USGS site [351849078163901](#) is shown in the table below:

Water Level Statistics

How do we [calculate statistics?](#)

Overall Water Level Statistics (Depth to water, feet below land surface)

| Lowest Water Level | Median Water Level | Highest Water Level | First Measurement Date | Last Measurement Date | Number of Measurements | Years of Record | Latest Value | Latest Percentile |
|----------------------------------|--------------------|---------------------|------------------------|-----------------------|------------------------|-----------------|--------------|-------------------|
| 8.65 | 2.8 | -0.07 | 1980-01-30 | 2022-07-04 | 14129 | 42.5 | 7.87 | 0.0 |
| Statistics Calculated 2022-07-06 | | | | | | | | |

Monthly Water Level Statistics (Depth to water, feet below land surface)

| Month | Lowest Median | 10th Percentile | 25th Percentile | 50th Percentile | 75th Percentile | 90th Percentile | Highest Median | Number of Measurements | Years of Record |
|----------------------------------|---------------|-----------------|-----------------|-----------------|-----------------|-----------------|----------------|------------------------|-----------------|
| Jan | 6.09 | 4.11 | 2.55 | 1.54 | 0.88 | 0.76 | 0.6 | 43 | 43 |
| Feb | 3.25 | 2.5 | 1.78 | 1.35 | 1.07 | 0.6 | 0.42 | 42 | 42 |
| Mar | 3.1 | 2.1 | 1.9 | 1.35 | 0.96 | 0.74 | 0.38 | 43 | 43 |
| Apr | 4.05 | 2.76 | 2.48 | 1.92 | 1.5 | 1.11 | 0.60 | 42 | 42 |
| May | 5.39 | 4.7 | 3.68 | 2.86 | 2.2 | 1.5 | 0.43 | 41 | 41 |
| Jun | 7.10 | 5.75 | 4.82 | 4.2 | 3.15 | 1.70 | 1.4 | 41 | 41 |
| Jul | 7.82 | 7.31 | 6.54 | 5.61 | 3.34 | 1.82 | 0.89 | 41 | 41 |
| Aug | 8.37 | 7.62 | 6.63 | 5.1 | 3.43 | 2.42 | 0.96 | 40 | 40 |
| Sep | 8.42 | 7.87 | 6.3 | 4.08 | 2.70 | 1.78 | 0.60 | 40 | 40 |
| Oct | 8.32 | 7.5 | 6.49 | 4.12 | 2.79 | 2.17 | 0.96 | 41 | 41 |
| Nov | 7.65 | 7.2 | 5.91 | 3.76 | 2.0 | 1.4 | 0.72 | 41 | 41 |
| Dec | 7.57 | 6.5 | 4.79 | 3.24 | 1.38 | 0.96 | 0.61 | 41 | 41 |
| Statistics Calculated 2022-07-06 | | | | | | | | | |

Table 1. Screenshot of the statistics section for site USGS: [351849078163901](#).

Displaying Percentiles on the NGWMN Data Portal Interface

The percentiles for multiple sites can also be displayed on the NGWMN Data Portal in map view. To display the percentiles, open the layers tab on the center right-side of the portal map interface and change the display from 'Default' to 'Most Recent Water Level'. This will show the statistical context of the most recent water-level at each site in terms of monthly percentiles for the site. Note that for 'Surveillance' and 'Special Studies' NGWMN sites, the latest data may be several months to years old. To show more recent water-levels only, you can apply a filter to select only Water-Level Network 'Trend' sites. Trend sites are expected to be measured at least quarterly (many trend sites have realtime or continuous water-level data).

Other filters can also be applied to narrow down the sites to be viewed. Common filters are: 1) Aquifer Type (shown under the 'Aquifer Characteristics' section of the NGWMN Map Filters). Aquifer type can be set to 'Unconfined' to look at water-level conditions in unconfined sites to help answer questions related to drought conditions in groundwater. In contrast, 'Confined' sites could be selected to look at sites mainly impacted by groundwater withdrawals. 2) NGWMN Subnetwork (shown in the NGWMN Networks section). This can be used to select sites in the NGWMN 'Background' network to display sites that are minimally affected by human activity. 3) Principal Aquifer. This can be used to select any Principal Aquifers of interest.

To select recent sites that primarily show climatic variations in shallow unconfined wells minimally affected by human activity, you would apply the Water-Level Network filter, the 'Background' Subnetwork filter, the 'Trend' Monitoring Category filter, and the Aquifer Type = 'Unconfined' Filter. This would include all wells in the USGS Climate Response Network (CRN) and other wells monitored by the USGS and other NGWMN Data Providers that meet the USGS CRN basic criteria. An example of a map of these sites is shown below.

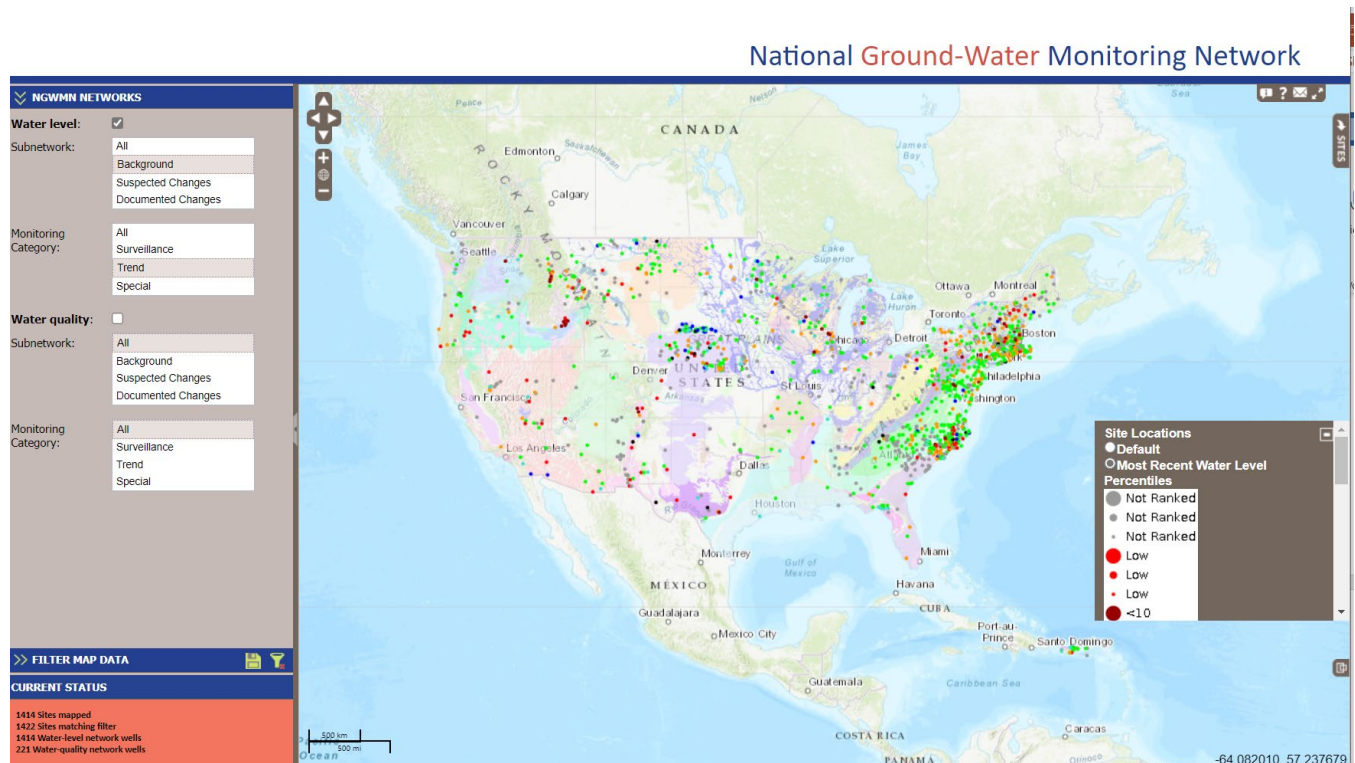


Figure 1. Screenshot of the NGWMN Data Portal showing Unconfined sites with minimal human influence that are measured at least quarterly from all NGWMN data providers.

Users can save filters into a URL that they can access again by clicking the 'Disk' Icon on the 'FILTER MAP DATA' section heading and saving the URL that is generated. A URL with the filters used to create the map above is available [here](#). This will select the sites used in the example above, the user would then need to open the 'Layers' tab to display 'Most Recent Water Level' for the percentiles to display.

[Displaying Percentiles using a GIS system](#)

A shapefile of the NGWMN sites and current percentiles can be downloaded through the Portal. The NGWMN Tip Sheet: [Tip Sheet on creating shapefiles of Network Sites and Recent WL](#) describes how to download various Shapefiles of NGWMN data and includes instructions on downloading a shapefile that contains the water-level percentiles.

This can allow a user to create more specific maps in ARCMAP. For example, you can filter on sites with data during a certain period along with many other NGWMN attributes. Some additional steps are required in ArcCatalog and ArcMap to display the statistics. These steps are described in the Tip Sheet above.

References

Subcommittee on Ground Water of the Advisory Committee on Water Information, 2009 (revised 2013), A national framework for ground water monitoring in the United States: Advisory Committee on Water Information, accessed October 23, 2013, at

http://acwi.gov/sogw/ngwmn_framework_report_july2013.pdf.

NGWMN Data Portal Help Document: accessed July 25, 2022, at

https://cida.usgs.gov/ngwmn/doc/NGWMN_Data_Portal_Help_Documentation.pdf.

NGWMN Data Portal Statistics Methods: accessed July 25, 2022, at

<https://cida.usgs.gov/ngwmn/provider/statistics-methods/>.