
Appendix: USGS NWIS Data Store

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Overview

The USGS NWIS data store corresponds to the United States Geological Survey (USGS) National Water Information System (NWIS), which stores real-time and historical water data. The data store focuses on daily values as described on the following page:

<http://waterservices.usgs.gov/rest/USGS-DV-Service.html>

The initial effort has focused on basic integration between NWIS and TSTool conventions; however, technical issues remain, as described below.

USGS NWIS and Standard Time Series Properties

The standard time series identifier for USGS NWIS time series in TSTool is of the form:

`Location.DataSource.DataType.Interval~DataStoreName`

More specifically, the identifier adheres to the following convention:

`SiteNum.AgencyCode.ParameterCode-Statistic [Name | Code] .Interval~DataStoreName`

where identifier parts are described as follows:

- The `SiteNum` corresponds to a USGS site. The NWIS Mapper (<http://wdr.water.usgs.gov/nwisgmap/>), USGS Site Inventory (<http://waterdata.usgs.gov/nwis/inventory>) or other published information from the USGS can be used to determine site numbers.
- `AgencyCode` is blank for USGS sites or is specified from the following list:
http://nwis.waterdata.usgs.gov/nwis/help/?read_file=nwis_agency_codes&format=table
- `ParameterCode` is taken from the parameter list available from the following list:
<http://nwis.waterdata.usgs.gov/usa/nwis/pmcodes>
Ideally a parameter name could be used; however, the list of parameters is extensive and a concise unique parameter name is difficult to define.
- `StatisticCode` and `StatisticName` are taken from the list of supported statistics:
<http://waterservices.usgs.gov/rest/USGS-DV-Service.html>
Currently TSTool uses `StatisticName` rather than `StatisticCode`, if the name can be looked up. This is done for readability. However, if the list of supported statistics increases and names are not unique, the statistic code will be used. The statistic code is recognized if used in place of the name.
- `Interval` defaults to 1Day.
- `DataStoreName` is the user-defined data store name from the configuration information.
- Data units are taken from the WaterML file.
- Missing numerical values are internally represented as NaN and are assigned to any date/times in the period that do not have values.
- Data value flags, if encountered are set in the time series.

Limitations

USGS NWIS data store limitations relative to TSTool standard features are as follows:

- TSTool is using the REST API to retrieve USGS NWIS data, as documented above. Additional enhancements to the service are being implemented and functionality may change.
- In order to provide full TSTool functionality, some type of site/time series list service needs to be utilized. Currently, the TSTool query features allow only a single time series to be selected, which can then be copied to the command list. Normally, the query features would allow one or more time series to be queried.
- NWIS WaterML is slightly non-standard. Additional work is needed to enable a generic CUAHSI/WaterML data store. In this approach a single data store type could be utilized rather than a USGS NWIS data store.

Data Store Configuration File

A data store is configured by enabling USGS NWIS data stores in the main *TSTool.cfg* configuration file, and creating a data store configuration file for each data store. Configurations are processed at software startup. An example of the TSTool configuration file is shown below. Multiple data stores can be defined using the [DataStore:DataStoreName] syntax. For NWIS, this would allow, for example, accessing different versions of the web services.

```
# Configuration file for TSTool

[TSTool]

USGSNWISEnabled = true

# Startup data stores (note that data store name in config file takes precedence)

[DataStore:USGS-NWIS]

ConfigFile = "USGS-NWIS.cfg"
```

TSTool Configuration File with USGS NWIS Data Store Properties

Properties for each data store are specified in an accompanying data store configuration file (see below), which in the following example is located in the same folder as the TSTool configuration file and configures a data store named "USGS-NWIS".

```
# Configuration information for "USGS-NWIS" data store.
# Properties are:
#
# The user will see the following when interacting with the data store:
#
# Name - data store name used in applications, for example as the
#       input type information for time series identifiers (usually a short string)
# Description - data store description for reports and user interfaces (short phrase)
#
# The following are specific to the RCC ACIS data store:
#
# ServiceRootURI - web service root URI, including the server name and root path
Type = "UsgsNwisDataStore"
Name = "USGS-NWIS"
Description = "USGS NWIS Web Services"
ServiceRootURI = "http://interim.waterservices.usgs.gov/NWISQuery"
```

USGS NWIS Data Store Configuration File