

TSTool Training

Data Filling

Version: 9.07.02, 2010-08-20

Duration: 30 minutes

Level: Introduction

Colorado's Decision Support Systems

Developed by DWR and CWCB



This Presentation

- Provides an introduction to TSTool data filling features
- Is designed for self-paced training
- Is accompanied by examples, each of which reside in a folder distributed with this presentation
 - See the doc/Training folder under the software installation

TSTool Data Filling Features

- Every time series has a missing data value indicator (-999 and NaN are common)
- Displays show blanks for missing data
- Many commands are available to fill missing data
- Filled values can be flagged and annotated in reports
- Tools are available to evaluate extent of data gaps

TSTool Data Filling Commands

- FillConstant()
- FillDayTSFrom2MonthTSAnd1DayTS() – prorate “volume”
- FillFromTS() – useful for merge
- FillHistMonthAverage()
- FillHistYearAverage()
- FillInterpolate()
- FillMixedStation() – regression technique
- FillMOVE2() – regression technique
- FillPattern() – uses historical averages in “bins”
- FillProrate()
- FillRegression()
- FillRepeat()

Not all the commands are discussed in this training – see TSTool documentation.

Tools to Find Data Gaps

- Data coverage report
- Period of record graph

See example: `example1-FindDataGaps\FindDataGaps.TSTool`

File Edit View Commands Run Results Tools Help

Input/Query Options

Input Type: HydroBase

Input Name:

Data Type: Stream - Streamflow

Time Step: Month

Where: District Equals

Where: Matches

Where: Matches

Analysis

Report

Select on Map

Options

Diagnostics...

Diagnostics - View Log File ...

Time Series List (55 time series, 0 selected)

Data Coverage by Year...

Data Limits Summary...

Month Summary (Daily Means)...

Month Summary (Daily Totals)...

Year to Date Total... <Daily or real time CFS Only!>

Abbrev.	Name/Description	Da
TRACO	NORTH FORK WHITE RIVER BELOW TRAPPERS LAKE, CO. - 09302400.USGS.Streamflow.Month (1903-08 to 2009-09)	US
TRACO	NF WHITE R ABOVE RIPPLE C, NR TRAPPERS LAKE, CO. - 09302420.USGS.Streamflow.Month (1903-08 to 2009-09)	US
BUFCO	NORTH FORK WHITE RIVER AT BUFORD, CO. - 09303000.USGS.Streamflow.Month (1903-08 to 2009-09)	US
WHACO	SOUTH FORK WHITE RIVER AT BUDGES RESORT, CO. - 09303300.USGS.Streamflow.Month (1903-08 to 2009-09)	US
SBUDCO	WAGONWHEEL CREEK AT BUDGES RESORT, CO. - 09303320.USGS.Streamflow.Month (1903-08 to 2009-09)	US
PATBUDCO	PATTERSON CREEK NEAR BUDGES RESORT, CO. - 09303340.USGS.Streamflow.Month (1903-08 to 2009-09)	US
SFWBUDCO	SOUTH FORK WHITE RIVER NEAR BUDGES RESORT, CO. - 09303400.USGS.Streamflow.Month (1903-08 to 2009-09)	US

Get Time Series List

Copy Selected to Commands

Copy All to Commands

Commands (2 commands, 0 selected, 0 with failures, 0 with warnings)

```
1 # Example to find data gaps
2 ReadDateValue(InputFile="white-streamflow.dv")
3
4
5
6
7
8
9
10
```

Data file contains White River Basin monthly streamflow data from HydroBase

"Data Coverage by Year" processes all selected time series in the results

Run Selected Commands Run All Commands Clear Commands

Results

Ensembles Output Files Problems Tables Time Series Views

55 time series, 55 selected

- 1) NORTH FORK WHITE RIVER BELOW TRAPPERS LAKE, CO. - 09302400.USGS.Streamflow.Month (1903-08 to 2009-09)
- 2) NF WHITE R ABOVE RIPPLE C, NR TRAPPERS LAKE, CO. - 09302420.USGS.Streamflow.Month (1903-08 to 2009-09)
- 3) NORTH FORK WHITE RIVER AT BUFORD, CO. - 09303000.USGS.Streamflow.Month (1903-08 to 2009-09)
- 4) SOUTH FORK WHITE RIVER AT BUDGES RESORT, CO. - 09303300.USGS.Streamflow.Month (1903-08 to 2009-09)
- 5) WAGONWHEEL CREEK AT BUDGES RESORT, CO. - 09303320.USGS.Streamflow.Month (1903-08 to 2009-09)
- 6) PATTERSON CREEK NEAR BUDGES RESORT, CO. - 09303340.USGS.Streamflow.Month (1903-08 to 2009-09)
- 7) SOUTH FORK WHITE RIVER NEAR BUDGES RESORT, CO. - 09303400.USGS.Streamflow.Month (1903-08 to 2009-09)
- 8) SOUTH FORK WHITE RIVER NEAR BUFORD, CO. - 09303500.USGS.Streamflow.Month (1903-08 to 2009-09)
- 9) SOUTH FORK WHITE RIVER AT BUFORD, CO. - 09304000.USGS.Streamflow.Month (1903-08 to 2009-09)
- 10) BIG BEAVER CREEK NEAR BUFORD, CO. - 09304100.USGS.Streamflow.Month (1903-08 to 2009-09)



Data Coverage Report

Years shown in the report are for calendar type: Calendar

Start: 1903-01

End: 2009-12

indicates 100% coverage
** indicates >= 75% coverage
++ indicates >= 50% coverage
-- indicates >= 25% coverage
.. indicates > 0% coverage
spaces indicate 0% coverage

Simple text report – see legend
for meaning of symbols

Station	Name	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
09302400	NORTH FORK WHITE RIVER BELOW TRAPPERS LA																							
09302420	NF WHITE R ABOVE RIPPLE C, NR TRAPPERS L																							
09303000	NORTH FORK WHITE RIVER AT BUFORD, CO, co																							
09303300	SOUTH FORK WHITE RIVER AT BUDGES RESORT,																							
09303320	WAGONWHEEL CREEK AT BUDGES RESORT, CO.,																							
09303340	PATTERSON CREEK NEAR BUDGES RESORT, CO.,																							
09303400	SOUTH FORK WHITE RIVER NEAR BUDGES RESOR																							
09303500	SOUTH FORK WHITE RIVER NEAR BUFORD, CO.,																							
09304000	SOUTH FORK WHITE RIVER AT BUFORD, CO., c																							
09304100	BIG BEAVER CREEK NEAR BUFORD, CO., const																							
09304150	MILLER CREEK NEAR MEEKER, CO., constant=																							
09304200	WHITE RIVER ABOVE COAL CREEK, NEAR MEEKE																							
09304300	COAL CREEK NEAR MEEKER, CO., constant=0.																							
09304500	WHITE RIVER NEAR MEEKER, CO., constant=0																							
09304600	WHITE RIVER AT MEEKER, CO., constant=0.0																							
09304800	WHITE RIVER BELOW MEEKER, CO, constant=0																							
09305500	PICEANCE CREEK AT RIO BLANCO, CO., const																							
09306007	PICEANCE CREEK BELOW RIO BLANCO, CO., co																							
09306015	MIDDLE FORK STEWART GULCH NEAR RIO BLANC																							
09306022	STEWART GULCH AB WEST FORK NR RIO BLANCO																							
09306025	WEST FORK STEWART GULCH NEAR RIO BLANCO,																							
09306028	W F STEWART GULCH AT MOUTH, NEAR RIO BLA																							
09306033	SOPCHUM GULCH NEAR RIO BLANCO, CO, cons																							

Scroll to right to see
the most recent years,
which have more data

Print

Save

Close

Simple Fill Commands

- Fill with constant, interpolation, or repeat, use when more a complex method is not possible
- Also use as a final fill technique when gaps remain after other fill techniques (e.g, fill precipitation with zero if no other choice)

See example: `example2-SimpleFill\SimpleFill.TSTool`

Command Problem Summary

Total number of failures: 0
Total number of commands with failures: 0
Total number of warnings: 216
Total number of commands with warnings: 1

[Check File HTML Report](#)

#	Time, sec.	Warnings	Failures	Command
1	0.000	0	0	# Example illustrating errors in commands
2	0.000	0	0	# Problem is that the filename is incorrect (remove X to fix)
3	0.047	0	0	ReadDateValue(InputFile="streamflow.dv")
4	0.000	0	0	# Fill the time series with historical monthly average
5	0.016	0	0	FillHistMonthAverage(FillFlag="Auto")
6	0.000	0	0	# Write the filled time series to a different filename
7	0.093	0	0	WriteDateValue(OutputFile="streamflow-filled.dv",Precision=2)
8	0.000	0	0	# Check the time series for missing data and write a check file
9	0.016	216	0	CheckTimeSeries(CheckCriteria="Missing",Flag="MISSING",FlagDesc="No recorded value")
10	0.000	0	0	WriteCheckFile(OutputFile="streamflow-checks.html",Title="Streamflow Missing Data Checks.")
	0.172	216	0	

List of commands with
count of warnings and
failures

Command Problem Details

Total number of failures: 0
Total number of commands with failures: 0
Total number of warnings: 216
Total number of commands with warnings: 1

Details about
each warning
and failure

#	Severity	Type	Command	Problem	Recommen
1	WARNING	Missing	CheckTimeSeries(CheckCriteria="Missing",Flag="MISSING",FlagDesc="No recorded value")	Time series 06711590.USGS.Streamflow.Month value -999.000000 at 1902-01 is missing	
				Time series	

Fill Using Regression

- Ordinary Least Squares regression or MOVE2
- Log transform (or no transform)
- See FillRegression() and FillMOVE2() commands

Fill HydroBase Diversion Records Using Diversion Comments

- Special case where annual values are recorded to indicate zero diversion
- Can also use “currently in use” flag to fill with additional zeros
- See FillUsingDiversionComments() command

Fill Using Historical Averages

- Suitable for controlled data such as diversion and reservoir time series
- Use FillHistMonthAverage() to fill monthly time series with historical averages
- For more detail, use AnalyzePattern() to determine wet/dry/average characteristics of indicator time series and then fill data with FillPattern()

More Information

Help...View Documentation to view the
TSTool documentation