Colorado's Decision Support Systems (CDSS)

TSTool Training

Quality Control

Version: 10.00.01, 2011-05-09

Duration: 30 minutes

Level: Introduction

This Presentation

- Provides an introduction to TSTool quality control 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

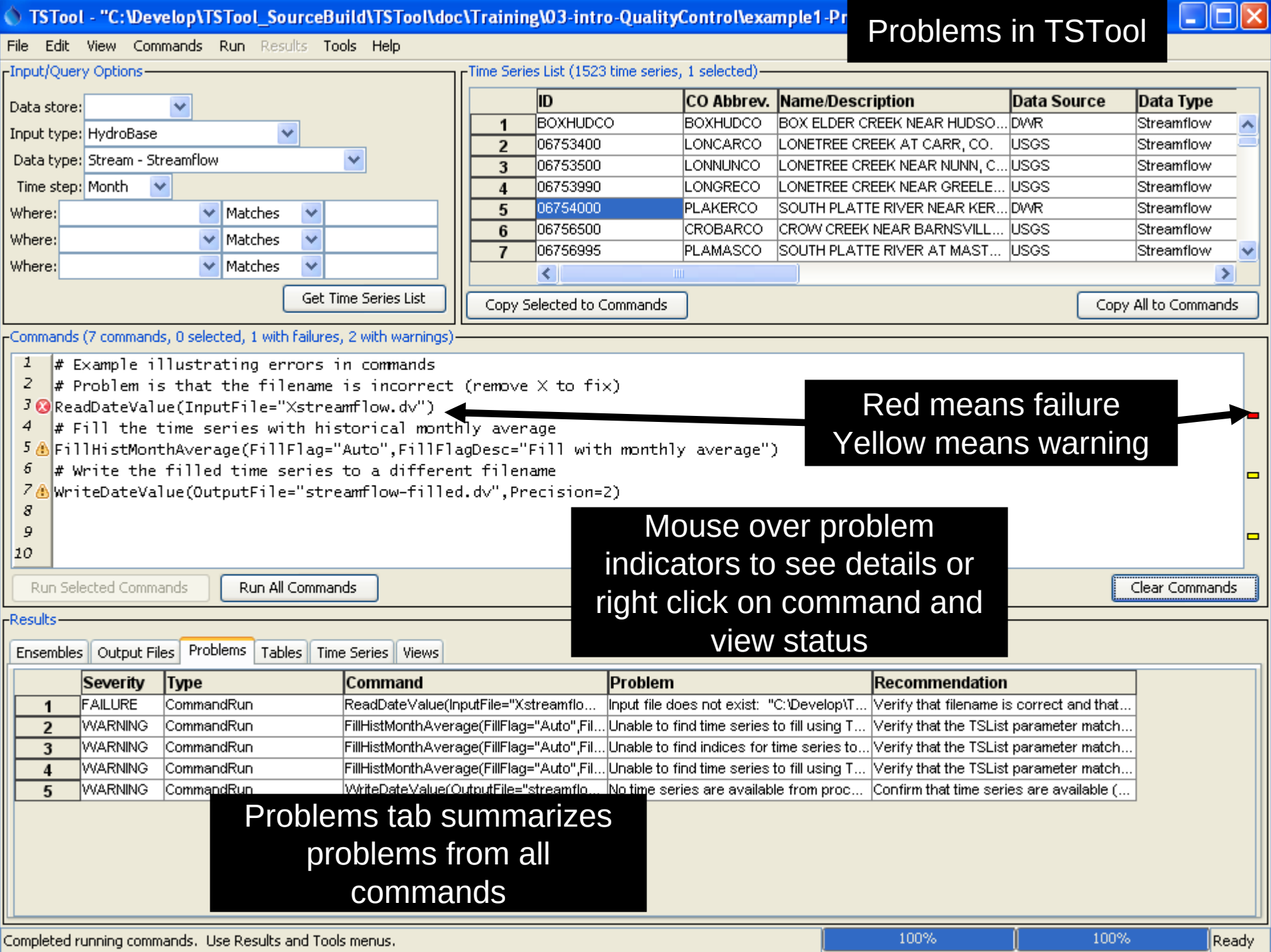
TSTool Quality Control Features

- Warning and Failure indicators – DO NOT IGNORE THEM
- Automation – use it to increase the amount of quality control checks
- CheckTimeSeries() – check for unexpected values
- Command tests – illustrate how software is tested and also can be applied to your own processes

Warning and Failure Indicators

- Provided at multiple levels
- TSTool tries to complete command processing so that a complete picture of problems is known – usually fixing the first problem(s) clears up later problems

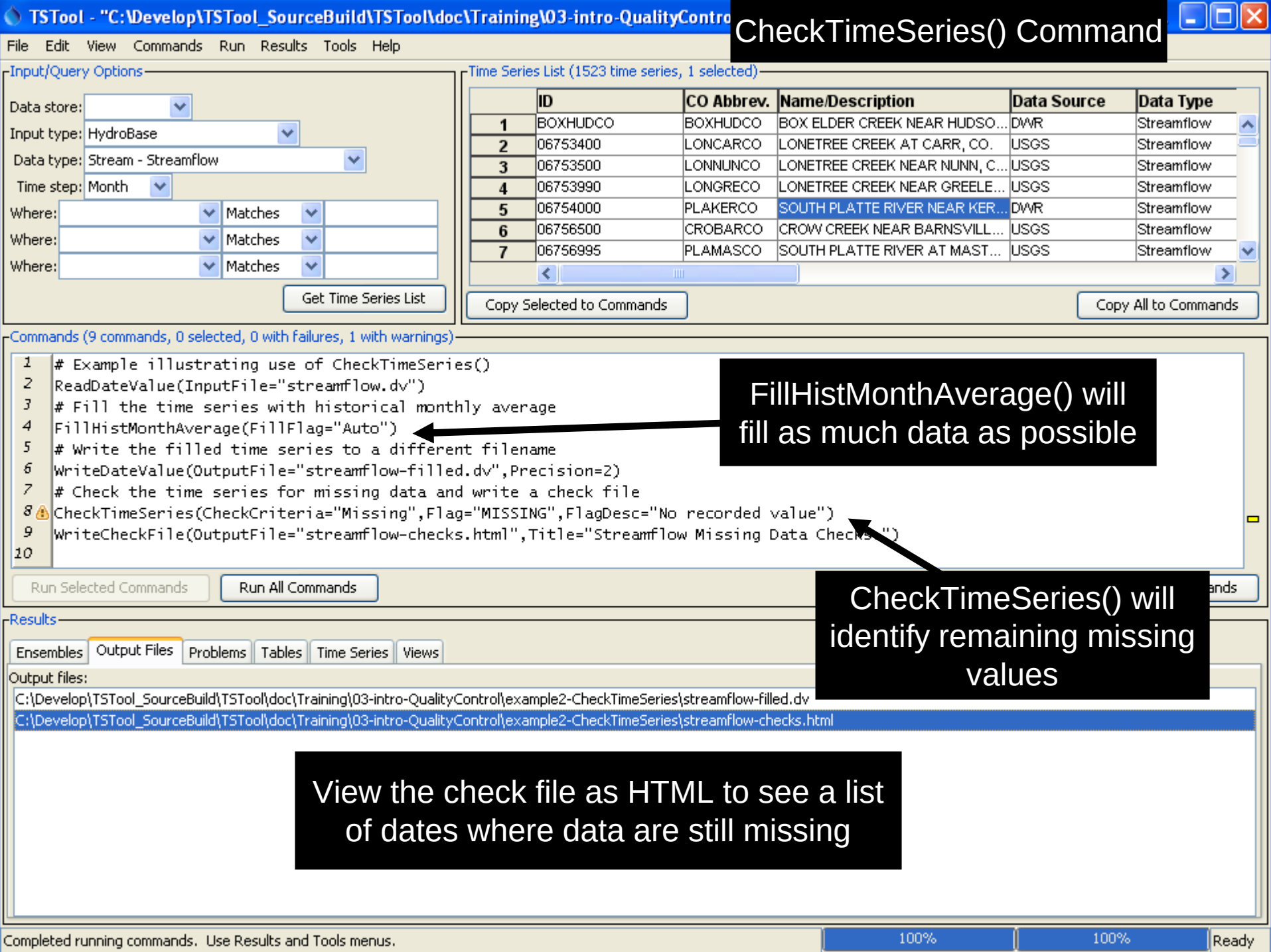
See example: example1-Problems\Problems.TSTool


TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\03-intro-QualityControl\example1-Pr
Problems in TSTool
File Edit View Commands Run Results Tools Help
Input/Query Options
Data store:
Input type: HydroBase
Data type: Stream - Streamflow
Time step: Month
Where: Matches
Where: Matches
Where: Matches
Get Time Series List
Time Series List (1523 time series, 1 selected)
ID CO Abbrev. Name/Description Data Source Data Type
1 BOXHUDCO BOXHUDCO BOX ELDER CREEK NEAR HUDSO... DWR Streamflow
2 06753400 LONCARCO LONETREE CREEK AT CARR, CO. USGS Streamflow
3 06753500 LONNUNCO LONETREE CREEK NEAR NUNN, C... USGS Streamflow
4 06753990 LONGRECO LONETREE CREEK NEAR GREELE... USGS Streamflow
5 06754000 PLAKERCO SOUTH PLATTE RIVER NEAR KER... DWR Streamflow
6 06756500 CROBARCO CROW CREEK NEAR BARNSVILL... USGS Streamflow
7 06756995 PLAMASCO SOUTH PLATTE RIVER AT MAST... USGS Streamflow
Copy Selected to Commands
Copy All to Commands
Commands (7 commands, 0 selected, 1 with failures, 2 with warnings)
1 # Example illustrating errors in commands
2 # Problem is that the filename is incorrect (remove X to fix)
3 ReadDateValue(InputFile="Xstreamflow.dv")
4 # Fill the time series with historical monthly average
5 FillHistMonthAverage(FillFlag="Auto",FillFlagDesc="Fill with monthly average")
6 # Write the filled time series to a different filename
7 WriteDateValue(OutputFile="streamflow-filled.dv",Precision=2)
8
9
10
Red means failure
Yellow means warning
Mouse over problem indicators to see details or right click on command and view status
Run Selected Commands
Run All Commands
Clear Commands
Results
Ensembles Output Files Problems Tables Time Series Views
Severity Type Command Problem Recommendation
1 FAILURE CommandRun ReadDateValue(InputFile="Xstreamflo... Input file does not exist: "C:\Develop\T... Verify that filename is correct and that...
2 WARNING CommandRun FillHistMonthAverage(FillFlag="Auto",Fil... Unable to find time series to fill using T... Verify that the TSList parameter match...
3 WARNING CommandRun FillHistMonthAverage(FillFlag="Auto",Fil... Unable to find indices for time series to... Verify that the TSList parameter match...
4 WARNING CommandRun FillHistMonthAverage(FillFlag="Auto",Fil... Unable to find time series to fill using T... Verify that the TSList parameter match...
5 WARNING CommandRun WriteDateValue(OutputFile="streamflo... No time series are available from proc... Confirm that time series are available (...
Problems tab summarizes problems from all commands
Completed running commands. Use Results and Tools menus.
100%
100%
Ready

CheckTimeSeries() Command

- Check for specific criteria (such as missing data or out of range values)
- Flag detected values
- Use WriteCheckFile() to write summary of check results

See example: example2-CheckTimeSeries\CheckTimeSeries.TSTool


TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\03-intro-QualityContro
CheckTimeSeries() Command
File Edit View Commands Run Results Tools Help
Input/Query Options
Data store:
Input type: HydroBase
Data type: Stream - Streamflow
Time step: Month
Where: Matches
Where: Matches
Where: Matches
Get Time Series List
Time Series List (1523 time series, 1 selected)
ID CO Abbrev. Name/Description Data Source Data Type
1 BOXHUDCO BOXHUDCO BOX ELDER CREEK NEAR HUDSO... DWR Streamflow
2 06753400 LONCARCO LONETREE CREEK AT CARR, CO. USGS Streamflow
3 06753500 LONNUNCO LONETREE CREEK NEAR NUNN, C... USGS Streamflow
4 06753990 LONGRECO LONETREE CREEK NEAR GREELE... USGS Streamflow
5 06754000 PLAKERCO SOUTH PLATTE RIVER NEAR KER... DWR Streamflow
6 06756500 CROBARCO CROW CREEK NEAR BARNSVILL... USGS Streamflow
7 06756995 PLAMASCO SOUTH PLATTE RIVER AT MAST... USGS Streamflow
Copy Selected to Commands
Copy All to Commands
Commands (9 commands, 0 selected, 0 with failures, 1 with warnings)
1 # Example illustrating use of CheckTimeSeries()
2 ReadDateValue(InputFile="streamflow.dv")
3 # Fill the time series with historical monthly average
4 FillHistMonthAverage(FillFlag="Auto")
5 # Write the filled time series to a different filename
6 WriteDateValue(OutputFile="streamflow-filled.dv",Precision=2)
7 # Check the time series for missing data and write a check file
8 CheckTimeSeries(CheckCriteria="Missing",Flag="MISSING",FlagDesc="No recorded value")
9 WriteCheckFile(OutputFile="streamflow-checks.html",Title="Streamflow Missing Data Checks")
10
FillHistMonthAverage() will fill as much data as possible
CheckTimeSeries() will identify remaining missing values
Run Selected Commands
Run All Commands
Results
Ensembles Output Files Problems Tables Time Series Views
Output files:
C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\03-intro-QualityControl\example2-CheckTimeSeries\streamflow-filled.dv
C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\03-intro-QualityControl\example2-CheckTimeSeries\streamflow-checks.html
View the check file as HTML to see a list of dates where data are still missing
Completed running commands. Use Results and Tools menus.
100%
100%
Ready

Command Problem Summary

Check File HTML Report

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

#	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

Details about each warning and failure

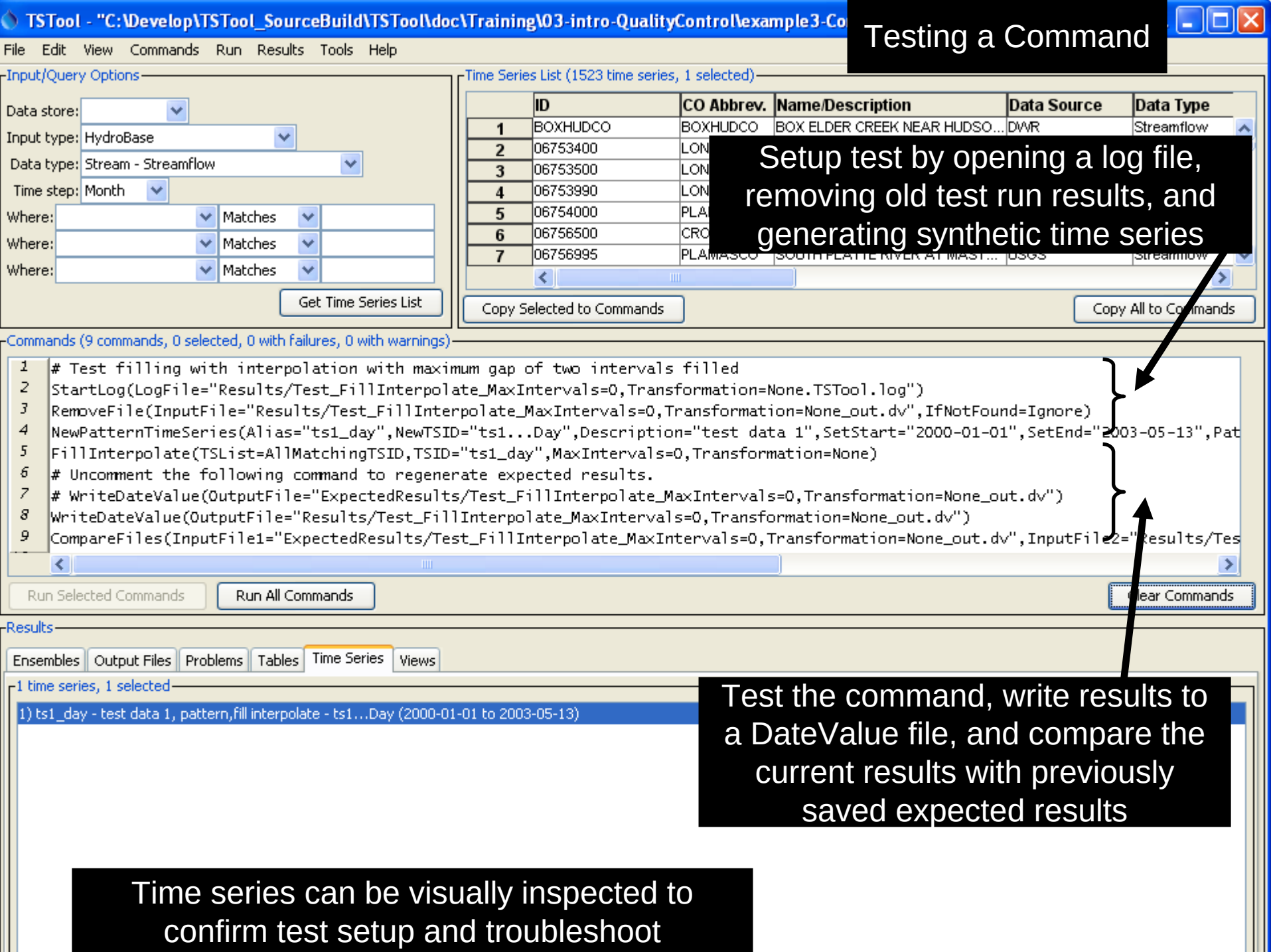
Total number of failures: 0
Total number of commands with failures: 0
Total number of warnings: 216
Total number of commands with warnings: 1

#	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	

Command Tests

- Used to verify software functionality
- For new development, users can submit tests and then confirm that enhanced software meets requirements
- Tests also can be used to verify a process, such as whether a model is producing expected results

See example: example3-CommandTest*.TSTool


TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\03-intro-QualityControl\example3-Co
Testing a Command
File Edit View Commands Run Results Tools Help
Input/Query Options
Data store:
Input type: HydroBase
Data type: Stream - Streamflow
Time step: Month
Where: Matches
Where: Matches
Where: Matches
Get Time Series List
Time Series List (1523 time series, 1 selected)
ID
CO Abrev.
Name/Description
Data Source
Data Type
1 BOXHUDCO BOXHUDCO BOX ELDER CREEK NEAR HUDSO... DWR Streamflow
2 06753400 LON
3 06753500 LON
4 06753990 LON
5 06754000 PLA
6 06756500 CRO
7 06756995 PLA
Setup test by opening a log file, removing old test run results, and generating synthetic time series
Copy Selected to Commands
Copy All to Commands
Commands (9 commands, 0 selected, 0 with failures, 0 with warnings)
1 # Test filling with interpolation with maximum gap of two intervals filled
2 StartLog(LogFile="Results/Test_FillInterpolate_MaxIntervals=0,Transformation=None.TSTool.log")
3 RemoveFile(InputFile="Results/Test_FillInterpolate_MaxIntervals=0,Transformation=None_out.dv",IfNotFound=Ignore)
4 NewPatternTimeSeries(Alias="ts1_day",NewTSID="ts1...Day",Description="test data 1",SetStart="2000-01-01",SetEnd="2003-05-13",Pat
5 FillInterpolate(TSList=AllMatchingTSID,TSID="ts1_day",MaxIntervals=0,Transformation=None)
6 # Uncomment the following command to regenerate expected results.
7 # WriteDateValue(OutputFile="ExpectedResults/Test_FillInterpolate_MaxIntervals=0,Transformation=None_out.dv")
8 WriteDateValue(OutputFile="Results/Test_FillInterpolate_MaxIntervals=0,Transformation=None_out.dv")
9 CompareFiles(InputFile1="ExpectedResults/Test_FillInterpolate_MaxIntervals=0,Transformation=None_out.dv",InputFile2="Results/Tes
Run Selected Commands
Run All Commands
Clear Commands
Test the command, write results to a DateValue file, and compare the current results with previously saved expected results
Results
Ensembles Output Files Problems Tables Time Series Views
1 time series, 1 selected
1) ts1_day - test data 1, pattern,fill interpolate - ts1...Day (2000-01-01 to 2003-05-13)
Time series can be visually inspected to confirm test setup and troubleshoot

Automating Tests

- Multiple tests can be automated to rapidly test software and processes
- See the CreateRegressionTestCommandFile() to collect tests into a suite of tests
- See the RunCommands() command to run a command file

More Information

Help…View Documentation to view the TSTool documentation