Colorado's Decision Support Systems (CDSS)

TSTool Training

Time Series Statistics

Version: 10.00.01, 2011-05-09

Duration: 30 minutes

Level: Introduction

This Presentation

- Provides an introduction to computing time series statistics in TSTool
- 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

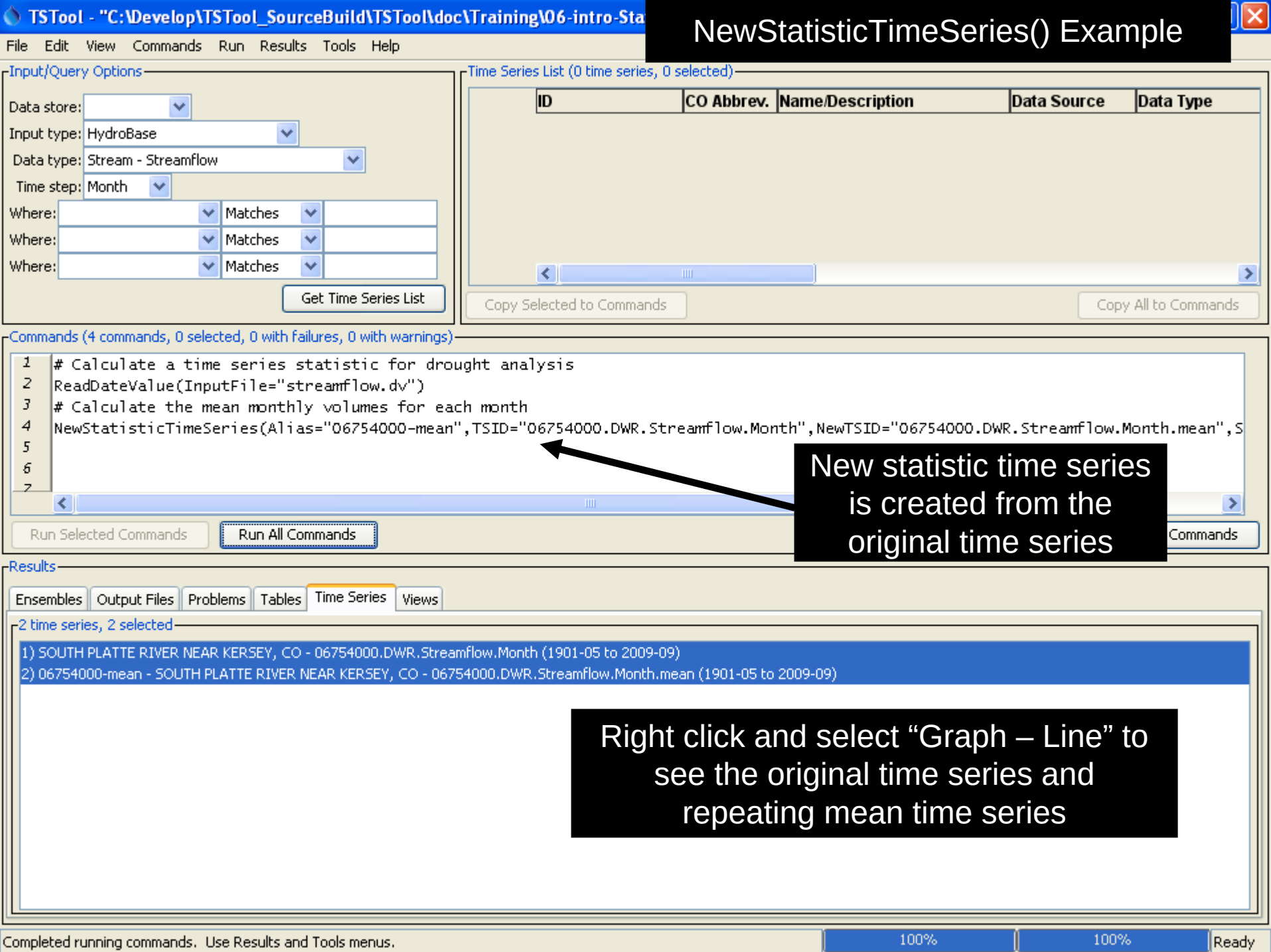
TSTool Statistics Features

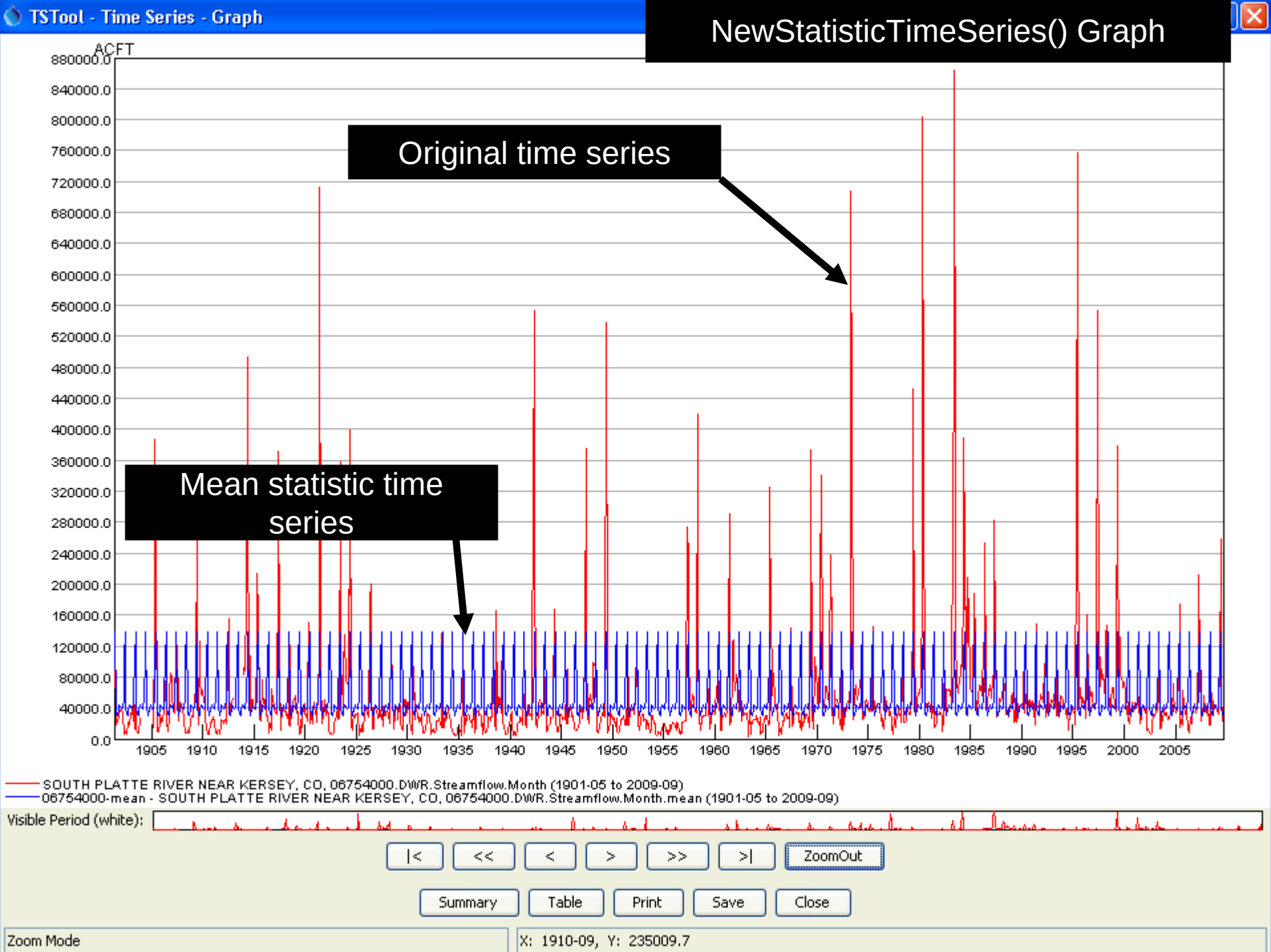
- A statistic is a value computed from a sample that has been extracted from a time series
- A statistic can be computed from an entire time series
- Time series of statistics can also be computed and can be further processed like any other time series

Calculating Statistic Using Sample of all Years

- For example the mean for Jan 1 is computed using all Jan 1 values
- Useful to characterize a time series
- The resulting repeating time series of the statistic can be used for computations and visualization

See example: example1-NewStatisticTimeSeries\ KerseyMean.TSTool

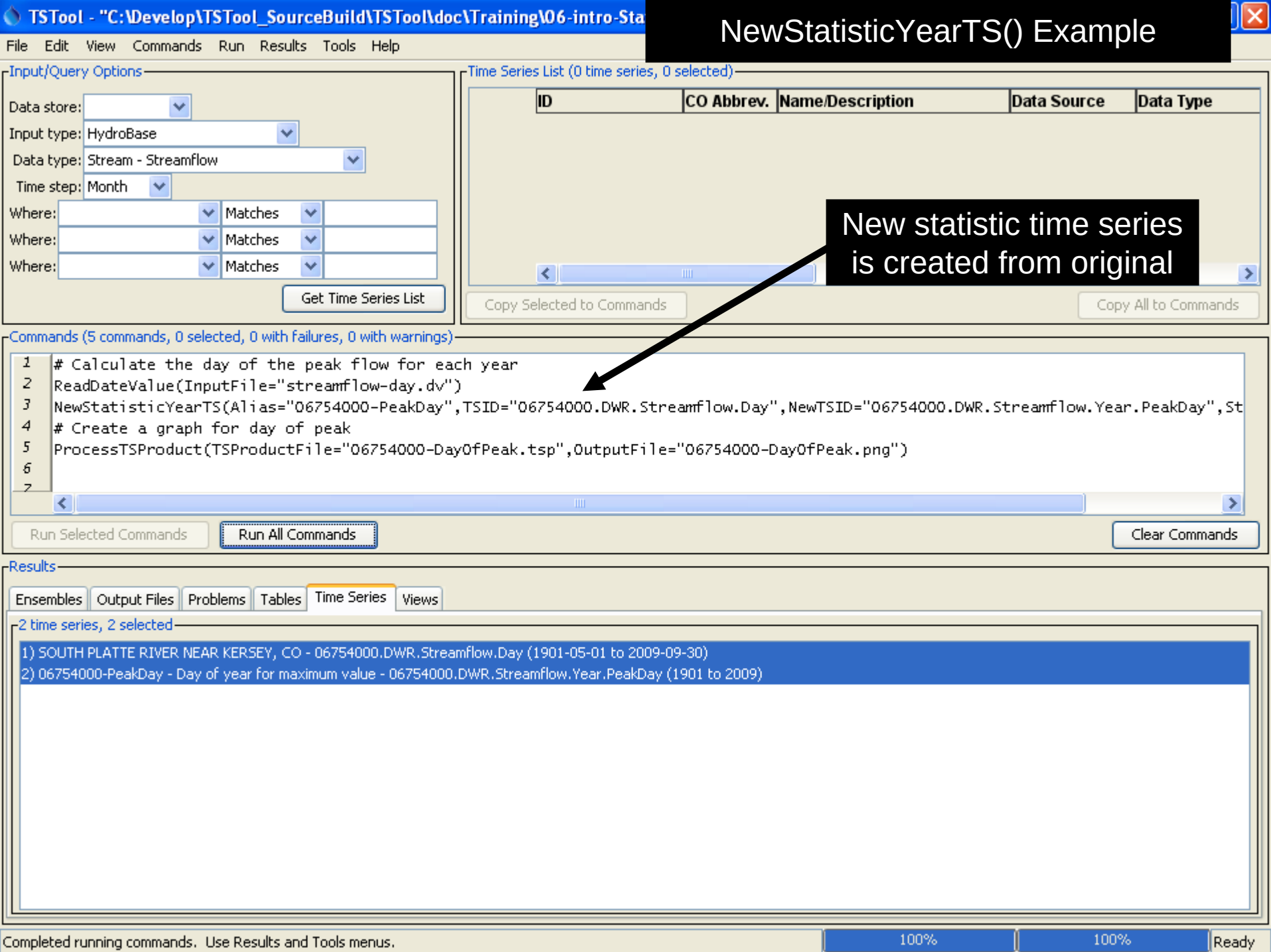

TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\06-intro-Sta
NewStatisticTimeSeries() Example
File Edit View Commands Run Results Tools Help
Input/Query Options
Data store:
Input type: HydroBase
Data type: Stream - Streamflow
Time step: Month
Where: Matches
Where: Matches
Where: Matches
Get Time Series List
Time Series List (0 time series, 0 selected)
ID
CO Abbrev.
Name/Description
Data Source
Data Type
Copy Selected to Commands
Copy All to Commands
Commands (4 commands, 0 selected, 0 with failures, 0 with warnings)
1 # Calculate a time series statistic for drought analysis
2 ReadDateValue(InputFile="streamflow.dv")
3 # Calculate the mean monthly volumes for each month
4 NewStatisticTimeSeries(Alias="06754000-mean",TSID="06754000.DWR.Streamflow.Month",NewTSID="06754000.DWR.Streamflow.Month.mean",S
5
6
7
Run Selected Commands
Run All Commands
Commands
New statistic time series is created from the original time series
Results
Ensembles Output Files Problems Tables Time Series Views
2 time series, 2 selected
1) SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.Month (1901-05 to 2009-09)
2) 06754000-mean - SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.Month.mean (1901-05 to 2009-09)
Right click and select “Graph – Line” to see the original time series and repeating mean time series
Completed running commands. Use Results and Tools menus.
100%
100%
Ready

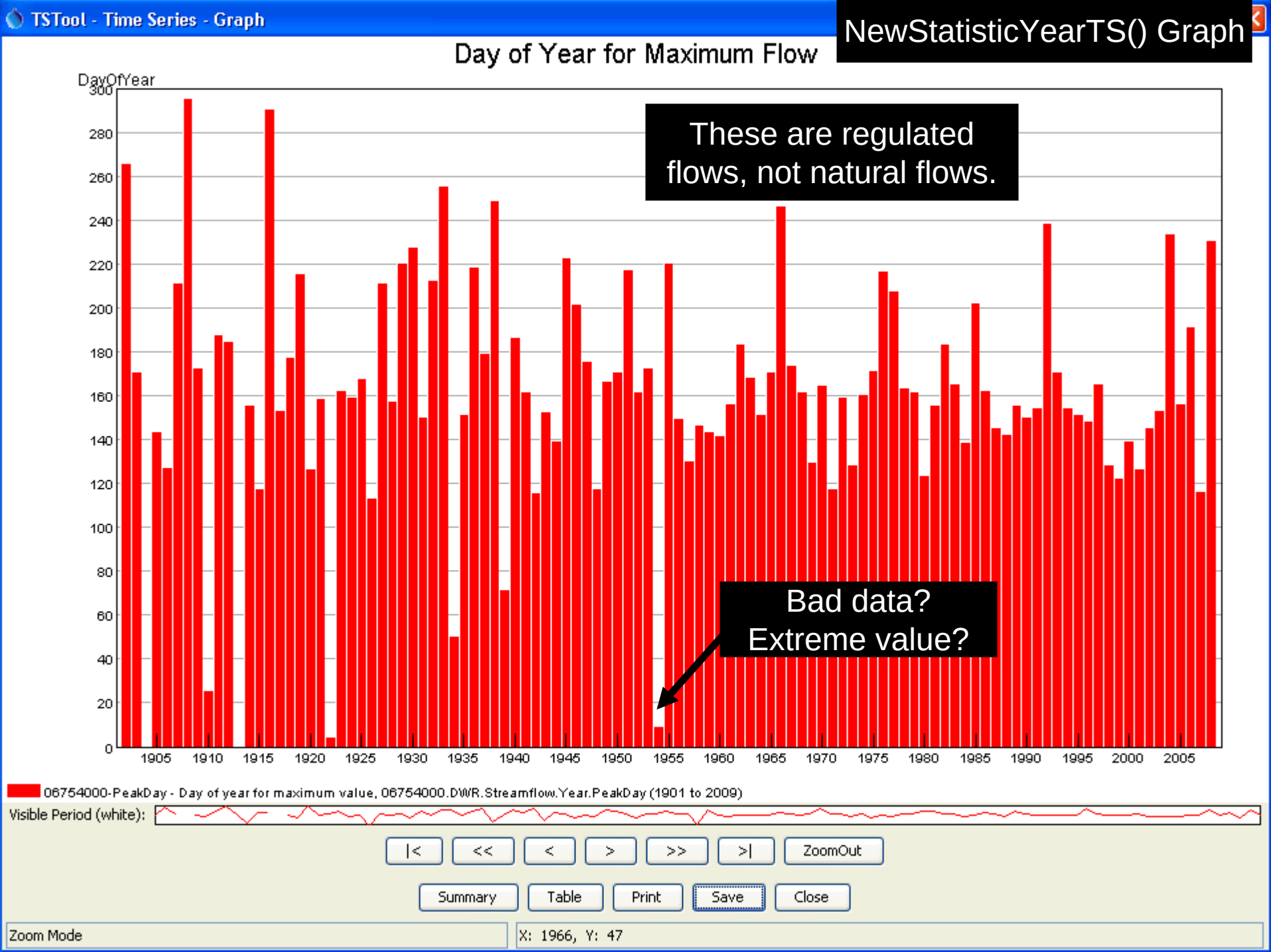

TSTool - Time Series - Graph
NewStatisticTimeSeries() Graph
ACFT
880000.0
840000.0
800000.0
760000.0
720000.0
680000.0
640000.0
600000.0
560000.0
520000.0
480000.0
440000.0
400000.0
360000.0
320000.0
280000.0
240000.0
200000.0
160000.0
120000.0
80000.0
40000.0
0.0
1905
1910
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
Original time series
Mean statistic time series
SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month (1901-05 to 2009-09)
06754000-mean - SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month.mean (1901-05 to 2009-09)
Visible Period (white):
|<
<<
<
>
>>
>|
ZoomOut
Summary
Table
Print
Save
Close
Zoom Mode
X: 1910-09, Y: 235009.7

Calculating an Annual Statistic Using Sample Within Each Year

- Useful to characterize a time series
  - How many times (or percent of values) in a year has a critical value been exceeded?
  - What is the critical value in a year?
  - What is the earliest or latest day or month in a year that a value occurs?

See example: example2-NewStatisticYearTS\KerseyPeakDate.TSTool

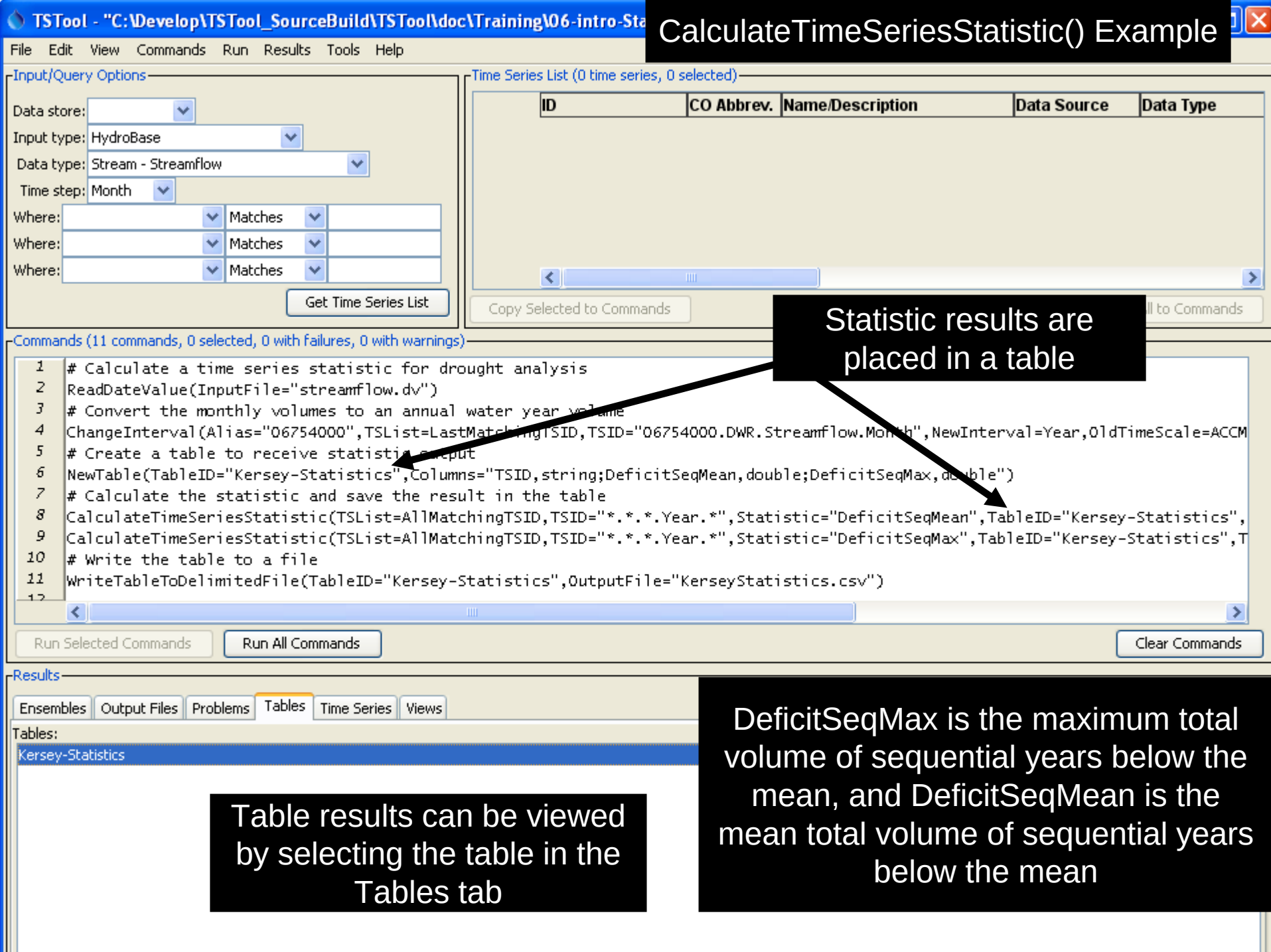

TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\06-intro-Sta
NewStatisticYearTS() Example
File Edit View Commands Run Results Tools Help
Input/Query Options
Data store:
Input type: HydroBase
Data type: Stream - Streamflow
Time step: Month
Where: Matches
Where: Matches
Where: Matches
Get Time Series List
Time Series List (0 time series, 0 selected)
ID
CO Abbrev.
Name/Description
Data Source
Data Type
Copy Selected to Commands
Copy All to Commands
New statistic time series is created from original
Commands (5 commands, 0 selected, 0 with failures, 0 with warnings)
1 # Calculate the day of the peak flow for each year
2 ReadDateValue(InputFile="streamflow-day.dv")
3 NewStatisticYearTS(Alias="06754000-PeakDay",TSID="06754000.DWR.Streamflow.Day",NewTSID="06754000.DWR.Streamflow.Year.PeakDay",St
4 # Create a graph for day of peak
5 ProcessTSProduct(TSProductFile="06754000-DayOfPeak.tsp",OutputFile="06754000-DayOfPeak.png")
6
Run Selected Commands
Run All Commands
Clear Commands
Results
Ensembles Output Files Problems Tables Time Series Views
2 time series, 2 selected
1) SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.Day (1901-05-01 to 2009-09-30)
2) 06754000-PeakDay - Day of year for maximum value - 06754000.DWR.Streamflow.Year.PeakDay (1901 to 2009)
Completed running commands. Use Results and Tools menus.
100%
100%
Ready

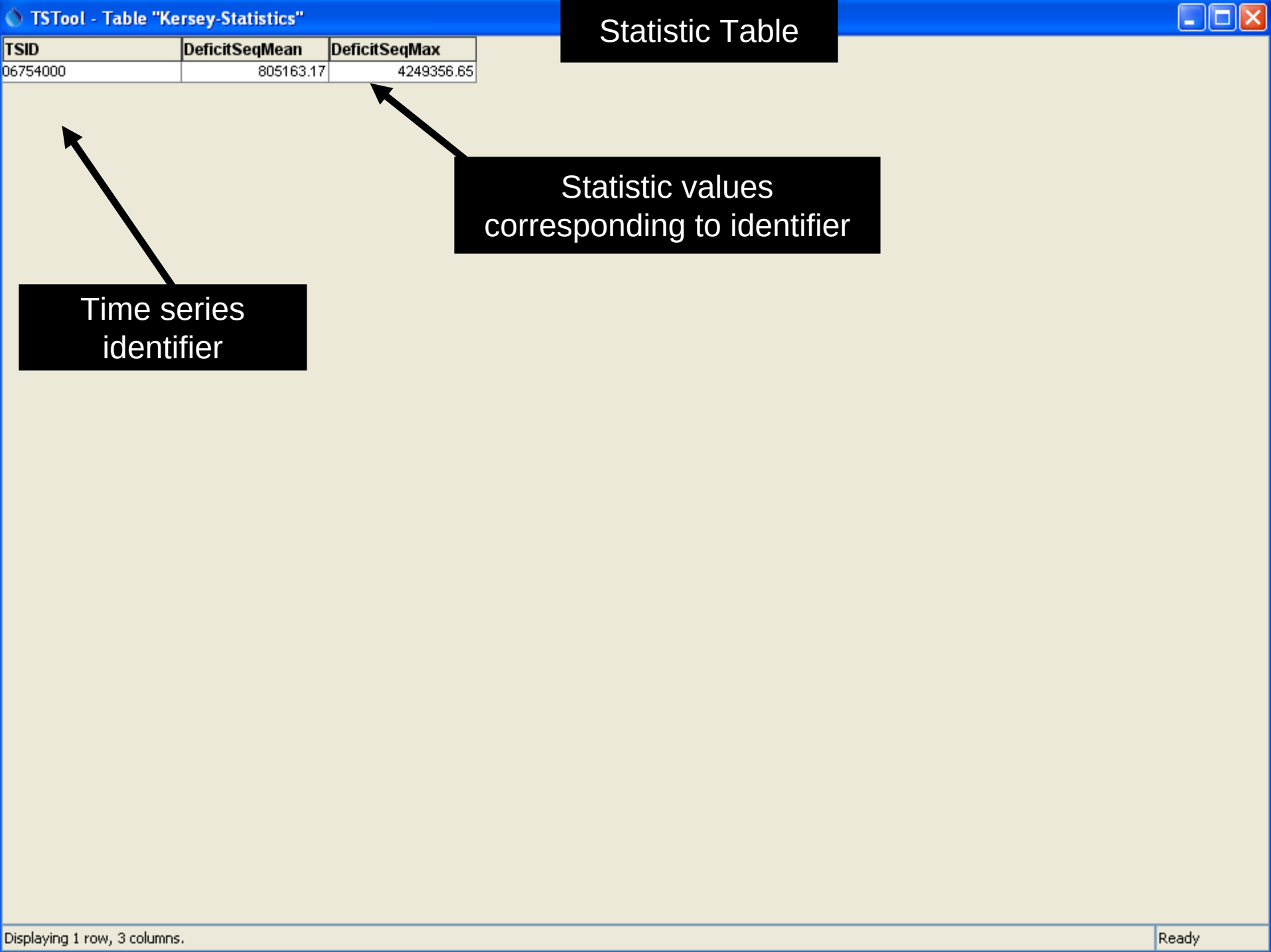

TSTool - Time Series - Graph
NewStatisticYearTS() Graph
Day of Year for Maximum Flow
DayOfYear
These are regulated flows, not natural flows.
Bad data?
Extreme value?
06754000-PeakDay - Day of year for maximum value, 06754000.DWR.Streamflow.Year.PeakDay (1901 to 2009)
Visible Period (white):
|<
<<
<
>
>>
>|
ZoomOut
Summary
Table
Print
Save
Close
Zoom Mode
X: 1966, Y: 47

Calculating a Single Statistic

- Useful to characterize a time series, in particular for annual values
  - Simple statistic like mean, median
  - Analysis of drought or surplus relative to mean
  - Analysis of drought or surplus length (years)
- May make sense only for some time series data types and intervals

See example: example3-CalculateTimeSeriesStatistic\CalculateTimeSeriesStatisic.TSTool


TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\06-intro-Sta
CalculateTimeSeriesStatistic() Example
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 (0 time series, 0 selected)
ID
CO Abbrev.
Name/Description
Data Source
Data Type
Copy Selected to Commands
Statistic results are placed in a table
Commands (11 commands, 0 selected, 0 with failures, 0 with warnings)
1 # Calculate a time series statistic for drought analysis
2 ReadDateValue(InputFile="streamflow.dv")
3 # Convert the monthly volumes to an annual water year volume
4 ChangeInterval(Alias="06754000",TSList=LastMatchingTSID,TSID="06754000.DWR.Streamflow.Month",NewInterval=Year,OldTimeScale=ACCM
5 # Create a table to receive statistic output
6 NewTable(TableID="Kersey-Statistics",Columns="TSID,string;DeficitSeqMean,double;DeficitSeqMax,double")
7 # Calculate the statistic and save the result in the table
8 CalculateTimeSeriesStatistic(TSList=AllMatchingTSID,TSID="*.*.*.Year.*",Statistic="DeficitSeqMean",TableID="Kersey-Statistics",
9 CalculateTimeSeriesStatistic(TSList=AllMatchingTSID,TSID="*.*.*.Year.*",Statistic="DeficitSeqMax",TableID="Kersey-Statistics",T
10 # Write the table to a file
11 WriteTableToDelimitedFile(TableID="Kersey-Statistics",OutputFile="KerseyStatistics.csv")
Run Selected Commands
Run All Commands
Clear Commands
Results
Ensembles Output Files Problems Tables Time Series Views
Tables:
Kersey-Statistics
Table results can be viewed by selecting the table in the Tables tab
DeficitSeqMax is the maximum total volume of sequential years below the mean, and DeficitSeqMean is the mean total volume of sequential years below the mean


TSTool - Table "Kersey-Statistics"
Statistic Table
TSID
DeficitSeqMean
DeficitSeqMax
06754000
805163.17
4249356.65
Statistic values corresponding to identifier
Time series identifier
Displaying 1 row, 3 columns.
Ready

More Information

Help…View Documentation to view the TSTool documentation