

# TSTool Training

## Time Series Statistics

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 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`

## Input/Query Options

Input Type: HydroBase

Input Name:

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 TS 06754000-mean = NewStatisticTimeSeries(TSID="06754000.DWR.Streamflow.Month", NewTSID="06754000.DWR.Streamflow.Month.mean", ...
5
6
7
8
9
10
```

Run Selected Commands

Run All Commands

Clear Commands

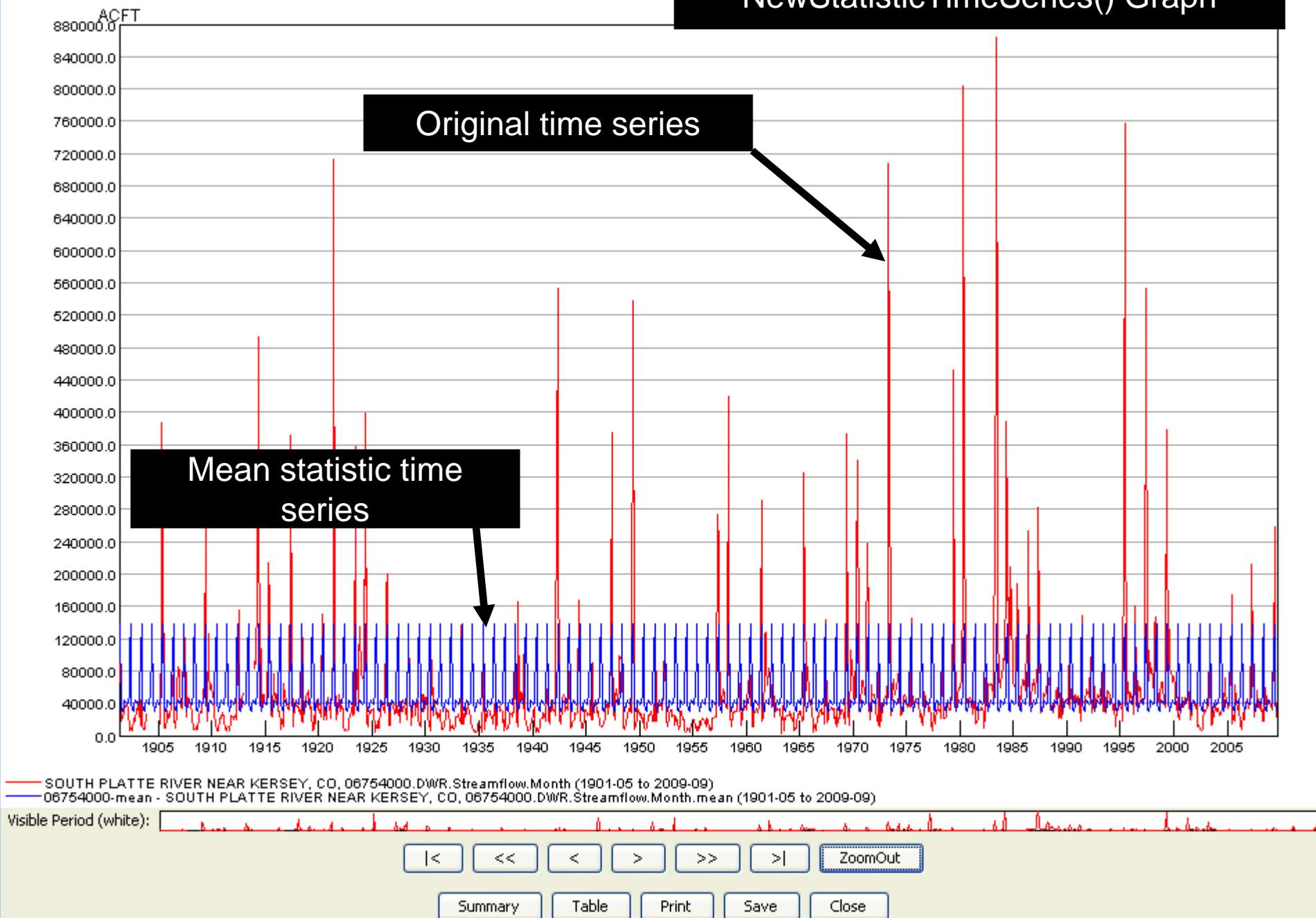
## Results

Ensembles Output Files Problems Tables Time Series Views

## 2 time series, 2 selected

- 1) SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.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



# 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

## Input/Query Options

Input Type: HydroBase

Input Name:

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 TS 06754000-PeakDay = NewStatisticYearTS(TSID="06754000.DWR.Streamflow.Day", NewTSID="06754000.DWR.Streamflow.Year.PeakDay", Stati
4 # Create a graph for day of peak
5 ProcessTSProduct(TSPProductFile="06754000-DayOfPeak.tsp",OutputFile="06754000-DayOfPeak.png")
6
7
```

Run Selected Commands

Run All Commands

Clear Commands

## Results

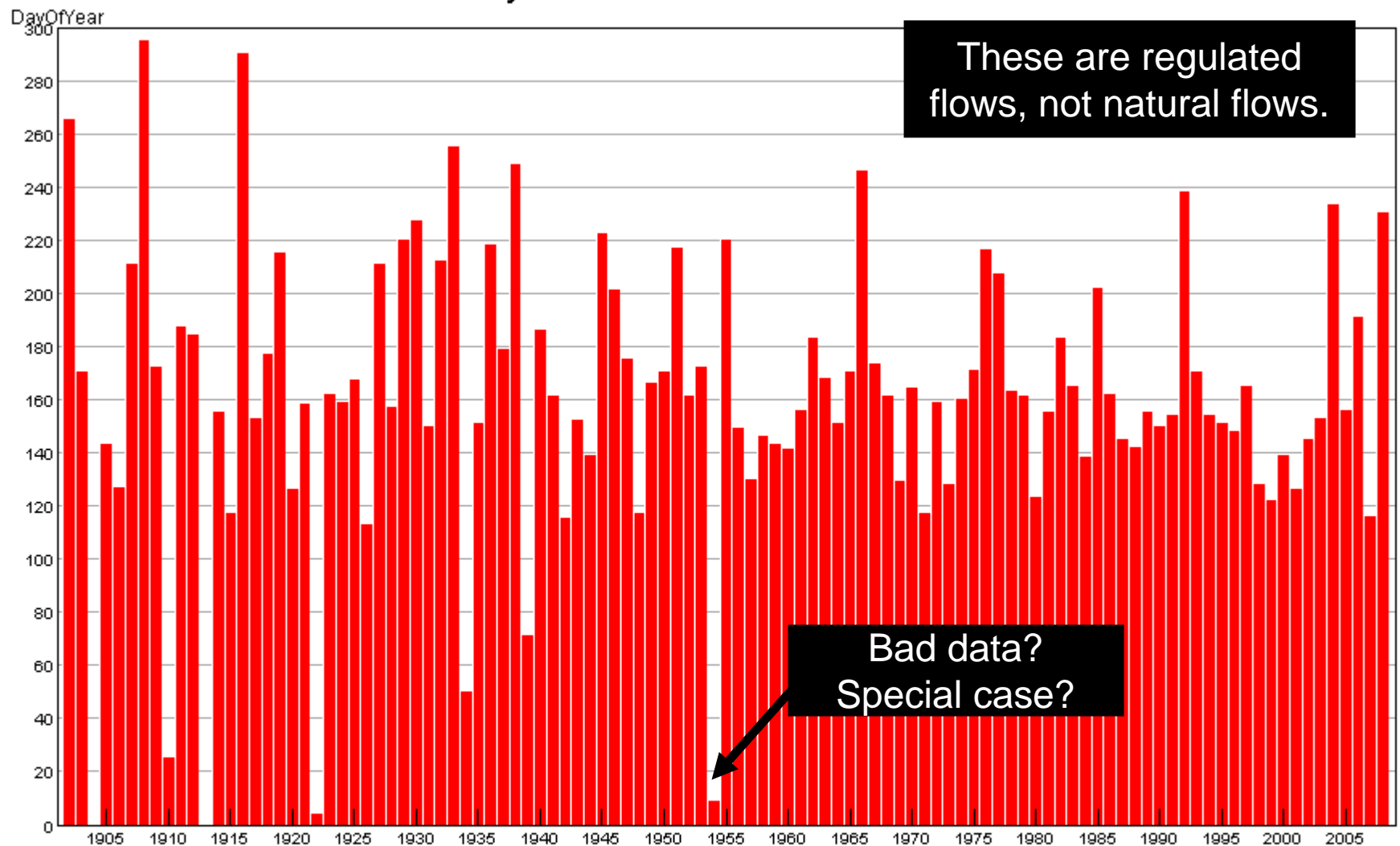
Ensembles Output Files Problems Tables Time Series Views

## 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)



Day of Year for



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\

CalculateTimeSeriesStatistic.TSTool

## Input/Query Options

Input Type:

Input Name:

Data Type:

Time Step:

Where:

Where:

Where:

## Time Series List (0 time series, 0 selected)

ID	CO Abbrev.	Name/Description	Data Source	Data Type
<input type="button" value="Copy Selected to Commands"/> <input type="button" value="to Commands"/>				

## 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 TS 06754000 = ChangeInterval(TSID="06754000.DWR_Streamflow.Month",NewInterval=Year,OldTimeScale=ACCM,NewTimeScale=ACCM,OutputYe
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",
10 # Write the table to a file
11 WriteTableToDelimitedFile(TableID="Kersey-Statistics",OutputFile="KerseyStatistics.csv")

```

Statistic results are placed in a table

## 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

TSID	DeficitSeqMean	DeficitSeqMax
06754000	805163.17	
06754000		4249356.65

Time series  
identifier

Statistic values (bug in  
code results in extra  
row)

# More Information

Help...View Documentation to view the  
TSTool documentation