

TSTool Training

Graphing Time Series

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 graphing 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 Graphing Features

- Optimized for time series data
 - Speed
 - Handle missing data, units, etc.
 - Allow different data intervals on same plot
- Can automate graph product generation
 - Run in batch mode
 - Many properties to configure plot appearance
- Data are stored separate from plot definition, with link that uses the time series identifier

Simple Graph Example

- Consistent data types
- Simple graph properties
- One graph per page

See example: `example1-SimpleGraph\Kersey-streamflow.TSTool`

Input/Query Options

Input Type:

Input Name:

Data Type:

Time Step:

Where: Division Equals

Where: Station Name Contains

Where: Matches

Time Series List (1 time series, 0 selected)

	ID	CO Abbrev.	Name/Description	Data Source	Data Ty
1	06754000	PLAKERCO	SOUTH PLATTE RIVER NEAR KER...	DWR	Streamfl

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

```
1 # Simple graph for one streamflow station
2 ReadDateValue(InputFile="data-month.dv")
3
4
5
6
7
8
9
10
```

Reading example data
that contains streamflow
and other data

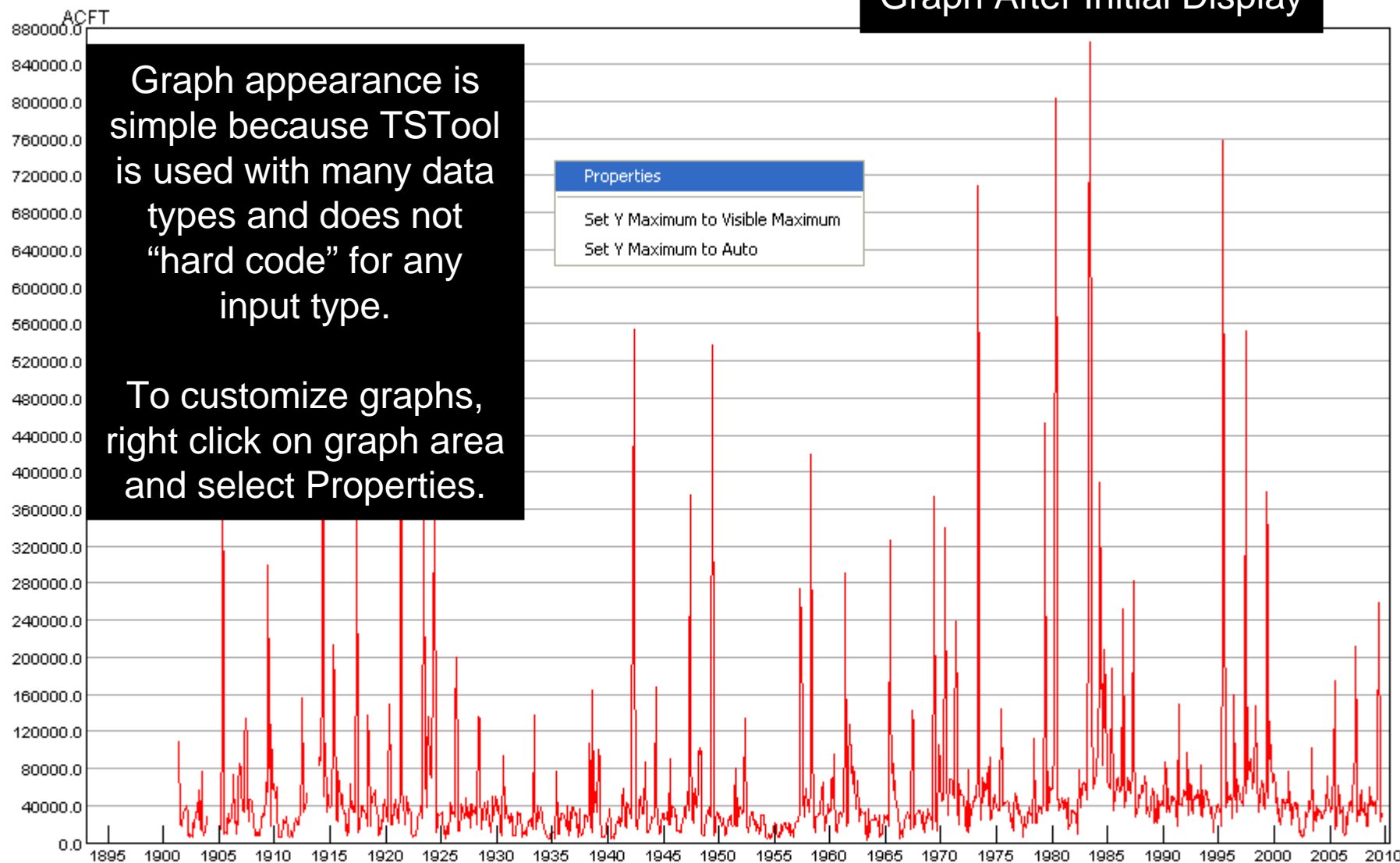
Results

Ensembles Output Files Problems Tables Time Series Views

5 time series, 1 selected

- 1) SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)
- 2) GREELEY - 3546.NOAA.Precip.Month (1893-01 to 2010-05)
- 3) GREELEY UNC - 3553.NOAA.Precip.Month (1893-01 to 2010-05)
- 4) GREELEY - 3546.NOAA.TempMean.Month (1893-01 to 2010-05)
- 5) GREELEY UNC - 3553.NOAA.TempMean.Month (1893-01 to 2010-05)

Select only the streamflow
time series, right click and
then "Graph - Line"



— SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)

Visible Period (white):



|< << < > >> >| ZoomOut

Summary

Table

Print

Save

Close

Zoom Mode

X: 1935-02, Y: 736705.0

Graph Properties

- Product (page) properties at top
- Graph properties (on page) in middle
- Time series properties (on graph) on bottom

TSTool - Time Series Product Properties

Product Properties:

General | Titles | Layout

Product ID: Product1

Product Name:

☒ Product Enabled

Graph Properties:

1 -

General | Graph Type | Titles | X Axis | Y Axis | Label | Legend | Zoom | Analysis | Annotations

☒ Graph Enabled

Y Percent Size:

Time Series Properties:

1 - 06754000.DWR.Streamflow.Month~DateValue~C:\Develop\TSTool_So...

General | Graph Type | Axes | Symbol | Label | Legend | Analysis

☒ Time Series Enabled

Apply Close

Graph Properties – Edited

- Set page title
- Set graph title
- Set time series color to blue
- Press Apply to update the graph

TSTool - Time Series Product Properties

Product Properties:

General Titles Layout

Main Title: South Platte River Near Kersey Arial Plain 20

Sub Title: 06754000 Arial Plain 10

Graph Properties: 1 - Streamflow

General Graph Type Titles X Axis Y Axis Label Legend Zoom Analysis Annotations

Main Title: Streamflow Arial Plain 20

Sub Title: Arial Plain 10

Time Series Properties: 1 - 06754000.DWR.Streamflow.Month~DateValue~C:\Develop\TSTool_So...

General Graph Type Axes Symbol Label Legend Analysis

Line Style: Solid Line Width: 1

Color: Blue Blue Custom

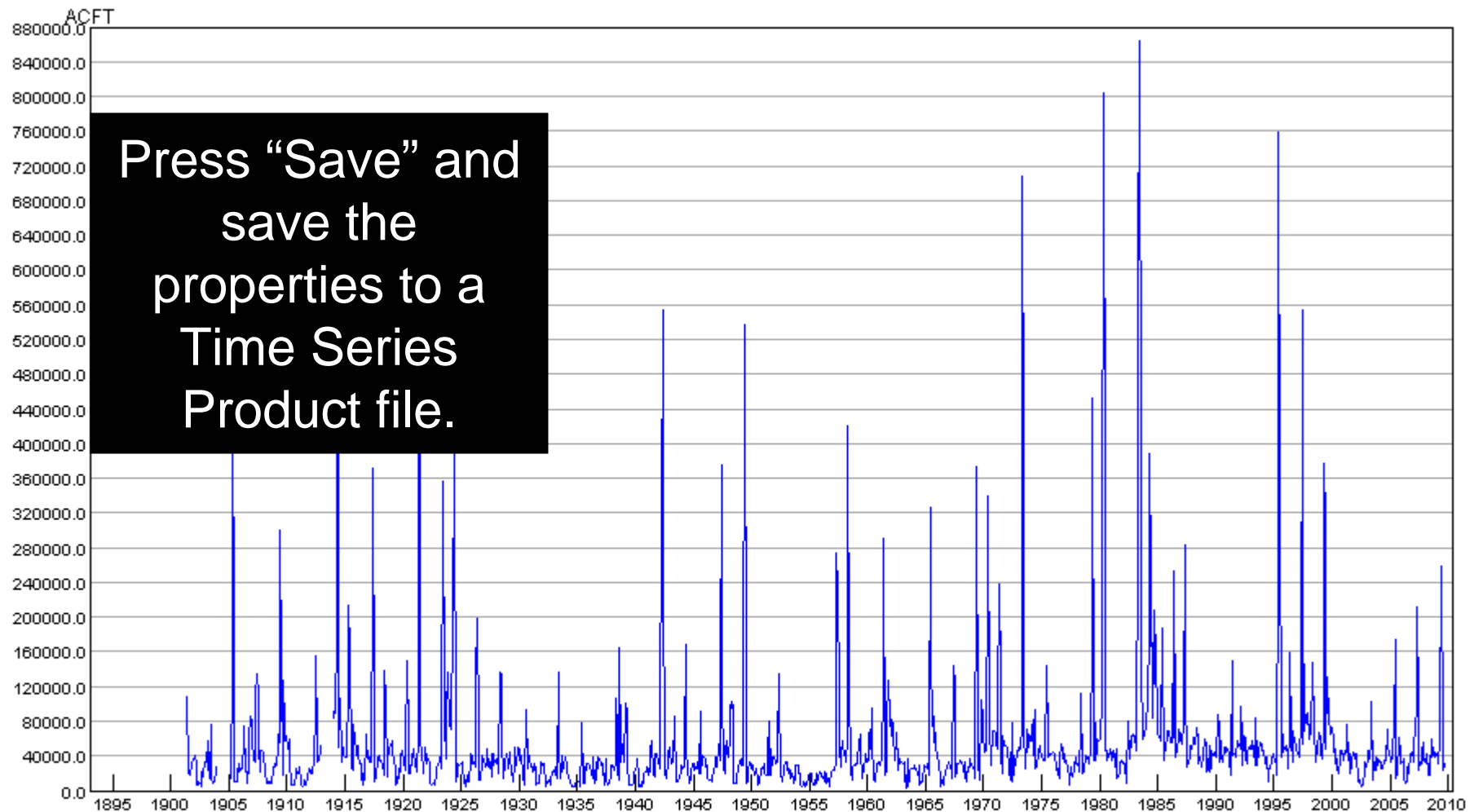
Symbol Style: None Symbol Size: 0

Apply Close

South Platte River Near Kersey

06754000

Streamflow



— SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)

Visible Period (white):

|< << < > >> >| ZoomOut

Summary

Table

Print

Save

Close

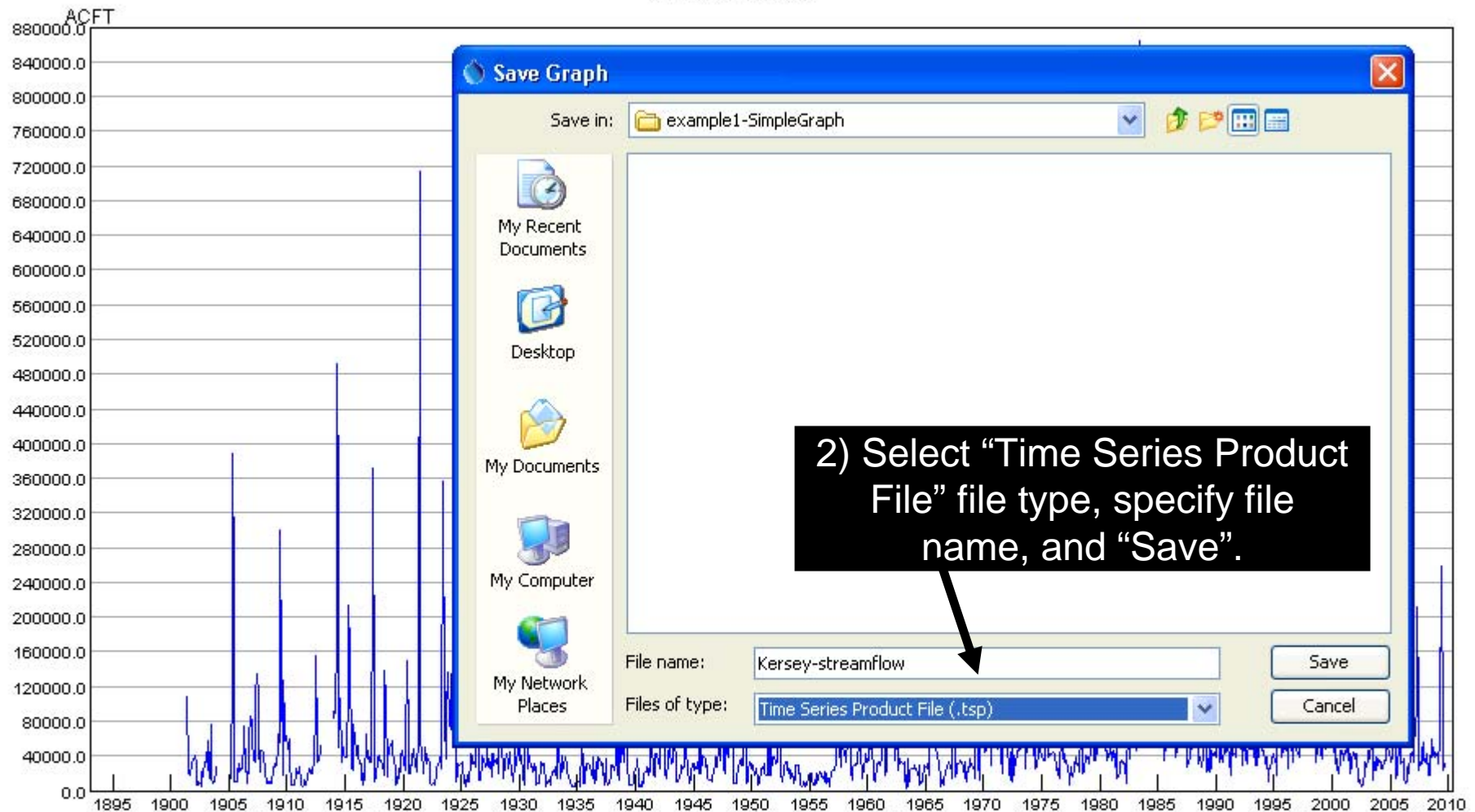
Zoom Mode

X: 1935-02, Y: 232683.6

South Platte River Near Kersey

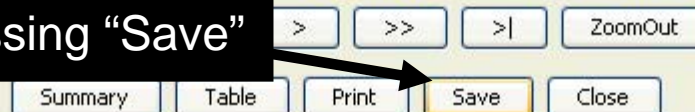
06754000

Streamflow



2) Select "Time Series Product File" file type, specify file name, and "Save".

1) Start by pressing "Save"



— SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)

Visible Period (white):

Input/Query Options

Input Type:

Input Name:

Data Type:

Time Step:

Where: Division Equals

Where: Station Name Contains

Where: Matches

Time Series List (1 time series, 0 selected)

	ID	CO Abbrev.	Name/Description	Data Source	Data Ty
1	06754000	PLAKERCO	SOUTH PLATTE RIVER NEAR KER...	DWR	Streamfl

Commands (4 commands, 0 selected, 0 with failures, 0 with warnings)

```
1 # Simple graph for one streamflow station
2 ReadDateValue(InputFile="data-month.dv")
3 # Process the graph product to display the configured graph and generate an image
4 ProcessTSProduct(TSPProductFile="Kersey-streamflow.tsp",OutputFile="Kersey-streamf
5
6
7
8
9
10
```

Commands... Output
Time Series...
ProcessTSProduct()
command - graph is
produced using time
series data and plot
product file

Results

Ensembles Output Files Problems Tables Time Series Views

5 time series, 5 selected

- 1) SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)
- 2) GREELEY - 3546.NOAA.Precip.Month (1893-01 to 2010-05)
- 3) GREELEY UNC - 3553.NOAA.Precip.Month (1893-01 to 2010-05)
- 4) GREELEY - 3546.NOAA.TempMean.Month (1893-01 to 2010-05)
- 5) GREELEY UNC - 3553.NOAA.TempMean.Month (1893-01 to 2010-05)

[[Product]

```
ProductType = "Graph"  
TotalWidth = "600"  
TotalHeight = "400"  
MainTitleString = "South Platte River Near Kersey"  
SubTitleString = "06754000"
```

Page properties

[SubProduct 1]

```
GraphType = "Line"  
MainTitleString = "Streamflow"  
LayoutYPercent = ""
```

Graph properties

[Data 1.1]

```
TSID = "06754000.DWR.Streamflow.Month~DateValue~C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\04-intro-Graphs\example0-ExampleData  
Color = "Blue"
```

Time series properties

Note that the time series identifier may include the absolute path to the file – this should be edited in the file to a relative path (or remove the input type altogether) to allow copying from one folder location to another.

See the TSView Appendix in TSTool for a full list of properties

Complex Graph Example

- Different data types and units
- Multiple graphs on a page

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

Complex Graph Example

File Edit View Commands Run Results Tools Help

Input/Query Options

Input Type:

Input Name:

Data Type:

Time Step:

Where: Division 1 - South Platte

Where: Station Name kersey

Where:

Time Series List (1 time series, 0 selected)

	ID	CO Abbrev.	Name/Description	Data Source	Data Ty
1	06754000	PLAKERCO	SOUTH PLATTE RIVER NEAR KER...	DWR	Streamfl

Commands (3 commands, 0 selected, 0 with failures, 0 with warnings)

```

1 # Simple graph for one streamflow, temperature, and precipitation data
2 ReadDateValue(InputFile="data-month.dv")
3 # Process the graph product to display the configured graph and generate an image file
4
5
6
7
8
9
10

```

Data file includes streamflow, temperature, and precipitation

Results

Ensembles Output Files Problems Tables Time Series Views

5 time series, 5 selected

- 1) SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)
- 2) GREELEY - 3546.NOAA.Precip.Month (1893-01 to 2010-05)
- 3) GREELEY UNC - 3553.NOAA.Precip.Month (1893-01 to 2010-05)
- 4) GREELEY - 3546.NOAA.TempMean.Month (1893-01 to 2010-05)
- 5) GREELEY UNC - 3553.NOAA.TempMean.Month (1893-01 to 2010-05)

Continue Graph?

The data units are incompatible
Continue graphing anyway?

Right click on all time series and select "Graph - Line". When warned about incompatible units, press "Yes" to continue.

See units in legend

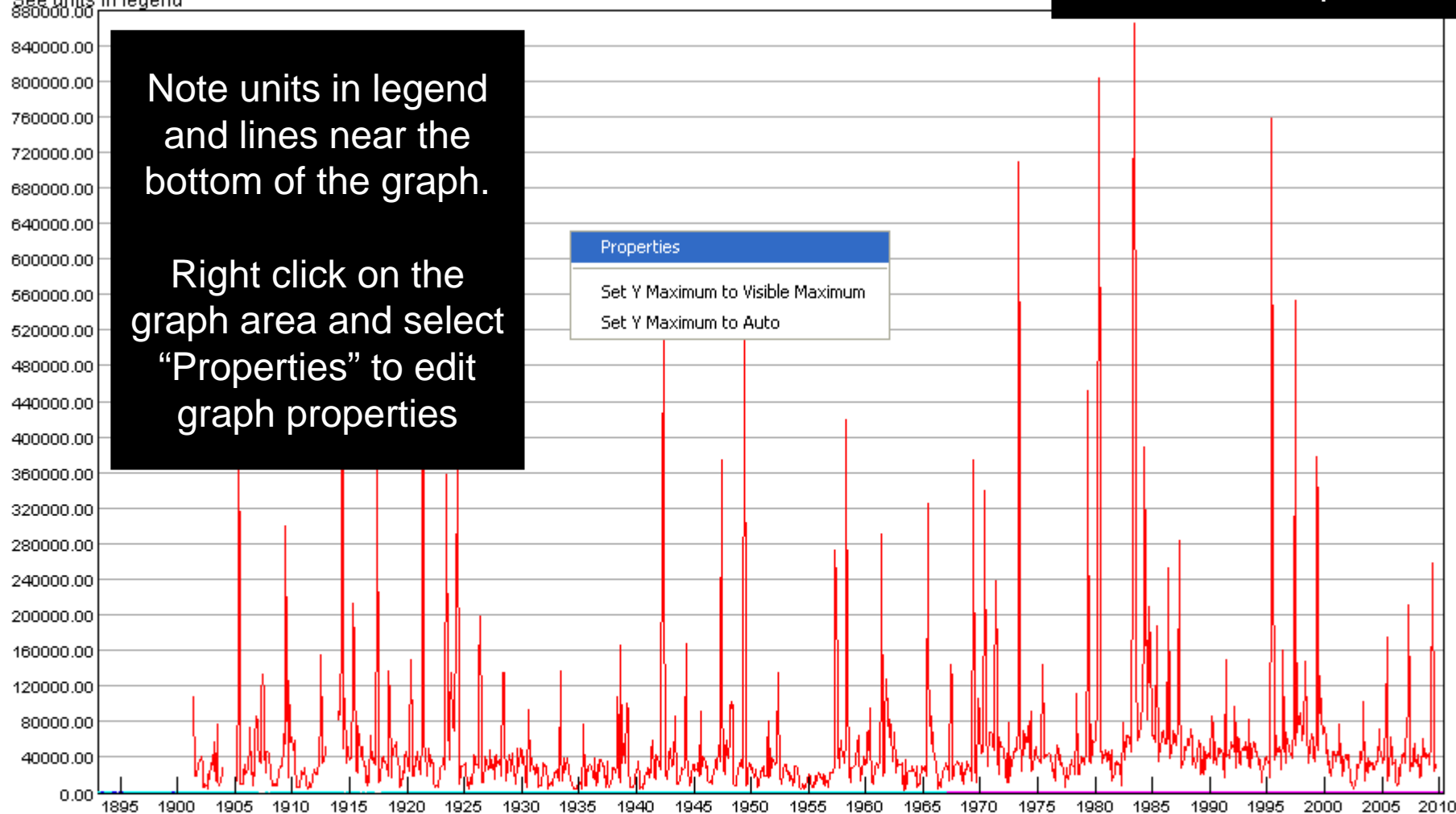
Note units in legend
and lines near the
bottom of the graph.

Right click on the
graph area and select
“Properties” to edit
graph properties

Properties

Set Y Maximum to Visible Maximum

Set Y Maximum to Auto



— SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month, ACFT (1893-01 to 2010-05)
— GREELEY, 3546.NOAA.Precip.Month, IN (1893-01 to 2010-05)
— GREELEY UNC, 3553.NOAA.Precip.Month, IN (1893-01 to 2010-05)
— GREELEY, 3546.NOAA.TempMean.Month, F (1893-01 to 2010-05)
— GREELEY UNC, 3553.NOAA.TempMean.Month, F (1893-01 to 2010-05)

Visible Period (white):

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ZoomOut

Summary

Table

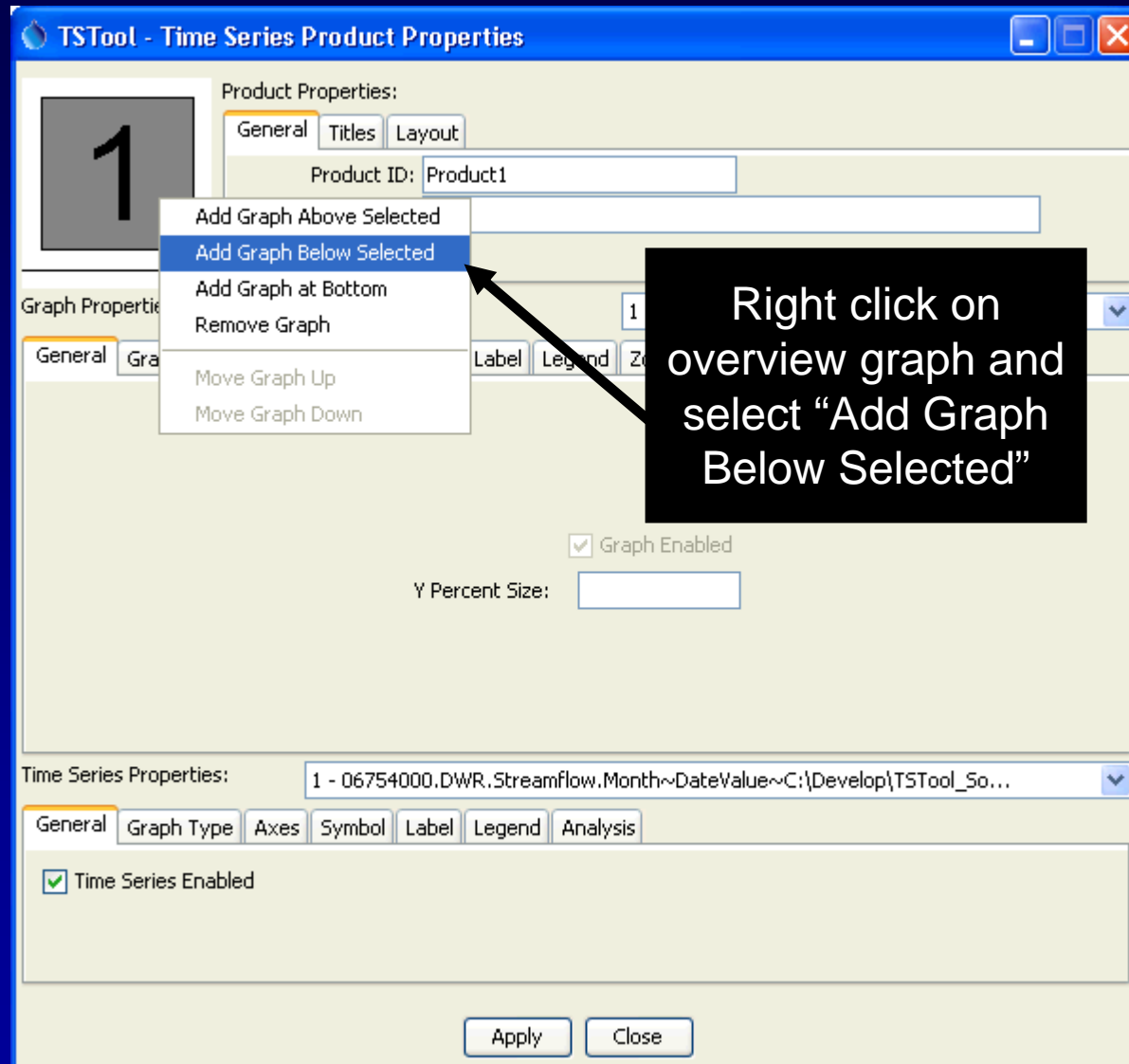
Print

Save

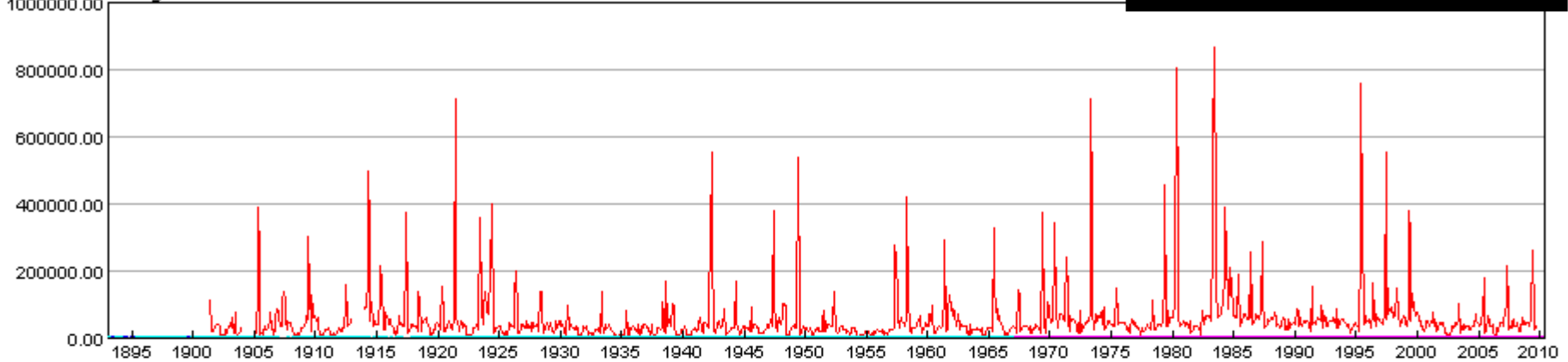
Close

Graph Properties

- To display more than one graph on a page, split the page
- The graph will redraw and the “Graph Properties” area will list each graph on the page



See units in legend



— SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month, ACFT (1893-01 to 2010-05)
— GREELEY, 3546.NOAA.Precip.Month, IN (1893-01 to 2010-05)
— GREELEY UNC, 3553.NOAA.Precip.Month, IN (1893-01 to 2010-05)
— GREELEY, 3546.NOAA.TempMean.Month, F (1893-01 to 2010-05)
— GREELEY UNC, 3553.NOAA.TempMean.Month, F (1893-01 to 2010-05)

Now need to move
time series from first
graph to new blank
graph

Visible Period (white):



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ZoomOut

Summary

Table

Print

Save

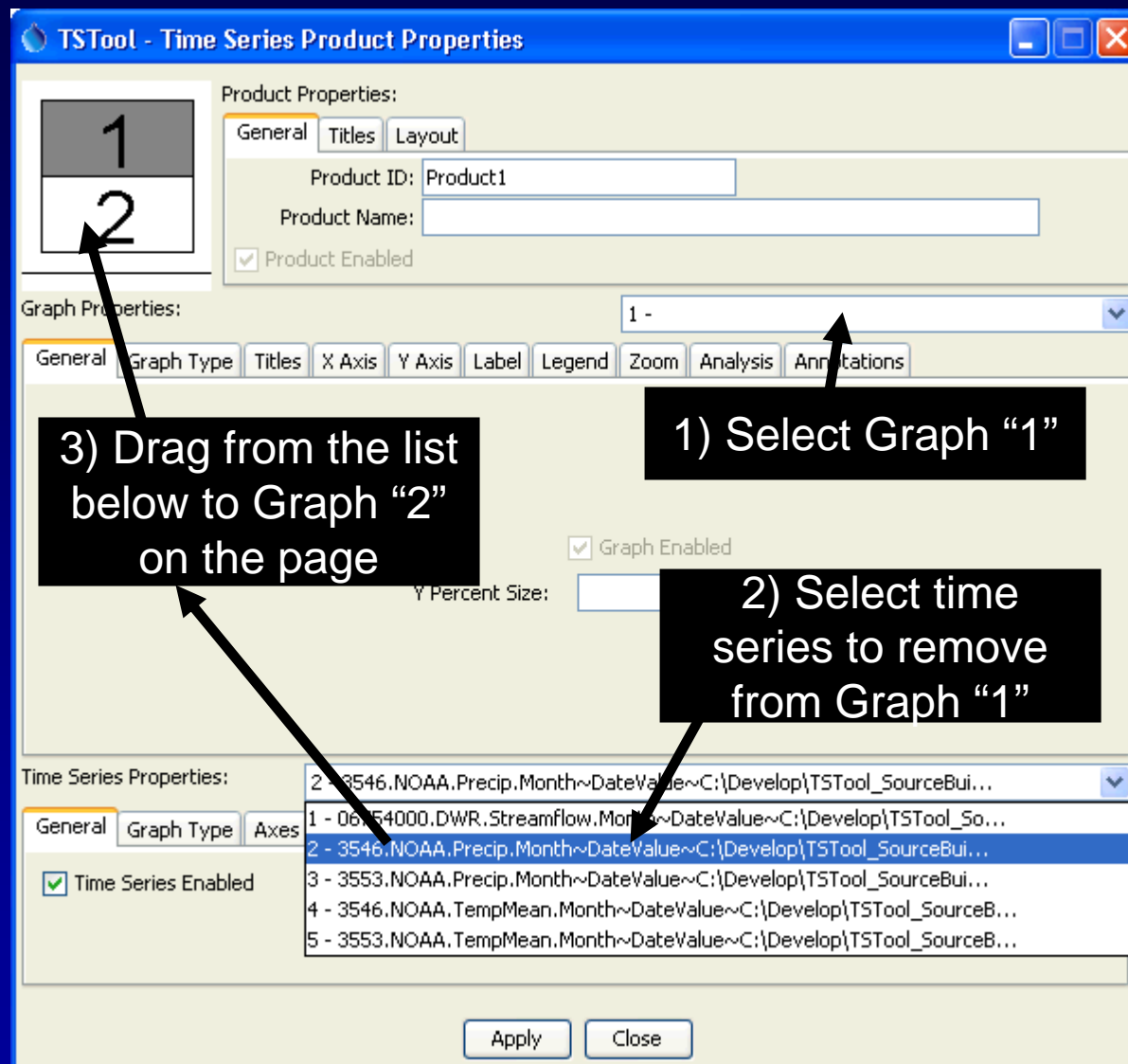
Close

Zoom Mode

X: 0000, Y: 0.00

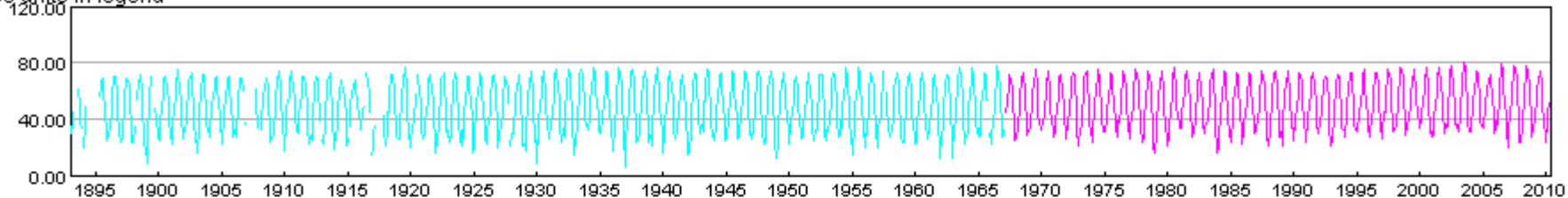
Graph Properties – Drag Time Series

- To move time series, drag from the list to the new graph area
- Repeat as necessary
- Also set other properties and press “Apply” before switching between graphs and time series
- The graph will update as time series are moved and “Apply” is pressed



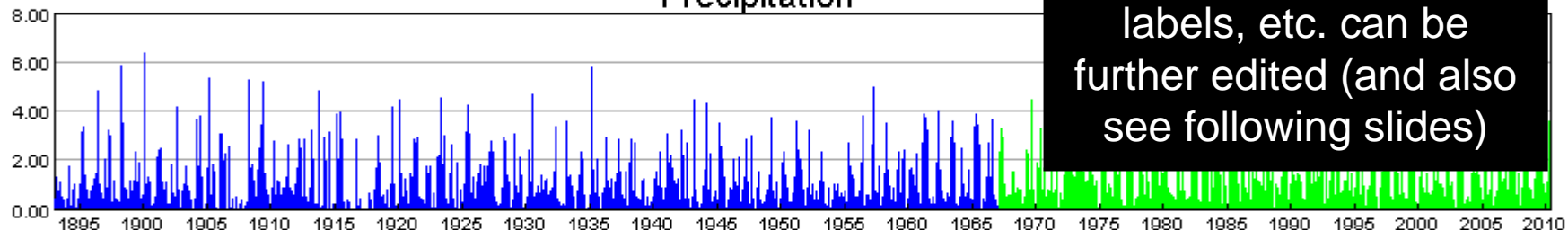
Kersey Data Temperature

See units in legend



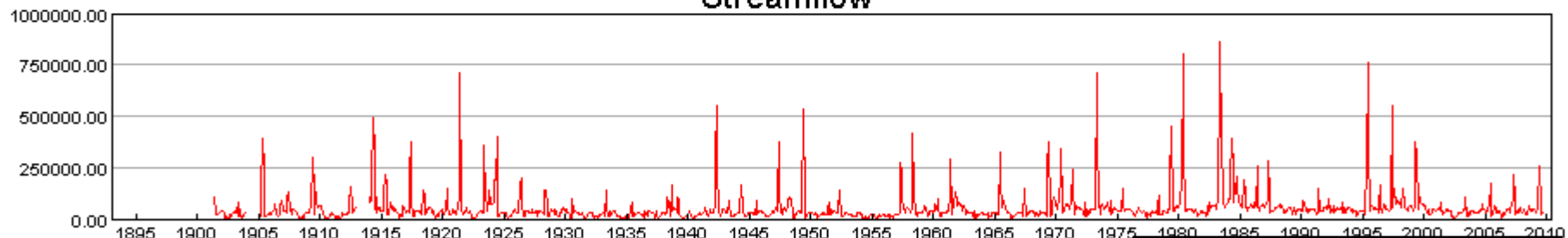
— GREELEY, 3546.NOA.TempMean.Month (1893-01 to 2010-05)
— GREELEY UNC, 3553.NOA.TempMean.Month (1893-01 to 2010-05)

Precipitation



■ GREELEY, 3546.NOA.Precip.Month (1893-01 to 2010-05)
■ GREELEY UNC, 3553.NOA.Precip.Month (1893-01 to 2010-05)

Streamflow



— SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)

Colors, precision of labels, etc. can be further edited (and also see following slides)

Save the graph properties as a time series product file to allow its recreation

Graph navigation for all graphs is linked



Input/Query Options

Input Type:

Input Name:

Data Type:

Time Step:

Where: Division 1 - South Platte

Where: Station Name kersey

Where: Matches

Time Series List (1 time series, 0 selected)

	ID	CO Abbrev.	Name/Description	Data Source	Data Ty
1	06754000	PLAKERCO	SOUTH PLATTE RIVER NEAR KER...	DWR	Streamfl

Commands (4 commands, 0 selected, 0 with failures, 0 with warnings)

```
1 # Simple graph for one streamflow, temperature, and precipitation data
2 ReadDateValue(InputFile="data-month.dv")
3 # Process the graph product to display the configured graph and generate an image file
4 ProcessTSProduct(TSPProductFile="ComplexGraph.tsp",OutputFile="ComplexGraph.png")
5
6
7
8
9
10
```

The configured product is processed

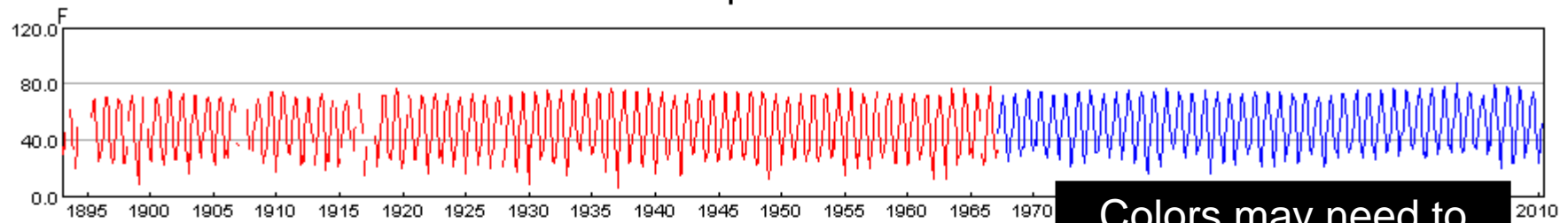
Results

Ensembles Output Files Problems Tables Time Series Views

5 time series, 1 selected

- 1) SOUTH PLATTE RIVER NEAR KERSEY, CO - 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)
- 2) GREELEY - 3546.NOAA.Precip.Month (1893-01 to 2010-05)
- 3) GREELEY UNC - 3553.NOAA.Precip.Month (1893-01 to 2010-05)
- 4) GREELEY - 3546.NOAA.TempMean.Month (1893-01 to 2010-05)
- 5) GREELEY UNC - 3553.NOAA.TempMean.Month (1893-01 to 2010-05)

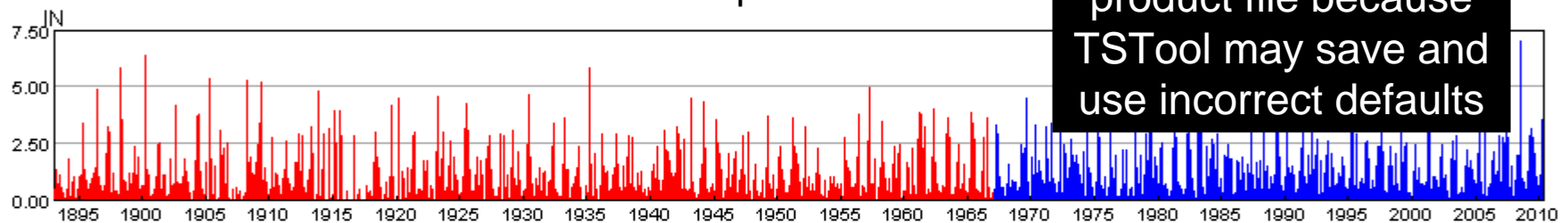
Kersey Data Temperature



— GREELEY, 3546.NOAA.TempMean.Month (1893-01 to 2010-05)
— GREELEY UNC, 3553.NOAA.TempMean.Month (1893-01 to 2010-05)

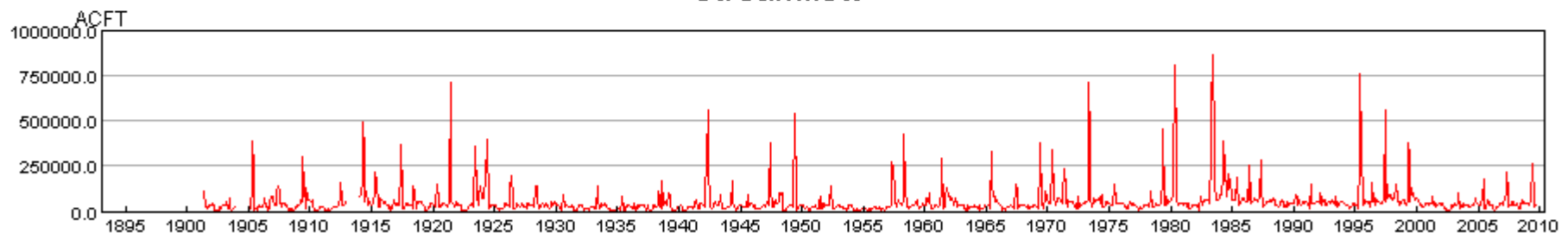
Colors may need to
be edited in the
product file because
TSTool may save and
use incorrect defaults

Precipitation



— GREELEY, 3546.NOAA.Precip.Month (1893-01 to 2010-05)
— GREELEY UNC, 3553.NOAA.Precip.Month (1893-01 to 2010-05)

Streamflow



— SOUTH PLATTE RIVER NEAR KERSEY, CO, 06754000.DWR.Streamflow.Month (1893-01 to 2010-05)

Visible Period (white):

|< << < > >> >| ZoomOut

Summary

Table

Print

Save

Close

Zoom Mode

X: 1942-11, Y: 6.24

More Information

Help...View Documentation to view the
TSTool documentation