TSTool Training

Getting Started

Version: 9.07.02, 2010-08-20

Duration: Less than 30 minutes

Level: Introduction

Colorado's Decision Support Systems

Developed by DWR and CWCB





This Presentation

- Provides an introduction to TSTool for new users
- 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
  - Full use of TSTool requires access to databases and internet (some examples will not work without such access)

TSTool Feature Summary

- Read and write time series in various formats
- Automate processing using a command language
- Fill/manipulate data
- Quality control
- Analyze data and generate products

TSTool Origins in CDSS

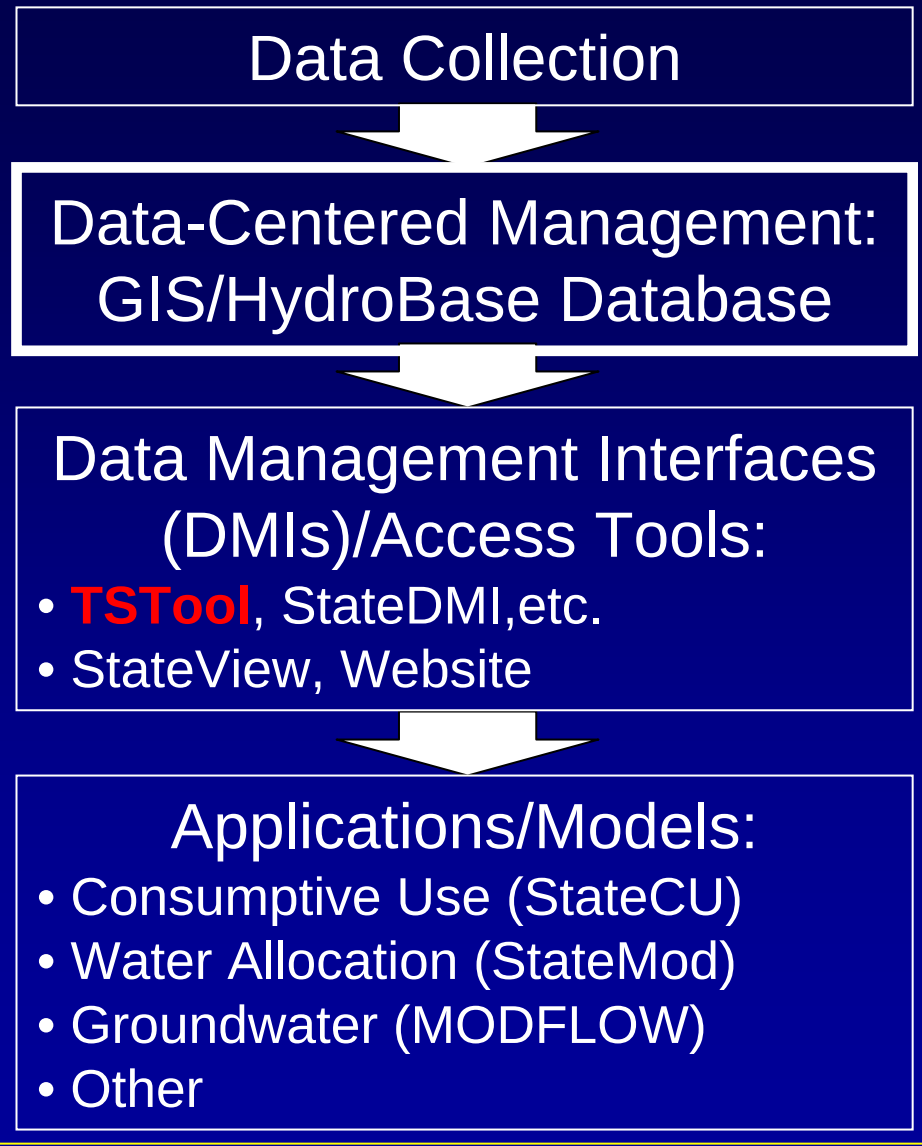
- Originally developed for Colorado's Decision Support Systems (CDSS)
  - Read time series data from HydroBase database and files
  - Fill missing data
  - Create input files for StateCU and StateMod models
  - Process model results into products
- Within CDSS, complements other software
  - TSTool processes time series
  - StateDMI processes some time series but focuses on other data files

TSTool …Beyond CDSS

- Read/write CADSWES RiverWare files
- Read MODSIM time series files
- Read/write Army Corps HEC-DSS files
- Read/write National Weather Service River Forecast System files
- Process ensembles of time series
- Retrieve files using FTP and URLs
- Run on Windows and Linux/UNIX
- Run external programs and Python Scripts
- …many enhancements beyond CDSS core

CDSS Data-Centered Approach

- Open access to data
- Share data for multiple uses
- Applications focus on analysis and generating results/products
- Concepts are applicable beyond CDSS



Starting TSTool

If not already installed, download and install the software from http://cdss.state.co.us (see the Products…DMI Utilities link).

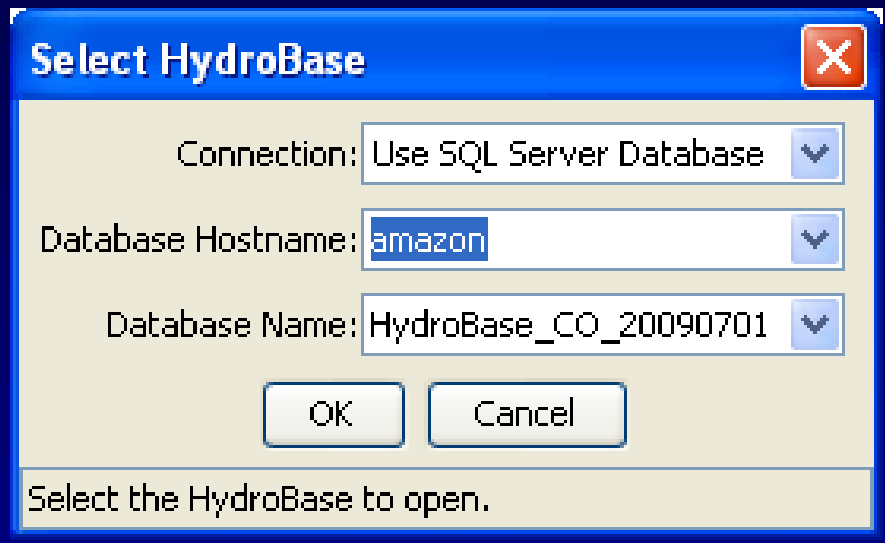
To run, for example:

Start…All Programs…CDSS…TSTool-09.07.02

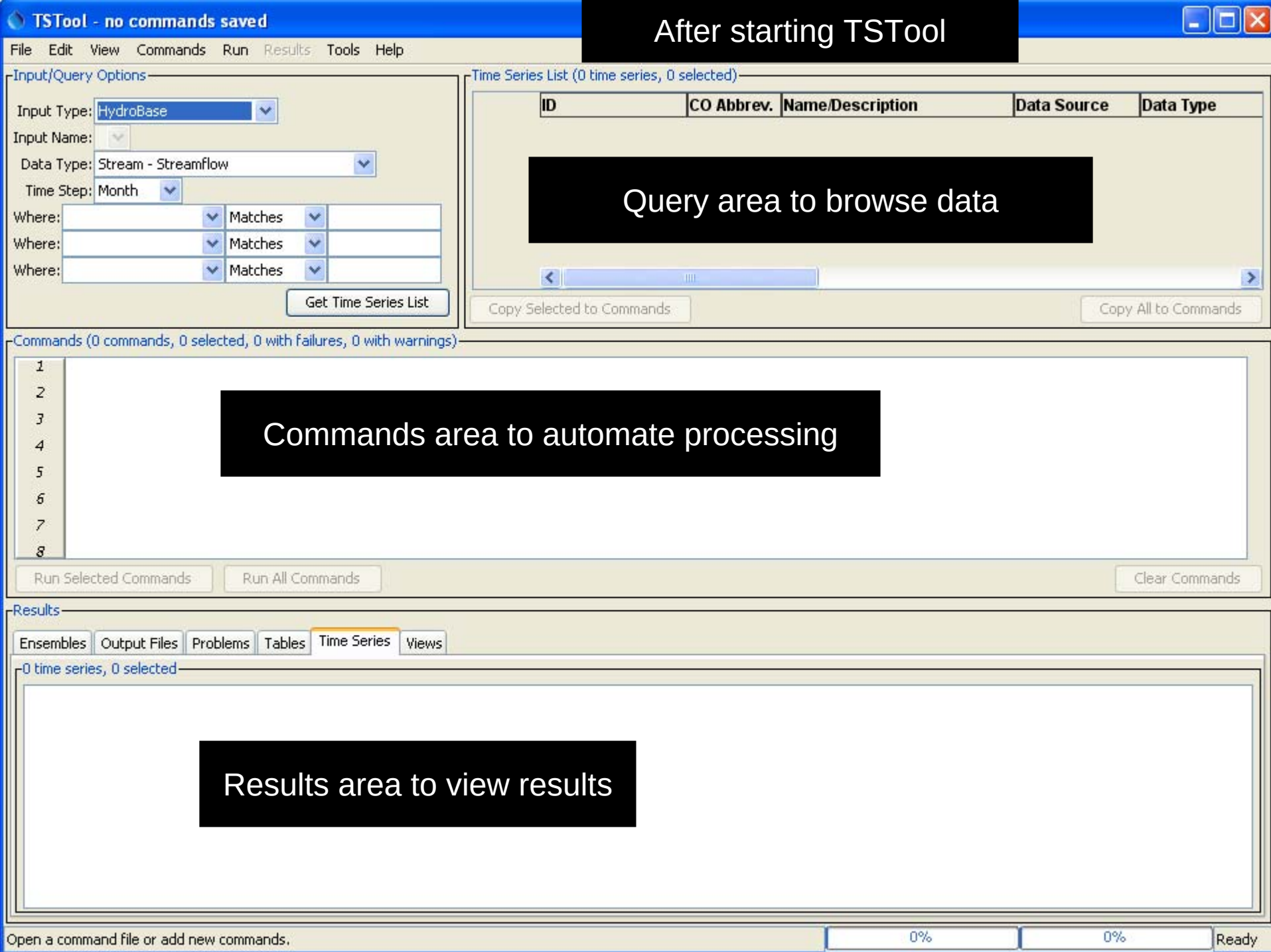
Multiple versions can be installed and will be listed in the CDSS menu.

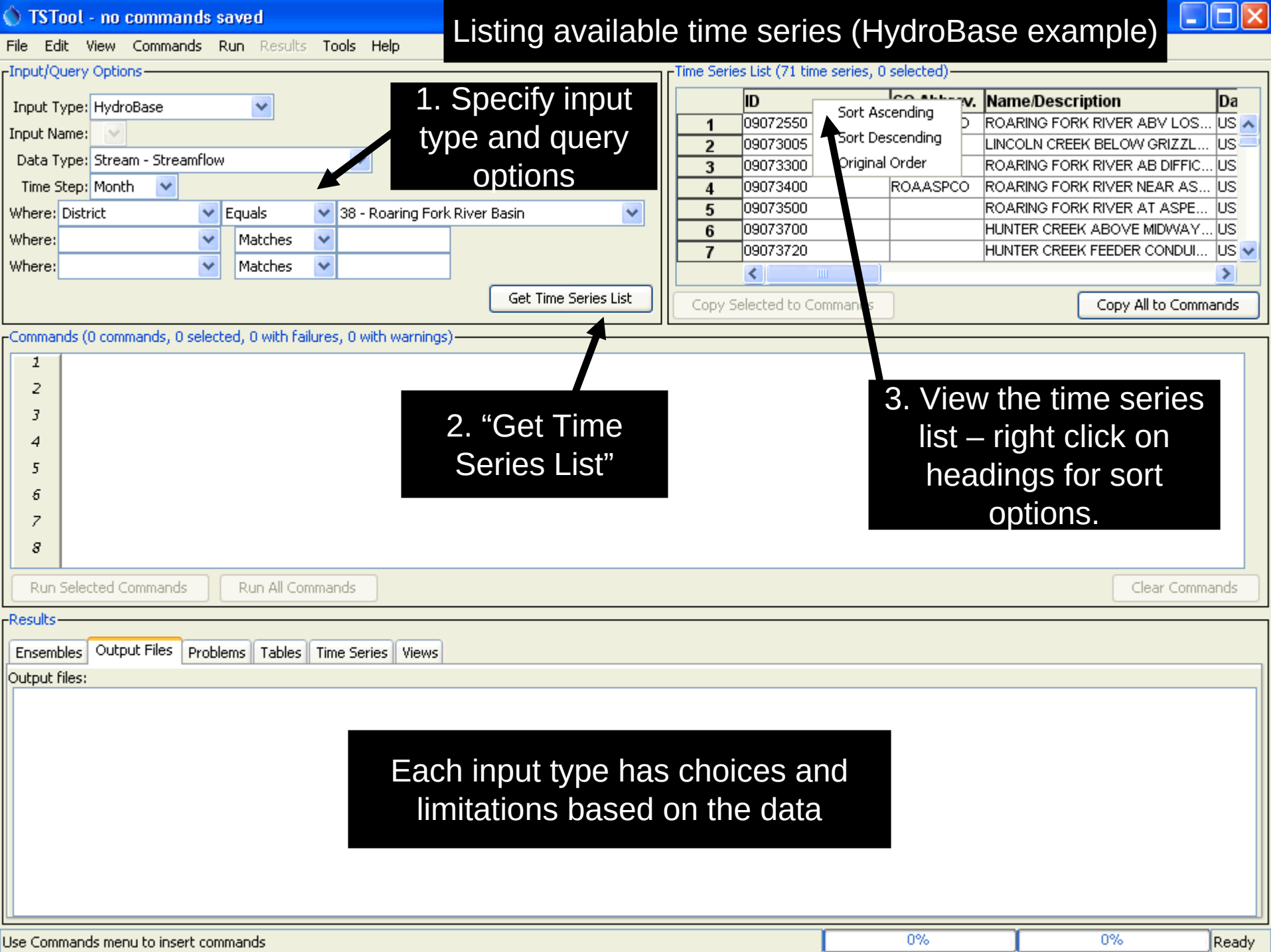
Select HydroBase

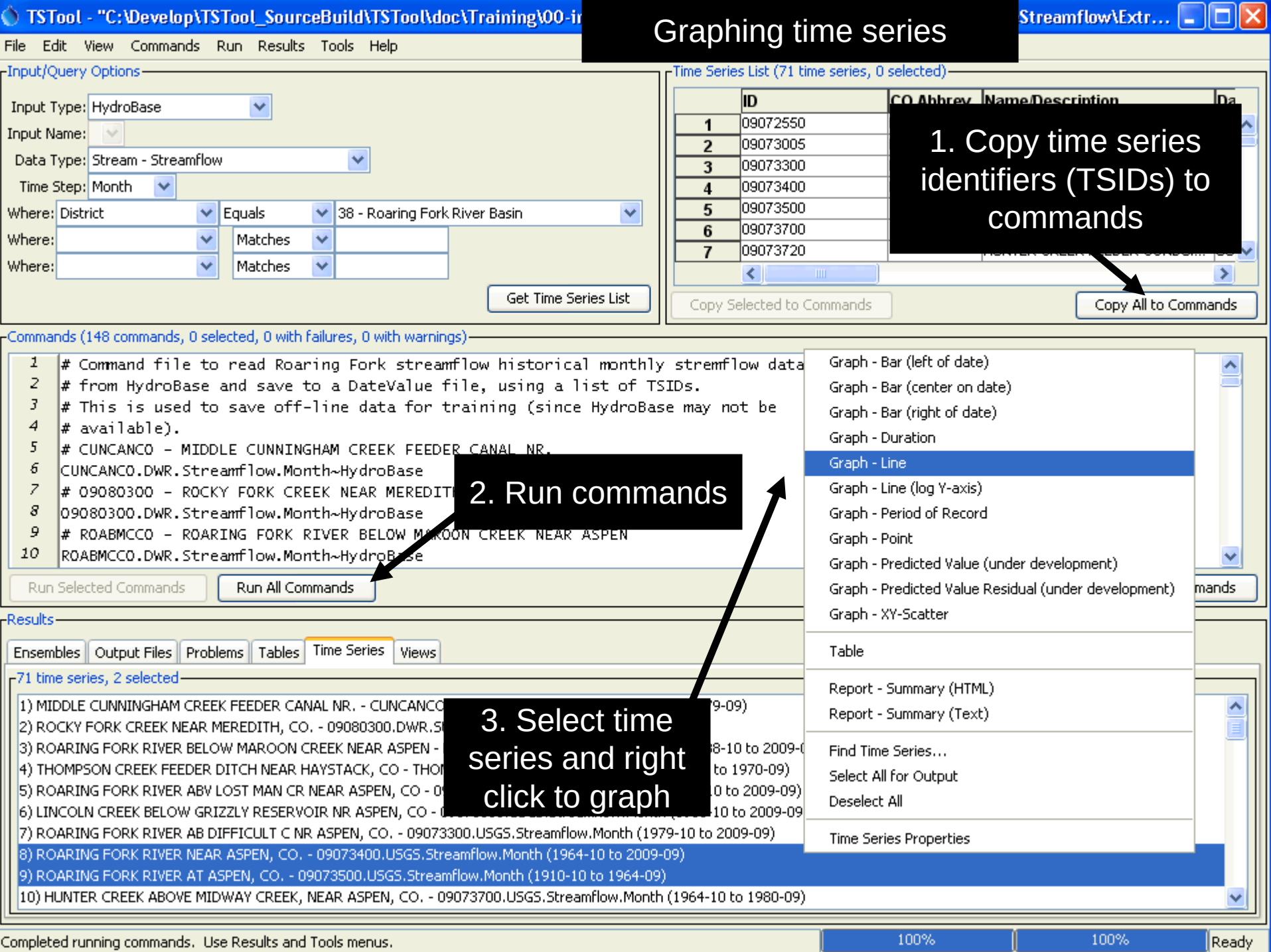
- Select HydroBase server (can be local computer)
- Select available HydroBase version

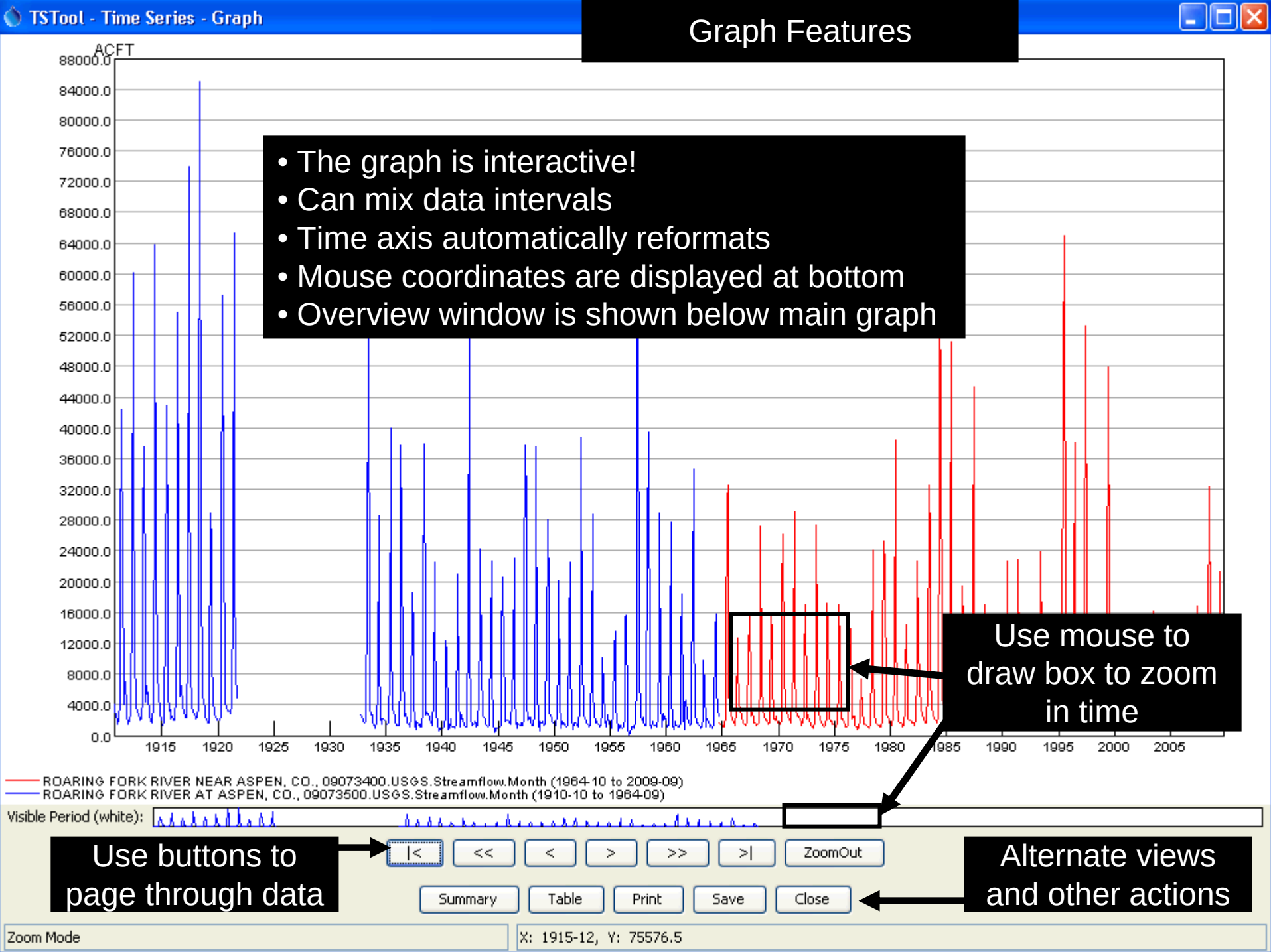


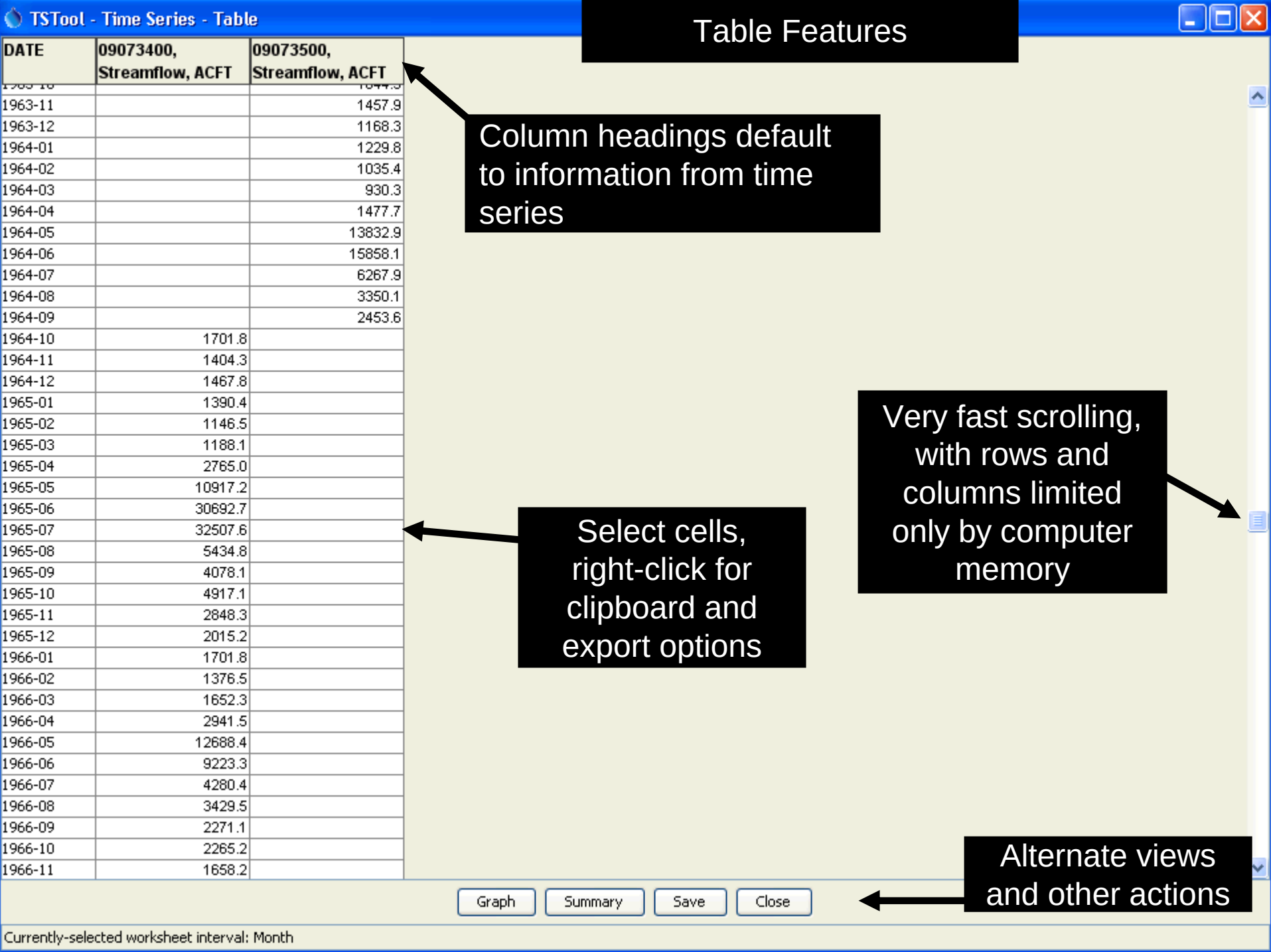
Reading data from HydroBase will not be possible if HydroBase is not available (but web services and other options are available if internet access is available).


TSTool - no commands saved
After starting 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: 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
Query area to browse data
Copy Selected to Commands
Copy All to Commands
Commands (0 commands, 0 selected, 0 with failures, 0 with warnings)
1
2
3
4
5
6
7
8
Commands area to automate processing
Run Selected Commands
Run All Commands
Clear Commands
Results
Ensembles
Output Files
Problems
Tables
Time Series
Views
0 time series, 0 selected
Results area to view results
Open a command file or add new commands.
0%
0%
Ready

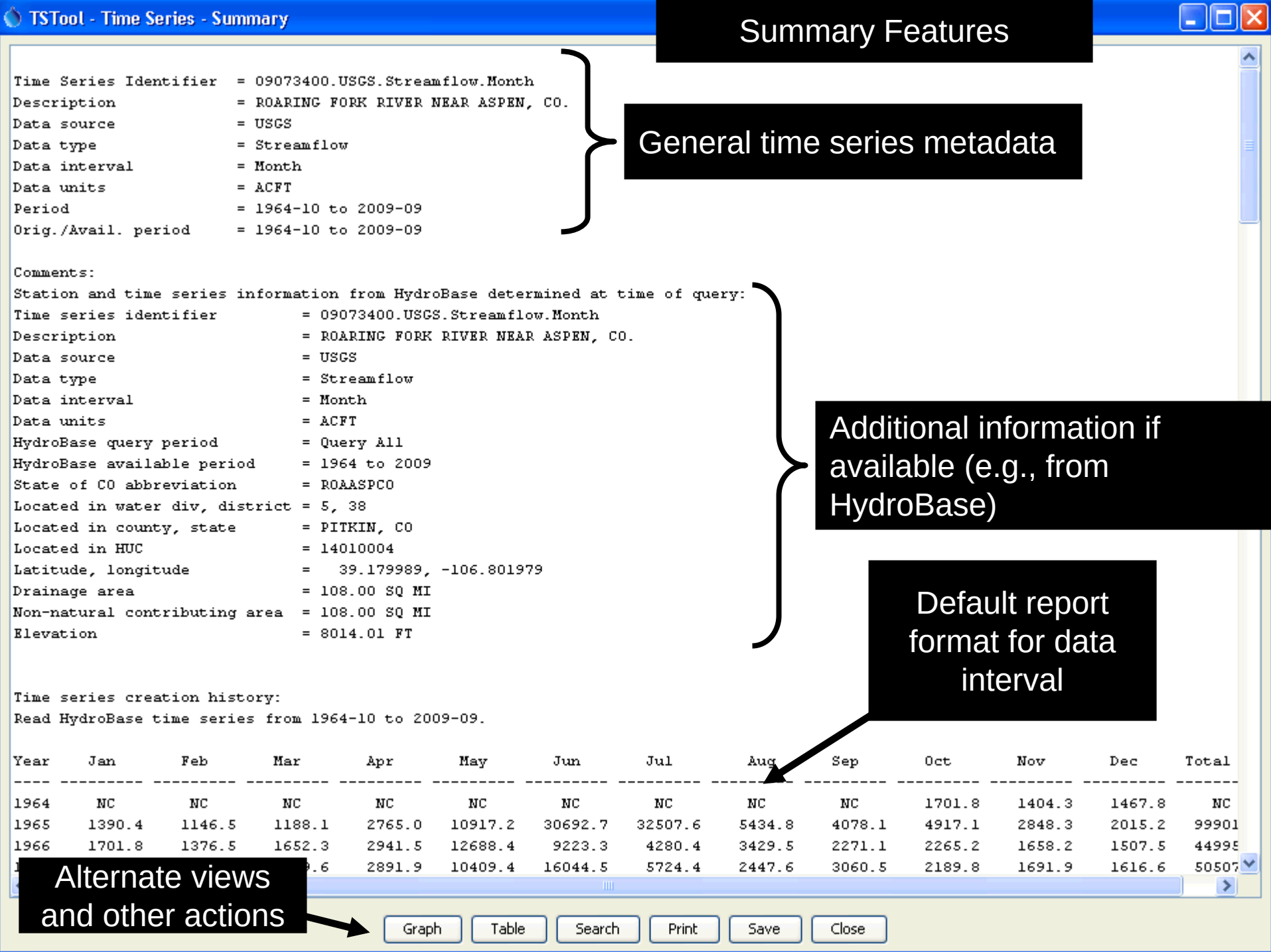

TSTool - no commands saved
File Edit View Commands Run Results Tools Help
Listing available time series (HydroBase example)
Input/Query Options
Input Type: HydroBase
Input Name:
Data Type: Stream - Streamflow
Time Step: Month
Where: District Equals 38 - Roaring Fork River Basin
Where: Matches
Where: Matches
Get Time Series List
1. Specify input type and query options
Time Series List (71 time series, 0 selected)
ID
Name/Description
1 09072550 ROARING FORK RIVER ABV LOS...
2 09073005 LINCOLN CREEK BELOW GRIZZL...
3 09073300 ROARING FORK RIVER AB DIFFIC...
4 09073400 ROAASPCO ROARING FORK RIVER NEAR AS...
5 09073500 ROARING FORK RIVER AT ASPE...
6 09073700 HUNTER CREEK ABOVE MIDWAY...
7 09073720 HUNTER CREEK FEEDER CONDUI...
Sort Ascending
Sort Descending
Original Order
Copy Selected to Commands
Copy All to Commands
Commands (0 commands, 0 selected, 0 with failures, 0 with warnings)
2. "Get Time Series List"
3. View the time series list – right click on headings for sort options.
Run Selected Commands
Run All Commands
Clear Commands
Results
Ensembles Output Files Problems Tables Time Series Views
Output files:
Each input type has choices and limitations based on the data
Use Commands menu to insert commands
0%
0%
Ready


TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc\Training\00-ir
Streamflow\Extr...
Graphing time series
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 38 - Roaring Fork River Basin
Where: Matches
Where: Matches
Get Time Series List
Time Series List (71 time series, 0 selected)
ID
1 09072550
2 09073005
3 09073300
4 09073400
5 09073500
6 09073700
7 09073720
1. Copy time series identifiers (TSIDs) to commands
Copy Selected to Commands
Copy All to Commands
Commands (148 commands, 0 selected, 0 with failures, 0 with warnings)
1 # Command file to read Roaring Fork streamflow historical monthly stremflow data
2 # from HydroBase and save to a DateValue file, using a list of TSIDs.
3 # This is used to save off-line data for training (since HydroBase may not be
4 # available).
5 # CUNCANCO - MIDDLE CUNNINGHAM CREEK FEEDER CANAL NR.
6 CUNCANCO.DWR.Streamflow.Month~HydroBase
7 # 09080300 - ROCKY FORK CREEK NEAR MEREDIT
8 09080300.DWR.Streamflow.Month~HydroBase
9 # ROABMCCO - ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN
10 ROABMCCO.DWR.Streamflow.Month~HydroBase
2. Run commands
Run Selected Commands
Run All Commands
Graph - Bar (left of date)
Graph - Bar (center on date)
Graph - Bar (right of date)
Graph - Duration
Graph - Line
Graph - Line (log Y-axis)
Graph - Period of Record
Graph - Point
Graph - Predicted Value (under development)
Graph - Predicted Value Residual (under development)
Graph - XY-Scatter
Table
Report - Summary (HTML)
Report - Summary (Text)
Find Time Series...
Select All for Output
Deselect All
Time Series Properties
Results
Ensembles Output Files Problems Tables Time Series Views
71 time series, 2 selected
1) MIDDLE CUNNINGHAM CREEK FEEDER CANAL NR. - CUNCANCO
2) ROCKY FORK CREEK NEAR MEREDITH, CO. - 09080300.DWR.S
3) ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN -
4) THOMPSON CREEK FEEDER DITCH NEAR HAYSTACK, CO - THO
5) ROARING FORK RIVER ABV LOST MAN CR NEAR ASPEN, CO -
6) LINCOLN CREEK BELOW GRIZZLY RESERVOIR NR ASPEN, CO -
7) ROARING FORK RIVER AB DIFFICULT C NR ASPEN, CO. - 09073300.USGS.Streamflow.Month (1979-10 to 2009-09)
8) ROARING FORK RIVER NEAR ASPEN, CO. - 09073400.USGS.Streamflow.Month (1964-10 to 2009-09)
9) ROARING FORK RIVER AT ASPEN, CO. - 09073500.USGS.Streamflow.Month (1910-10 to 1964-09)
10) HUNTER CREEK ABOVE MIDWAY CREEK, NEAR ASPEN, CO. - 09073700.USGS.Streamflow.Month (1964-10 to 1980-09)
3. Select time series and right click to graph
Completed running commands. Use Results and Tools menus.
100%
100%
Ready


TSTool - Time Series - Graph
Graph Features
ACFT
88000.0
84000.0
80000.0
76000.0
72000.0
68000.0
64000.0
60000.0
56000.0
52000.0
48000.0
44000.0
40000.0
36000.0
32000.0
28000.0
24000.0
20000.0
16000.0
12000.0
8000.0
4000.0
0.0
1915
1920
1925
1930
1935
1940
1945
1950
1955
1960
1965
1970
1975
1980
1985
1990
1995
2000
2005
• The graph is interactive!
• Can mix data intervals
• Time axis automatically reformats
• Mouse coordinates are displayed at bottom
• Overview window is shown below main graph
Use mouse to draw box to zoom in time
ROARING FORK RIVER NEAR ASPEN, CO., 09073400.USGS.Streamflow.Month (1964-10 to 2009-09)
ROARING FORK RIVER AT ASPEN, CO., 09073500.USGS.Streamflow.Month (1910-10 to 1964-09)
Visible Period (white):
Use buttons to page through data
|<
<<
<
>
>>
>|
ZoomOut
Summary
Table
Print
Save
Close
Alternate views and other actions
Zoom Mode
X: 1915-12, Y: 75576.5



DATE	09073400, Streamflow, ACFT	09073500, Streamflow, ACFT
1963-11		1457.9
1963-12		1168.3
1964-01		1229.8
1964-02		1035.4
1964-03		930.3
1964-04		1477.7
1964-05		13832.9
1964-06		15858.1
1964-07		6267.9
1964-08		3350.1
1964-09		2453.6
1964-10	1701.8	
1964-11	1404.3	
1964-12	1467.8	
1965-01	1390.4	
1965-02	1146.5	
1965-03	1188.1	
1965-04	2765.0	
1965-05	10917.2	
1965-06	30692.7	
1965-07	32507.6	
1965-08	5434.8	
1965-09	4078.1	
1965-10	4917.1	
1965-11	2848.3	
1965-12	2015.2	
1966-01	1701.8	
1966-02	1376.5	
1966-03	1652.3	
1966-04	2941.5	
1966-05	12688.4	
1966-06	9223.3	
1966-07	4280.4	
1966-08	3429.5	
1966-09	2271.1	
1966-10	2265.2	
1966-11	1658.2	


TSTool - Time Series - Summary
Summary Features
Time Series Identifier = 09073400.USGS.Streamflow.Month
Description = ROARING FORK RIVER NEAR ASPEN, CO.
Data source = USGS
Data type = Streamflow
Data interval = Month
Data units = ACFT
Period = 1964-10 to 2009-09
Orig./Avail. period = 1964-10 to 2009-09
General time series metadata
Comments:
Station and time series information from HydroBase determined at time of query:
Time series identifier = 09073400.USGS.Streamflow.Month
Description = ROARING FORK RIVER NEAR ASPEN, CO.
Data source = USGS
Data type = Streamflow
Data interval = Month
Data units = ACFT
HydroBase query period = Query All
HydroBase available period = 1964 to 2009
State of CO abbreviation = ROAASPCO
Located in water div, district = 5, 38
Located in county, state = PITKIN, CO
Located in HUC = 14010004
Latitude, longitude = 39.179989, -106.801979
Drainage area = 108.00 SQ MI
Non-natural contributing area = 108.00 SQ MI
Elevation = 8014.01 FT
Additional information if available (e.g., from HydroBase)
Default report format for data interval
Time series creation history:
Read HydroBase time series from 1964-10 to 2009-09.
Year Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec Total
1964 NC NC NC NC NC NC NC NC NC 1701.8 1404.3 1467.8 NC
1965 1390.4 1146.5 1188.1 2765.0 10917.2 30692.7 32507.6 5434.8 4078.1 4917.1 2848.3 2015.2 99901
1966 1701.8 1376.5 1652.3 2941.5 12688.4 9223.3 4280.4 3429.5 2271.1 2265.2 1658.2 1507.5 44995
2891.9 10409.4 16044.5 5724.4 2447.6 3060.5 2189.8 1691.9 1616.6 50507
Alternate views and other actions
Graph
Table
Search
Print
Save
Close

Time Series Identifier (TSID)

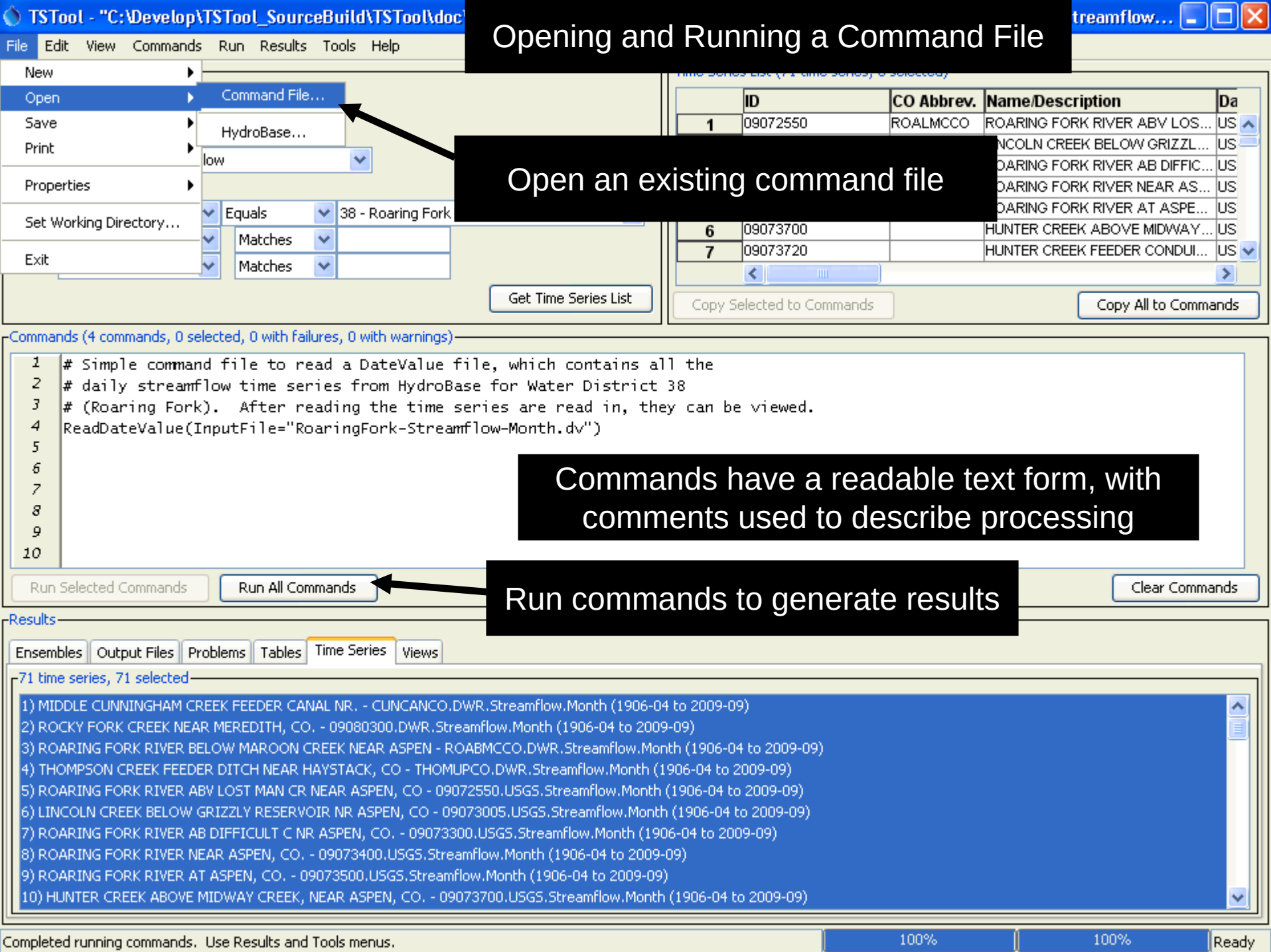
- LocID.Source.DataType.Interval
- LocID.Source.DataType.Interval~InputType
- LocID.Source.DataType.Interval~InputType~Filename

The TSID uniquely identifies the time series and allows TSTool to find the time series in databases and files.

A short alias can also be used to identify time series and can be set in some commands that create time series.

Opening and Running an Existing Command File

- File…Open…Command File
- Select a *.TSTool file (in this case choose example1-StreamflowCommands\StreamflowCommands.TSTool)
- Press the Run All Commands button under the command list
- View the results


TSTool - "C:\Develop\TSTool_SourceBuild\TSTool\doc
treamflow...
Opening and Running a Command File
File Edit View Commands Run Results Tools Help
New
Open
Save
Print
Properties
Set Working Directory...
Exit
Command File...
HydroBase...
Open an existing command file
low
Equals
38 - Roaring Fork
Matches
Matches
Get Time Series List
ID
CO Abbrev.
Name/Description
1 09072550 ROALMCCO ROARING FORK RIVER ABV LOS...
6 09073700 HUNTER CREEK ABOVE MIDWAY...
7 09073720 HUNTER CREEK FEEDER CONDUI...
Copy Selected to Commands
Copy All to Commands
Commands (4 commands, 0 selected, 0 with failures, 0 with warnings)
1 # Simple command file to read a DateValue file, which contains all the
2 # daily streamflow time series from HydroBase for Water District 38
3 # (Roaring Fork). After reading the time series are read in, they can be viewed.
4 ReadDateValue(InputFile="RoaringFork-Streamflow-Month.dv")
Commands have a readable text form, with comments used to describe processing
Run Selected Commands
Run All Commands
Run commands to generate results
Clear Commands
Results
Ensembles Output Files Problems Tables Time Series Views
71 time series, 71 selected
1) MIDDLE CUNNINGHAM CREEK FEEDER CANAL NR. - CUNCANCO.DWR.Streamflow.Month (1906-04 to 2009-09)
2) ROCKY FORK CREEK NEAR MEREDITH, CO. - 09080300.DWR.Streamflow.Month (1906-04 to 2009-09)
3) ROARING FORK RIVER BELOW MAROON CREEK NEAR ASPEN - ROABMCCO.DWR.Streamflow.Month (1906-04 to 2009-09)
4) THOMPSON CREEK FEEDER DITCH NEAR HAYSTACK, CO - THOMUPCO.DWR.Streamflow.Month (1906-04 to 2009-09)
5) ROARING FORK RIVER ABV LOST MAN CR NEAR ASPEN, CO - 09072550.USGS.Streamflow.Month (1906-04 to 2009-09)
6) LINCOLN CREEK BELOW GRIZZLY RESERVOIR NR ASPEN, CO - 09073005.USGS.Streamflow.Month (1906-04 to 2009-09)
7) ROARING FORK RIVER AB DIFFICULT C NR ASPEN, CO. - 09073300.USGS.Streamflow.Month (1906-04 to 2009-09)
8) ROARING FORK RIVER NEAR ASPEN, CO. - 09073400.USGS.Streamflow.Month (1906-04 to 2009-09)
9) ROARING FORK RIVER AT ASPEN, CO. - 09073500.USGS.Streamflow.Month (1906-04 to 2009-09)
10) HUNTER CREEK ABOVE MIDWAY CREEK, NEAR ASPEN, CO. - 09073700.USGS.Streamflow.Month (1906-04 to 2009-09)
Completed running commands. Use Results and Tools menus.
100%
100%
Ready

More Information

Help…View Documentation to view the TSTool documentation