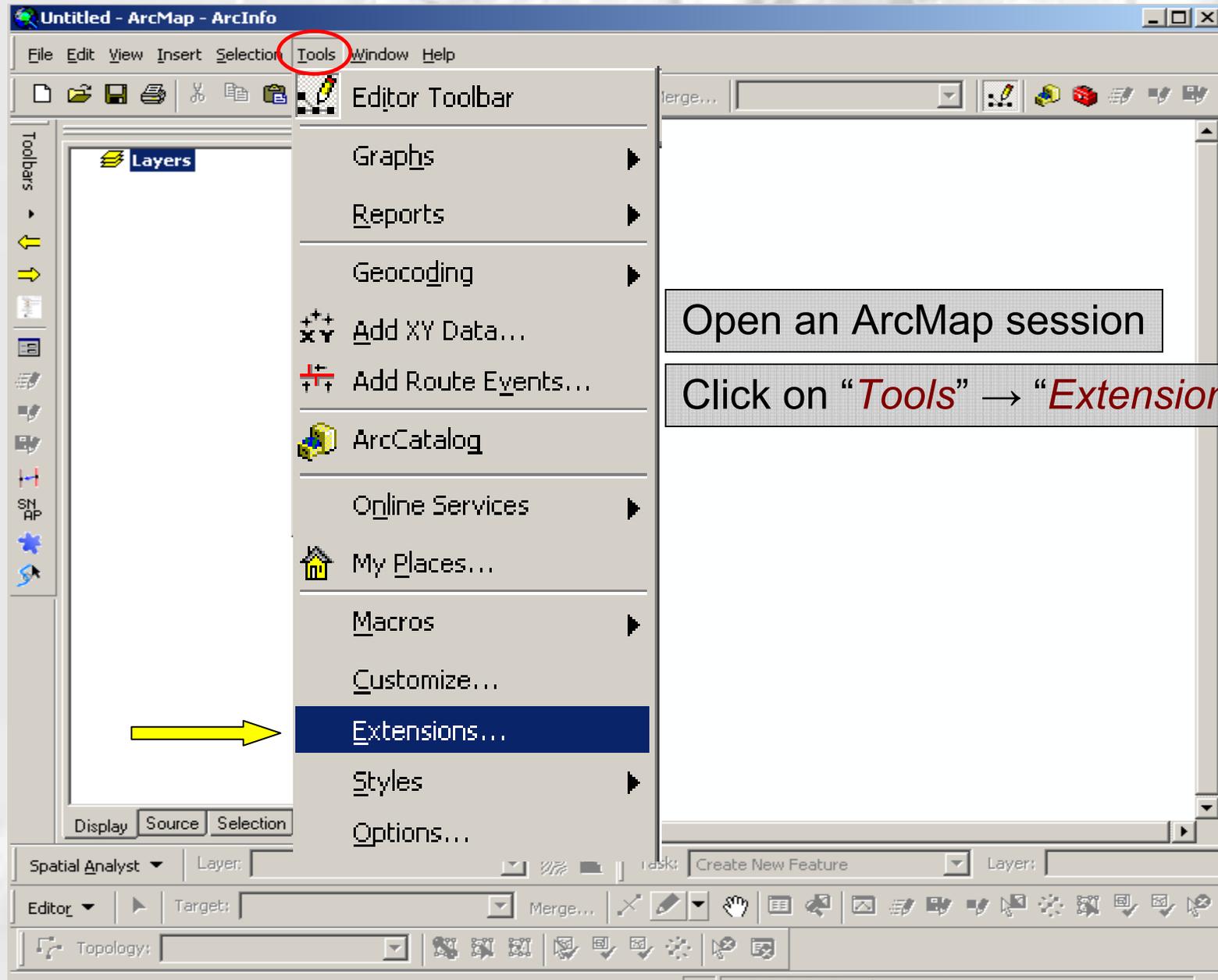


# Module 1

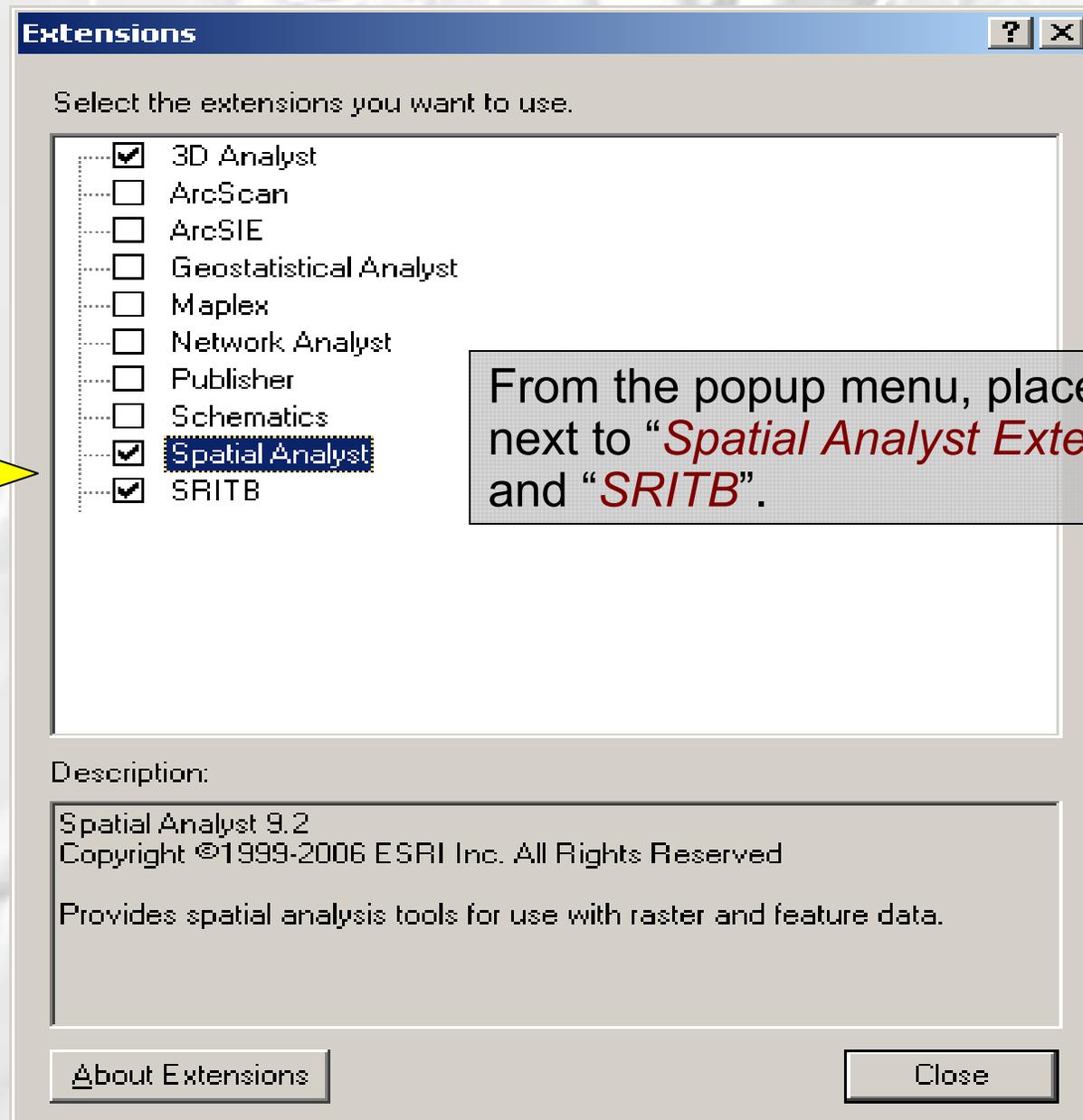
## Objectives and Tasks

- Enable the Spatial Analyst, SRITB Extension
- Add Spatial Analyst Toolbar to the View
- Merge DEMs
- Project DEM Data
- Clip a DEM to a Defined Area
- Calculate Elevation Values by Map Unit

# Enable Spatial Analyst & SRITB Extension



# Enable Spatial Analyst Extension & SRITB, cont.



From the popup menu, place a check next to “*Spatial Analyst Extension*” and “*SRITB*”.

# Add Spatial Analyst Toolbar to the View

The screenshot shows the ArcMap interface with the 'View' menu open. The 'View' menu is circled in red. The 'Toolbars' option is highlighted in blue, and a yellow arrow points to it. The 'Spatial Analyst' option is also highlighted in blue, with a yellow arrow pointing to it. A yellow arrow also points to the 'Spatial Analyst' toolbar icon in the 'Toolbars' list on the left. A text box in the upper right of the menu area says: "Click on 'View' → 'Toolbars' and select 'Spatial Analyst'". A floating toolbar window titled 'Spatial Analyst' is visible in the lower right, showing a dropdown menu with 'Spatial Analyst' selected and a 'Layer: hillshade' field. A text box in the lower right says: "Place the Spatial Analyst Toolbar to desired location".

Click on "*View*" → "*Toolbars*" and select "*Spatial Analyst*"

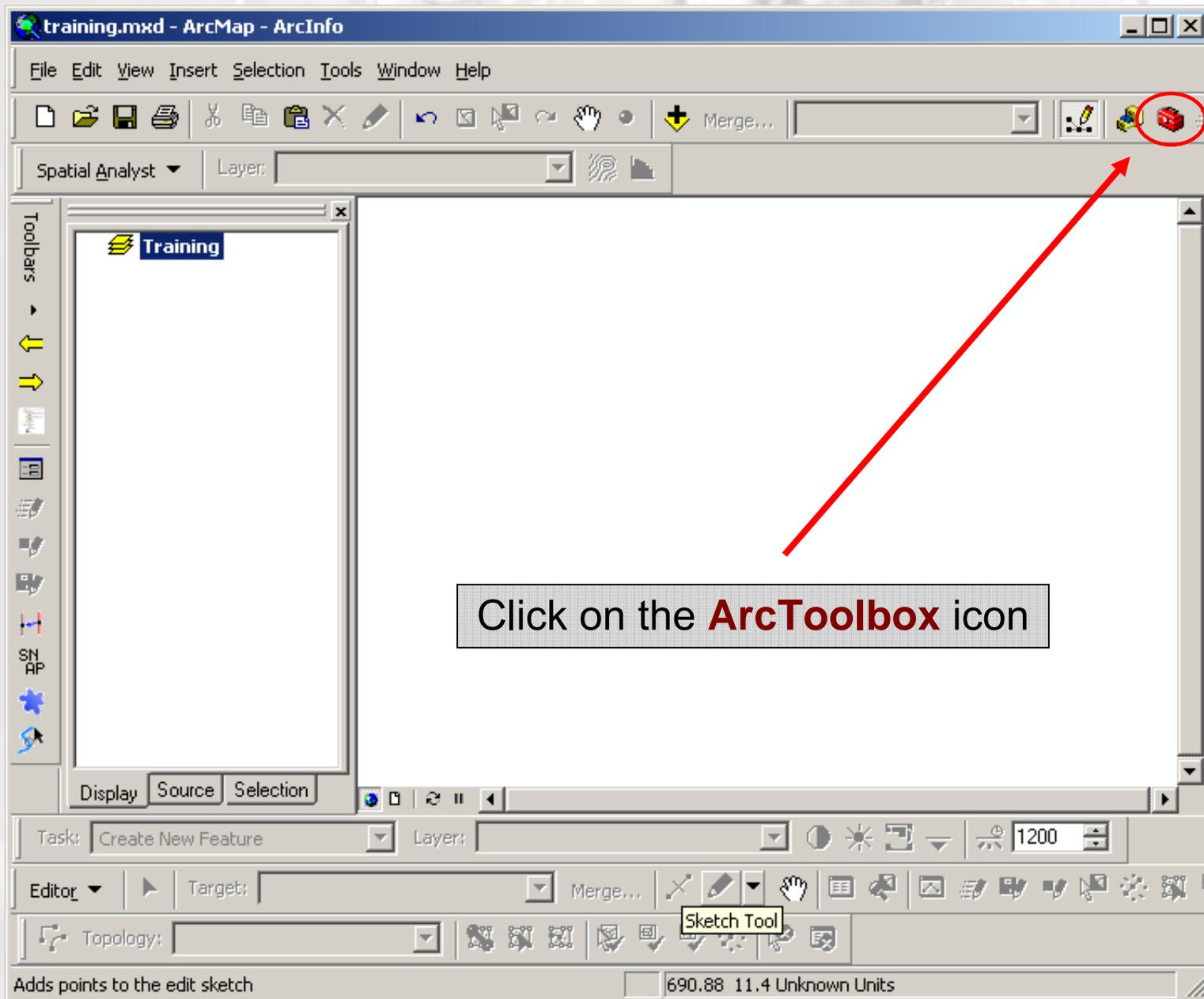
Place the Spatial Analyst Toolbar to desired location

# Environment Settings

**Environment Settings** control Spatial Analyst processes within the ArcToolbox window.

- The “**Current Workspace**” setting directs ArcGIS where to look for input data and where to store output data
- The “**Scratch Workspace**” setting directs ArcGIS where to store temporary data
- The “**Output Extent**” setting controls the overall size of the study area
- The “**Mask**” setting controls which cells within an Output Extent will be considered (clipping function)
- The “**Cell Size**” setting controls resolution (the smaller the cell size, the finer the resolution)

# Merge DEMs



# Merge DEMs, cont.

The screenshot displays the ArcMap interface with the ArcToolbox window open. The ArcToolbox is organized into a tree structure under the 'Spatial Analyst Tools' category. The 'Merge Rasters' toolset is expanded, and the 'Mosaic To New Raster' tool is highlighted with a yellow arrow. A text box with a black border and red text provides instructions: 'In the ArcToolbox window, click on "MT Soils -- Spatial Analyst Tools AG92 ver 5.6" → "Merge Rasters" → "Mosaic To New Raster"'. The main map area shows a 'Training' layer. The status bar at the bottom indicates the current scale is 1200 and the map extent is 26.01 524.57 Unknown Units.

training.mxd - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

Spatial Analyst Layer: [ ]

Toolbars

- Digital Soil Mapping Tools ver1-2
- Digital Soil Survey Setup ver1-5
- Geoprocessing\_Wizard\_Tools
- MT Soils -- Spatial Analyst Tools AG92 ver 5.6
  - 1. REAP
  - 2a. Temp. Regimes (2 Climatic zones on 4 Aspects - N,E,S,W )
  - 2b. Temp. Regimes-FFD (7 Climatic zones on 2 Aspects - N,S)
  - 3a. Temp-Moisture. (used with Toolset 2a)
  - 3b. Temp-Moisture. (used with Toolset 2b)
  - 4. Slope-Curvature
  - 5. Aspect
  - 6. Map Unit Intersect
  - 7. Elevation Clip
  - Conversion Tools
  - DEM
  - Extraction
  - Math
  - Merge Rasters
    - Mosaic To New Raster
  - Projections
- Spatial Analyst Tools

Training

Display

Source Selection

Task: Create New Feature Layer: [ ]

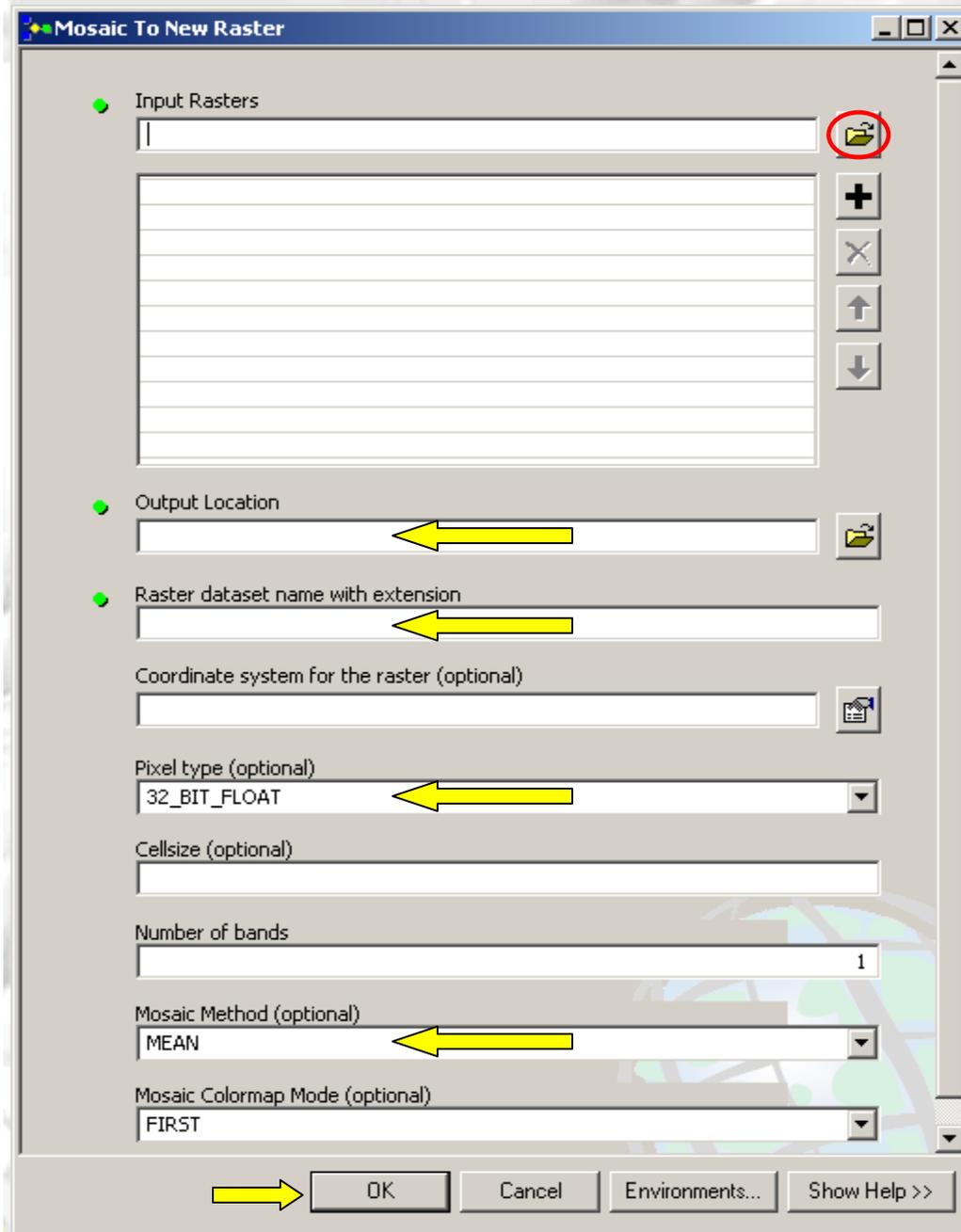
Editor Target: [ ] Merge... Load Objects...

Topology: [ ]

26.01 524.57 Unknown Units

In the ArcToolbox window, click on  
"MT Soils -- Spatial Analyst Tools AG92 ver 5.6"  
→ "Merge Rasters" → "Mosaic To New Raster"

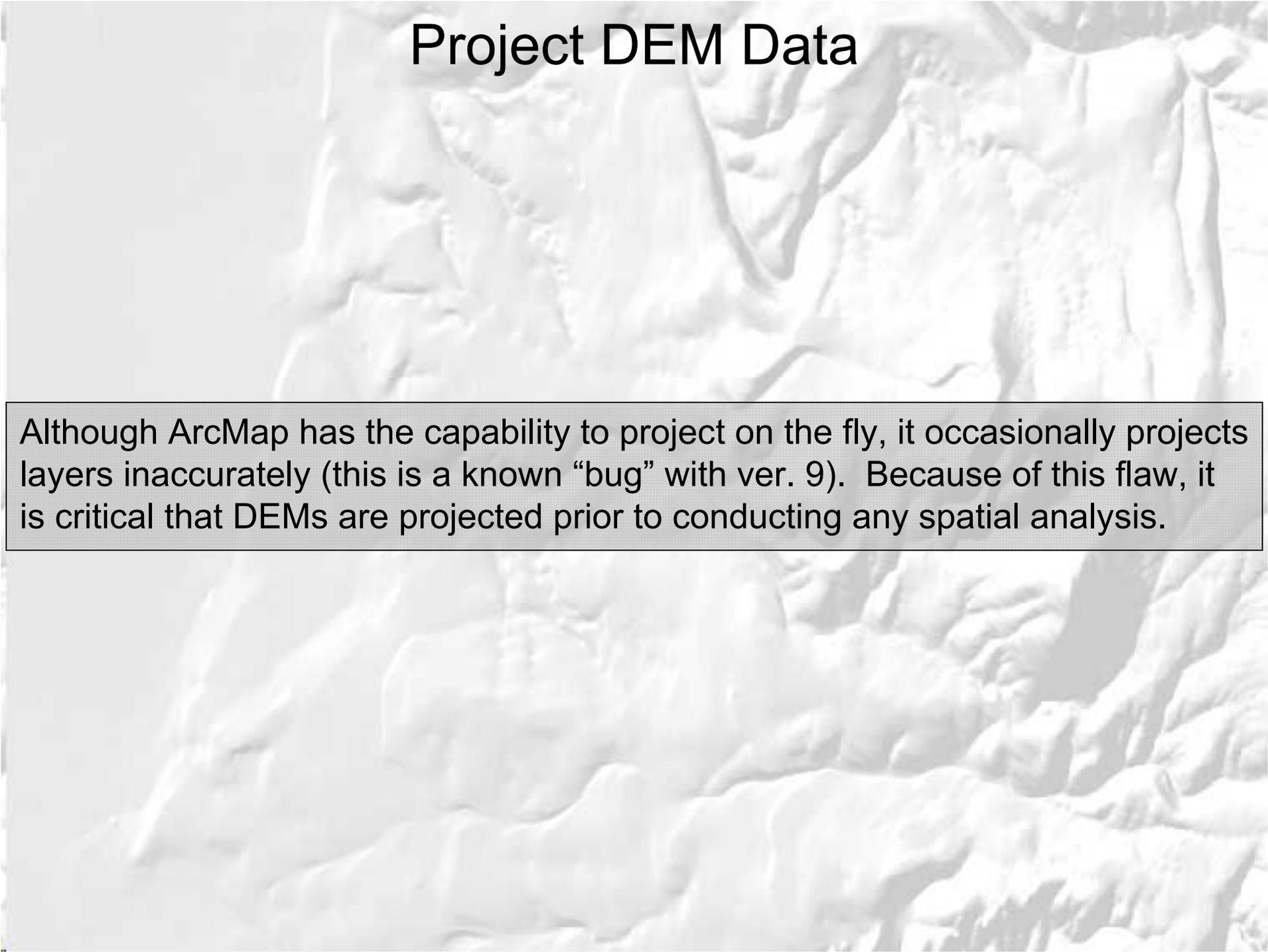
# Merge DEMs, cont.



In the “**Mosaic to New Raster**” dialog box:

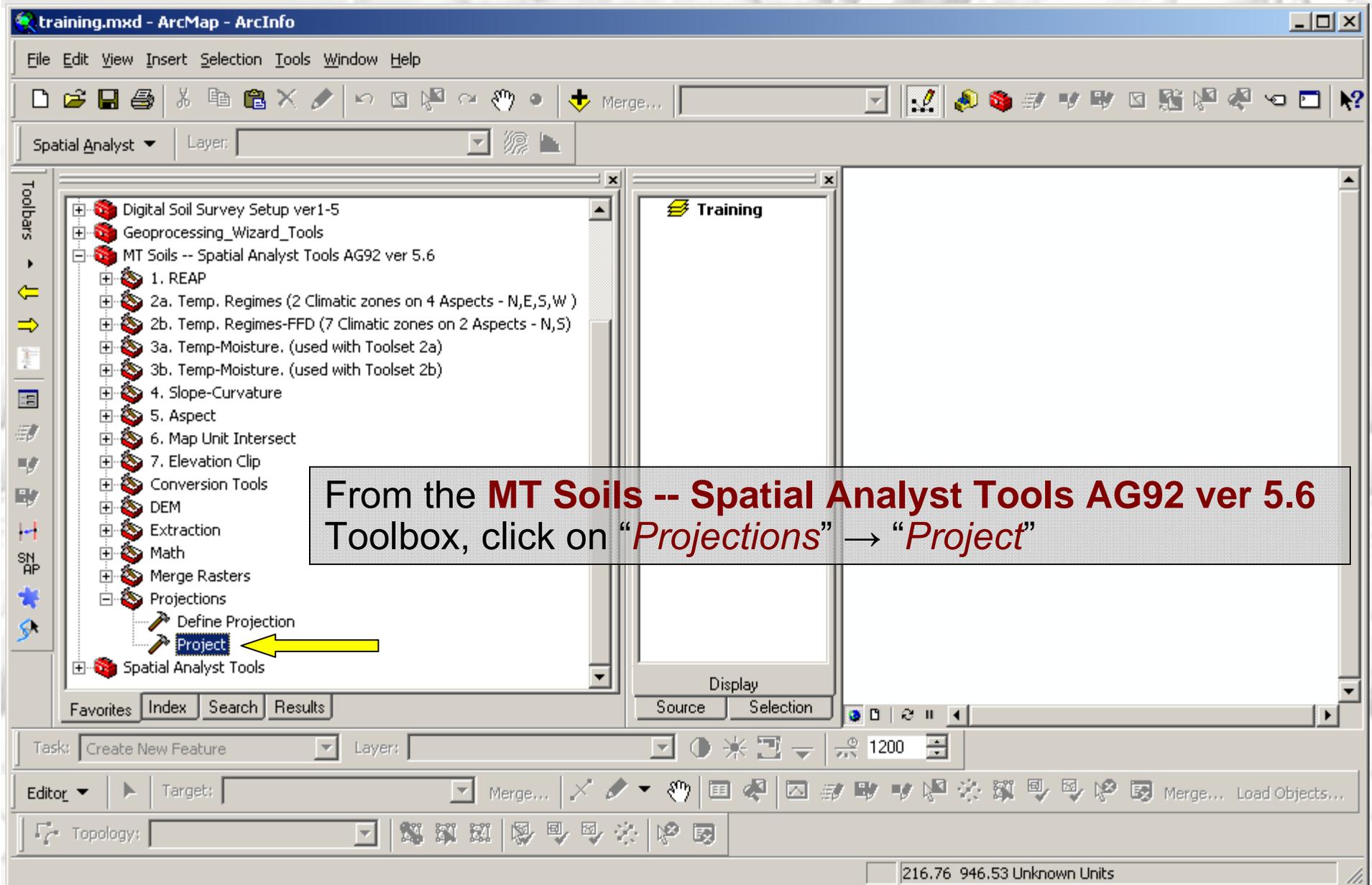
- Load the rasters that will be merged by clicking on the folder icon and navigating to their location.
- Enter the location where the new file will be stored. For example, “C:\WorkSpace\spatial”.
- Name the raster (no extension is required).
- Set the **Pixel type** to “**32\_BIT\_FLOAT**”
- Set the **Mosaic Method** to “**MEAN**”
- Accept the other default settings
- Click “**OK**”

# Project DEM Data



Although ArcMap has the capability to project on the fly, it occasionally projects layers inaccurately (this is a known “bug” with ver. 9). Because of this flaw, it is critical that DEMs are projected prior to conducting any spatial analysis.

# Project DEM Data, cont.



# Project DEM Data, cont.

In the following example, a DEM, with a projection of **Nad\_27\_UTM\_Zone\_11**, will be projected to **Nad\_83\_UTM\_Zone\_11**

Navigate to and select the raster that will be projected.

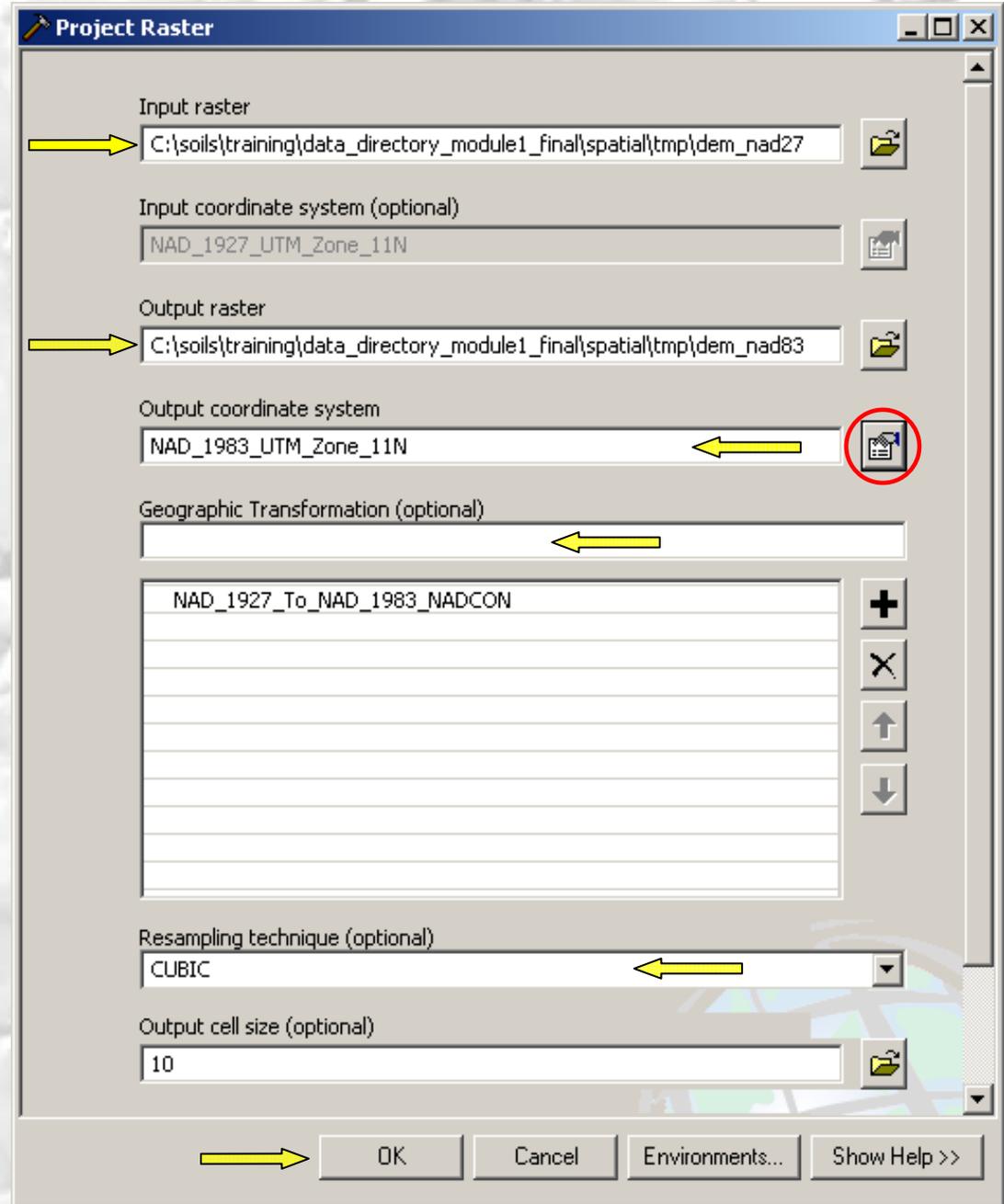
Name and set the path to where the **Output raster** will be stored.

Click on the icon next to the **Output coordinate system**.

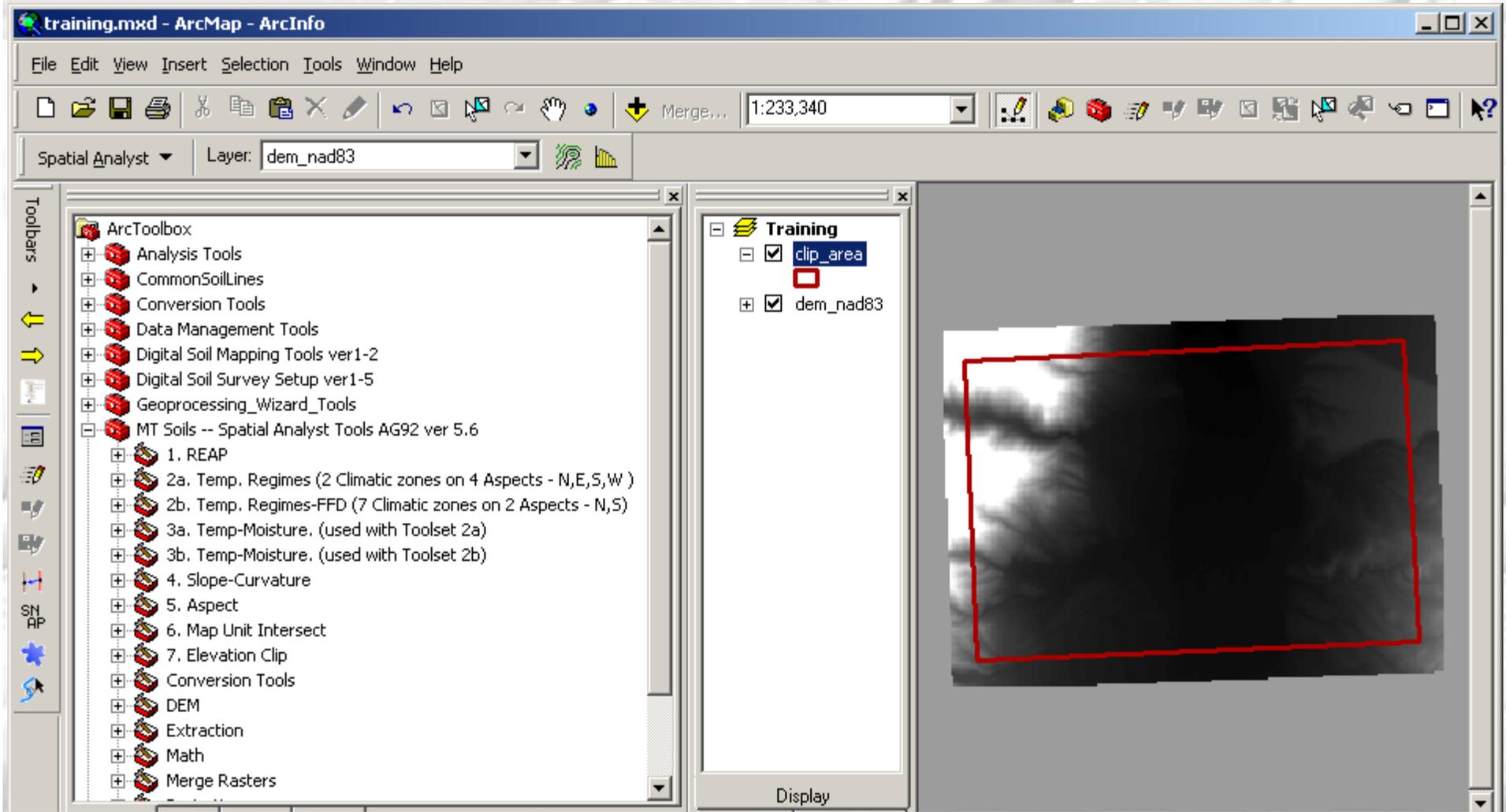
Click on “**Select**” → “**Projected Coordinate Systems**” → “**UTM**” → “**Nad 83**” → “**NAD 1983 UTM Zone 11N.prj**”

Under **Geographic Transformation**, select “**NAD\_1983\_UTM\_Zone\_11N**”

For **Resampling technique** select “**CUBIC**”, and click “**OK**”

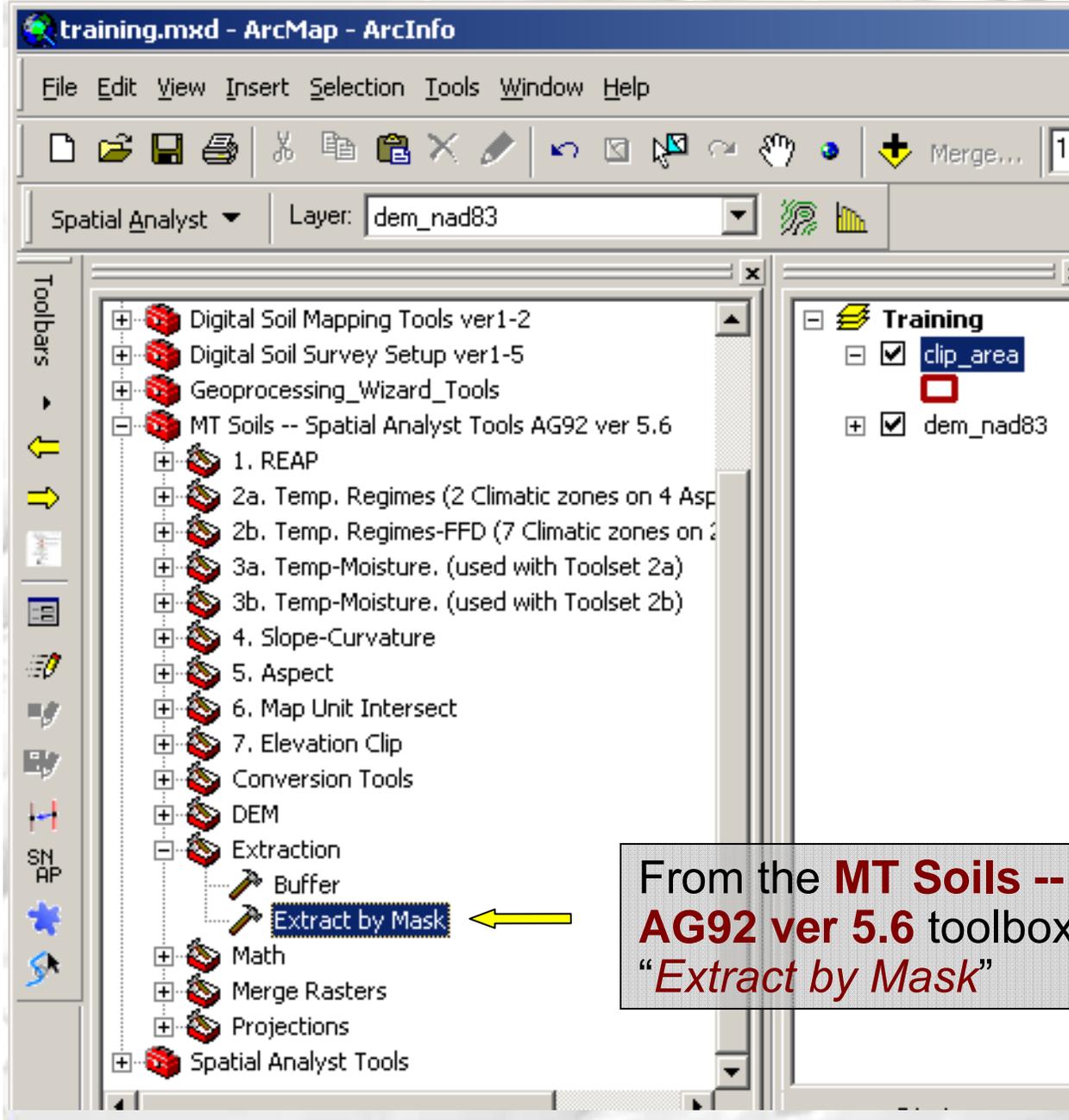


# Clip a DEM to a Defined Area



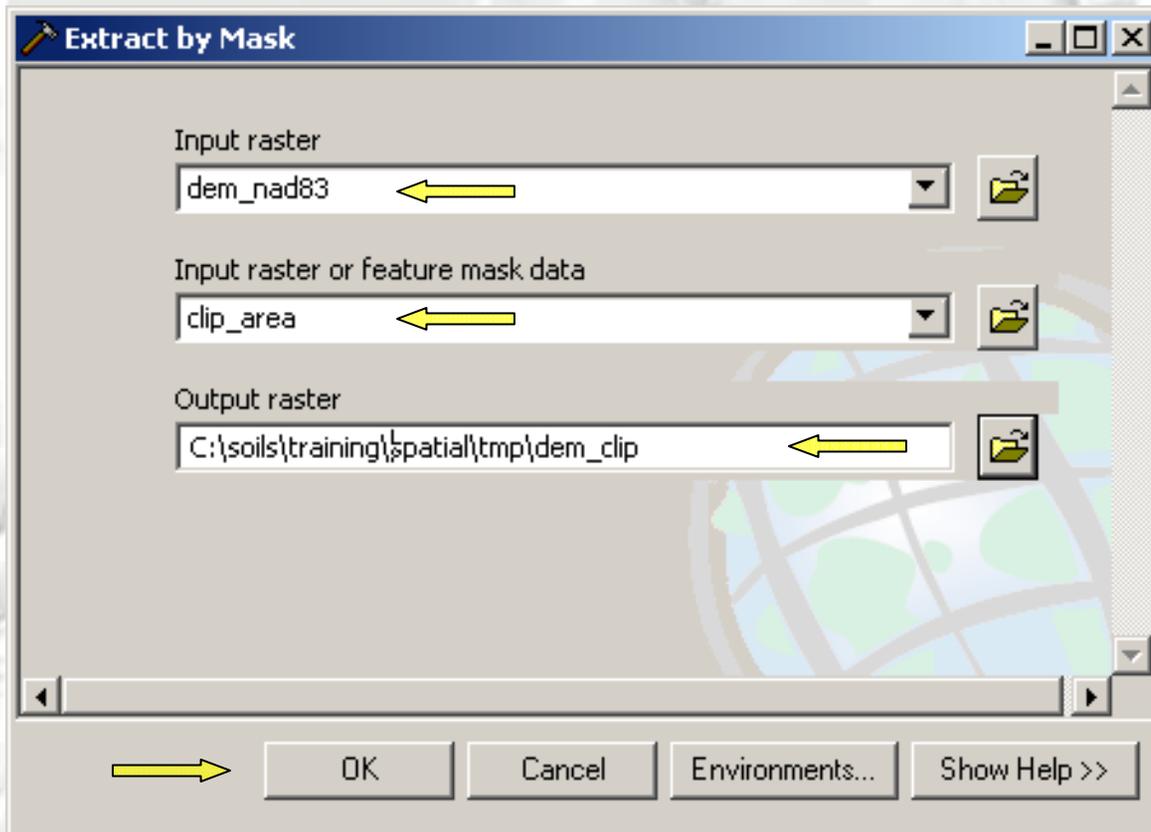
In this following exercise, the **Extract by Mask Tool** will be used to clip a DEM (dem\_nad83) to a shapefile (clip\_area).

# Clip a DEM to a Defined Area, cont.



From the **MT Soils -- Spatial Analyst Tools AG92 ver 5.6** toolbox, click on "**Extraction**" → "**Extract by Mask**"

# Clip a DEM to a Defined Area, cont.



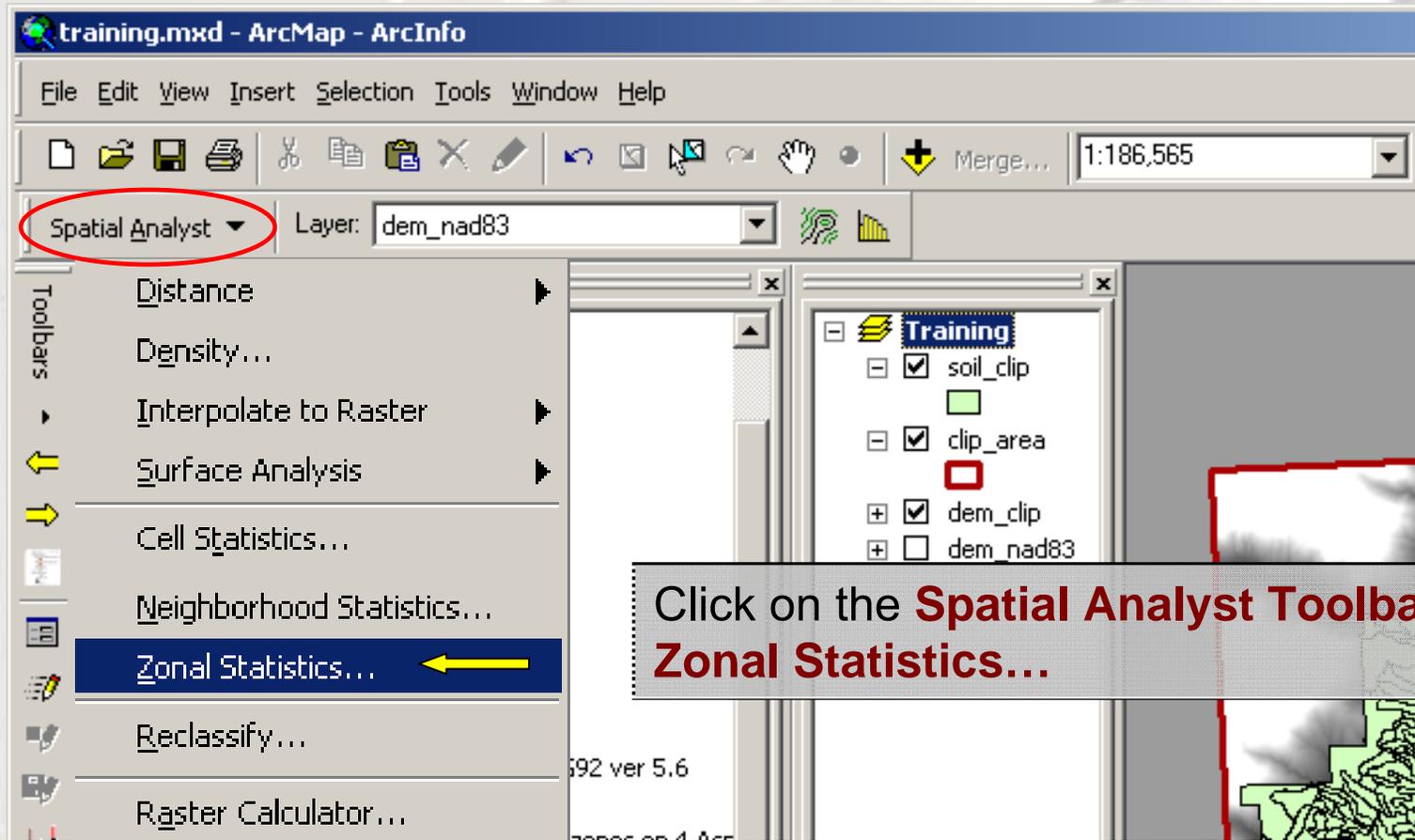
In the **Extract by Mask** dialog box

- Select the DEM or raster
- Under **Input raster or feature mask data**, select the raster, feature class or shapefile that will be used to clip the DEM”
- Name the **Output raster** (ex. “dem\_clip”)
- Click “**OK**”

# Calculate Elevation Values by Map Unit

The **Spatial Analyst Toolbar** → **Zonal Statistics** option can create a table with elevation values for each map unit. The output table includes Min, Max, Mean, and Standard Deviation.

In this exercise, an elevation raster (“**dem\_clip**”) is used with a soil polygon layer (“**soil\_clip**”) to produce a map unit elevation table.



# Calculate Elevation Values by Map Unit, cont.

In the **Zonal Statistics** dialog box

Select a soil polygon layer (“*soil\_clip*”) in the **Zone dataset** field.

For **Zone field**, select “*MUSYM*”.

For **Value raster**, select a DEM (“*dem\_clip*”).

Uncheck **Chart statistics**.

Name and save the file (“*mapunit\_elev.dbf*”) in the **Output table** field.

Accept all other default values and click **OK** to complete the process.

**Zonal Statistics**

Zone dataset: soil\_clip

Zone field: MUSYM

Value raster: dem\_clip

Ignore NoData in calculations

Join output table to zone layer

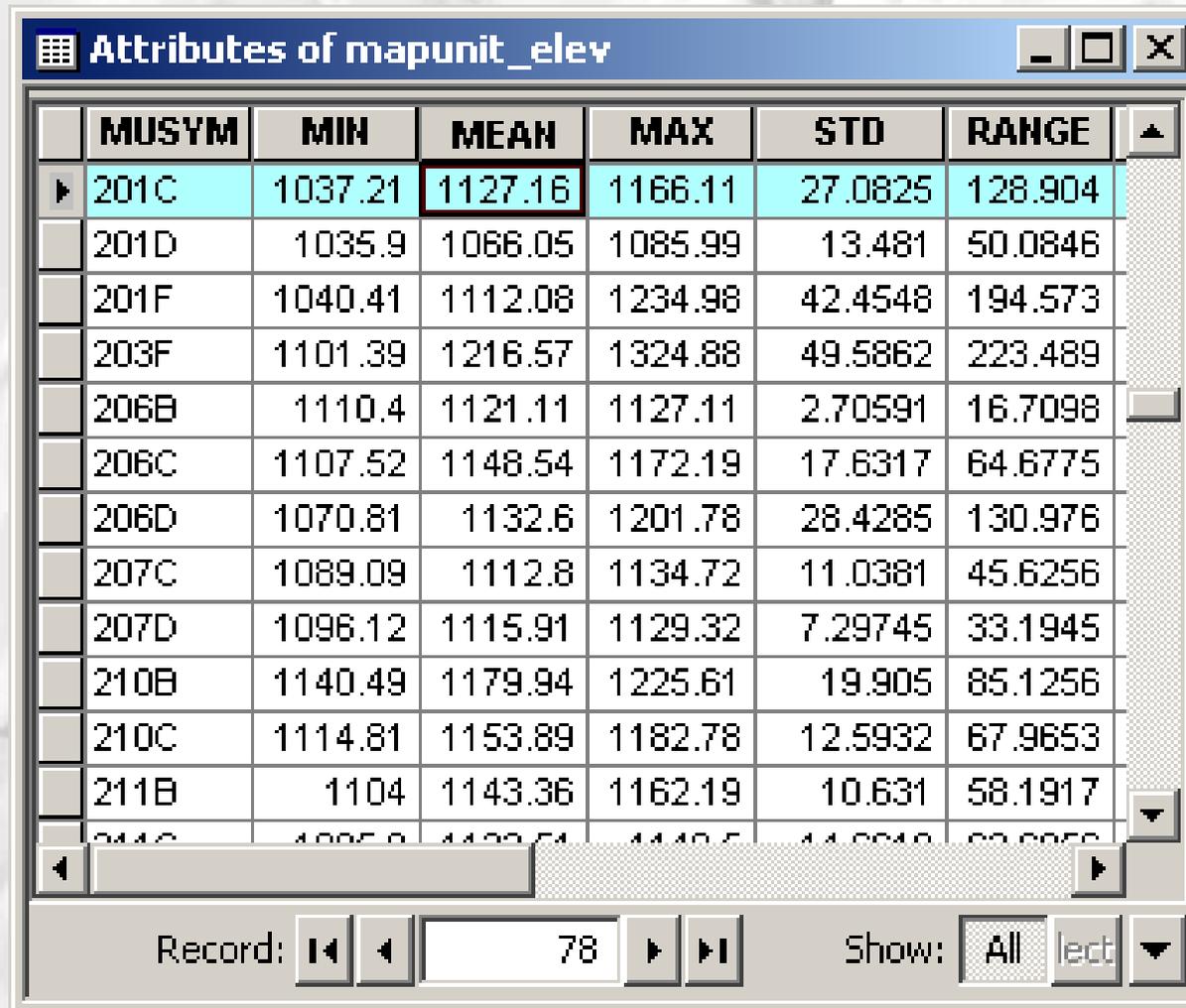
Chart statistic: Mean

Output table: atials\tables\mapunit\_elev.dbf

OK Cancel

# Calculate Elevation Values by Map Unit, cont.

The resulting table has several columns with statistical information about individual map units such as **MIN**, **MAX**, **RANGE**, **MEAN** and **STANDARD DEVIATION**.



MUSYM	MIN	MEAN	MAX	STD	RANGE
201C	1037.21	1127.16	1166.11	27.0825	128.904
201D	1035.9	1066.05	1085.99	13.481	50.0846
201F	1040.41	1112.08	1234.98	42.4548	194.573
203F	1101.39	1216.57	1324.88	49.5862	223.489
206B	1110.4	1121.11	1127.11	2.70591	16.7098
206C	1107.52	1148.54	1172.19	17.6317	64.6775
206D	1070.81	1132.6	1201.78	28.4285	130.976
207C	1089.09	1112.8	1134.72	11.0381	45.6256
207D	1096.12	1115.91	1129.32	7.29745	33.1945
210B	1140.49	1179.94	1225.61	19.905	85.1256
210C	1114.81	1153.89	1182.78	12.5932	67.9653
211B	1104	1143.36	1162.19	10.631	58.1917
211C	1095.9	1133.54	1149.5	11.9819	53.6059

Record: 78 Show: All