**Raster Riser for ArcGIS 10.0**

*Reference Manual and Tutorial*

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**Install files:** RasterRiser.esriAddIn  
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**Description:** Provides a sorting list for manually ordering mosaic dataset rasters in ArcMap. Rasters in the mosaic dataset appear in a sorting list with drag-and-drop functionality that allows the user to "rise" or "sink" individual images, or groups of images, inside an edit session. The tool includes navigation, spatial selection and search tools to facilitate raster "rising" and "sinking".  
**Requirements:** ArcGIS Desktop 10.0  
**Manual update:** November 1, 2011
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Installation Instructions

1. Double-click the RasterRiser.esriAddIn file.
2. Select Install Add-In from the ESRI ArcGIS Add-In Installation Utility (Fig. 1.1).
3. Click OK on the Installation Succeeded dialog to finish the installation.

Troubleshooting: If the Add-In cannot be installed, make sure to check administrative options from: Customize > Add-In Manager > Options panel.

Adding to ArcMap

Once the Add-In has been installed:

1. Open ArcMap.
2. Look for the Raster Riser toolbar somewhere on the screen.
   a. If the toolbar has not appeared automatically: click on Customize > Toolbars and make sure Raster Riser is checked.
Toolbar Description

The **Raster Riser toolbar** holds a single command button:

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raster Riser</td>
<td>Show/Hide the Raster Riser window.</td>
</tr>
</tbody>
</table>

Table 3.1. Name and description of toolbar components.

Raster Riser Window

The **Raster Riser** window contains two different toolbars: the toolbar at the top holds sorting, reordering, and flagging tools, while the bottom one is the search toolbar. Rasters in the mosaic dataset are listed in the middle section of the window. Here, each raster is represented by a row displaying its **name** and **Object ID (OID)**.

![Raster Riser window](image)

**Figure 4.1.** Brief overview of the Raster Riser window and its controls.

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sort by field</td>
<td>Select a field to sort rasters by.</td>
</tr>
<tr>
<td>Push to top</td>
<td>“Rise” the selection to the top of the sorting list.</td>
</tr>
<tr>
<td>Push to bottom</td>
<td>“Sink” the selection to the bottom of the sorting list.</td>
</tr>
<tr>
<td>Flag</td>
<td>Flag the current selection. Names and OIDs for flagged images appear in bold font.</td>
</tr>
</tbody>
</table>
The Mosaic Dataset

A mosaic dataset is a data model within the geodatabase used to manage a collection of raster datasets (images) stored as a catalog and viewed as a mosaicked image. When you add a mosaic dataset to ArcMap, it is added as a mosaic layer that appears in the table of contents as a special group layer with a minimum of three layers: Boundary, Footprint, and Image (Fig. 5.1).

![Figure 5.1. Mosaic layer in the ArcMap Table Of Contents.](image)

**Boundary layer**

The Boundary layer displays the boundary of the mosaic dataset. By default, boundary is the extent of all the raster datasets, defined by their footprints, within the mosaic dataset.

**Footprint layer**

The Footprint layer displays the footprints for each raster within the mosaic dataset. From the Footprint layer, you can open the attribute table for the mosaic dataset (Fig. 5.2). This table displays a list of all the rasters in the mosaic dataset and many of their properties, such as the minimum and maximum pixel sizes that are used to display each raster in the mosaicked image. It may also contain additional fields, often derived from metadata that can be used when querying the mosaic dataset, such as acquisition date.

![Figure 5.2. The Footprint layer contains the attribute table for the mosaic dataset. It displays a list of all rasters and many of their properties.](image)
Image layer

The Image layer controls the **rendering** of the mosaicked image similarly to a raster layer. You can modify the **display properties**, such as the stretch, RGB band combination, resampling, and mosaic method.

How Raster Riser Works

*Raster Riser* makes it simple to organize images in a mosaic by manually dragging and dropping them along a **sorting list.** In the background, the toolset makes use of the mosaic layer capability to display images based on **attribute table** field values. A field is created inside the **Footprint layer** attribute table (RASTER_RISER_S), which is populated with numeric values representing the **weights** of images relative to each other; the ones with lower values (e.g. -10) appear higher in the list and on the map. As you drag images up or down the **sorting list**, a new weight is assigned to them, and the map display is updated to reflect the changes.

![Relationship between the Raster Riser window and the Footprint attribute table.](image)

*Figure 6.1.* Relationship between the Raster Riser window and the Footprint attribute table. The Raster Riser window is in sync with the RASTER_RISER_S field in the attribute table. Visibility of rasters is controlled by the RASTER_RISER_V field. When a raster is turned off, it will get a value of -1 and will not be displayed on the map.

**Visibility** of images in the mosaic is changed in a similar way. When you begin sorting the mosaic, the toolset adds a **definition query** to the mosaic layer → RASTER_RISER_V <> -1. At first, all images are visible, but once you turn any of them off, the toolset will update the RASTER_RISER_V visibility field in the Footprint layer attribute table with a value of -1. This tells the mosaic layer not to display that particular image.

Mosaicking Tutorial Using Raster Riser

The following is a step-by-step mosaicking tutorial using *Raster Riser* and images obtained from the *Mars Reconnaissance Orbiter (MRO) Context Camera (CTX)*. These are single-band, black-and-white, 8-bit images, but the process is still applicable to any image type.

**IMPORTANT:** The instructions outlined in steps 1 and 4 (below) are **necessary** to fully take advantage of the functionality built into *Raster Riser.*
Overview

1. Preparing input rasters
2. Creating the mosaic dataset
3. Excluding NoData areas
4. Configuring the mosaic dataset for use in Raster Riser
5. Reordering rasters using Raster Riser
6. Removing unwanted rasters from the mosaic dataset
7. Exporting the mosaic

1. Preparing input rasters

Before we create the mosaic dataset, we want to prepare the rasters that will be mosaicked by calculating their statistics and pyramids. Statistics are required for a mosaic dataset to perform geoprocessing operations or certain tasks, such as applying stretches or color corrections. Pyramids are used to improve performance. Since we will be displaying every raster in the mosaic dataset at once, scale-dependent, down-sampled versions of each raster will allow for faster display during ordering.

Calculate statistics

a. Using ArcCatalog (or the Catalog window within ArcMap)...
b. Make sure that all rasters to be included in the mosaic dataset live at a single location.
c. Open the Batch Calculate Statistics geoprocessing tool located under: Data Management > Raster > Raster Properties.
d. Click on the folder icon next to the Input Raster Datasets field.
e. On the Input Raster Datasets dialog:
   - Navigate to the location where the rasters live.
   - Select all the rasters (using Shift + Click or Ctrl + Click).
   - Click Add.
f. Accept the defaults and click OK.

Build pyramids

a. Open the Batch Build Pyramids geoprocessing tool located under: Data Management > Raster > Raster Properties.
b. Click on the folder icon next to the Input Raster Datasets field.
c. On the Input Raster Datasets dialog:
   - Navigate to the location where the rasters live.
   - Select all the rasters (using Shift + Click or Ctrl + Click).
   - Click Add.
d. Click OK.

2. Creating the mosaic dataset

Mosaic datasets must live inside a geodatabase. We will be using a File Geodatabase in this tutorial.
Create File Geodatabase

a. In ArcCatalog (or using the Catalog window inside ArcMap), inside the folder where the geodatabase will be created:
   - Right-click > New > File Geodatabase.
   - Enter a new name.

Create Mosaic Dataset

a. Inside the geodatabase > Right-click > New > Mosaic Dataset...
b. On the Create Mosaic Dataset dialog:
   - Enter a name in the Mosaic Dataset Name.
   - Specify a Coordinate System.
   - Accept other defaults, and Click OK.

Add rasters to Mosaic Dataset

a. Right-click the mosaic dataset > Add Rasters...
b. On the Add Rasters To Mosaic Dataset dialog:
   - Raster Type  Make sure Raster Dataset is selected.
   - Input  Select Workspace.
   - Click on the folder icon to navigate to a folder > Select the folder > Click Add.
   - Make sure Update Overviews is unchecked.
   - Click OK.

**NOTE:** See Advanced Options for handling duplicate rasters.

3. Excluding NoData areas

Areas in a raster containing NoData values can be excluded from a raster by using the Footprint layer. Footprints contain the outline of each raster within the mosaic dataset. In the case of CTX rasters, the extent of raster data is not rectangular as suggested by the file extents. It is, in fact, contained within a skewed rectangle in the dataset, and the other pixel values surrounding this skewed rectangle are NoData values (Fig. 7.1).

**Figure 7.1.** Example of an image with NoData values excluded using the Footprint layer.
Re-build footprints

a. Open the **Build Footprints** geoprocessing tool located under: Data Management > Raster > Mosaic Dataset.
b. On the **Build Footprints** dialog:
   - Click on the folder icon next to the **Raster Dataset** > Navigate to the mosaic dataset > Select it > Click **Add**.
   - Make sure the **Minimum Data Value** is set to 1.
   - **Maximum Data Value** → 255.
   - **Approximate number of vertices** → 25.
   - **Shrink distance** → 500 (see notes below).
   - **Maintain sheet edges** → unchecked.
   - **Skip overviews** → checked.
   - **Update Boundary** → checked.
   - Under the **Advanced Options** section: set the **Request Size** to 1000 and the **Minimum Region Size** to 176 (see notes below).
   - Click **OK**.

**NOTES:** The **Shrink distance** value should be in the units of the mosaic dataset; it is used to counteract effects of lossy compression around data edges.

Also, ESRI recommends a **Request Size** of 1000 for skewed data areas. CTX-specific testing indicates that the **Minimum Region Size** can be computed from \( R \times 0.176 \rightarrow 1000 \times 0.176 = 176 \). This simple formula can be used if the **Request Size** is changed.

4. Configuring the mosaic dataset for use in Raster Riser

When ordering images using **Raster Riser** it is best if we look at all rasters at once. A mosaic dataset, by default, has settings for the faster display of images. These settings include the number of rasters to display at once, and the scales at which images are displayed. We want to **change** these two settings so we are able to work with the mosaic as a whole, regardless of the scale level of our map.

**Change maximum number of raster per mosaic**

a. Open ArcCatalog (or using the Catalog window inside ArcMap)...
b. Right-click the mosaic dataset: Properties > Defaults tab.
   - Set the **Maximum Number of Rasters per Mosaic** (under Image Properties) to the total number of rasters in your mosaic dataset.
c. Click **OK**.

**Change maximum pixel resolution for all rasters in the mosaic dataset**

a. Open a **new** ArcMap document and add the mosaic dataset using the **Add Data** button located on the **Standard** toolbar.
b. Right-click the **Footprint** layer on the **Table Of Contents**, and select **Open Attribute Table**.
c. On the Footprints attribute table:
   - Right-click the MaxPS field and select Field Calculator...
   - On the Field Calculator dialog, inside the MaxPS = box: type in a high number (since this tutorial is based on CTX rasters, enter 1000).

d. Click OK.
e. Repeat the above step for the MinPS field, but enter a value of zero.
f. Zoom to the extent of the mosaic dataset by clicking the Full Extent button located on the Tools toolbar. All rasters should now be visible on the map.

Change the symbology of the Footprint layer and display labels (optional)

a. Right-click the Footprint layer and click Properties.
b. Under the Symbology tab:
   - Click once on the Symbol being used to bring up the Symbol Selector dialog.
   - On the Symbol Selector dialog select an Outline Color of No Color.
   - Click OK.
c. Under the Labels tab:
   - Check the Label features in this layer checkbox.
   - Select the OBJECTID field on the Label Field drop-down menu.
   - Change the color and size of the label as needed.
   - Click OK.
d. Click OK.

5. Reordering rasters using Raster Riser

Now that the mosaic dataset has been configured to be used with Raster Riser, we’ll go through the workflow of using the toolset.

Start editing the mosaic dataset

a. Drag the mosaic layer from the Table Of Contents and drop it onto the Raster Riser window.

An edit session is started automatically and the Raster Riser window is populated with all the rasters in the mosaic layer.

Sort rasters by a specific field (optional)

Rasters in the Raster Riser window can be reordered at any time by a particular field in the Footprint layer attribute table. When the new sorting is applied to the dataset, rasters on the map will be displayed in the same order as the Raster Riser sorting list. To sort the rasters by a field:
a. Click on the Sort by field button located at the top of the Raster Riser window to show the Sort By Field dialog.
b. Select a field from the drop-down menu.
c. Select either Ascending or Descending.
d. Click Sort.

Select rasters

Rasters in the Raster Riser window are in sync with the map, so whatever selection you make on the map, will also be set on the Raster Riser window, and vice-versa. You can use generic selection tools available in ArcMap to select groups of rasters from the map. To select a raster on the Raster Riser window, you may simply click on it. A group of rasters can be selected by holding the shift or control keys while clicking on individual rasters.

Raster Riser also offers the Select intersecting tool. This is a spatial selection tool that can be accessed by right-clicking any raster in the sorting list.

Rise and Sink rasters

The sorting list in the Raster Riser window provides drag-and-drop functionality to reposition individual rasters (or groups) along the sorting list. To reposition a selection:

a. Drag the selection on top of another raster and let go to finish.

When dragging the selection, Raster Riser is aware of the drag direction. If you drag the selection up, the raster that you drop the selection on will be shifted down to the end of your selection. If you drag the selection down, the raster you drop the selection on will be shifted upwards, on top of your selection (Fig. 7.2).

Another way of repositioning rasters is to use the embedded tools in the Raster Riser window, namely the Push to top and Sink to bottom tools. These tools are available at the top of the window, and can also be accessed by right-clicking inside the sorting list.
Flag rasters

Flags are a way to keep track of rasters that are not part of a selection. For example, when you select a group of rasters and want to keep track of all of them while working with other rasters in the sorting list.

![Flagged rasters are set in bold font. Other selections can be made.](image)

Toggle raster visibility

Rasters on the map can be turned off by unchecking the box next the raster name on the sorting list. Doing so will assign a value of -1 to the RATER_RISER_V field on the attribute table (Fig. 7.4). Instructions for removing rasters that are turned off using this method are outlined in section 6. Removing unwanted rasters from the mosaic dataset.

![Example showing visibility toggled off for two rasters in a selection.](image)

Search the sorting list

To search for a particular raster Name or Object ID, begin entering text inside the Search box located at the bottom of the Raster Riser window. Rasters that contain the text entered in this box will be dynamically highlighted on the sorting list. The number of rasters that meet the search criteria will appear on the Matching
rasters section, on top of the Search box. To clear highlighted items, simply empty the Search box, or click on the Clear search button that appears to the right (Fig. 7.5).

![Image of Raster Riser window]

Figure 7.5. Search example with search criteria of “17”. Raster Riser highlights every occurrence of the text entered in the search box and displays the number of rasters that match it.

Stop editing the mosaic dataset

So far, the changes we’ve made to the mosaic layer are temporary. When you stop an edit session, you can save any changes you have made with Raster Riser, or you can quit editing without saving. You can also save the edits you have made at any time by clicking Save Edits on the Editor menu. This keeps the edit session active. To stop the edit session:

a. Click on the Editor menu located on the Editor toolbar, and click Stop Editing.

b. If you have made any edits since the last time you saved edits, click Yes to save them. Clicking No discards the edits.

Once the edit session is stopped, the Raster Riser window will be cleared of all rasters.

![Image of Editor toolbar]

Figure 7.6. Go to the Editor Toolbar; click the Editor menu, and select Stop Editing to finish sorting the mosaic.

6. Removing unwanted rasters from the mosaic dataset

Rasters that are turned off on the Raster Riser sorting list can be removed after the edit session is ended by using the Remove Rasters From Mosaic Dataset geoprocessing tool. To remove rasters turned off using Raster Riser:
a. Open the **Remove Rasters From Mosaic Dataset** geoprocessing tool located under: Data Management > Raster > Mosaic Dataset.
b. Navigate to, or select the **Mosaic Dataset**.
c. Click on the SQL button next to the **Query Definition** field.
d. On the **Query Builder** dialog:
   - Enter: “RASTER_RISER_V” = -1 in the box located beneath the Get Unique Values button (keep the quotes).
   - Click **OK**.
e. Make sure the **Update Boundary** is checked.
f. **Mark Affected Overviews** → unchecked.
g. **Delete Overview Images** → unchecked.
h. Click **OK**.

### 7. Exporting the mosaic

As mentioned before, **Raster Riser** only takes advantage of the mosaic layer capability to display rasters in the mosaic dataset by a particular field. The easiest way to make changes permanent is to **save the map**, and simply keep using the mosaic layer as a dynamic display of the mosaic. Another way is to export the mosaic layer to a **Raster Dataset** (an image file). This process will actually **stitch together** all the images in the order they appear on the map to generate a **single image**. To do this:

a. On the ArcMap **Table Of Contents**: right-click the mosaic layer **Image layer** and select **Export Data**...
b. On the **Export Mosaic Dataset Data** dialog:
   - Make sure the **Extent** is set to that of the **Mosaic Dataset**.
   - **Spatial Reference** → **Mosaic Dataset**.
   - Set the **Location** where the mosaic dataset will be exported by clicking on the folder icon on the **Output Raster** section.
   - Enter a **Name** for the exported mosaic.
   - Select a **Format** (e.g. TIFF).
   - Click **Save**.
Uninstalling Raster Riser

**ArcMap**

1. From the top menu select: **Customize > Add-In Manager**.
2. On the **Add-In Manager** window: select the **Raster Riser** Add-In and click **Delete this Add-In** (Fig. 8.1).
3. Click **Yes** on the **Delete Add-In** window to confirm.
4. Close the **Add-In Manager** window by clicking **Close**.
5. The Add-In will not be present the next time you open ArcMap.

![Add-In Manager](image)

**Figure 8.1.** The ‘Add-In Manager’ is used to uninstall *Raster Riser* in ArcGIS 10.0.

**Contact Info:**

Please email any bugs, comments, and feedback to:

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