Lesson 3. Working with mosaic datasets
In which we learn:

- How to prepare an empty mosaic dataset
- How to add images to a mosaic dataset
- How to change symbology in a mosaic dataset
- How to add a time attribute
- How to add a time dimension to the mosaic dataset
- How to view time series data in a mosaic dataset

How to prepare an empty mosaic dataset

1. Activate the **Analysis** tab on the context ribbon and choose the red **Tool** icon to open the **Geoprocessing** pane.

2. Type the words *create mo* into the *Find Tools* box. The **Create Mosaic Dataset** tool will likely appear at the top. Click on the tool to open it.

3. In the **Parameters** tab:
   - For *Output Location*, navigate to the project default geodatabase: **C:\...\EO_SRS_ArcGISPro\ArcPro_RS_2019\ ArcPro_RS_2019.gdb**.
   - For *Mosaic Dataset Name*, type **LakeTravis_S2_TS**.
   - For *Coordinate System*, use the pulldown to choose one of LakeTravis raster files. The parameter should update to the raster projection: **WGS_1984_UTM_Zone_14N**.
   - For *Product Definition*, pull down and choose *Sentinel 2 MSI*. We will use this band information as a cheat sheet. Copy into **Notepad** or a notebook the minimum and maximum spectral values for Band 4 (650, 680), Band 3 (543, 577) and Band 2 (458, 522). Return to the *Product Definition* pull down and this time choose *Natural color*, second from top. Update the values to the actual Sentinel 2 spectral band numbers. The *Product Definition* will update to custom.
   - You can skip *Pixel Properties* for this mosaic dataset.

4. Click the **Run** button. The tool output will appear in the **Contents** pane and on the map. Although the **LakeTravis_S2_TS** will appear in the **Contents** pane as having a red *Boundary* outline, a green *Footprint* outline and an *RGB image*, the mosaic dataset is empty.

How to add images to a mosaic dataset

5. Return to the **Geoprocessing** pane. Click on the Back arrow by the tool name. Begin typing the words *add rasters to* into the *Find Tools* box. Choose the **Add Rasters to Mosaic Dataset** tool.

6. In the **Parameters** tab:

- For *Mosaic Dataset*, choose **LakeTravis_S2_TS** using the pulldown or navigate to the project default geodatabase: **C:\...\EO_SRS_ArcGISPro\ArcPro_RS_2019\ ArcPro_RS_2019.gdb** to locate it.
- Leave the *Raster Type* as *Raster Dataset*.
- For *Processing Template*, leave *Default*.
- For *Input Data*, use the pulldown to change from *File* to *Dataset*. We do this because the source files are file geodatabase rasters.
- Click open the Add Files icon and navigate to the project default geodatabase: **C:\...\EO_SRS_ArcGISPro\ArcPro_RS_2019\ ArcPro_RS_2019.gdb**. Select all 6 **LakeTravis**_*yyyymmdd_hhmm* raster files.
- Click open **Raster Processing**. Check on the boxes to *Calculate Statistics* and *Build Raster Pyramids*.
- Leave the remaining parameters as the defaults.

7. Click the **Run** button. The **Contents** pane won't change, but the map view will update to show one of the Lake Travis Sentinel 2 files inside the green Footprint outline. Which of the dates is on top (visible)?

How to change symbology in a mosaic dataset

One very handy capability of mosaic datasets is that you can change symbology once and have that same symbology applied to all of the rasters in the mosaic dataset. When the mosaic dataset consists of overlapping tiles, changes will be immediately evident. In the case of a time-enabled mosaic data set with tiles stacked on top of each other, changes will be seen while traversing time.

8. In the **Contents** pane, highlight the **Image** layer in the mosaic dataset **LakeTravis_S2_TS.** Click on the **Appearance** tab under **Raster Layer**.

9. Click on the **Stretch Type** icon and a list of possible stretches are displayed. The current stretch will be highlighted in blue. Test out some other options and keep one that you like.

In order to have more control over the applied stretches, open the **Symbology** pane where you can adjust clip percentages or change standard deviation options.

How to add a time attribute

10. In the **Contents** pane, right-click the **Footprint** sublayer, and click open the **Attribute Table**.

11. The Attribute Table opens. We are going to add a date field called TimeStamp:
    - Click **Add Field** at top of the open table. A new **Fields: Footprint** table tab opens.
    - The **Fields: Footprint** table shows a new empty row at the bottom of the grid.
    - For *Field Name*, type *Timestamp*.
    - Tab over to *Alias*, and type *Time Stamp* .

- Tab over to *Data Type* and choose *Date* from the options presented.
- Gaze up at the ribbon. The icons have changed to table related tools. Click on the **Save** button at top right.
- Click on the **X** next to the **Fields: Footprint** tab to close it.

12. With the **LakeTravis_S2_TS: Footprint** attribute table still open, scroll to the far right until you find the new **Time Stamp** field.

13. Highlight the **Time Stamp** field in the table view and right-click, choosing **Calculate Field** from the context menu. The **Calculate Field** geoprocessing tool opens in the **Geoprocessing** pane.

14. In the *TimeStamp* = box type the following (you can copy and paste from the PDF version of this lesson):

    - datetime.datetime.strptime(!Name![11:19], '%Y%m%d')

15. Click the **Run** button.

How to add a time dimension to the mosaic dataset

16. Return to the **Geoprocessing** pane. Click on the Back arrow by the tool name. Begin typing the words *build multi* into the *Find Tools* box. Choose the **Build Multidimensional Info** tool.

17. In the **Parameters** tab:
    - For *Mosaic Dataset*, choose **LakeTravis_S2_TS** using the pulldown or navigate to the project default geodatabase: **C:\...\EO_SRS_ArcGISPro\ArcPro_RS_2019\ ArcPro_RS_2019.gdb** to locate it.
    - For *Variable Field*, choose *Name*.
    - For *Dimension Fields*, choose *TimeStamp*.

18. Click the **Run** button. When the tool is done, scroll back to the **Time Stamp** field to verify that the calculated dates are correct. Close the attribute table.

How to view time series data in a mosaic dataset

19. Return to the **Contents** pane and highlight **LakeTravis_S2_TS**.

20. Right-click and choose **Properties**.

21. In the left pane of the **Layer Properties** window, click on **Time**.

22. Change the following **Time** settings:
    - For *Layer Time*, choose **Each feature has a single time field.**
    - For *Time Field*, choose *Time Stamp*.

- As soon as you choose *Time Stamp*, the *Time Extent* beginning and ending dates will update.

23. Click the **OK** button to close the **Layer Properties** window.

24. Two things will change:
    - The ribbon will update to show the **Time** tools.
    - A time slider will appear at the top of the **LakeTravis_S2_TS** mosaic dataset.

It can be a little tricky to set up time parameters in the ribbon, especially when time steps are inconsistent, as is the case with the Lake Travis datasets. In the current example, there is one date from January 2017, four dates relatively close together during the second half of 2018 and a final date from September 2019. Consequently, there will be a lot of time gaps. Knowing that, let's proceed with set up using ribbon tools.

25. Begin at the left side of the ribbon with **Current Time** group.

    - Set the *Start* to *1/11/2017*. The time of day is not important so accept what ArcGIS Pro estimates.
    - Set the *Span* to *1.5 Months*.
    - The *End* parameter updates accordingly.

26. In the **Step** group, choose the radio button next to *Step Interval* and set to *1 Months*.

27. In the **Playback** group, click on the central arrowhead (Play All Steps). Be patient the first time. The map view will go blank during the first have of the 'show' while the mosaic dataset builds itself. After one complete playback, you can replay, or manually manipulate the time slide. Give the map view time to refresh while stepping through.

28. If time permits, apply a different stretch to see how all of the rasters in the dataset are affected.