Web AppBuilder for Image Services

User Documentation

(2016/11/18)

Disclaimer

Applicable for WABIS Version 20161208

Note: The functionality of WABIS has not been exhaustively tested and is not currently covered under ArcGIS Support. Questions or suggestions related to these widgets should be addressed to the GitHub forum associated with the download or sent to ImageManagementWorkflows@esri.com.

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Overview

What is Web AppBuilder for Image Services (WABIS)?

WABIS widgets make it easy for you to incorporate imagery into a wide range of web apps created using ArcGIS Web AppBuilder. Image services widgets have a number of features, including:

- Managing, analyzing, and visualizing imagery in your app.
- Working within the existing Web AppBuilder for ArcGIS framework.
- Modular design that easily integrates with other GIS and image services widgets.
- Implemented with no coding required.

Example apps created using WABIS widgets can be found on the WABIS GitHub page (https://github.com/Esri/WAB-Image-Services-Widgets).

What do you get?

The Web AppBuilder for Image Services ZIP file downloaded from GitHub contains the following:

- A Web AppBuilder theme designed to work smoothly with imagery
- A variety of image services widgets for Web AppBuilder (see **WABIS Widget Descriptions** below)

What are the system requirements?

- Web AppBuilder for ArcGIS Version 2.2 installed (See **Installing WABIS** below)
- ArcGIS Online account

  Note: WABIS widgets may not be compatible with versions other than Web AppBuilder v2.2.

What's in this document?

- An overview of WABIS
- Instructions for how to install WABIS
- Instructions for creating a basic app using WABIS widgets
- A guide to the different widgets' capabilities, configuration parameters, and user interfaces

Introduction

With WABIS, app creators can add the ability to manage, analyze, and visualize imagery to their web apps. Typically, web apps have (1) base maps, which provide general context for the user, and (2) operational layers, which contain key information with which the application interacts. By including imagery in an app's operational layers, the user can access additional context and new options for analysis.

Among other things, image services widgets enable users to do the following in an app:

Manage imagery. Add and change imagery layers; choose mosaic, interpolation, and compression parameters; and set visualization options for your imagery.

Incorporate time. Select particular dates to display and analyze; filter imagery by date; and use a slider to view images chronologically.

Analyze imagery. Visually compare two layers; classify imagery; calculate change between two dates; and generate spectral profiles.

An app creator can use WABIS to add imagery functionality to an app in two ways:

1. Image services widgets can work directly with imagery layers in the primary webmap associated with the app.
2. An app creator can use the IS Layers widget to identify an additional, auxiliary webmap containing imagery layers. These layers will then be available to the app along with the layers in the app's primary webmap.

This setup means three things:

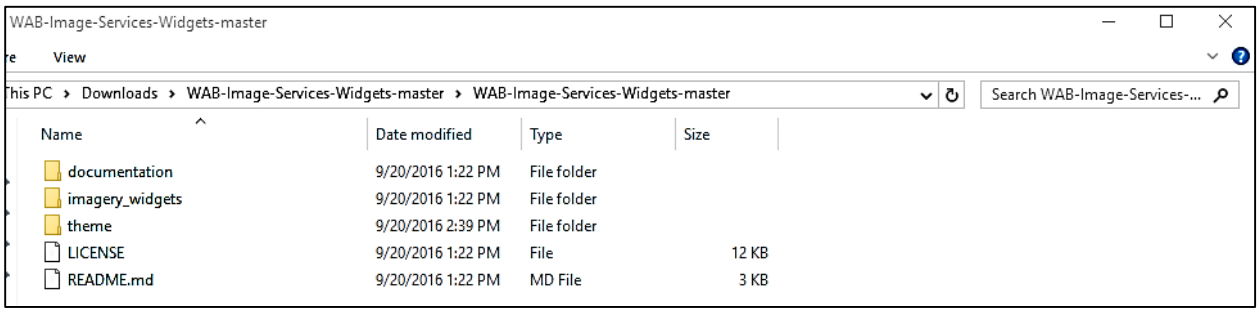
- **For WABIS widgets to function properly, a webmap with at least one image layer must be associated with the app in Web AppBuilder when the app is created.** If two or more image layers are present, a secondary layer can be added for further visualization and analysis capabilities.
- By using an auxiliary webmap, app creators have the option to add imagery to their web applications and maintain relevant image services without modifying the primary webmap that defines the application.
- Since image services typically cover the extent of the area of interest (in this case, the app window), there is no need for users to select and work with individual images—the appropriate image will be generated and visualized on-the-fly by the app.

Installing WABIS

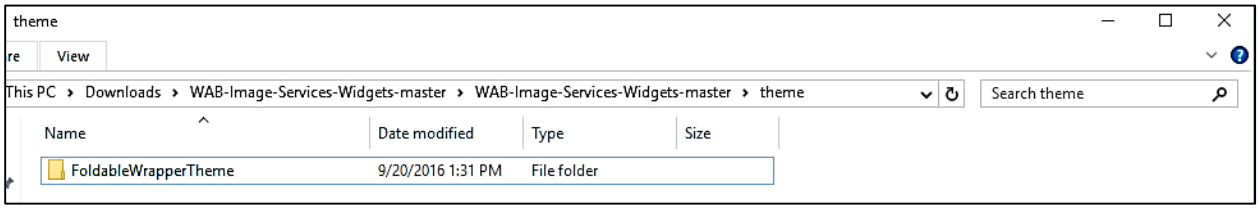
Note: WebApp Builder for ArcGIS (Developer Edition) Version 2.2 should be installed and set up on your computer before proceeding. Instructions for accomplishing this can be found at https://developers.arcgis.com/web-appbuilder/guide/getstarted.htm.

To set up Web AppBuilder for Image Services, complete the following steps.

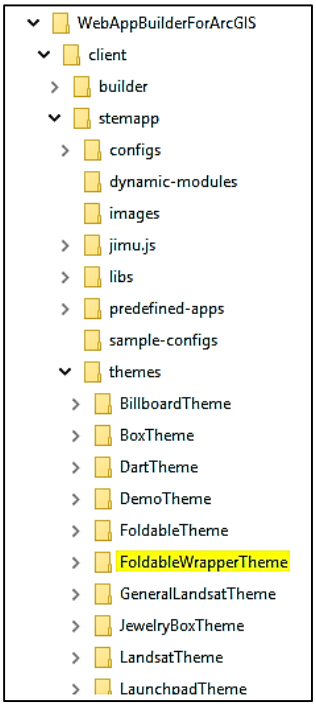
1. Download the **WAB-Image-Services-Widgets-master ZIP file** by clicking https://github.com/Esri/WAB-Image-Services-Widgets/archive/master.zip.
2. **Unzip** WAB-Image-Services-Widgets-master.zip to your computer and **open** the unzipped folder.



3. Open the **theme** folder.



4. Copy the **FoldableWrapperTheme folder** to the themes folder in your Web AppBuilder installation location (i.e. …/WebAppBuilderForArcGIS/client/stemapp/themes).



5. Return to the unzipped **WAB-Image-Services-Widgets-master** directory. Open the **imagery_widgets** folder.
6. Copy the folders found in the **imagery_widgets** folder to the **widgets** folder in your Web AppBuilder installation location. (i.e. …/WebAppBuilderForArcGIS/client/stemapp/widgets).
7. If running, **close Web AppBuilder** to refresh the Image Services themes and widgets before developing an imagery app.

Create a Basic Web App Using WABIS

Note: Restart Web AppBuilder if you just set up the Web AppBuilder for Image Services. This will ensure that all the new imagery options are available.

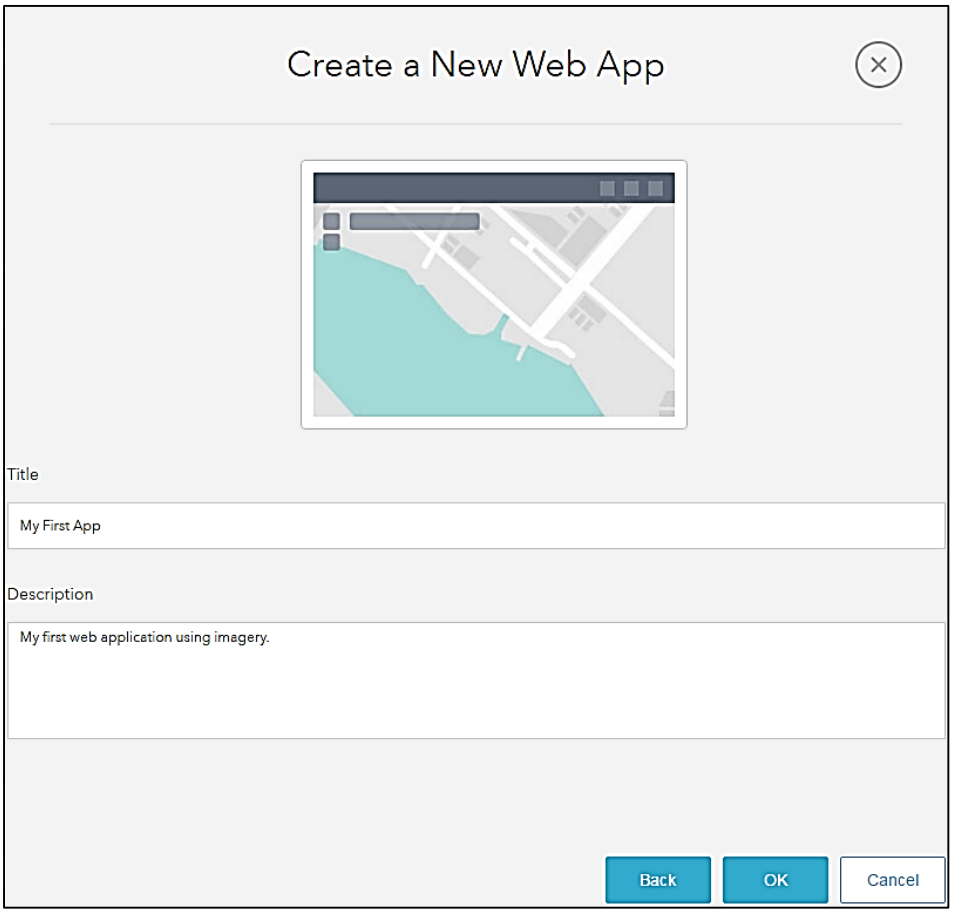
1. Navigate to your **Web AppBuilder installation location** (for example, C:/arcgis-web-appbuilder-2.2/WebAppBuilderForArcGIS/).

2. **Double-click the startup.bat file** to start Web AppBuilder. If prompted, click **Run**.

   Note: The Web AppBuilder interface should automatically open in a browser window. If it doesn't, restart the Web AppBuilder, or use your browser to navigate to: http://<**your_machine_name**>:3344/webappbuilder/.

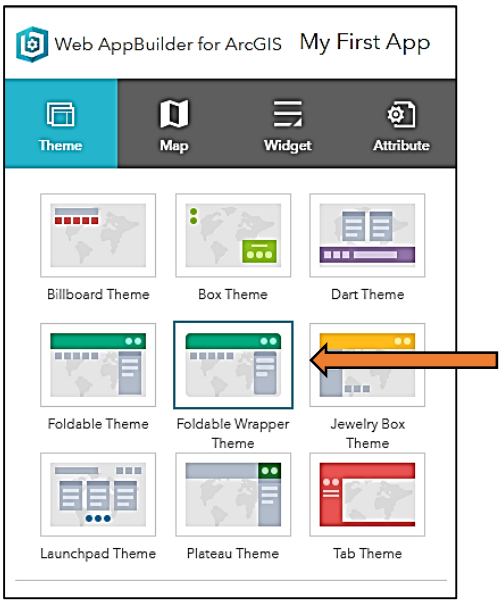
3. On the AppBuilder homepage, click **Create New**, select **Default (2D)**, and click **Next**.

4. Enter an **app name** ("My First App," for example) and a **description**. Select **OK**.

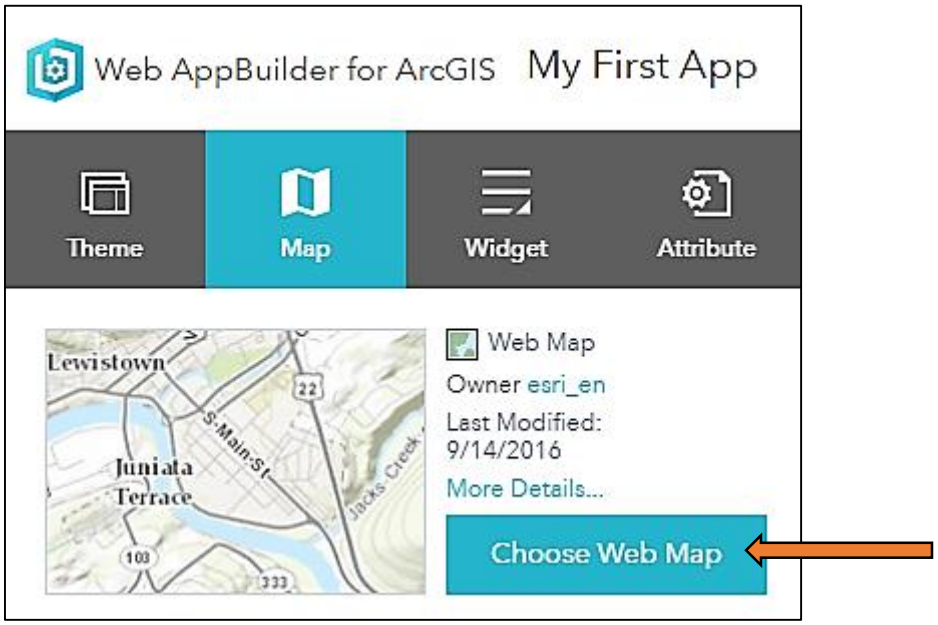


5. Select the **Foldable Wrapper Theme**. Leave the rest of the Theme options as-is.

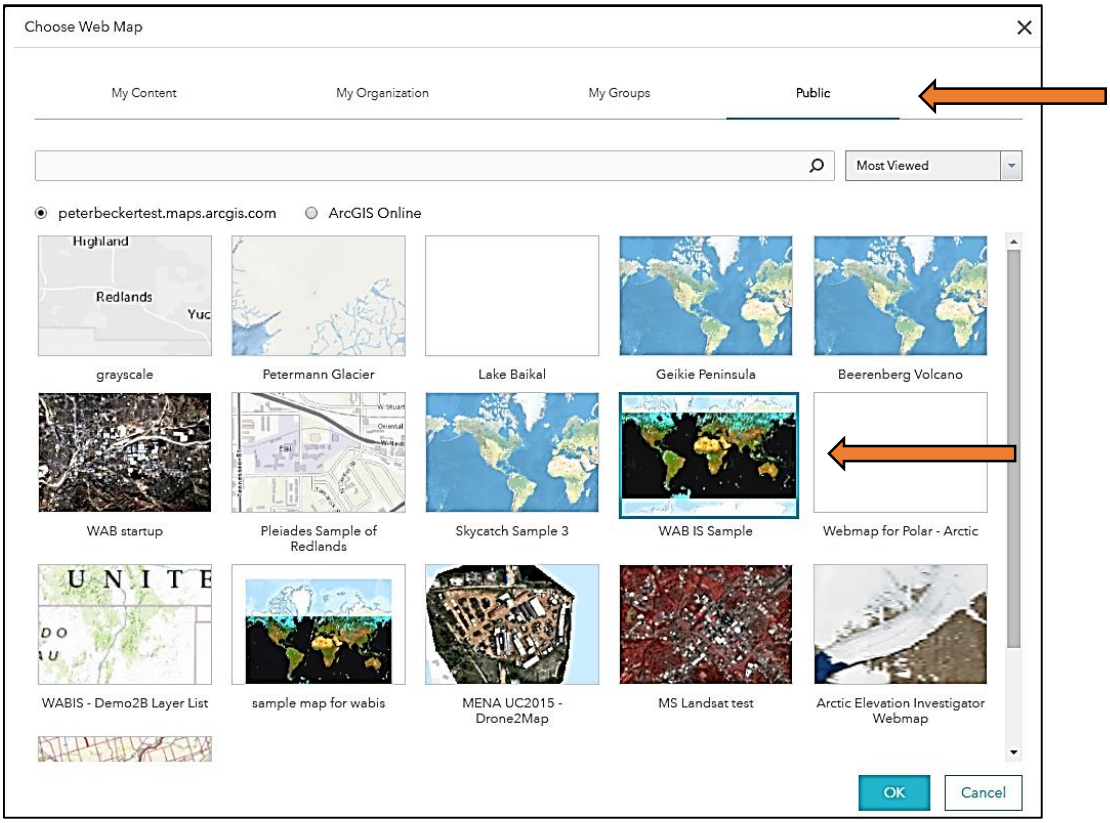
   Note: The Foldable Wrapper Theme ensures proper positioning of widgets specific to image services and won't work when all the widgets are grouped together.



6. Select the **Map** tab at the top left and click **Choose Web Map**.



7. Select **Public** at the top, select **WAB IS Sample** from the available web maps, then click **OK**. (You may need to search for "WAB IS Sample.") The layers in the web map will be added to the map in the builder.



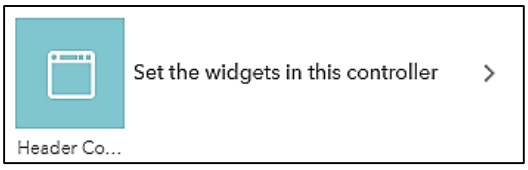
Note: This sample web map with two imagery layers has been made public to facilitate this guide. However, any web map with one or more operational imagery layers can be added at this step and will work with WABIS widgets.

Web maps with more than two layers can be used as well, but only the top two layers should be turned on, and the visibility of all but the top two layers should be turned off using the Layer List widget.

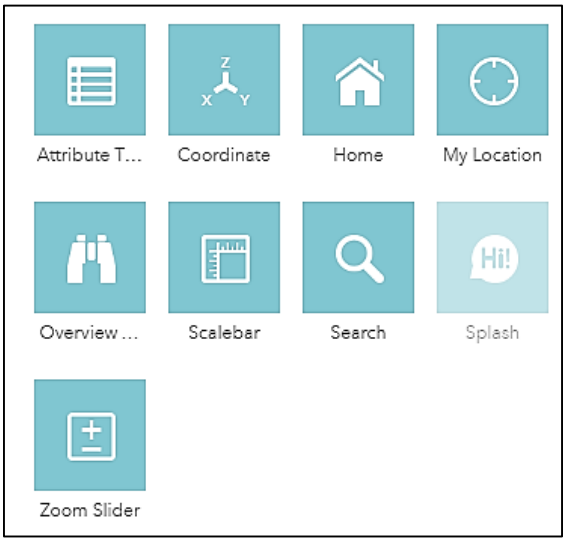
8. Select the **Widget** tab at the top left. Here you can select which widgets to include in your app.

Note: Web AppBuilder has three widget sections:

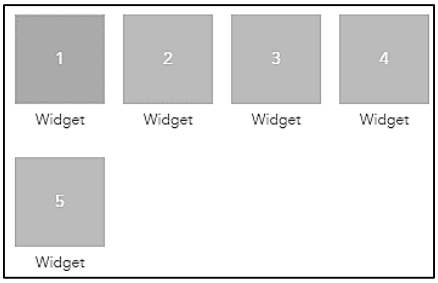
a. The first section allows the app creator to add widgets to the header by clicking **Set the widgets in this controller**. By default, the Legend and the Layer List widget controls show up here. Additional widgets can be added to the header as desired.



b. The second section lists the default widgets included on the body of the app. Hover over each to see the widget control highlighted on the app, and to find the icon that turns the widget on/off and the icon that allows the app creator to configure the widget.



c. The third section allows the app creator to add up to five widgets that are displayed on the screen of the app itself. Click on any of the numbered gray boxes to see a list of options.

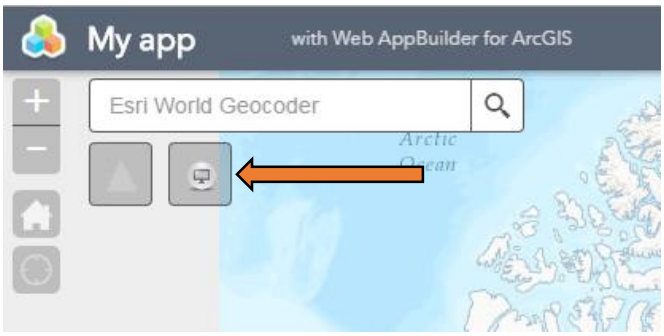


9. Add the IS Layers and IS Renderer image services widgets to your app by **clicking the numbered gray boxes** and looking for widget names that start with "**IS**."

   Note: Image services widgets will all start with IS.

10. Click **Save**.

11. Click **Launch** to view your finished web app in a new browser tab. Your widget icons will appear in the upper left corner of the app (identified with an arrow below).



12. **Click the icons** to try out your new image services widgets.
13. Return to the **AppBuilder** tab in your browser. Click **Previews** to explore what your app will look like to a user on a variety of devices.

WABIS Widget Descriptions

WABIS widgets offer a variety of tools for manipulating and analyzing imagery in your applications.

Notes:

- Be sure to load **all** widgets in the header controller before opening any of the header controller widgets in the app.
- Some widgets require the creator of the app to configure them during the first-time load. However, once the widget is configured, the only way to change the configuration is to remove the widget (by clicking the icon) and then reloading it. **While the widget icons have a pencil symbol that suggests the configuration can be edited, this will not work properly for all WABIS widgets.**
- **Always save your application after making changes in the AppBuilder by clicking Save at the bottom left of the screen.**

IS Layers

The IS Layers widget sets and changes the primary and secondary imagery layers in the app, and allows you to define an auxiliary image services webmap to be associated with your app.

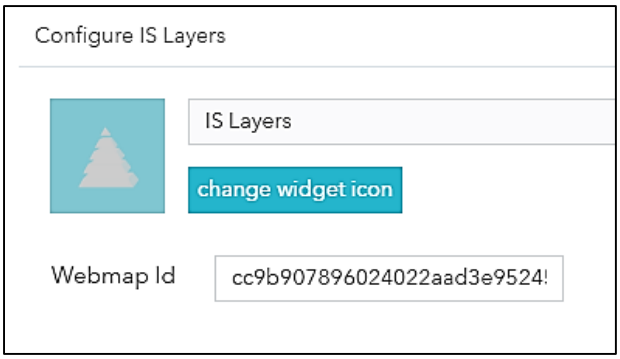
Configuration

The app creator can define **webmapId**, which is the ID of an auxiliary webmap that defines the image services available in the widget's dropdown menu (in addition to the image service layers present in the app's default webapp).

- This webmap is typically populated with different image layers (at least one).
- Properties for each image layer are set as part of that webmap.
- The webmap can be maintained independently of the app.
- The webmap and its contents must be shared with the app's users.

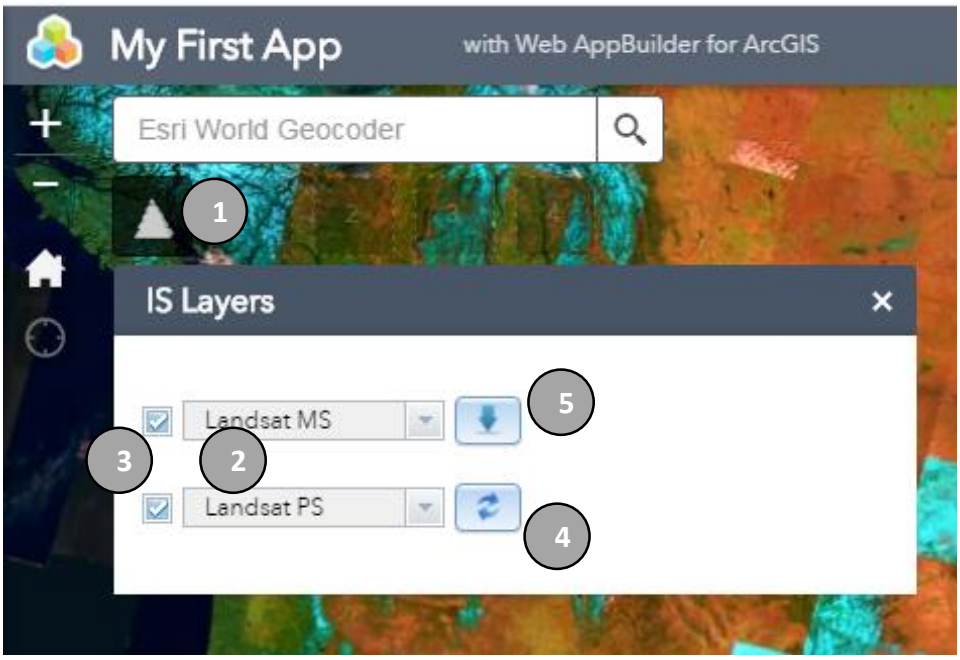
When the app creator selects the IS Layers widget, it will automatically be configured with the Webmap ID of the webmap associated with your app.

Note: When the webmap is opened in ArcGIS Online, the Webmap ID will be the string following "?id=" in the item URL.



User interface

This is an image of the IS Layers widget interface, with explanations of the numbered features below:



1.  is the **IS Layers icon**. Click the icon to toggle the widget dialog box on and off.
2. Two **dropdown menus** allow the user to choose primary and secondary layers.

   Note: The dropdown menu will include (1) the image services associated with the Webmap ID identified during IS Layers widget configuration and (2) the image services associated with the app's default webmap.
3. Toggle the layers on and off using the **checkboxes** next to each dropdown menu.

4. Click  to **switch** the primary and secondary layers.

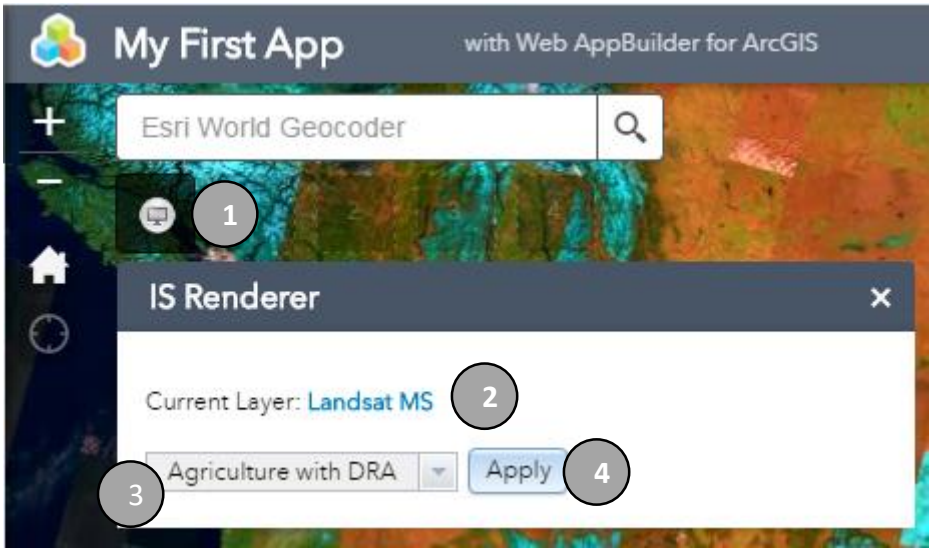
5. Click  to **copy** the primary layer to the secondary layer.

IS Renderer

The IS Renderer widget sets the service functions and stretch on the primary layer. The dropdown menu in the widget is automatically populated with the service functions associated with the primary layer.

User interface

This is an image of the IS Renderer widget interface, with explanations of the numbered features below:



1.  is the **IS Renderer icon**. Click the icon to toggle the widget dialog box on and off.
2. **Current Layer** identifies the layer being visualized by the widget.

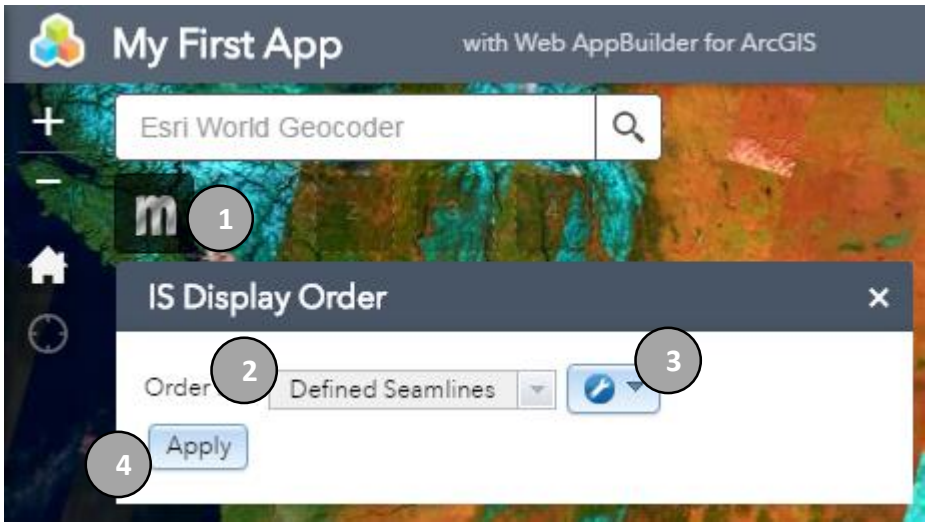
   Note: This will be the primary layer, which can be changed using the IS Layers widget.
3. The dropdown menu lists the available visualization options based on the service functions set up in the associated imagery webmap.
4. Click  to visualize your primary layer using the selected option from the dropdown menu.

IS Display Order

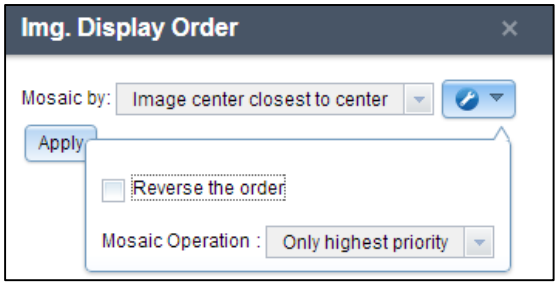
The IS Display Order widget sets the mosaic rule for the primary layer, which determines which image in the mosaic will be visualized if images overlap.

User interface

This is an image of the IS Display Order widget interface, with explanations of the numbered features below:



1.  is the **IS Display Order icon**. Click the icon to toggle the widget dialog box on and off.
2. The **Order By** dropdown menu lists the mosaicking options, some of which also take require additional selections. Options include:
    - Only scale
    - An attribute: The user must select an attribute to sort by and enter a priority value (i.e. the value from the chosen attribute field you wish to appear on top).
    - Image center closest to center
    - Fixed order with most NW on top
    - Sensor location closest to center
    - Defined seamlines
    - A list of images: The user must enter image IDs as a comma separated list.
3. Click on  to choose the **Mosaic Operations** available for your selected mosaic method (a **checkbox** that will reverse the order of your chosen mosaic method will also be available).



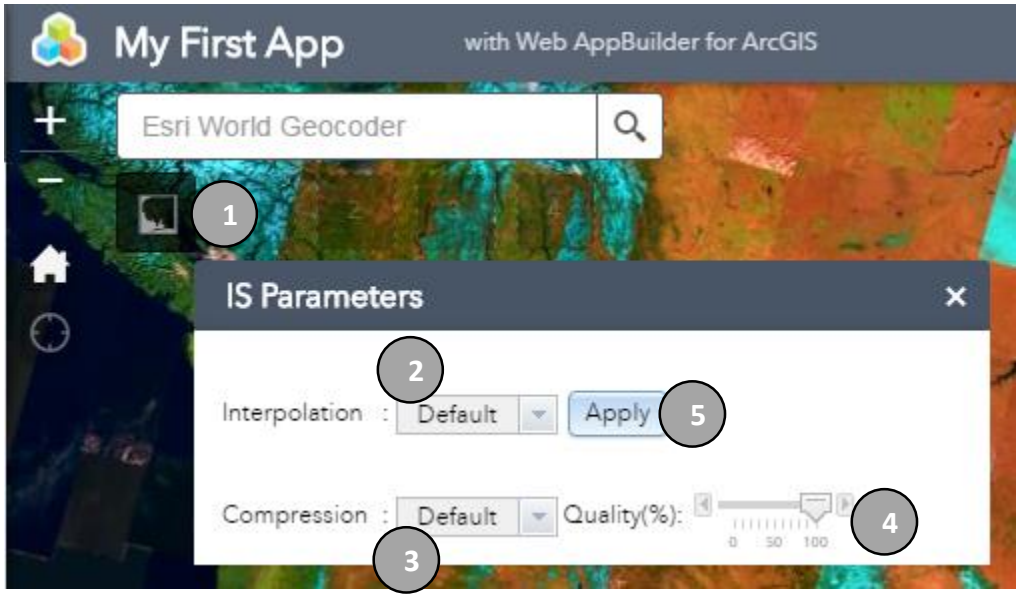
4. Click  to visualize your primary layer using the selected mosaicking parameters.

IS Parameters

The IS Parameters widget allows users to set interpolation and compression for the primary layer.

User interface

This is an image of the IS Parameters widget interface, with explanations of the numbered features below:



1.  is the **IS Parameters icon**. Click the icon to toggle the widget dialog box on and off.
2. The **Interpolation** dropdown menu lists the interpolation options for imagery layers, including:
    - Default (as defined by the image service)
    - Bilinear
    - Cubic convolution
    - Majority
    - Nearest neighbor
3. The **Compression** dropdown menu lists the compression options for imagery layers, including:
    - Default (as defined by the image service)
    - None
    - Jpgpng
    - Png
    - Jpg
5. Use the **Quality** slider to determine the acceptable level of data loss due to compression.
6. Click  to save the selected interpolation and compression parameters.

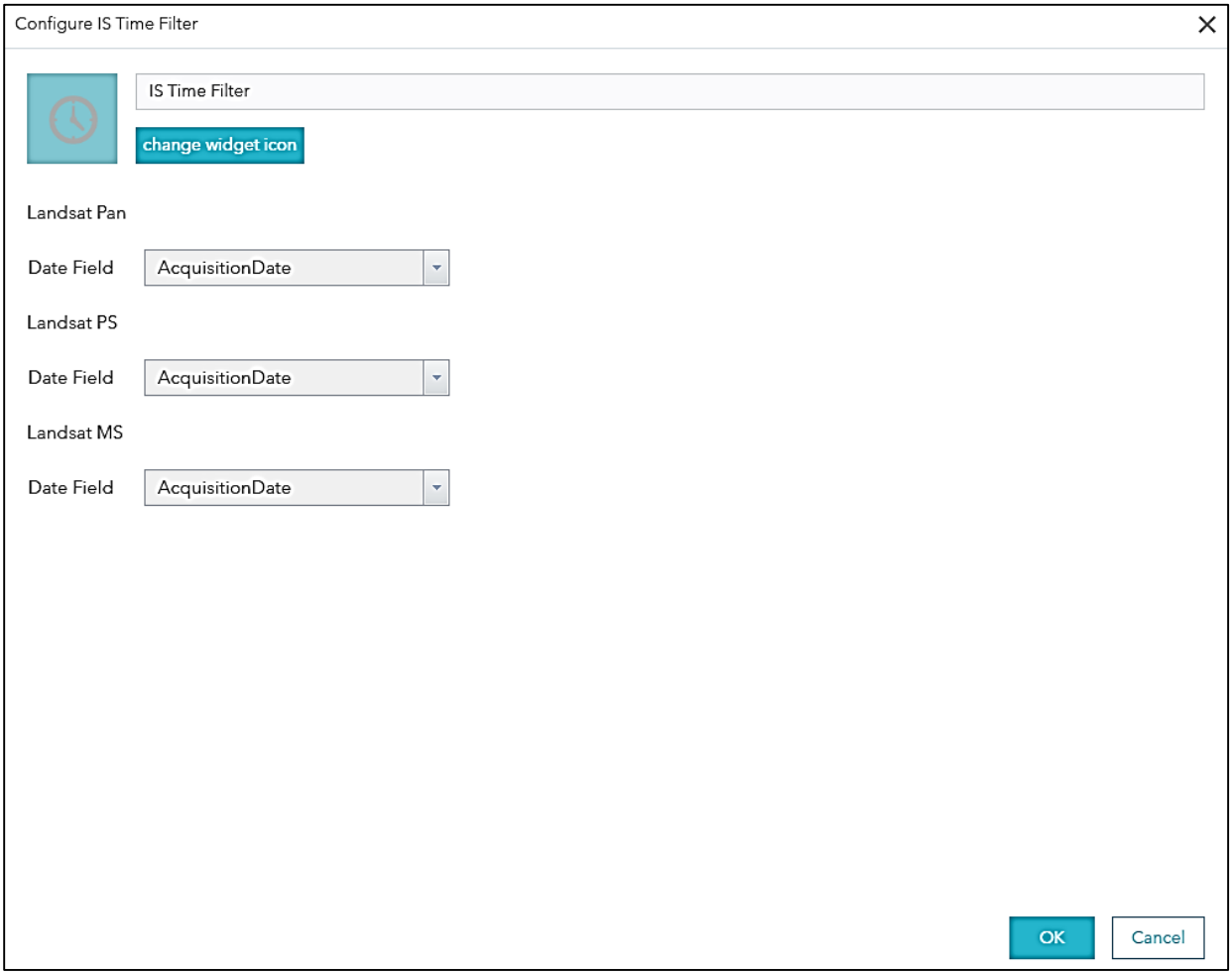
IS Time Filter

The IS Time Filter widget displays all the rasters from the primary layer that intersect with the current area of interest (AOI) on a slider in chronological order.

Note: For this tool to be active, the primary layer must have a date field specified, with the Object ID and Category fields exposed.

Configuration

During configuration, the IS Time Filter widget gives you the option to choose the date field used by the time filter widget for each image service available in the app. By default, when available, the widget will choose the AcquisitionDate field.



User Interface

This is an image of the IS Time Filter widget interface, with explanations of the numbered features below:

1.  is the **IS Time Filter icon**. Click the icon to toggle the widget dialog box on and off.
2. Check the **Time Slider checkbox** to activate the widget and define the current area of interest.
3. Move the **slider** to display the corresponding raster.
4. Use the **Show** dropdown to choose whether the image or the footprint should be displayed.
5. Use the **Age** dropdowns to determine the range of time before the chosen date to display (for example, “8 days” will display all images taken during the 8 days leading up to the date on the slider).
6. Click the  button to reset the area of interest (after zooming to a different location, for example).

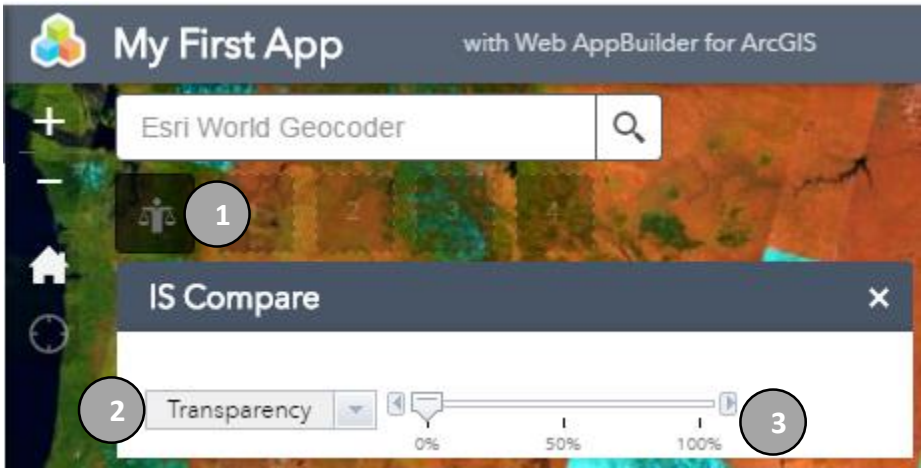
IS Compare

The IS Compare widget sets transparency or enables swipe on the topmost imagery layer in order to compare that layer with the image below.

Note: Typically, this will compare the primary and secondary layers. However, it may also be used to compare the primary layer with the results layer (if present).

User interface

This is an image of the IS Compare widget interface, with explanations of the numbered features below:



1.  is the **IS Compare icon**. Click the icon to toggle the widget dialog box on and off.
2. The **dropdown** menu allows you to compare images by increasing the transparency of the top layer, or by using a swipe tool to uncover the secondary image below.
3. When Transparency is selected, use the **Transparency slider** to set the degree of the primary layer's transparency. (If Swipe is selected, the slider will disappear.)

IS Primary Acquisition Date

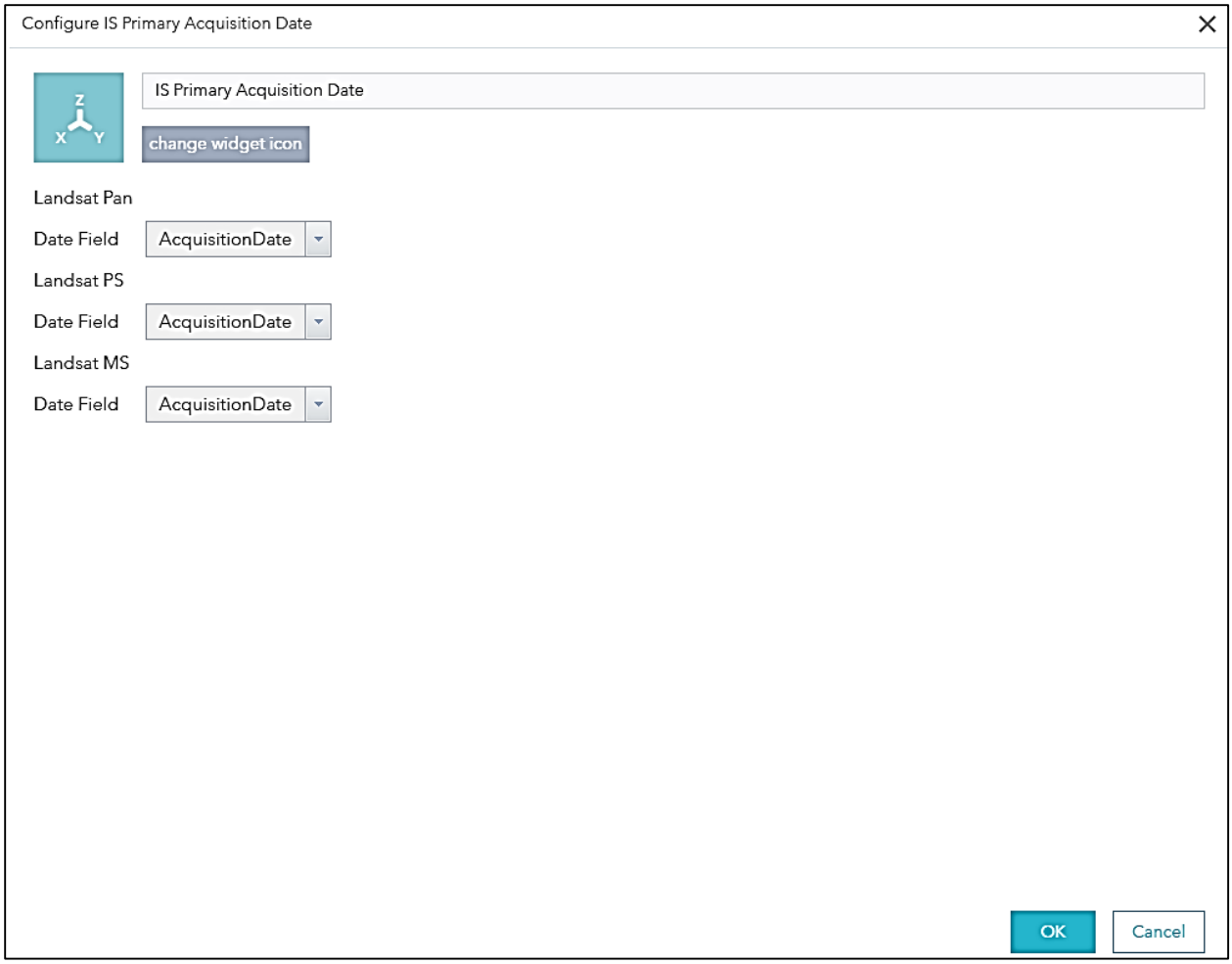
The IS Primary Acquisition Date widget shows the acquisition date of the visible primary layer raster at the center of the current extent. Alternatively, if a lock raster mosaic rule is applied (which enables users to lock the display of single or multiple rasters based on the ObjectID), the widget will show a range of acquisition dates.

Notes:

- For this tool to be active, the date field must be available for the primary layer image service.
- Additionally, the IS Primary Acquisition Date widget must be loaded in the placeholders (i.e. numbered boxes).
- Finally, the date will only be visible in the user interface when the layer is active.

Configuration

During configuration, the IS Primary Date widget gives you the option to choose the date field used by the widget for each image service available in the app. By default, when available, the widget will choose the AcquisitionDate field.



User interface

 is the IS Primary Acquisition Date icon. When selected, the acquisition date for the primary layer will appear on the screen under the icon. Alternatively, if a lock raster mosaic rule is applied, the widget will display the range of dates for the locked rasters.

IS Secondary Acquisition Date

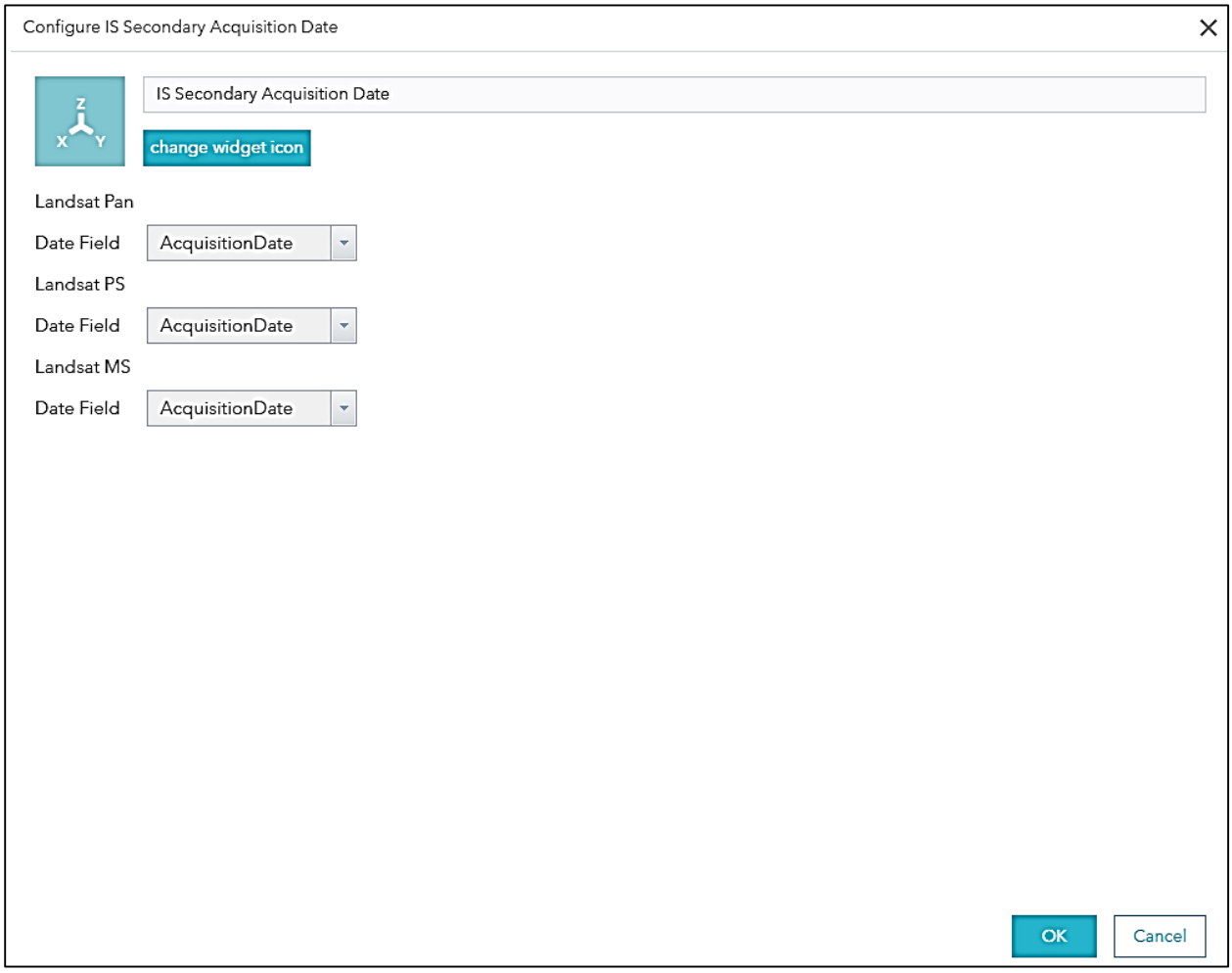
The IS Secondary Acquisition Date widget shows the acquisition date of the visible secondary layer raster at the center of the current extent. Alternatively, if a lock raster mosaic rule is applied (which enables users to lock the display of single or multiple rasters based on the ObjectID), the widget will show a range of acquisition dates.

Notes:

- For this tool to be active, the date field must be available for the secondary layer image service.
- Additionally, the IS Secondary Acquisition Date widget must be loaded in the placeholders (i.e. numbered boxes).
- Finally, the date will only be visible in the user interface when the layer is active.

Configuration

During configuration, the IS Secondary Date widget gives you the option to choose the date field used by the widget for each image service available in the app. By default, when available, the widget will choose the AcquisitionDate field.



User interface

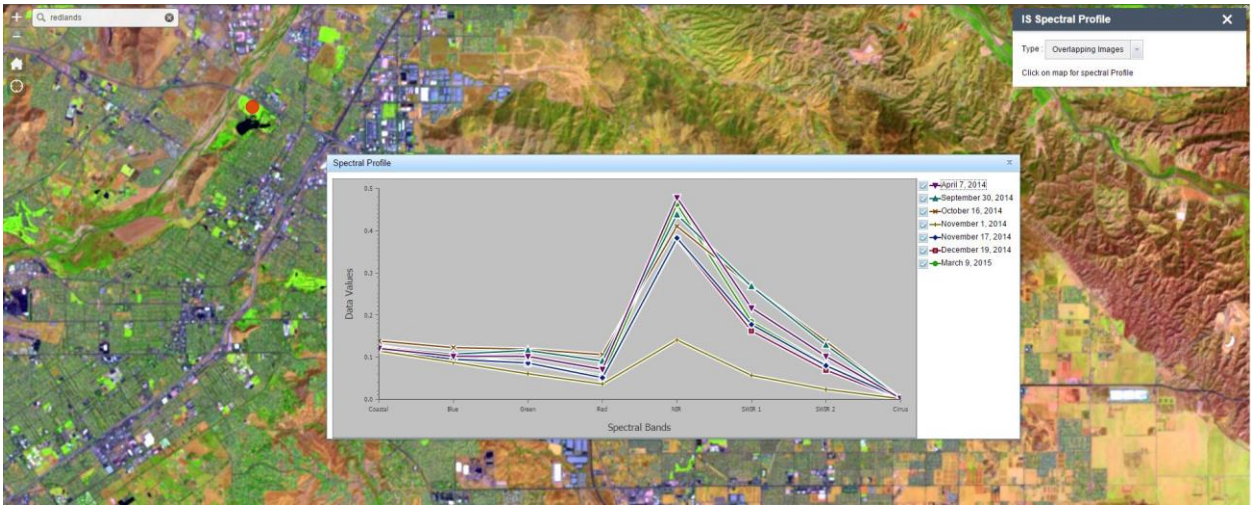
 is the IS Secondary Acquisition Date icon. When selected, the acquisition date for the secondary layer will appear on the screen under the icon. Alternatively, if a lock raster mosaic rule is applied, the widget will display the range of dates for the locked rasters.

IS Spectral Profile

The IS Spectral Profile widget shows a spectral profile for a selected point on the primary layer—the three available profile modes are (1) temporal spectral, (2) non-temporal spectral, or (3) NDVI.

Notes:

- Users can access the three modes dependent on the fields available in the image service—temporal spectral and NDVI profiles require both **Category** and **Date** fields.
- The widget requires **band names**, specified in key properties at the item level. If the layer is already in the map during configuration, band names for that layer can also be specified then. An **NDVI profile** requires that the red, near infrared, and shortwave infrared bands be identified.



Configuration

During configuration, the app creator can identify the band names to be used for each available imagery layer.

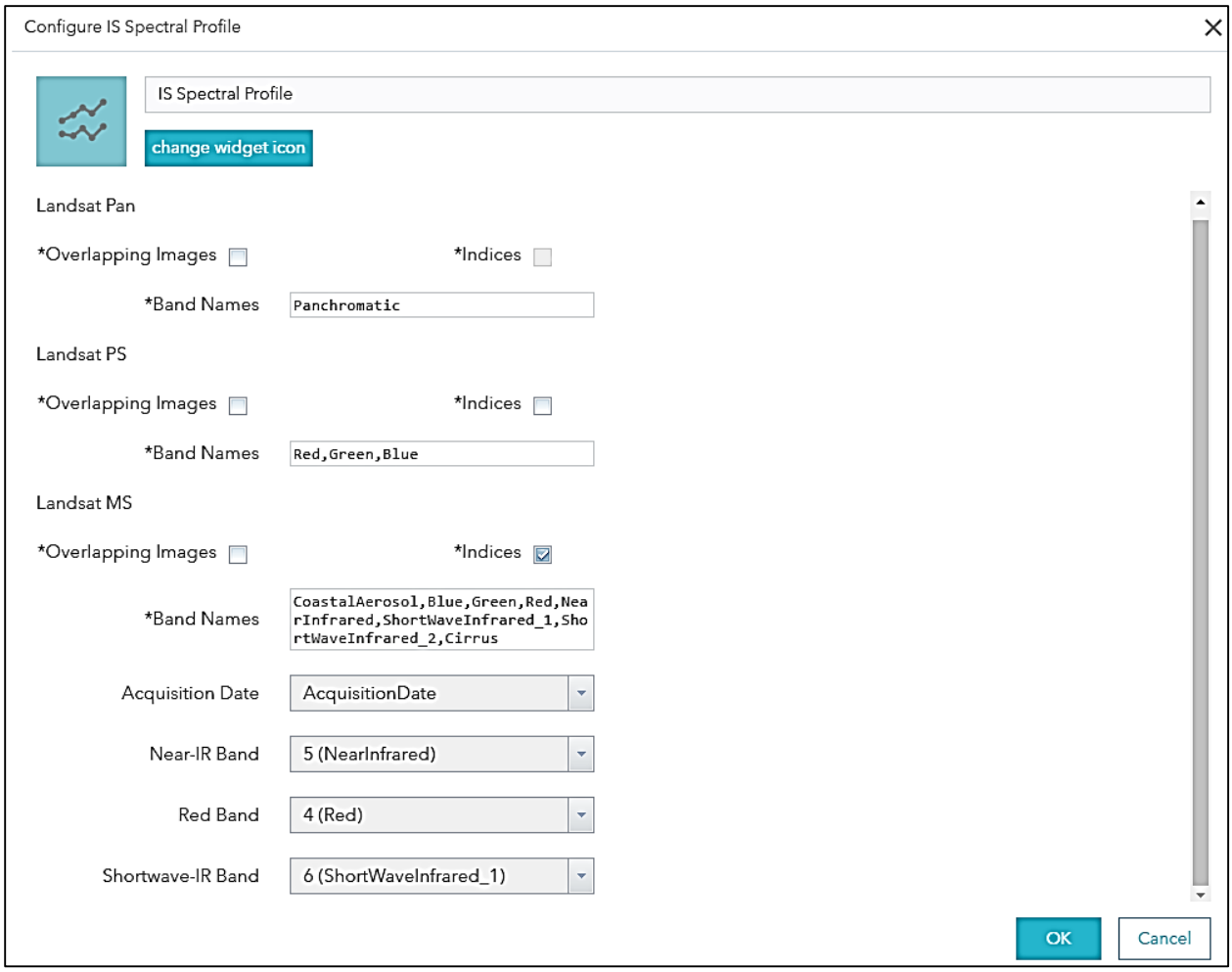
Additionally, the app creator can specify whether overlapping images or indices are enabled for each imagery layer using the checkboxes.

- If **Overlapping Images** is enabled for a layer, the app creator can choose the date field to be used by the widget. The widget will choose AcquisitionDate by default.

  Note: If the Category field or a date field is unavailable, the Overlapping Images option will not be available.

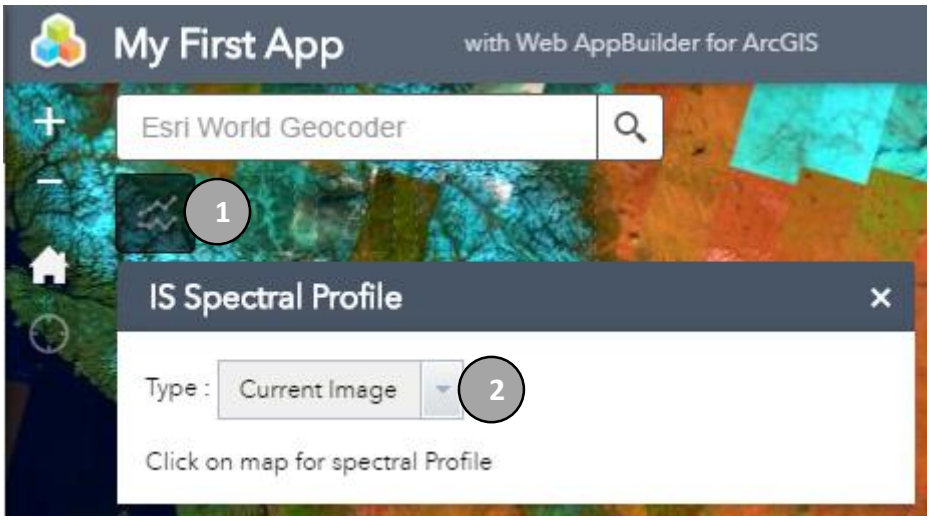
- If **Indices** is enabled for a layer, the app creator can also specify the near-infrared, red, and shortwave infrared bands.

  Note: If the Category field, a date field, or the required index bands are unavailable, the Indices option will not be available.



User interface

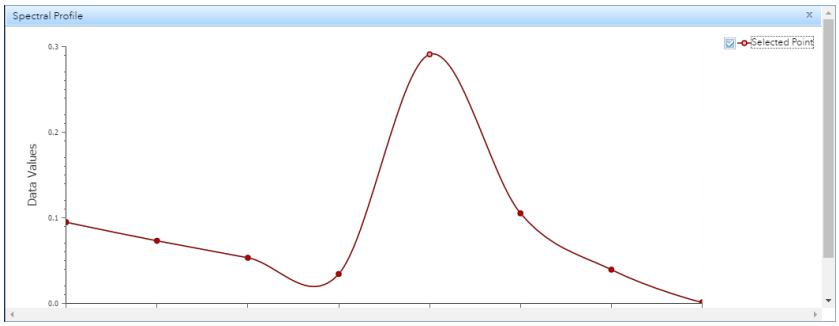
This is an image of the IS Spectral Profile widget interface, with explanations of the numbered features below:



1.  is the **IS Spectral Profile icon**. Click the icon to toggle the widget dialog box on and off.
2. The **dropdown** menu allows you to choose between a spectral profile for the current image, overlapping images (which returns spectral values for all images that overlap at that point), or the vegetation index NDVI.

How to use the widget

1. Decide **which profile** suits your needs—Current Image, Overlapping Images, or Indices(NDVI).
2. **Click** on a point on the map. The resulting spectral profile will look something like this:



IS Time Filter Profile

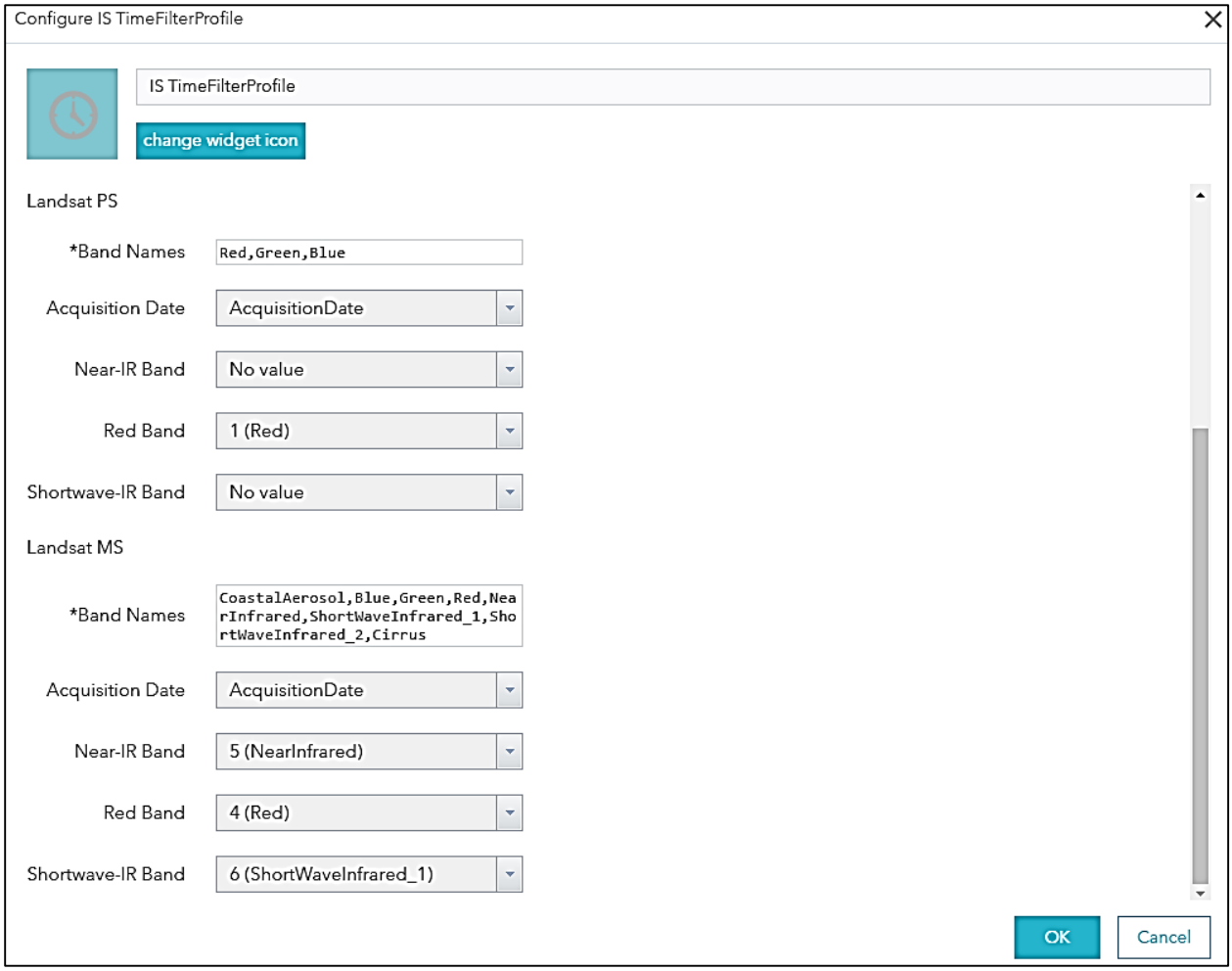
The IS Time Filter Profile widget combines the functionality of the IS Time Filter and IS Spectral Profile widgets. It allows users to move through time by clicking on the graph points of a spectral profile.

Configuration

During configuration, the app creator can identify the band names, acquisition date field, and index bands (near infrared, red, and shortwave infrared) to be used for each available imagery layer.

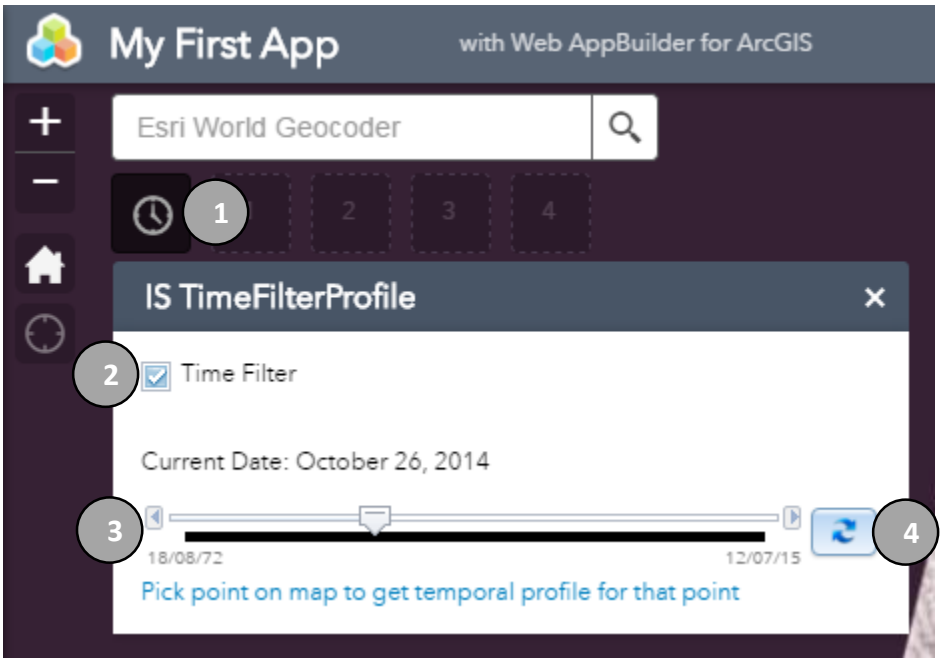
Notes:

- If the index bands are unavailable or unidentified, the Is Time Filter Profile widget will not return any results.
- The Category and GroupName fields must be exposed on the imagery layer for this widget to function properly.



User interface

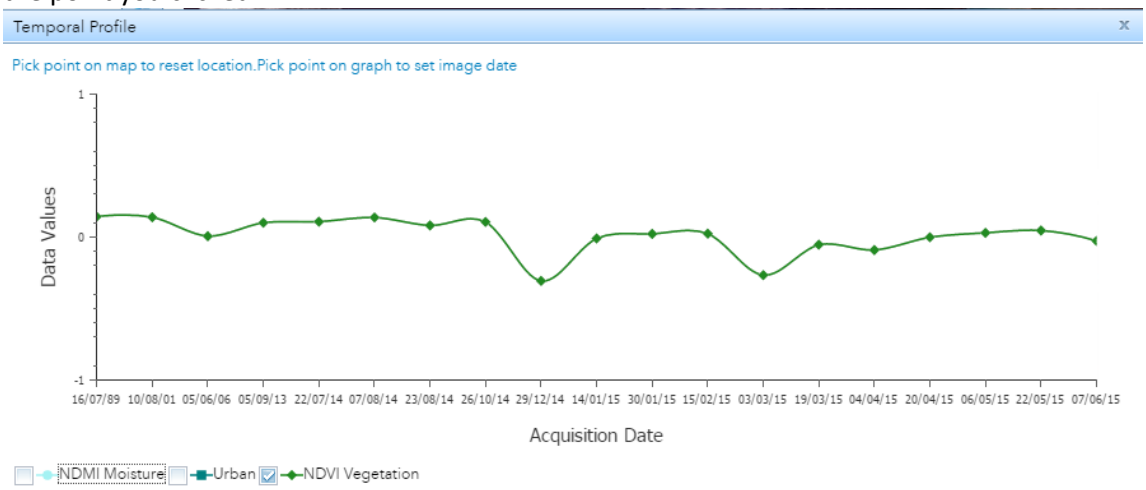
This is an image of the IS Time Filter Profile widget interface, with explanations of the numbered features below:



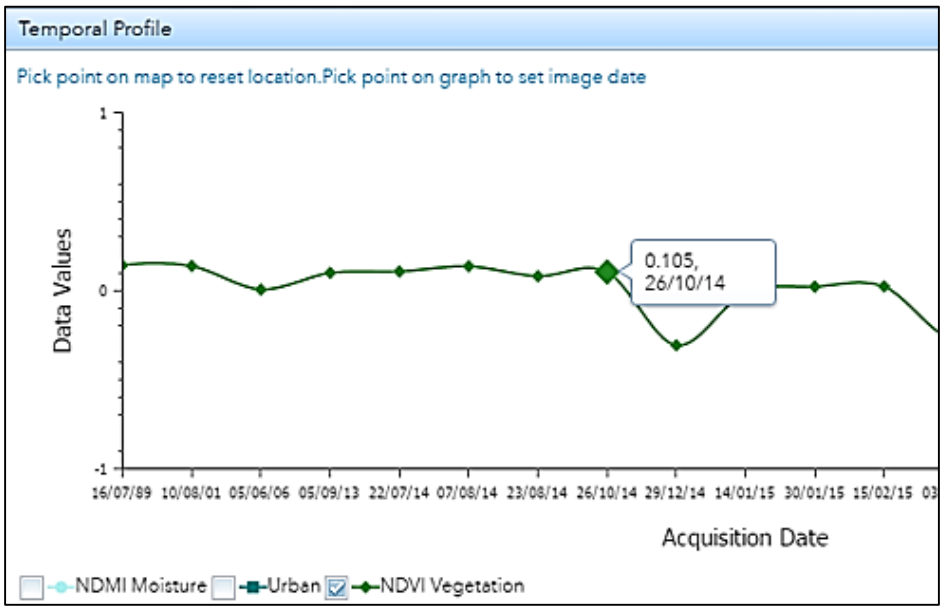
1.  is the **IS Time Filter Profile icon**. Click the icon to toggle the widget dialog box on and off.
2. Click the **Time Filter checkbox** to activate the widget.
3. Move the **slider** to change the date of the imagery visualized in your app.
4. Click the  button to refresh the widget (the chart will not refresh when the AOI is changed).

How to use the widget

1. Click on the map in your app. The widget will return a temporal profile of your chosen index at the point you clicked.



2. Click on a point on the profile to visualize the imagery for that date.



IS Change Detection

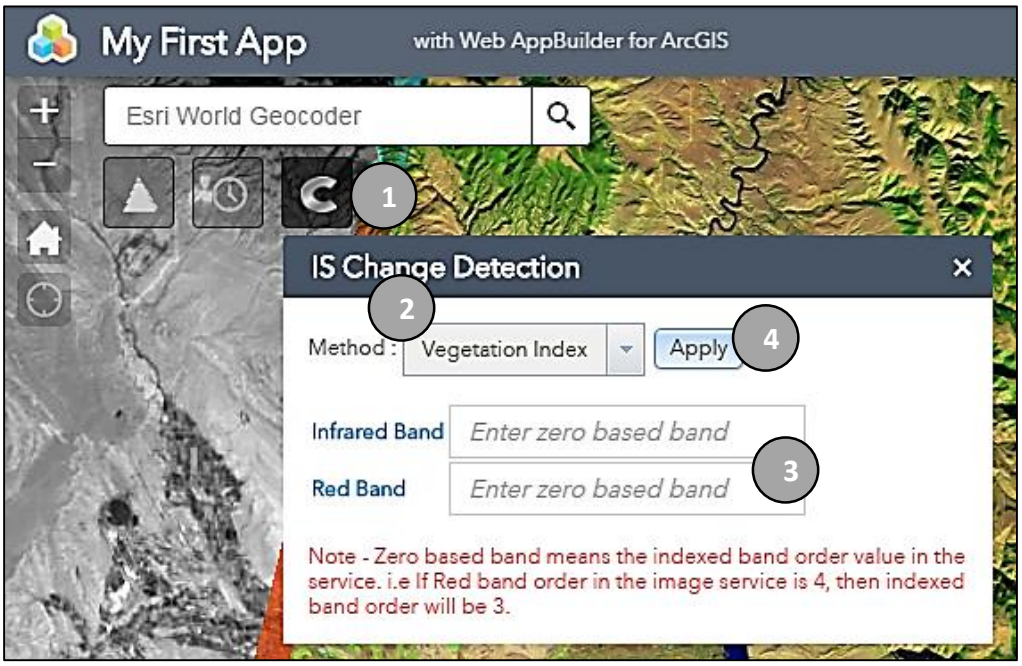
The IS Change Detection widget allows users to calculate the difference between two rasters on the primary and secondary layers. The result is added as a new "Result Layer," which can be added to the dropdown list of image services available to your app, or can be saved to ArcGIS Online. Assuming the primary date is later than the secondary date, increases are shown in green and decreases are shown in magenta.

This widget requires two additional widgets loaded in your app:

- IS Layers
- IS Time Filter

User interface

This is an image of the IS Change Detection widget interface, with explanations of the numbered features below:



1.  is the **IS Change Detection icon**. Click the icon to toggle the widget dialog box on and off.

   Note: The IS Layers and IS Time Filter widgets should also be available.

2. Use the **Method** dropdown list to choose the change detection method. Option include:
   a. **Difference** (no specific bands required)
   b. **Vegetation Index** (NDVI) (requires infrared and red bands)
   c. **Soil-Adjusted Vegetation Index** (SAVI) (requires infrared and red bands)
   d. **Water Index** (requires green and short-wave infrared bands)
   e. **Burn Index** (requires infrared and short-wave infrared bands)

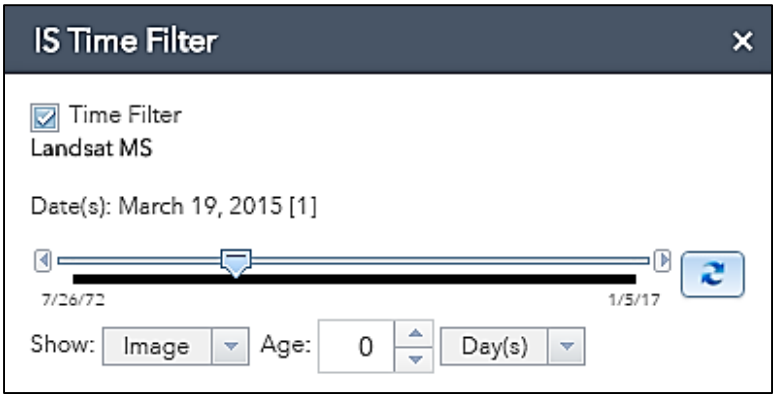
3. Enter **required bands** here, if necessary. Enter each band number, assume the first indexed band in your image service is zero, and number accordingly.
4. Click **Apply** to initiate change detection.

How to use the widget

The Change Detection widget is used in conjunction with the IS Layers and IS Time Filter widgets.

Set the earlier date for change detection:

1. Activate the **Layers** widget to select the layer you wish to use for change detection. Select the **primary layer** using the dropdown menu.
2. Activate the **Time Filter** widget. Click on the **check box** to display the slider.



3. Use the Time Filter slider to **select an earlier scene** for change detection.

4. Return to the **Layers** widget. **Click** on the  button to copy the primary layer to the secondary layer. The scene you've selected becomes the secondary layer.

Set the later date for change detection:

5. Return to the **Time Filter** widget **to select a later scene** for change detection. The date on the time slider will be automatically selected as the primary date—no need to click on anything.

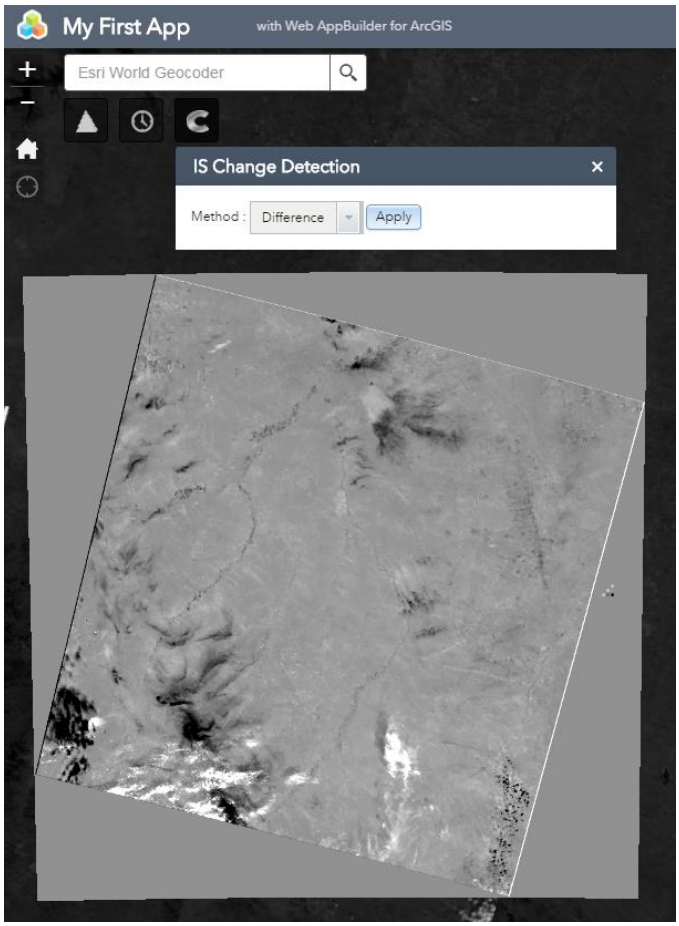
   Note: The two images selected must overlap.

Detect change:

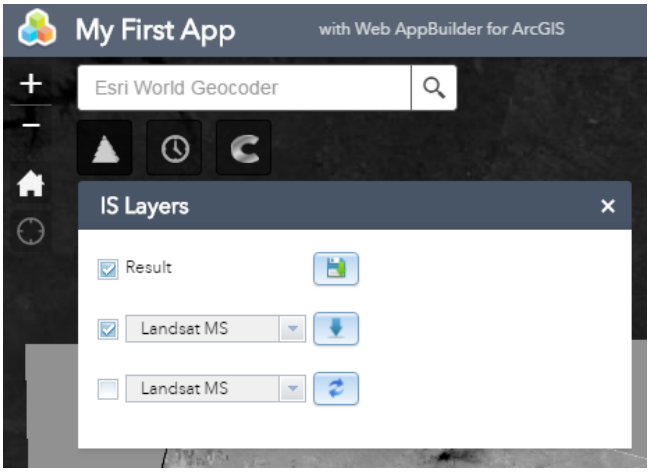
6. Open the **Change Detection** widget. Choose the desired change detection method using the dropdown menu.

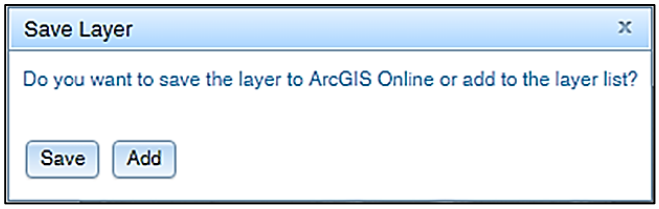
7. Specify any **required bands** (if they aren't automatically selected). Enter each band number, assuming the first indexed band in your image service is zero.

8. Click **Apply**. The result is then visualized in the app as a new **Result Layer**, shown below.



9. Open the **Layers** widget. **Click** on  to **save the layer** as an ArcGIS Online Item or add to the layer list in your app.





IS Classification

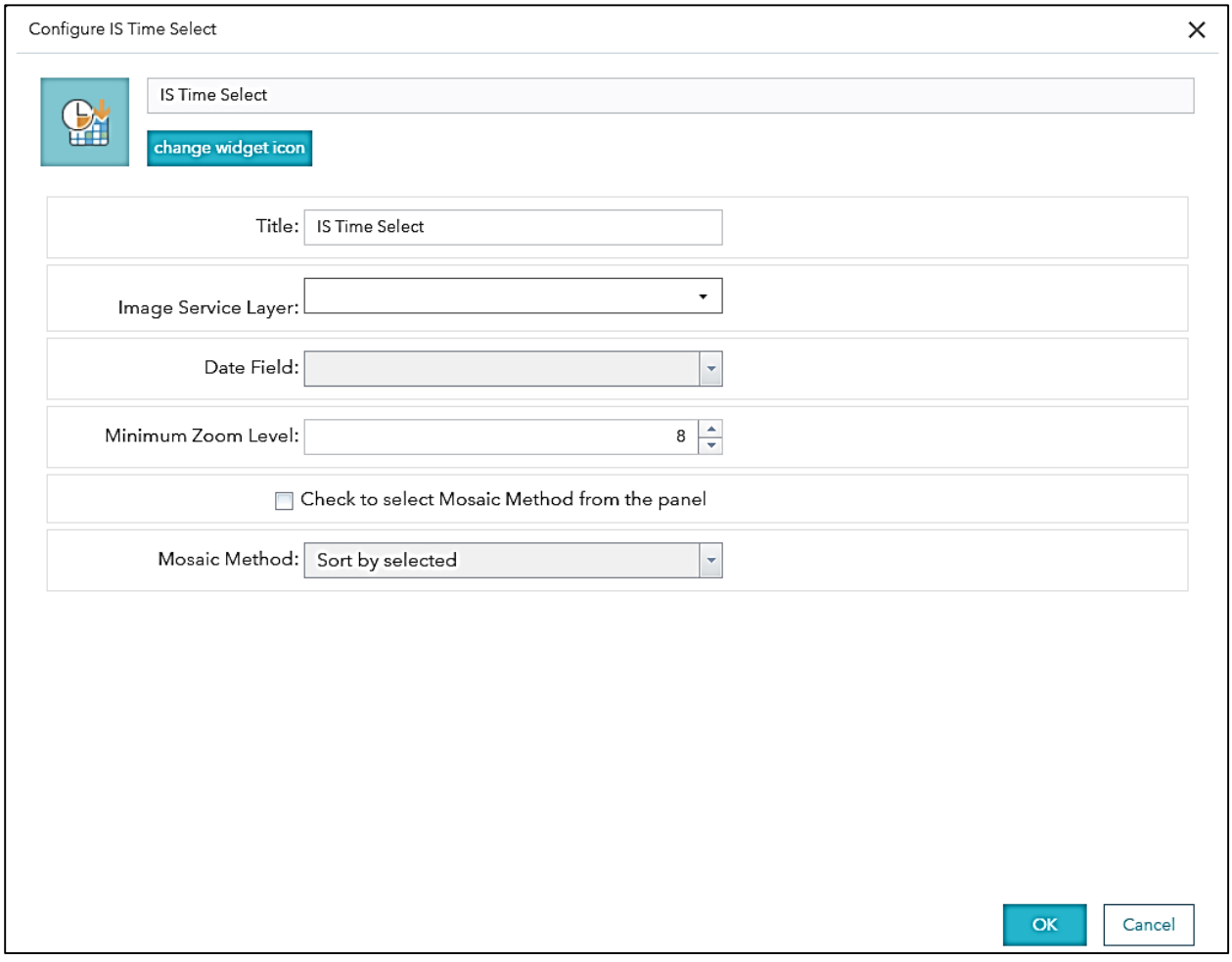
The IS Classification widget allows the user to draw features, associate categories, and perform classification. The result is added as a new "Result Layer," which can be added to the dropdown list of image services available to your app, or can be saved to ArcGIS Online.

Note: This widget has known issues that will be fixed in the ArcGIS 10.5 release. It will not function in ArcGIS 10.4, and the output using ArcGIS 10.3 will be incorrect.

IS Time Select

The IS Time Select widget allows the user to (1) display all primary layer images with the selected date on top, or (2) only display primary layer images for the selected date.

Configuration



The app creator can specify several things during the configuration step, including:

Image Service Layer: Determines which layer to use as input for the Time Select widget.

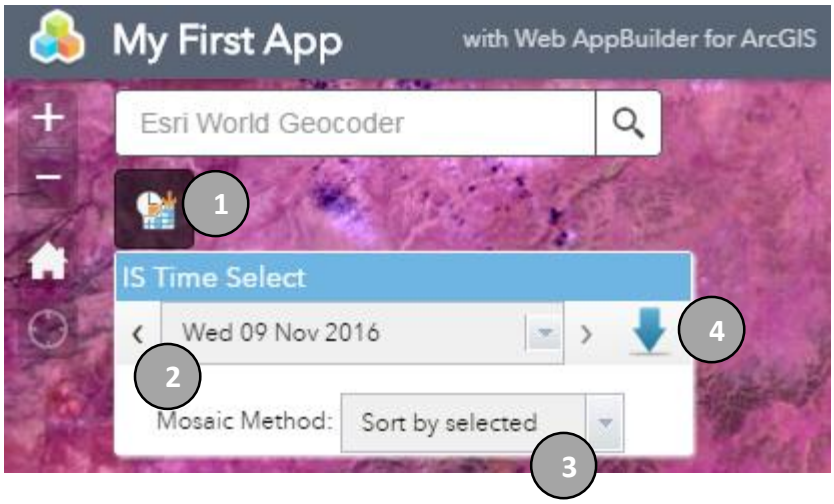
Date Field: Choose the metadata date field would you like the widget to use (**AcquisitionDate** is the default).

Minimum Zoom Level: The minimum zoom level at which the widget lets the user select a date (an integer value like 10, for example).

Mosaic Method: Choose the mosaic method for the returned images (options include **Sort by selected**, which uses the date field to sort, and **Lock to best**, which locks to the best image for that date using the image service's metadata or default sort field). The app creator can also use the **Check to select Mosaic Method from the panel checkbox** to allow the app user to select the mosaic method.

User interface

This is an image of the IS Time Select widget interface, with explanations of the numbered features below:



1.  is the **IS Time Select icon**. Click the icon to toggle the widget dialog box on and off.
2. Use the **Date** dropdown list to choose the date which you'd like to display.
3. If the app creator checked the **Check to select Mosaic Method from the panel** checkbox during configuration, the user will see the **Mosaic Method** dropdown menu, which can be used to choose either **Sort by selected** or **Lock to best**.
4. **Click** the  icon to set the current layer as the secondary layer (similar to IS Layers).

IS Split Tool

After using a widget that creates a results layer (IS Classification, for example), the IS Split Tool widget allows the user to compare primary, secondary, and results layers by swiping up, down, left, or right.

Note: This tool requires a results layer, so will only work immediately after performing change detection.

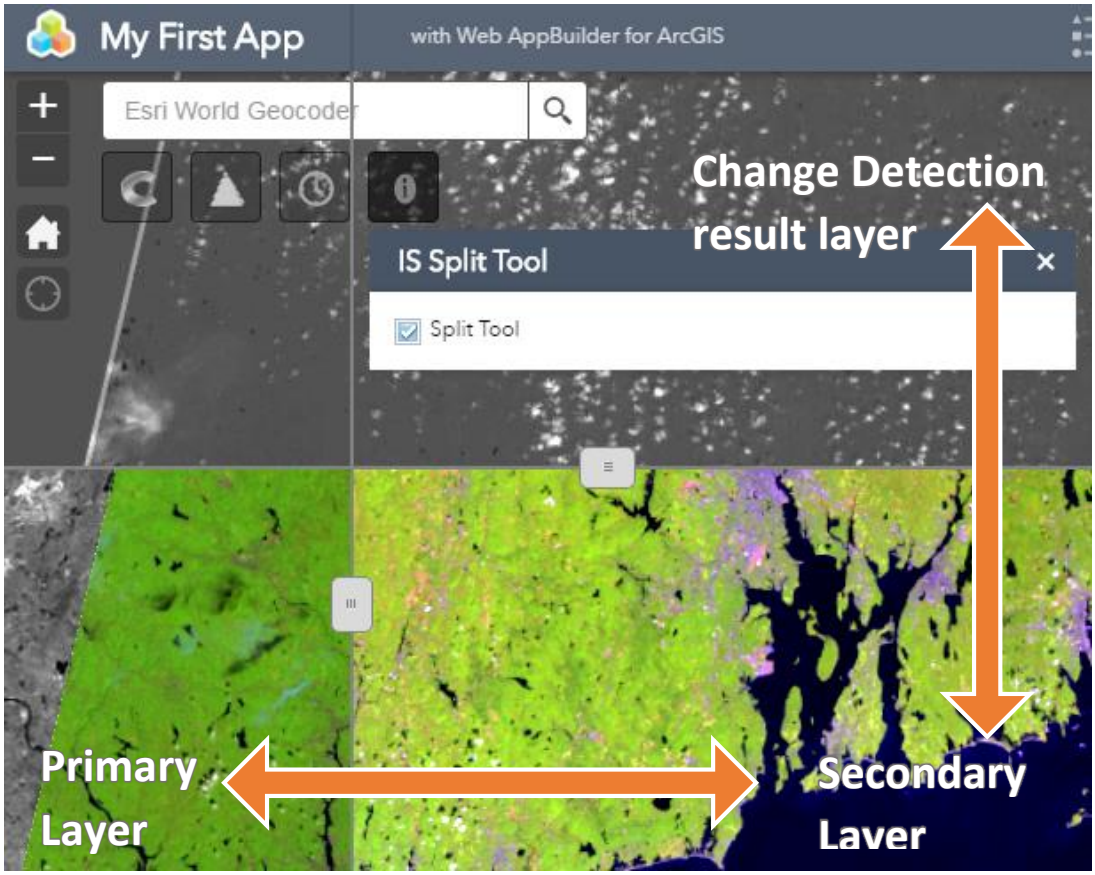
User interface

This is an image of the IS Split Tool widget interface, with explanations of the numbered features below:

1.  is the **IS Time Select icon**. Click the icon to toggle the widget dialog box on and off.

   Note: The widget icons required for change detection (IS Change Detection, IS Layers, and IS Time Filter) are also visible.

2. Check the **Split Tool checkbox** to activate the widget. Move the gray boxes on the swipes to reveal the primary, secondary, and results layers. The Split Tool will look like the following screen shot:

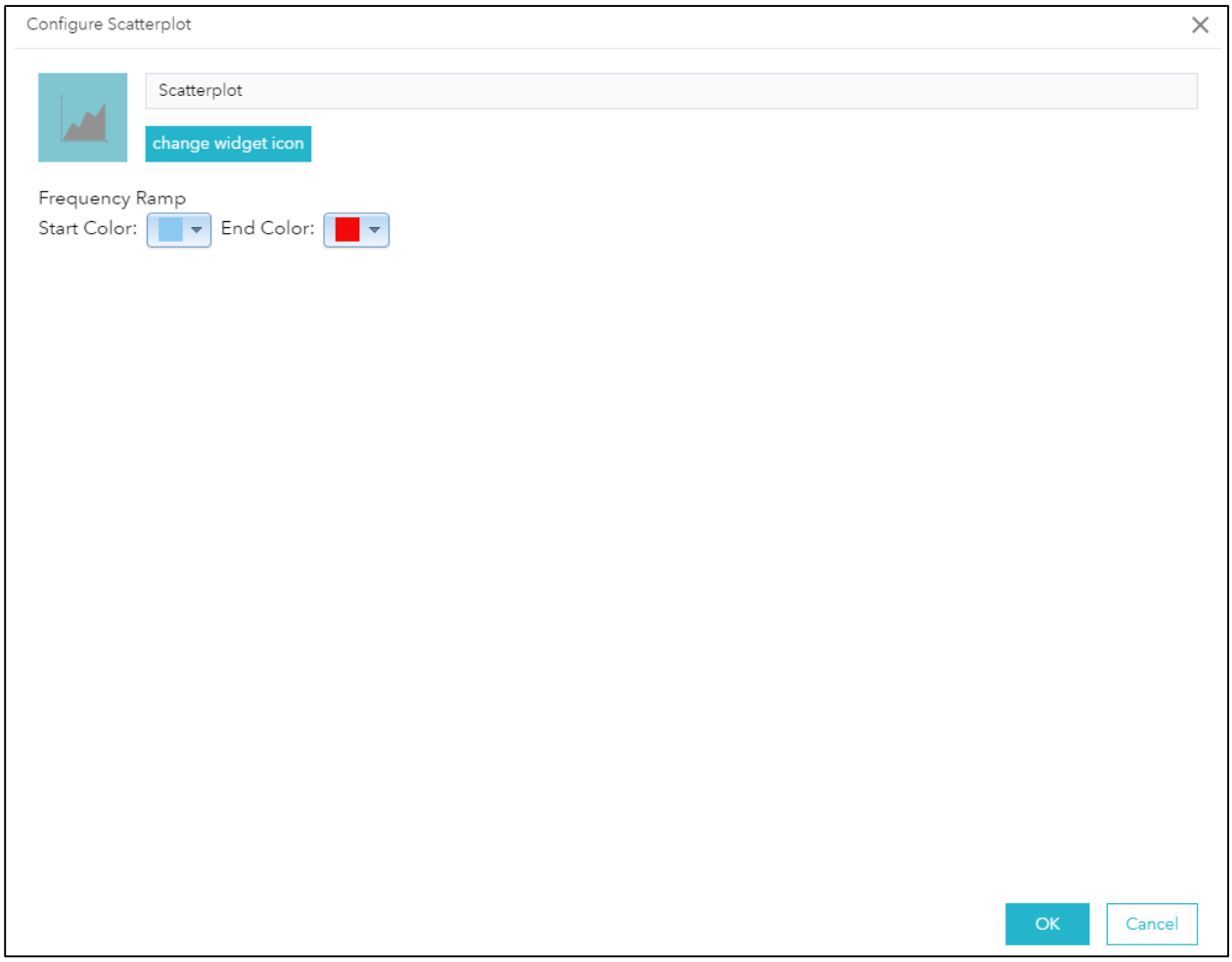


IS Scatterplot

The IS Scatterplot widget allows the user to select two bands from the image service layer and plot their values on a graph. The user can (1) highlight a region on the map by drawing and selecting the points on the plot, (2) click on the map to highlight that point on the scatterplot and get the pixel values, and (3) define an optional areas of interest for which the plot should be drawn.

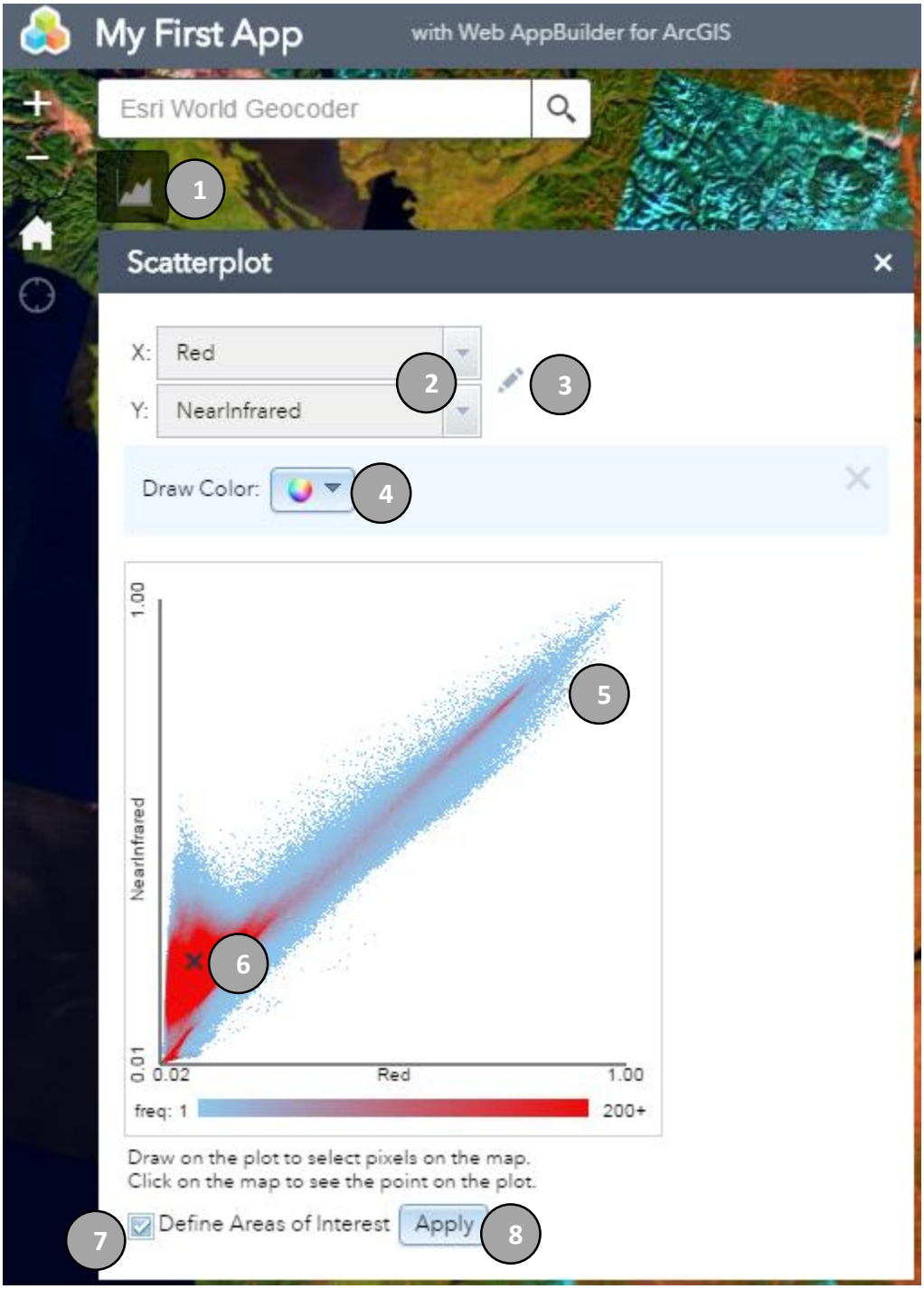
Configuration

During configuration, the user can specify the start and end colors for the color ramp used to illustrate how often different values occur in the scatterplot.



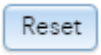
User Interface

This is an image of the Scatterplot widget interface, with explanations of the numbered features below.



1.  is the **Scatterplot** icon. Click the icon to toggle the widget dialog box on and off.
2. Use the **drop down lists** to select the bands to be plotted on the X and Y axes.

3. Click the  icon to view the **draw color**.
4. Use the  button to change the **draw color** from the default cyan (will appear after you click the  icon).
5. The **scatterplot** illustrates the band value for each pixel in the AOI. The color at each point indicates the number of pixels in the AOI with that given value, based on the color ramp chosen during configuration.
6. Clicking on the map places a **marker** on the scatterplot that indicates the band values of the clicked point. Hover over the marker to view the band values.
7. Check the **Define Areas of Interest checkbox** to draw on the map and select a custom area of interest.
8. Click on the 

button to **redraw** the plot for the defined AOI. Click the 

button that appears to **remove** the area of interest.