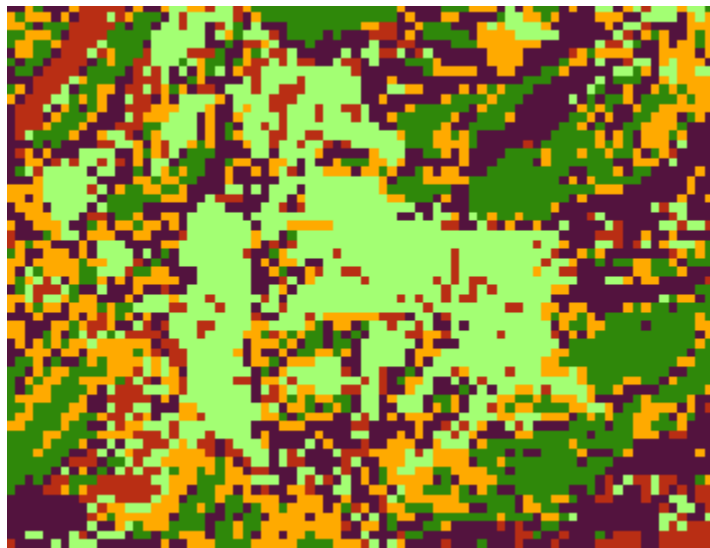


EXERCISE

Classification Wizard in ArcGIS Pro



Introduction

In this exercise you will learn how to conduct a supervised pixel-based classification to create a thematic raster. Pixel-based classifications rely solely on spectral characteristics of the input image. Supervised classifications require training samples to train the imagery based on landcover classes. You will learn how to create your own training schema and use the Image Classification Wizard in Pro to classify your raster dataset.

Objectives

- Build your own classification schema using the Image Classification Wizard in ArcPro
- Learn the basics of supervised classification

Required Data

- **AOI.shp** – shapefile of the area of interest for this exercise
- **4BComposite_SanRafaelRange_clip.tif** – 4 band Landsat 8 imagery to run our classification on

Prerequisites

- Install Esri ArcGIS Pro on computer
- Image Analyst or Spatial Analyst Extensions



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Part 1: Set up ArcMap

First you will open ArcGIS Pro and load the data for this exercise. You will check to make sure the band combinations are correct. If you already have a project going you can also insert another map in your existing project (Insert tab, Project group, New Map).

A. Launch Pro and Load the AOI

1. Launch ArcPro from the start menu by clicking **Start, Programs, ArcGIS Pro**.
2. Click the **Add Data** button and navigate to where you placed the course material.
3. In the SupervisedClassification_Exercises folder select **AOI.shp** and
4. **4BComposite_SanRafaelRange_clip.tif** and click **Add**.
 - i. Adjust the symbology of the AOI.shp to have no fill color but keep the border.

B. Create Band Combinations

ArcGIS Pro has built in band combinations that read the data as if ALL bands were present. In this case we didn't need all the bands for our composite, so we need to adjust the band combinations. A traditional natural color band combination for Landsat is 4,3,2 (Red, Green, Blue) but in our composite band 4 is NIR (not red) and band 2 is Green (not blue). It's important to be aware of how Esri creates these default band combinations. It's easy enough to adjust which is what we will do now.

In our case; Band 1 is blue, band 2 is green, band 3 is red and band 4 is near infrared. For a natural color band combo, we need it to be (3,2,1) and for color infrared it is (4,3,2)

1. **Highlight** the 4BandComposite_SanRafaelRange_clip.tif and select the Appearance tab, Band Combination, Custom
2. Fill in the Custom Band Combination pop up with Red = 3 Green = 2 Blue = 1 and name it

C. NaturalColor_Composite

1. Add another custom band combination for the color infrared and name it something intuitive like **ColorInfrared_Composite**.



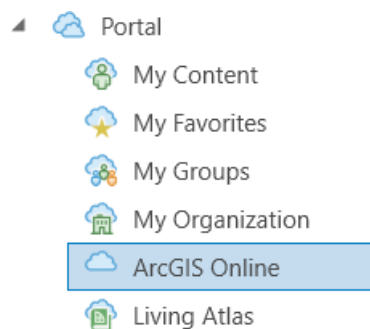
D. Change Basemap

We will select training samples using an imagery basemap because it is easy for all training students to access and the imagery was taken in the same year as California's most current NAIP imagery. When using basemaps, you can get more information on what imagery is being shown by deselecting all other layers in your Contents pane and clicking on the imagery area you are interested in. We are using 5mMaxar imagery from 2018.

1. Click **Map** tab, in the **Layer** group, select **World**

E. Add Reference Data

1. In the Map tab, Layer group, **Add Data** and select Data
2. Click on the **Portal cloud** and expand it then select **ArcGIS Online**



3. In the top right search bar look up **USA NLCD 2016** (National Land Cover Dataset)
4. Find the **USA NLCD Land Cover** Imagery Layer that is hosted by esri, select it, click **ok** to add. It may take a few seconds to load.
5. There are many classes so if you want to know what a certain color corresponds to deselect anything above your NLCD layer and click in the map window. An information pop-up will appear and tell you the class name associated with that area.

Part 2: Classification Tools

A. Get to know your data

1. Zoom to the AOI and look at the world imagery basemap while toggling on and off the NLCD layer. This gives you a good overview.
2. Zoom in and around your AOI and get to know what the landscape looks like at 5m. Our training schema is simple: Mixed/Evergreen Tree, Deciduous Tree, Shrubland, Herbland and other. While looking closer at the imagery find areas that meet the classification schema.

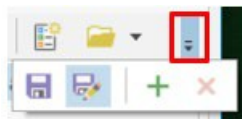
Photo Interpretation Tips: While initially exploring your imagery find examples of both evergreen and deciduous. Look at the shadows and colors of the vegetation. Remember how elevation and access to water affect where these trees grow. Then find some shrubland, grass/herbaceous land and areas that are void of vegetation. Notice the difference in textures and exposure of ground spacing between the shrubland and more herbaceous areas as well as the color of vegetation. Use the information pop ups and the actual layer to see what the NLCD classifies the area as but remember the NLCD is only a guiding dataset used to inform not determine your interpretation. The landscape could have changed between when our imagery was taken, and when this dataset was created. Use your best judgement and be consistent.

B. Create Training Schema

1. Highlight the 4Band_Composite in the Contents Pane. Select the Imagery tab, Image Classification group expand the Classification Tools drop down and click on **Training SamplesManager**
2. Select the **Create New Schema** button



3. Right Click on the New Schema, edit the properties, and change the name to
4. **SanRafel_TrainingSchema**. Click Save.
5. Right click on the newly named Schema and select **Add New Class**.
 - i. Add a new class with the Name: Mixed/ Evergreen with the Value of 1
 - ii. Repeat this process for the rest of the classes increasing the value by one every time. You can choose a color for each class.
 - (a) Deciduous = 2
 - (b) Herbaceous = 3
 - (c) Other = 4
 - (d) Shrub = 5
6. **Save** your schema in your temporary project folder by clicking the dropdown arrow in the Training Samples Manager then Save As.



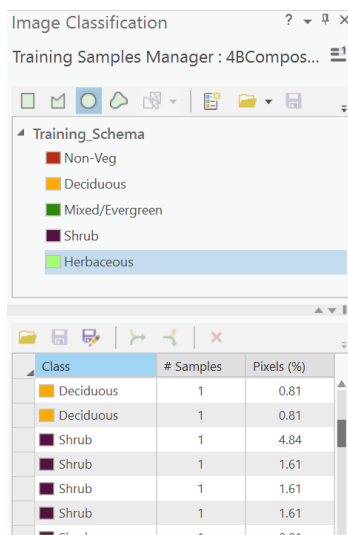
7. Start **generating training samples** by highlighting one of the classes in the Image Classification window Then click the circle polygon. You can toggle on and off the composite and basemap imagery to find areas the correspond to this class. When you find an area hold down and drag your cursor to create a circle around your training sample. You need to make fairly large training sample circles. See the example image below for a good idea of what the minimum circle would be.
 - i. Make around **10 training circles** for each class.



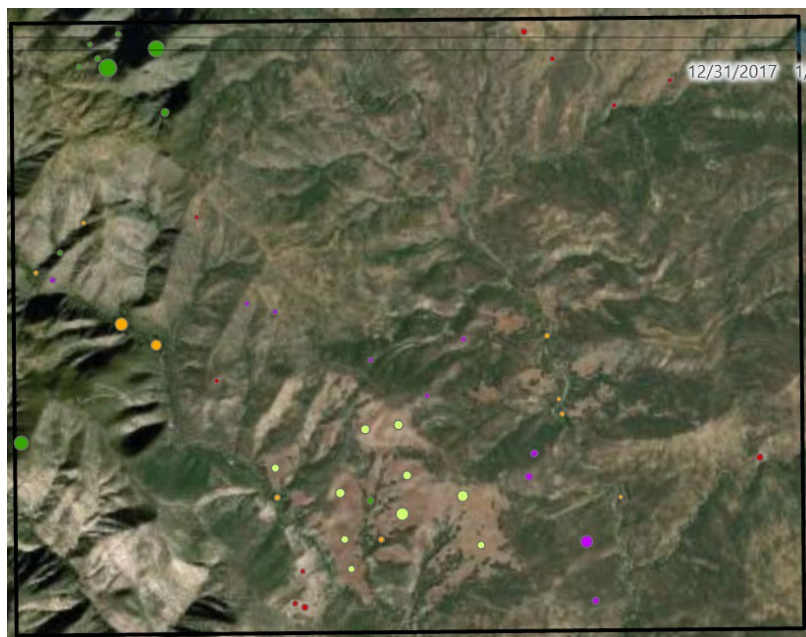


8. If you are unhappy with one of your circles simply highlight it in the bottom window of the Image Classification pane and click the red X.

9. Save both the trainings schema and the training features. The training features (bottom box) should be saved to the same folder as your schema. Save it as **SupervisedTraining_SanRaf.shp**.



10. Add the SupervisedTraining_SanRaf.shp to your map



Part 3: Classification Wizard

A. Classify Imagery

1. Highlight the 4Band_Composite image. In the Imagery tab, Image Classification group, open the **Classification Wizard**

- i. Select **Supervised** classification method and a **Pixel based** classification type
- ii. For classification schema click the drop down and choose **browse to existing schema**.
2. Navigate to and load the **SanRafel_TrainingSchema**
3. Add the training samples SupervisedTraining_SanRaf.shp
4. Click **Next**
5. Review the Training Samples Manager window. You can edit and refine your training samples here if you choose. When you are done. Click **Next**
6. In the Train window leave it **default**, Support Vector Machine.
7. Click **Run**
8. Your result will be a Preview of the classified raster. Explore the results compared to the basemap. This is helpful because you can now choose to move forward and classify the actual image OR go back and make adjustments to your classification schema.

Note: These results were likely muddy and not usable as a final product. When you conduct an image classification for your own projects you will need to use many more samples and likely work through several iterations of this process to get usable results. Common steps to improve your classification are refining samples, adding samples of areas that are misclassified and testing different classification methods.

9. Click **Run** then click **Next**
10. The **Reclassify** pane allows us to manually correct any misclassified areas in our output raster. Image classification is never perfect so manual editing can be used as a final step to clean up some of the lingering errors. In the reclassify window you can select areas in your in your classified raster and either reclassify all pixels in that region to a new class or choose one class to reclassify to a new class.

11. When you have finished manual edits click **Run**. You will get a reclassified raster with your edits.
12. We will not do an Accuracy Assessment but if we had enough samples to split them up between training and validation or if we had another dataset of ground truth data, we could use the Wizard to do an accuracy assessment.

Congratulations! You have successfully completed this exercise. You now know the basics of the Image Classification Wizard, how to make a training schema and select training samples to conduct a supervised pixel-based classification!