The (False) Color World

There's more to the world than meets the eye…

In this activity, your group will explore:

- **The Value of False Color Images**
- **Different Types of Color Images**
- **The Use of Contextual Clues for Feature Identification**

Beth Stein
Geospatial Instructor
Virginia Geospatial
Extension Program
bstein2@vt.edu

John McGee
Coordinator
The Virginia Geospatial
Extension Program &
VirginiaView
jmcg@vt.edu

Jim Campbell
Professor, VT
jayhawk@vt.edu

The (False) Color World

Exercise: There's more to the world than meets the eye…

Beth Stein	bstein2@vt.edu	**John McGee**	jmcg@vt.edu

Summary of skills covered:	• **Introduction to Remote Sensing** • **The Value of False Color Images** • **Different Types of Color Images** • **The Use of Contextual Clues for Feature Identification and basic image interpretation**
Data needed:	**True Color and False Color Images** **(available for download online at** **http://www.geoted.org/geospatial/2013institute)**
Equipment and Software needed:	Hardware: **Computer lab.** Software: **ArcMap (and other geographical viewers such as ArcGIS Explorer can be substituted)**
Related book exercise (if applicable):	**No text necessary.** **Optional readings might include:** • **NASA's "How are satellite images different from photographs?" and test out the Landsat 7 Compositor! http://landsat.gsfc.nasa.gov/education/compositor/**
Data Source:	**Not applicable.**

Objective

The goal of this lab is to learn about true and false color images. Using ArcMap, you will hone your skills at image interpretation and gain a better appreciation for the use of "invisible" radiation in remote sensing.

Introduction

True color images are those that depict a scene using wavelengths from the visible region of the spectrum. They show features in their "natural" colors, so they appear realistic to us. On the other hand, false color images assign colors to one or more "invisible" wavelengths. There are many forms of radiation on the electromagnetic spectrum that we cannot see, so false color images allow us to "see" the reflected energy. The results are images with unrealistic colors that can be difficult for us to interpret.

The first false color imagery dates back to the early 20th century, but gained popularity following the use of color infrared photography on airplanes in World War II. The military generated images to show near infrared wavelengths in red, red wavelengths in green, and green wavelengths in blue. The purpose was to improve reconnaissance and surveillance, since the near infrared wavelengths worked well for penetrating the atmosphere to detect weapons and troops. Following the War, new civilian applications for color infrared photographs were discovered. Many people had gained specialized skills and experience at photointerpretation, and were eager to continue in the field. Scientists who studied crops and forests took note of the benefits of including infrared wavelengths in their aerial images. Infrared wavelengths are useful for determining vegetation health, plant species, biomass, and soil moisture. Brighter red colors denote faster growing vegetation that is producing a lot of chlorophyll to be used in photosynthesis. Unhealthy crops, or those at the end of the growing season, will appear in dull red, green, or tan.

Today, we use satellites and aerial sensors to produce true and false color images that are widely used by the military, scientific community, regional planners, and various other professions. The Landsat satellites have been recording the visible and near infrared reflectance from Earth since the launch of the first satellite in 1976. This data can be used to produce both true and false color images of anywhere on Earth for the past 40 years. Depending on the specific application, often one type of image or the other will be used; at other times, both images will be compared to gain the most possible information about the landscape.

Materials

- ArcMap software (Version 10.0 or higher)
- True Color Image
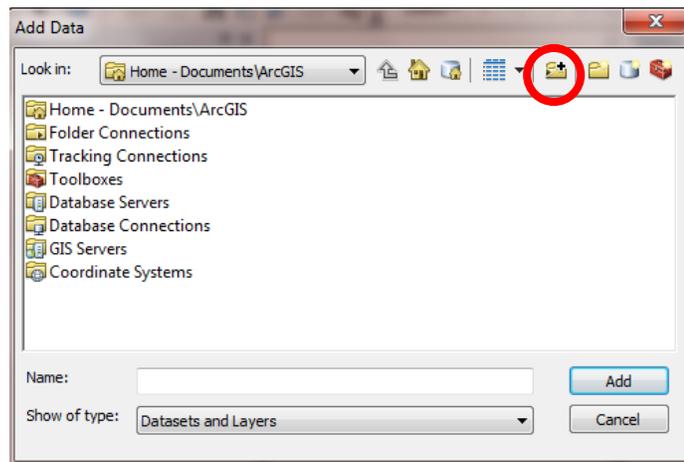- False Color Image

Procedure

1. Open ArcMap
2. Click "Cancel" when asked if you would like to open an existing map

Now we will add a true color image to the display. To open the image from the appropriate folder, we first need to add a folder connection. This can be done in several ways, but we will do it from the Add Data dialogue. Click the "Add Data" icon on the menu.

3. Click "Add Data" on the main toolbar.


4. Click on the "Connect to Folder" button.

5. Choose the "False Color Lab" folder on the Desktop by clicking once on the folder's name and then pressing "OK."

6. Next, single-click the image "Landsat True Color" and press "Add." (Double-clicking will bring up the option to add individual image layers, but since we want to add the composite image, we only click once.)

The true color image should now appear on the screen. Let's explore the image a bit.

7. Use the magnifier and pan tools to zoom in to various parts of the image.
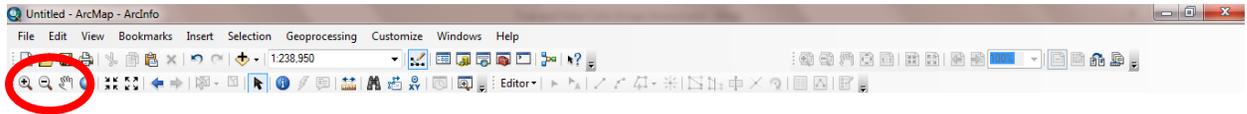

   See if you can identify the following features:
   - Agriculture fields
   - Forest
   - River
   - Roads
   - Town

Now we will open the False Color image for a comparison. Although many different false color images are possible depending on which wavelengths are selected for display, this color scheme is most similar to traditional color infrared aerial photography.

8. Click the "Add Data" button ⬩ again on the toolbar.

9. Since we previously connected to the "False Color Lab" folder on the Desktop, we should already have a folder connection established. Double-click on the "Folder Connections" button.
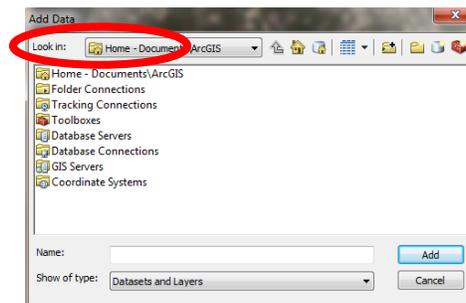
10. A list of folder connections will appear. Double-click on the "False Color Lab" folder to open it, then single-click the "Landsat False Color 1" image. Press "Add."

The false color image should now be in the display window.   ArcMap automatically places a new image "above" the previous image, so that it can be seen. To switch back and forth

between the images, check and uncheck the boxes beside the image names in the Table of Contents.

11. Notice the differences in the colors between the two images. Can you find the features you previously observed?

12. Fill out the following chart based on what color things appear in each image:

Land Cover Class	True Color	False Color
Agriculture		
Urban		
Water		
Forest		
Barren		

13. Let's add another false color image. Follow the steps above to add the "Landsat False Color 2" image, then explore the new image.

14. In your opinion, which type of image made each land cover class best "stand out"?

Land Cover Class	Best Image for Land Cover Class Discrimination?
Agriculture	
Urban	
Water	
Forest	
Barren	

15. Overall, which image did you prefer working with? Why?

_____
_____
_____

Additional Resources

To learn more, check out NASA's website, "How are satellite images different from photographs?" and test out the Landsat 7 Compositor! http://landsat.gsfc.nasa.gov/education/compositor/