



# Coffee Break Training - Community Risk Reduction

## Understanding Geospatial Information: Reading Imagery – Part 4: Defining Colors

No. CR-2015-4 June 3, 2015

Learning Objective: The student will be able to describe what the colors of a true-color satellite image represent.

The colors of an image depend on the specific type of light that the satellite instrument measures. **True-color** images use reflected light (i.e., the red, green and blue spectrum) so that the colors are similar to what an astronaut sees from space. **False-color** images use the **infrared** light spectrum (think of this as looking at the Earth with a thermal imaging camera). In a **true-color** image, the features seen on Earth from space appear as follows:

**Water** absorbs light, so it is dark blue or even black in appearance. If it contains sediment, it will reflect light and thereby color the water. Suspended sand or mud is dense, giving water a brownish look. Dispersed sediment changes the water's color to green or blue. Shallower waters with sandy bottoms can have a similar effect.

When sunlight is reflected off water surfaces, the resulting color is gray, silver or white, a phenomenon known as **sunglint**. Frozen water appears white or gray but sometimes slightly blue. Dirt or glacial debris can give snow and ice a tan color.

**Vegetation** appears in different shades of green, with any differences notable in true-color images. Grasslands tend toward pale green, forests are very dark green, and land used for agriculture is usually brighter in tone than natural vegetation. Seasonal climate changes in the high and middle latitudes affect plant and vegetation color. Spring vegetation tends to be paler than dense summer vegetation. Fall vegetation can be red, orange, yellow and tan; leafless and withered winter vegetation is brown.

Bare or very lightly vegetated ground is usually a shade of brown or tan, depending on the mineral content. When the ground is white or very pale tan, especially in dried lakebeds, it is because of salt-, silicon- or calcium-based minerals. Volcanic debris is brown, gray or black. Newly burned land is also dark brown or black, but the burn scar fades to brown before disappearing over time.

**Densely built areas** are typically silver or gray from the concentration of concrete and other building materials. Some cities have a more brown or red tone, depending on the materials used for rooftops.

The **clouds** in the Earth's atmosphere appear white and gray from space, much as they do when viewed from the ground. They also cast dark shadows on the ground that mirror the shape of the clouds. Some high, thin clouds are detectable only by the shadows they cast.

**Smoke** is often smoother than clouds, ranging in color from brown to gray. Smoke from oil fires is black. Haze is usually featureless and pale gray or a dingy white. Dense haze is opaque, but you can see through thinner haze. The color of smoke or haze usually reflects the amount of moisture and chemical pollutants, but it's not always possible to tell the difference between haze and fog in a visual interpretation of a satellite image. White haze may be natural fog, but it may also be pollution.

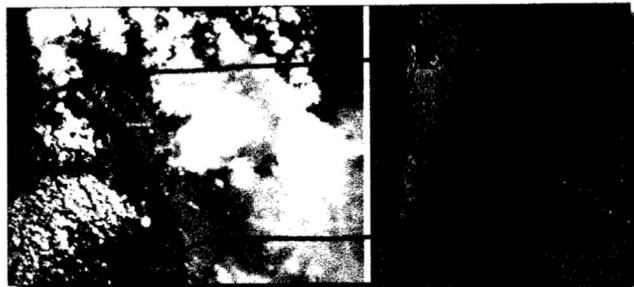
**Dust** ranges in color, depending on its source. It is most often slightly tan, but like soil, dust can be white, red, dark brown or even black due to different mineral content. **Volcanic plumes** also vary in appearance, depending on the type of eruption. Plumes of steam and gas are white. Ash plumes are brown. Resuspended volcanic ash is also brown.

When looking at a satellite image, you see everything between the satellite and the ground (clouds, dust, haze, land) in a single flat plane. This means that a white patch might be a cloud, but it could also be snow or a salt flat or **sunglint**. The combination of context, shape and texture will help you discern the differences. Looking at other images of the same area taken at another time in order to make a comparison helps to eliminate confusion.

### References

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NASA Earth Observatory Image License: <http://earthobservatory.nasa.gov/ImageUse/>.



The Adelaide Hills in Australia. Image on left depicts Jan. 3, 2015, bushfire. Image on right offers an unobstructed view of the same area. (Source/NASA Earth Observatory Images (<http://1.usa.gov/1EsyHEI>))

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