Coffee Break Training – Community Risk Reduction

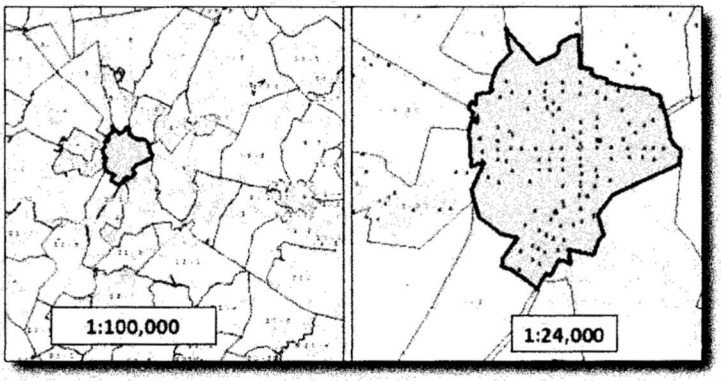
Understanding Geospatial Information: Reading Imagery — Part 2: Scale and Extent

No. CR-2015-2 May 6, 2015

Learning Objective: *The student will be able to explain the terms* **scale** *and* **extent**, *as well as their relationship to satellite imagery and map reading.*

Note: For the purposes of this training, think of an aerial photograph or satellite image as a map; those terms may be used here interchangeably.

Your first inclination on looking at a map is to identify familiar places. Imagery from military or commercial satellites has sufficient detail to show many points of interest. Such satellites may zoom in on small areas to collect fine details down to the scale of individual houses or cars, but in the process, the big picture or wide-angle extent is lost. A map thus has both a **scale** and an **extent**.



This graphic depicts two county fire box coverage maps of different scales, 1:100,000 on the left and 1:24,000 on the right. Note the difference in the area of the extent of Fire Box 1, which covers the downtown district of Gettysburg Borough, Pennsylvania. The fire hydrants, fire station and paramedic station are now visible at this larger scale.

When working with maps and aerial images, use **scale** to describe the sizes of things that appear on a map relative to the actual sizes of those things on the ground. A map's scale is the proportion between a distance on a map and a corresponding distance on the ground — **scale = distance on map** (Dm) divided by **distance on ground** (Dg), expressed as Dm/Dg.

This proportion is often expressed as a **representative fraction** in which Dm is customarily reduced to 1. The resulting proportion (or ratio) is typically expressed in the form 1:Dg rather than 1/Dg. The representative fraction 1:100,000, for example, means that a section of road that measures 1 unit in length on a map stands for a section of road on the ground that is 100,000 units long.

When we talk about large- and small-scale maps, we are talking about the relative level of detail of the features. The larger the map's scale, the more detail it depicts. A map scale of 1:24,000 has more detail and less extent than one of 1:100,000 scale. Before you can interpret an image, find out the scale.

Map scale is important for identification of geographic features. A large-scale image of a flood area will show individual homes and businesses surrounded by water. At a smaller scale, the wider extent will likely show which parts of the county or metropolitan area have flooded. At very large extents (i.e., very small scale), whole regions and countries may be noted.

If necessary, you can approximate linear measurements on satellite images by creating your own scale. This is possible with any satellite image that has recognizable, measurable geographic features.

Procedure: Locate a feature on the map that is easy to recognize (e.g., lake, road, peninsula). Measure the length of this object on the image with a ruler, and record the distance. Now find the same feature that you measured on your image on a map printed in an atlas. Use the scale on the map to determine the actual length of the object. Use a proportion to convert the estimated scale to a 1 centimeter (cm) scale. **Take the size of image object (cm)/size of actual object (kilometer (km))**, then convert to a ratio: **1 cm/km**.

The next lessons will cover the basic elements of reading satellite imagery: patterns, shapes and textures; colors and shadows; finding direction; and applying what you already know.

References

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