

Exploration of global soil resources using Google Earth

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Abstract

Geographic exploration of global soil resources can be facilitated using Google Earth (GE). Using our digital library with over 500 images of soil profiles from many countries, we developed an educational resource utilizing the widely accessible GE program. In this paper we detail the methods used to prepare the images and develop the information content for use in GE. Customized tours can be created that include images and map overlays.

Key Words

Soil education, soil images, Google Earth.

Introduction

Educational trends show an increasing reliance on Internet resources for classroom content. Development of educational materials on soils must utilize the latest technologies to ensure that we are reaching the widest audience possible. Google Earth (GE) provides an excellent venue for introducing soils to a wide audience. It has already become an indispensable reference tool for accessing online geographic information. A growing user community exists that readily shares new content and offers students a variety of topics to explore. For over 30 years we have created a collection of slides from all over the world of soil profiles, landscapes and people in the field. This collection is now digitized and many are georeferenced. A prototype format has been created for use with GE and it is hoped that the soil science community will improve and enhance this initial effort. The GE content will be available online at soils.usda.gov/use/worldsoils/gsr/.

Methods

Digitizing 35mm Slides

All of the images used in this project were originally 35 mm slides taken from 1968 to 1998. Digitizing the images was accomplished using a commercial slide scanning services company. The collection of over 5,000 slides was scanned at 2,000 dots per inch (dpi) and was stored on archival quality DVDs as JPG images.

Image Database

An Excel spreadsheet was used to catalogue the scanned images. Each image record includes: file name, slide notes, slide description, country, city, date taken, photographer, soil feature, soil classification and pedon ID.

Georeferencing Images

Many of the soil profile images were taken during international field tours held over the past 30 years. The field tour guide books either provided the latitude/longitude coordinates or had a tour map with profile locations indicated. For some slides the location was listed in the soil profile description found in the National Cooperative Soil Characterization Database managed by the USDA-NRCS, National Soil Survey Center (Soil Survey Staff 2009). Where no documentation could be found we relied on our knowledge of a region to provide a reasonable estimate of the location and designated those images as having an approximate location.

Creating Content for Google Earth

Keyhole Markup Language (KML) is the formatting language for displaying content within the GE environment. The KML syntax is similar to hypertext markup language (HTML) and so is familiar to web programmers. Icons are used to represent locations on the GE map. As shown in Figure 1, clicking on an icon opens up a content window that is often referred to as a description balloon. The description balloon contains the soil image and descriptive text as well as a hyperlink to the pedon description when available. For each image a KML file was created which can be grouped within a single zipped (KMZ) file that will be

placed online so that users can download all the images for use in GE. Adding map data is accomplished by using geographic information system (GIS) software to convert polygon maps to the KML format (Figure 2). ArcGIS has a 3D Analyst tool for converting a shapefile to KML. All of the polygon attribute information is retained in the KML version of the map and is accessed simply by clicking on the map.

Discussion

The tools for developing easily accessible geographic content online are readily available. The user community is growing and there are many other geographic datasets that are accessible with GE, including natural resources, climate and socioeconomic data. This provides students the ability to explore a wide range of information. We believe that it is incumbent on the soils community to take advantage of the GE platform to create content to help people better understand soils.

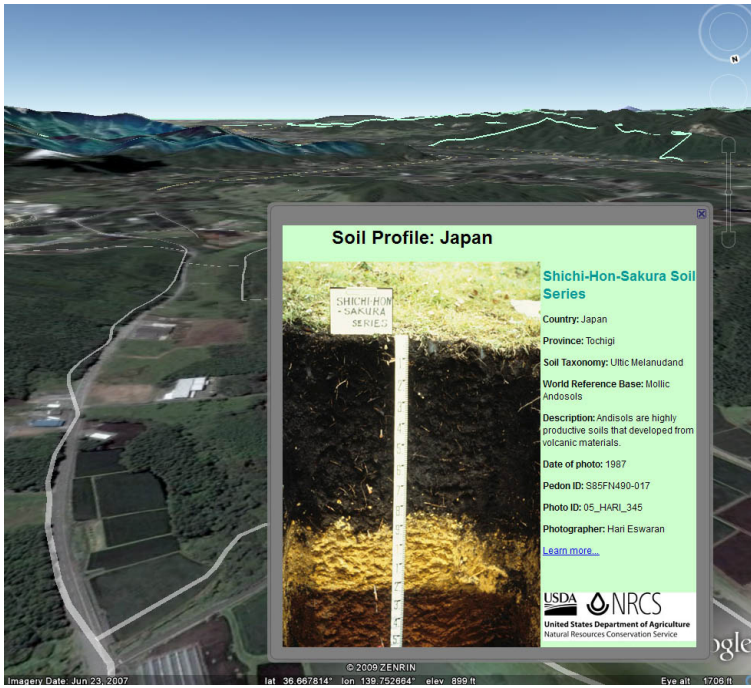


Figure 1. An example of a soil profile description balloon displayed within Google Earth.

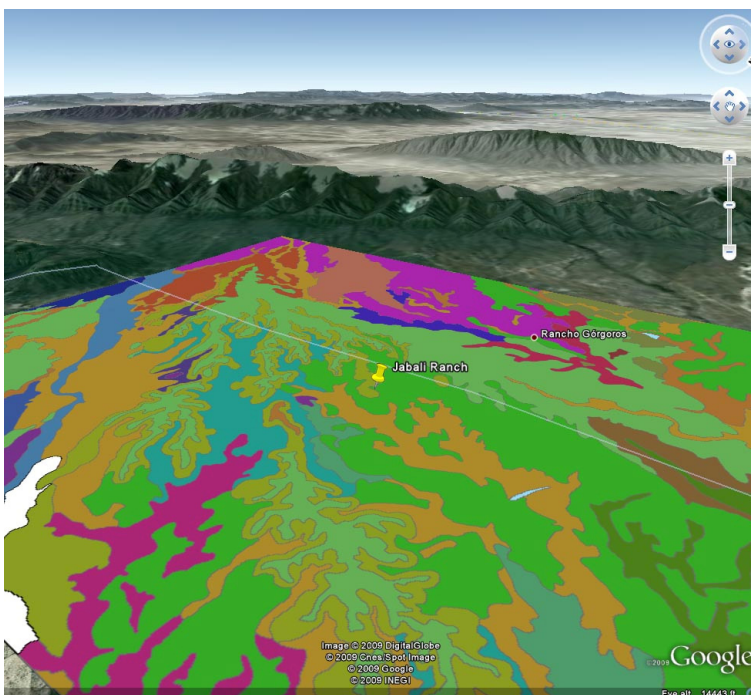


Figure 2. A polygon map can be overlain on the topographic data within Google Earth. The soil map is of the Jabali Ranch, Nuevo Leon, Mexico. Polygon attribute data is displayed by clicking on the map.

References

Google Earth version 5 (2009) <http://earth.google.com/>

Soil Survey Staff (2009) 'National Cooperative Soil Characterization Database'. (USDA, Natural Resources Conservation Service, National Soil Survey Center, Soil Survey Laboratory: Lincoln, NE).
<http://ssldata.nrcs.usda.gov/>