

Using Google Earth to organize, view and share photos and data related to earth locations

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Introduction

Google Earth is like a web browser for geographic information rather than web pages. Its built-in content of aerial imagery, 3d terrain and other geographic information combined with fast and easy navigation is enough to make it useful. However, it also has tools that allow anyone add their own content that can be saved as KMZ files and opened by others. We use it to manage, visualize, and share aerial and ground-based photos and data acquired while working on forest research projects.

Photos taken in the field are sometimes inconvenient for the author to access at a later time and are virtually impossible for another researcher or a member of the public to access. Similar problems can exist with other types of unpublished data collected for research or inventory. The purpose of this document is to increase awareness of how Google Earth can be used to create new types of publishable content which allow a limited or general audience to have easier access to data, photographs and other information in a realistic geographic context. Most of the examples below are from projects that used aerial photography to document various aspects of forest science and management. However, these techniques can be applied to photographs, data and field notes that are collected by almost anyone who does technical or professional work outdoors as demonstrated in the sections on oblique aerial photography and ground-based photos and data.

Types of content that can be displayed in Google Earth

Points, lines, polygons, photographs, images of maps, playable “tours” and popup windows that can be formatted in HTML.

Objects can be stored in folders and folders can be nested. A saved KMZ file can contain an individual object or a folder with multiple objects.

Small-format Vertical Aerial Photography

We have flown more than 30 photo missions (Figure 1) using a small format digital camera to test the feasibility of sampling the following forest features that are associated with rapid change or that cannot be seen on normally available imagery:

- the dates of snow disappearance,
- residual live conifers in beetle-killed pine stands,
- logging-related soil disturbance, and
- post-wildfire burn severity.

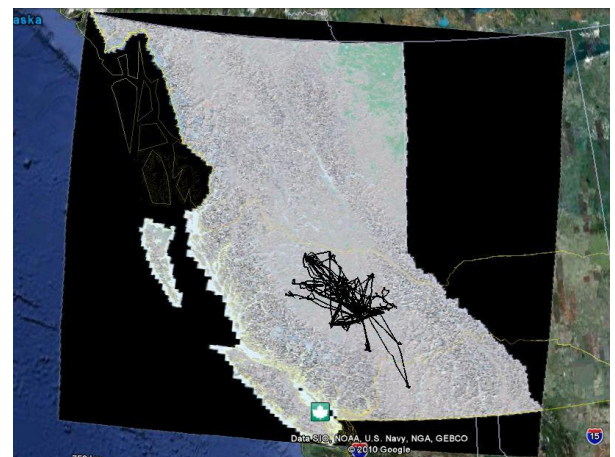


Figure 1

[Flight Lines \(1.5 mb KMZ file\)](#)

We wanted to manage our photos in such a way that they could be both archived and readily available in a way that was self-explanatory and efficient for both the user and computer networks. After each mission, the originals and sub-sampled versions of the photos were copied to separate folders on a publically accessible FTP site and a flight line map was created as a Google Earth KMZ file. Folders and flight line maps were organized and named by date and contain the flight track and photo points (approximate photo nadirs). Using some relatively modest external software, we developed a partially automated procedure for creating network links between photo points in Google Earth and jpeg files on the FTP site such that clicking on a point displays a popup window (a “balloon” in Google Earth) with a small version of the photo as well as other data associated with that point. For example, the following link is a flight line map for March 30th, 2007 and Figure 2 shows how it appears when loaded in Google Earth.

[Mar 30th 2007 flight line map](#) (134 kb KMZ file).

Clicking point 4162 on this flight line map displays a window containing a small version of the photo and vegetation data at the photo point (Figure 3). Although this procedure does not provide georeferenced photos, it is simple, fast and adequate for many purposes. Its simplicity is indicated by the fact that several thousand aerial photos can be available in this format with only a few person-hours of post-flight work. The author or other individual users can manually georeference the photos in Google Earth as needed.

The following file lists the dates of photo missions between 2006 and 2009 and contains a link to each flight line map.

[Index of flight line maps](#) (258 kb PDF file).

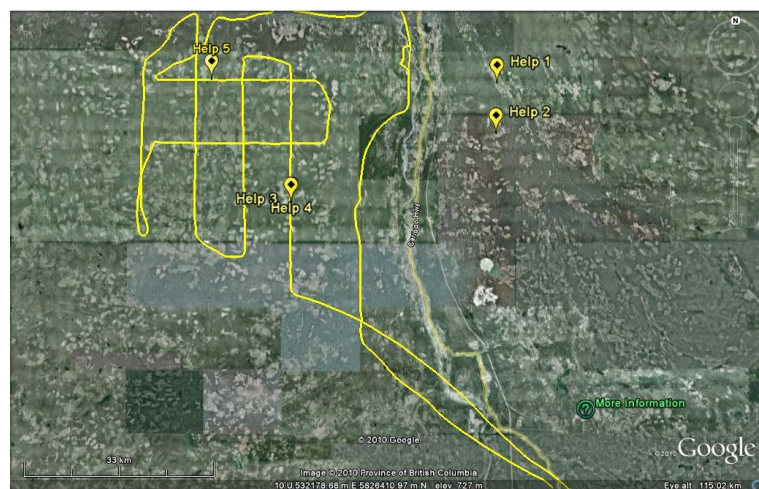


Figure 2

March 30, 2007 flight line map after being loaded in Google Earth

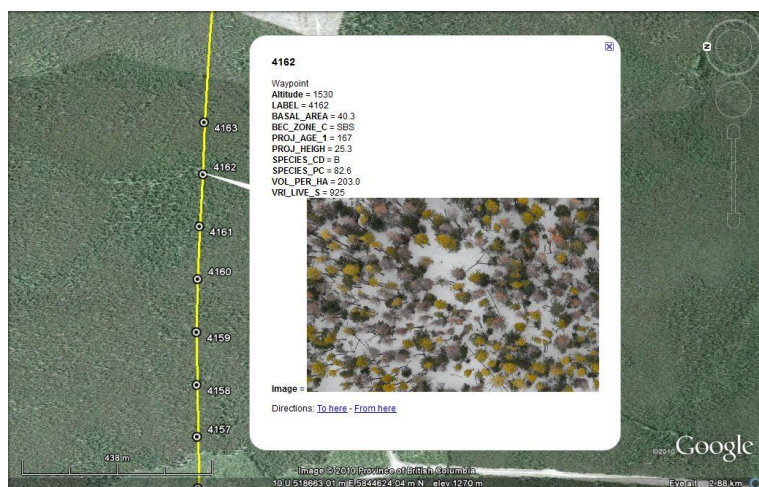


Figure 3

Popup window with data and image associated with point 4162 on the March 30, 2007 flight line map

Oblique aerial photography

Oblique photos were taken with a hand-held camera on some flights. In contrast to our vertical aerial photos they were taken with a hand-held camera like anyone could take during an aerial field inspection. The following file is a sample flight line map for a set of oblique photos taken from a helicopter

[Track and points Sep 16 2009](#) (42 kb KMZ file).

Other oblique photo flight line maps are available in the **Index of flight line maps** where photo missions and flight line maps are identified as “vertical” or “oblique”.

Georeferenced aerial photos

Google Earth has tools that allow a person to georeference vertical aerial photos, maps or oblique aerial photos using orthographic or perspective projections. Some of the KMZ file flight line maps listed in the index contain georeferenced photos (e.g. March 30th, 2007).

Two different tools are available for georeferencing maps or aerial photos. The first is the “Image Overlay” which assumes that an image has an orthographic projection and can drape it on the 3d terrain. This is appropriate for maps or vertical aerial photos that have a limited amount of distortion. The other is the “Photo Overlay” which allows photographs to be georeferenced while accommodating perspective distortion (Figures 4 and 5). This is done by adjusting the viewing parameters in the 3d window (camera x,y,z position, tilt, roll, yaw, and angle of view) until they match those of the photograph. The following KMZ file has examples in a folder named “Billboards”.

[Sep 16, 2009 flight line map](#)

Georeferenced oblique photos in the above file can be viewed by double-clicking on a photo icon or on its name in the Places Panel. If the “Photo Overlay” seems to load but you



Figure 4.
An oblique aerial photo, #6364, Sep 16th, 2009

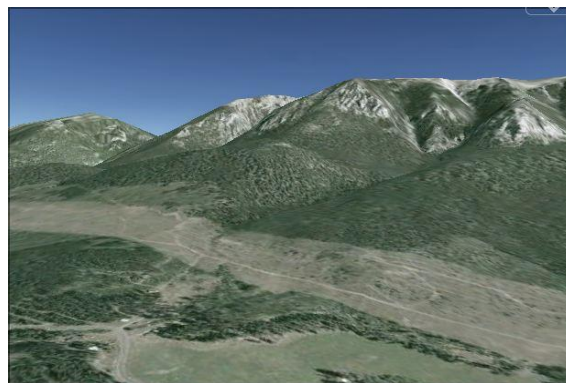


Figure 5.
View in Google Earth after georeferencing photo #6364. This is a projection of the base orthophoto from the 3d terrain to the camera location using Google Earth's Photo Overlay tool.

can see the image, right-click on it in the Places Panel, select Properties, and click OK. This usually makes the photo appear.

Ground-based photos and data

This section shows an example of using Google Earth to provide a rich and interactive viewing experience for some simple natural resource data and ground-based photographs.

A study was done to determine how channel width and riparian vegetation affect stream shade and was published in Teti (2006). Field work included making channel geometry measurements and taking a photograph at each of several hundred channel cross section. Photos and data collected during this type of field work contain a wealth of information but are typically underutilized because it is not practical to make them readily useable or even available to colleagues or the public. The following KMZ file is an example of how this problem might be addressed. It shows the locations of surveyed cross sections and allows data and photos to be inspected [Moffat Creek stream shade survey](#) (Figures 6 and 7).

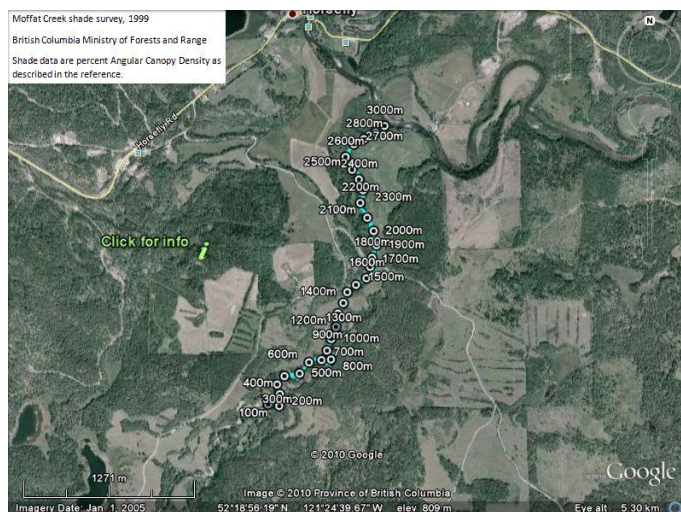


Figure 6.

The surveyed reach and cross sections on Moffat Creek.

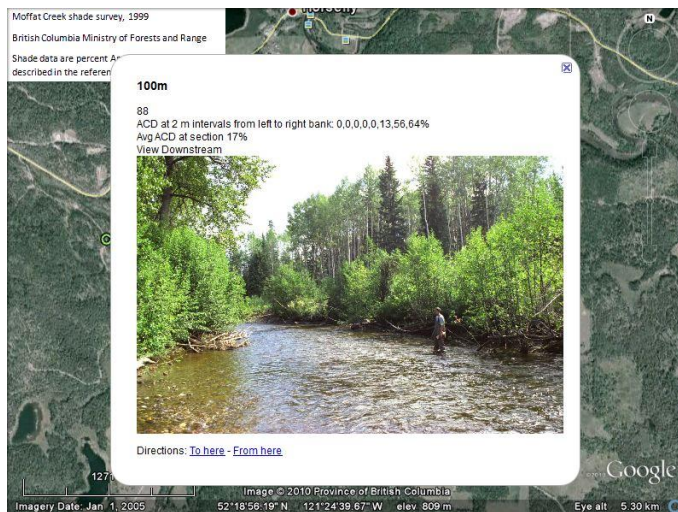


Figure 7.

A window pops up with data and a photo when one of the cross section points is clicked.

Google Earth files are available for three other stream reaches:

[Site 1 shade survey.kmz](#) (North Spius Ck. Tributary)

[Site 2 shade survey.kmz](#) (Juliet Ck. Tributary)

[Site 3 shade survey.kmz](#) (Juliet Ck. Tributary)

The file for Site 1 has a clickable icon that displays a summary table of data for the stream reach (Figure 8). Tables and other formatted objects can be interpreted if they are in HTML format. There are a number of ways to do this. The table in Figure 8 was created in MS Word, saved in HTML format, opened in Wordpad. The appropriate part of the HTML script was then copied and pasted into the Placemark's Description field.

Summary

Google Earth combined with other readily available tools allows photos, maps, other types of data, and their geographic relationships to be more accessible and useable. A simple “front end” document like this PDF file can contain hyperlinks to KMZ files and other data stored on a public FTP site. This has the potential to add long-term benefits to organizational investments with very small incremental costs.

For more information on these projects or Google Earth, contact me at pat.teti@gov.bc.ca or pteti@shaw.ca

Reference cited:

Teti, P. 2006. Stream Shade as a function of channel width and riparian vegetation in the BC Southern Interior. Streamline Watershed Management Bulletin, 9:10-15. Link: [streamline vol9 no2 art3.pdf](#)

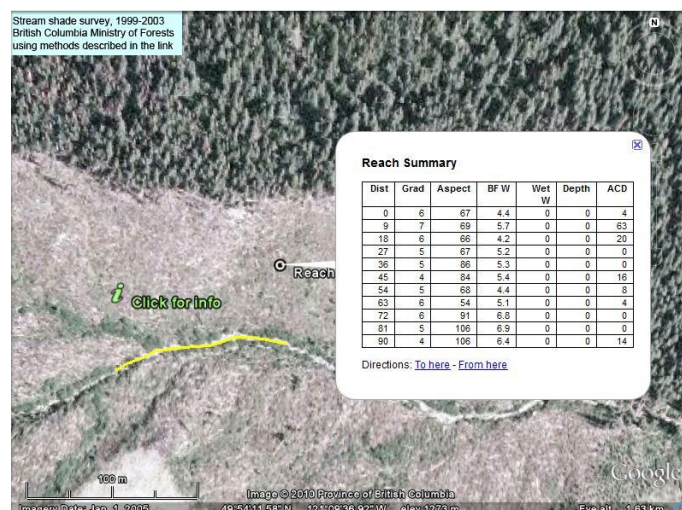


Figure 8.

Tables can be added to Placemarks like this one summarizing data for a stream reach.