

Intermediate Google Earth Skills

Notes, sample KMZ files, and exercises

Pat Teti
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Examples of content built in to Google Earth

- Start Google Earth (GE) and open the Layers Panel at bottom of sidebar (left side of screen).
- Turn on Borders and Labels by left-clicking the empty box. You can expand this folder by clicking the little box with the + sign. Zoom in until British Columbia fills your screen.
- Turn the “Weather” layer on. Note the “busy” icon next to where you just clicked, which means that data are being downloaded. Expand the Weather folder by clicking the box with the + sign. Note the different layers.
- Turn the Weather layer off and the Roads layer on. Zoom in on Williams Lake and note that the displayed content changes depending on the zoom level or “Eye altitude”, which is displayed in the lower right corner of the earth view.
- Turn terrain on and zoom in. Practice tilting, panning, and rotating the view as if you were flying using the shortcut keys, mouse, and navigation controls. You can return the view in the Earth window to normal map orientation by pressing the “r” key.

The orthophoto base imagery and the digital elevation model is probably the most useful built-in content.

Adding content to GE from public sources

Open <http://ilmbwww.gov.bc.ca/dm/wms/index.html>
<http://archive.ilmb.gov.bc.ca/dm/wms/index.html>

Scroll down to Administrative Forest Boundaries and click View in Google Earth. When you open a GE file, it should load as an object under Temporary Places in the Places Panel and GE will fly to a view associated with it (unless you stop it by pressing a key or mouse button). Administrative Forest Boundaries contains a number of folders and layers but only the GeoBC logo is turned on at first.

Google Earth data files have extensions of KMZ or KML.

KML stands for “Keyhole Markup Language”. A KML file is a text file and can be read with any text editor. A KMZ file is compressed KML file.

Explore the content of this file by expanding and contracting folders. Turn layers on and off one at a time. Forest Districts is a good one to start with.

Note differences in what's displayed depending on the viewing altitude, or scale. Turn the scale bar on if it is off (View, Scale Legend).

GE displays data from a source like this (it's called a WMS server) only a screen at a time and it has to be refreshed after panning or zooming. The refresh is usually automatic after a short time delay (the time delay can be changed under Properties, Refresh). You can also request a refresh by right-clicking on a layer and then left-clicking Refresh.

If a layer does not display or seems to stop working, it will sometimes help to close GE and re-open the added content. However, like everything over the internet, these links might not work on a particular day, their address might change, or they might be removed without warning. In those cases you will get an error message and a big red X in the Earth window.

Single clicking and double clicking an object in the Places Panel have different effects. A single click displays whatever is in the object's Description field (right-click Properties) but a double click makes GE fly you to that object's predefined view.

In the same website, scroll down to Base Mapping and Trim and click View in Google Earth. This file contains folders with drainage lines, transportation corridors, contour lines and other information at four different scales. Google Earth displays layers in a folder of a particular scale only when Eye altitude is within a certain range. For example, Eye altitude has to be greater than 185 km in order to see layers in "Base Mapping (1:7,500,000)" and it has to be less than 8 km in order to see data in "Base Mapping (1:20,000)".

Here is a KMZ file with my favorite layers from the Geo BC website.
<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Geo BC Maps Pats favorites.kmz>

Here is my favorite topographic map layer.
<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Canada Toporama.kmz>

It's from Natural Resources Canada Toporama
<http://geogratis.cgdi.gc.ca/geogratis/en/service/toporama.html>

There are many sources of geographic data in Google Earth format available on the internet. e.g. search google for Google Earth Gallery.

If you have Google Earth on your computer, you can open one of these links by holding down Ctrl and left-clicking on it.

Managing content in “My Places” and “Temporary Places”

Create a folder called My favorite GeoBC layers and put some layers into it.

Right-click on that folder and select “Save As”. Save it on your computer as a KMZ file and close GE.

Open Windows File Browser, navigate to the new KMZ file and open it.

Note that opening a GE object this way loads it into your Places Panel under Temporary Places. When you close GE, it forgets everything in Temporary Places. However, Google Earth also has an area called My Places which it loads every time the program starts. Any GE objects that you want to always be available can be put in My Places.

There are different ways to move objects and folders within Google Earth's Places Panel. You can right-click on an object, click Cut or Copy, then right-click paste where you want it go. You can also drag and drop. This is like managing files and folders with Windows File Browser.

Adding content from private sources

The following Google Earth files provide examples of different kinds of content created using Google Earth and other software (Garmin Mapsource, Global Mapper, GPS Photo Link, and MS Excel).

This one contains a waypoint and a text note created in Google Earth.

<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Wales Ck Crossing.kmz>

Let GE stop zooming, then left-click on the point to see the note.

When opening a Google Earth file, it's usually a good idea to let Google Earth finish loading and zooming before you click the mouse or any keys. This will allow GE to fly you to whatever predefined view was associated with the file. After a Google Earth object is loaded, you can re-fly to its pre-defined view by double clicking on it in the Places Panel.

This one contains a track, a polygon, and a point created in Google Earth.

<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Dragon Lake.kmz>

This file has a GPS track from a field trip and waypoints where photos were taken. Data were downloaded with Garmin Mapsource. Links to the photos were created in Google Earth.
<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Field Trip Aug 11 2009.kmz>

If you click on a waypoint that looks like a camera, you should see a popup window with a photo taken at that point. The photos

I download tracks and points from my GPS using Garmin Mapsource which has a “View in Google Earth” feature. OziExplorer and other programs have similar features and it can be also done with the latest version of Google Earth.

I used Google Earth to edit the track and points and to create links to the photos.

are on an FTP site, not the KMZ file. The Description Box of each point (available by right-clicking on a point and selecting Properties) contains a script that tells Google Earth where each photo is. You can use this example to do something similar if you want to make your photos viewable like this over the internet.

Image Overlays

An Image Overlay is a bitmap image with georeferencing information attached to it. It is displayed with fixed horizontal coordinates, can be draped over the 3d terrain, and can be viewed from any vertical or horizontal angle.

Maps and aerial photos can be made into Image Overlays using Google Earth if there are features on the overlay that can be matched to other georeferenced layers.

This file contains Image Overlays of a research plot.

ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/PlotMO1_2006_to_2008.kmz

Photos taken in 2006 and 2007 show pine tree defoliation that occurred in one year. The photo taken in March 2008 shows an unusual image obtained when snow covered the forest floor and the sky was overcast. Individual stems, broken stubs, and coarse woody debris are clearly visible due to the snow and diffuse lighting. You have to turn layers on and off to see all of them.

In order to see an image overlay, you have to be zoomed in appropriately, the overlay has to be turned on, its Transparency slider must be not be all the way to the left, and its Draw Order must be greater than any other overlapping Opaque overlay.

There are two different ways to change an overlay's Transparency – one is the slider at the bottom of the Places Panel and the other is the slider in its Properties box. Draw Order can be changed under the overlay's Properties, Location tab.

Photos

A Google Earth “Photo” (or “Billboard” as I prefer) is a view of the earth from a specific point in 3 dimensions, looking in a particular direction, with a particular vertical tilt (pitch), left/right tilt (roll), and zoom level. It provides a method for superimposing a landscape photo or an oblique aerial photo on the corresponding 3d terrain view.

File with some visually georeferenced “Billboards”

[ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Billboards of Sep 17th Oblique photos using FTP site.kmz](ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Billboards_of_Sep_17th_Oblique_photos_using_FTP_site.kmz)

(Kelly Creek fire, September 2009)

Terrain must be turned on to view Billboards correctly. Also, give Google Earth some time when you open a Billboard.

It takes practice to get the 3d terrain view in the Earth window to match the photo accurately. If you have a lot of photos for example, from a helicopter flight, an alternative to making Billboards is to create a flight line map with clickable links to photos as in the next example. These aren't oriented on the landscape like Billboards but they are a lot easier to create.

The following contains a flight line map from a fixed-wing aerial photo flight.

<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Mar 30 2007 photo points with VRI and links to images and help.kmz>

After Google Earth loads it and the screen stops zooming, click on the “Help 1” icon and follow the instructions.

This file contains a variety of content that can be created using a combination of Google Earth and other software, and then displayed in Google Earth.

- It contains links to over 300 megabytes of aerial photos on an FTP site.
- The Help icons are Placemarks with text added to their Description fields. The Description fields also contain some custom text formatting using HTML
- Some of the Help icons have customized Views (Properties/View) that fly you to a new location when double-clicked.
- There are examples of georeferenced aerial photos (Image Overlays).
- Each photo waypoint also contains selected VRI data for that location. When you left-click on a point the popup shows the VRI data as well as a small version of the photo. The VRI data for the waypoints by Mark Ager. I converted selected VRI data and links to the photos to the final Google Earth format with Excel, Global Mapper, and Wordpad.

If this is getting too complicated, remember that you can use Google Earth to simply create a view that you want someone else to see.

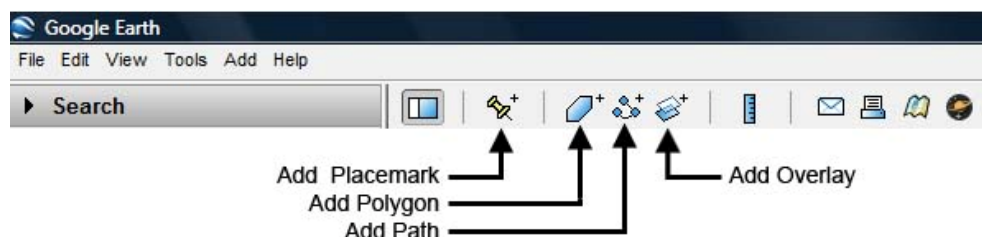
<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/WL Airport.kmz>

If you have access to a suitably equipped GIS person, you can create maps in ARC and export them in Google Earth format. Maps can also be published on a WMS server (which is what the GeoBC files are). Darren Mikulsek at Paragon Resource Mapping made themed maps of pine stands for me a couple years ago and he hosts them on a WMS server. They show stands greater than 70 percent Lodgepole pine and greater than 80 years old (as of 2008). To see it, load this file, zoom in to an eye altitude of less than 30 km, and turn the data layers on.

<ftp://ftp.for.gov.bc.ca/RSI/external/!publish/PTeti/GEWorkshop/Old Lodgepole Pine Stands.kmz>

Creating and changing the properties of spatial data

Google Earth has tools for creating Placemarks, Paths, Polygons, Image overlays, and Photos.



Placemark

Click the “Add Placemark” tool (or on the menu bar click Add, then Placemark). The placemark editing window will appear and offers a variety of options. You can drag that window out of the way and use any navigation tool to position the Placemark. Click and drag it with the left mouse button to adjust its location.

The editing window lets you name the point, select a symbol (to right of Name box), add a Description, and customize the Style, Color, and View associated with it. When done, click OK.

A newly created Placemark is listed in a folder in the Places panel depending on what folder was highlighted when you clicked Add Placemark. You can organize objects by creating folders and moving objects into them. Do this by dragging and dropping or cutting and pasting.

When done naming and organizing objects, you can save them in a file by right-clicking on a folder or object, clicking “Save Place As” and using the file save window.

Any object or folder can have a view associated with it. When you open the object, GE will fly you in to that view.

Path

A Google Earth Path is a connected series of straight line segments, usually used to approximate a curve. If created in GE, the default is for every vertex to be assigned an elevation of the ground at that point and for the line to be “clamped to the ground”. The path can also have an elevation above the ground.

Polygon

A Polygon is an enclosed shape bounded by straight line segments. Polygons can exhibit strange behavior in GE. This has to do with the elevation of the vertices, the topography, whether you have Terrain turned on, and the polygon’s Altitude properties (Clamped to Ground, Relative to Ground or Absolute).

Transferring data between your GPS and Google Earth

If you have version 5 of GE, you’ll be able to import waypoints and tracks from a Garmin or Magellan GPS. Version 4.2 cannot import data directly from a GPS. I’ve been told that version 5 is being tested for use by BC government employees.

You can download data from your GPS to your computer with Ozi Explorer, export them as KML and import them into GE. It’s easier if you have a Garmin GPS and Garmin Mapsource software.

An imported GPS waypoint is treated by GE as a Placemark and a track is treated as a Path.

Comments about other software

OziExplorer can load shapefiles and export them as KML files but I've had problems loading large shapefiles into Ozi.

I use Global Mapper to convert shapefiles to KMZ files. It can also load image overlays created in Google Earth. It can load spatial data from WMS servers and an advantage over Google Earth is that it can use that data to print maps of large areas rather than just one computer screen at a time.

When I make a helicopter or fixed wing flight, I record a full GPS track. Afterward, I use GPS Photo Link to calculate the locations of aerial photos. The same thing can be done with Ozi Photo Tool but I prefer GPS Photo Link.

There are usually a number of different ways of doing the same thing.

Exercises

1. Make a waypoint that when loaded, flies to this building, and which, when single clicked, displays a popup box that says "I am here".
2. Create a waypoint that when loaded, flies to the view a pilot sees ahead when she's on final approach to runway 29 at the Williams Lake Airport.
3. Create a jpeg file of an oblique view of the Sheep Creek Bridge looking either upstream or downstream with 3d terrain turned on from an Eye altitude of 500 metres. Make sure that some of the horizon is visible Note that the terrain appears in 3 dimensions but the bridge does not. Why do you think that is? Zoom in on some individual trees with a similar oblique view and rotate the view. Trees do not show up in 3d either.

The true position of bridges, building, and trees above the ground are not represented in GE because the digital elevation model only represents terrain. However, you can add 3 dimensional information to Placemarks, Paths, and Polygons in GE.

4. See if you can make a Google Earth Path that is a more accurate 3d representation of the actual location of the pavement of the highway 20 bridge. Hint: you need to use the Altitude tab in Properties. It might look something like this when you're done.



5. Make an Image Overlay

- First you need a jpeg image of map or something to make an overlay with. If you don't have an image, you can make one as follows. Zoom to an area of your choice in Google Earth, click File/Save/Save Image As and then use the file window to create and save the image.
- Next, click Add/Image Overlay or click the image overlay shortcut button. This makes the "Edit Image Overlay" window appear. Browse to the jpeg image and open it. Use the image control tools to orient the image overlay to the underlying orthophoto. You can click OK at any time and work on it more later by right-clicking on the overlay and selecting Properties. For more information see Google Earth Help.
- If you had Terrain turned on when you saved the JPEG file, it might be impossible to create a perfect overlay. This illustrates the difference between an aerial photo and an orthophoto.

6. Try to make a GE "Photo" from your jpeg image of the Sheep Creek Bridge.