BRITISH COLUMBIA
The Best Place on Earth

GeoBC

FOSS4G 2010
Barcelona

squeeze

Configuring MapServer and KML to Get The Most Out Of Google Earth

Michael Ross, Geoweb Arghitect
michael.ra.ross@gov.bc.ca

Daniel Edler, Web Cartographer
daniel.edler@gov.bc.ca

Integrated Land Management Bureau,
Province of British Columbia, Canada

Beautiful British Columbia

Yukon Territory
Northwest Territories
Atlin
Fort Nelson
Saskatchewan
Stewart
Fort St. John
Dawson Creek
Mackenzie
Alaska
Smithers
Alberta
Prince Rupert
Edmonton
Terrace
Prince George
Kitimat
Quesnel
Williams Lake
Calgary
Revelstoke
Kamloops
Vernon
Merritt
Cranbrook
Campbell River
Courtenay
Penticton
Kelowna
Nelson
British Columbia
Hope
Nanaimo
Vancouver
Victoria
Montana
Washington
Idaho
Map Centre: 54° 14' N, 125° 31' W

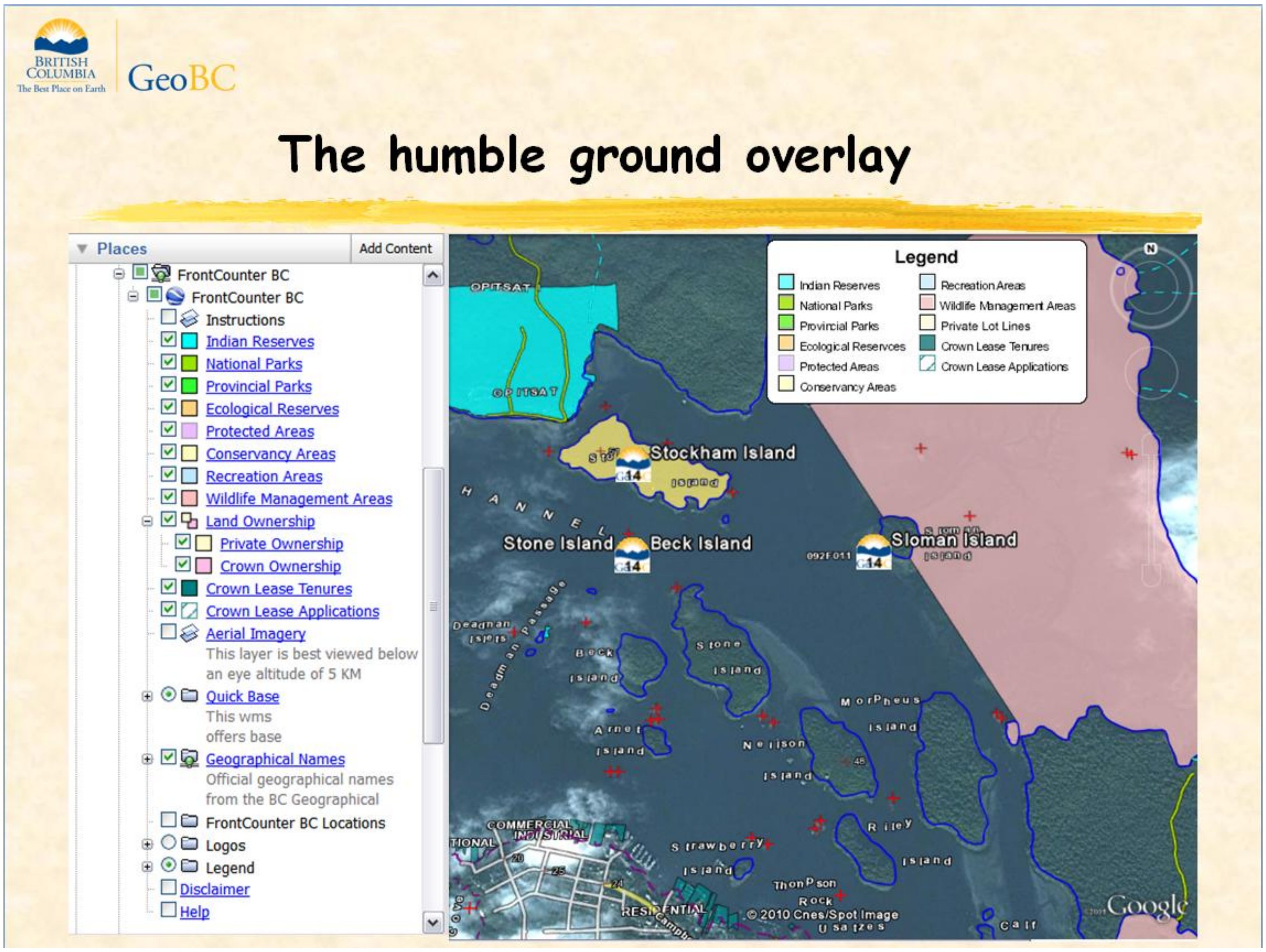
About British Columbia

BC is big

- almost twice the area of Spain (95 000 000 ha vs 50 500 000 ha)
- larger than the states of Washington, Oregon, and California combined
- spans five UTM zones

BC is 94% public land. That requires a lot of mapping and makes the province a major data producer..

BC has been using MapServer since 2003. This year we've been working with DM Solutions on the new KML features in MapServer 6.0.



The humble ground overlay

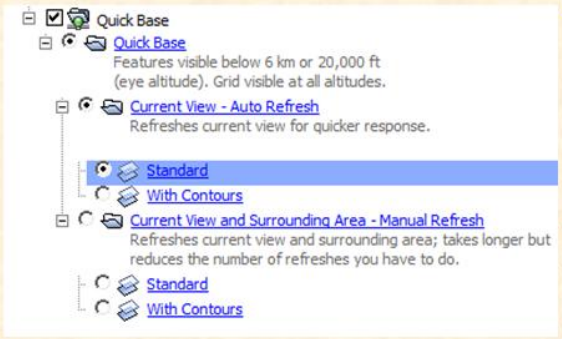
1. The getMap request for image output is the workhorse of the Web Map Service protocol. In KML, getMap is supported by the GroundOverlay element. A single GroundOverlay shows all selected vectors within a single image without giving away the vectors. Vectors n be portrayed in more complex styles than kml placemarks since dashed lines, arrows, and patterned and hatched fills are not supported in KML styles but they are in MapServer (and GeoServer). A ground overlay only consumes a single view's worth of memory.

2. In Google Earth, each layer in My Places is refreshed independently and awkwardly. You have to right-click on the layer name and select Refresh. It would be nice to have a Refresh tool on the tool bar or at least be able to refresh a folder and have all active layers within the folder refresh themselves.

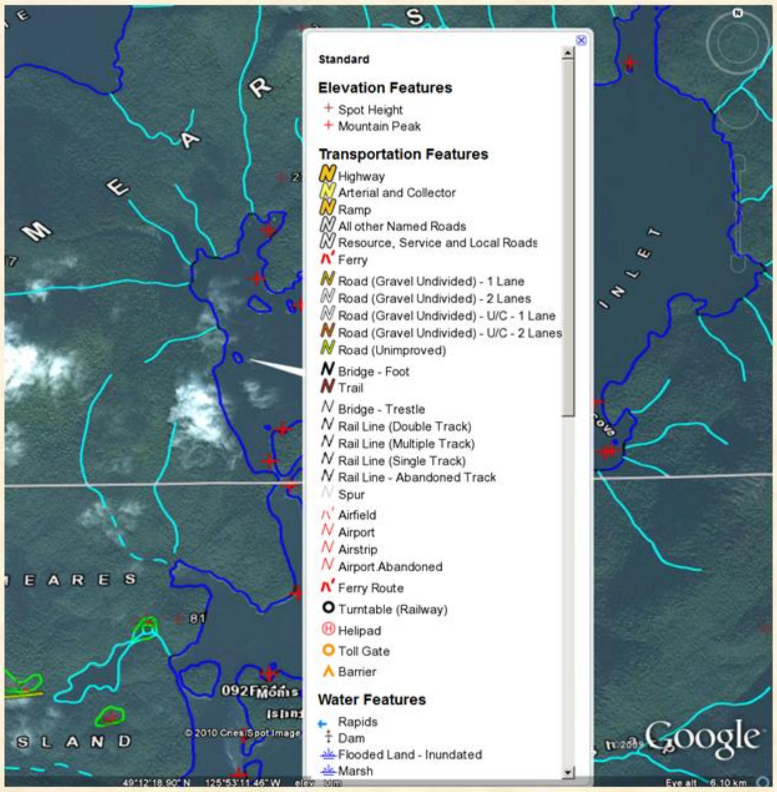
3. There is also no Zoom To Maximum Inverse Scale tool on each layer.

4. The legend shown here is a screen ovelay.

Legend in a balloon



Quick Base
Quick Base
Features visible below 6 km or 20,000 ft (eye altitude). Grid visible at all altitudes.
Current View - Auto Refresh
Refreshes current view for quicker response.
Standard
With Contours
Current View and Surrounding Area - Manual Refresh
Refreshes current view and surrounding area; takes longer but reduces the number of refreshes you have to do.
Standard
With Contours



Standard

Elevation Features
- Spot Height
- Mountain Peak

Transportation Features
- Highway
- Arterial and Collector
- Ramp
- All other Named Roads
- Resource, Service and Local Roads
- Ferry
- Road (Gravel Undivided) - 1 Lane
- Road (Gravel Undivided) - 2 Lanes
- Road (Gravel Undivided) - U/C - 1 Lane
- Road (Gravel Undivided) - U/C - 2 Lanes
- Road (Unimproved)
- Bridge - Foot
- Trail
- Bridge - Trestle
- Rail Line (Double Track)
- Rail Line (Multiple Track)
- Rail Line (Single Track)
- Rail Line - Abandoned Track
- Spur
- Airfield
- Airport
- Airstrip
- Airport Abandoned
- Ferry Route
- Turntable (Railway)
- Helipad
- Toll Gate
- Barrier

Water Features
- Rapids
- Dam
- Flooded Land - Inundated
- Marsh

Here is a a scrollable legend in the description element of a balloon for a single ground overlay containing dozens of wms layers.

The description element contains getLegendGraphic requests, one for each layer in the ground overlay. Scrolling makes this legend more useful than screen overlays.

BRITISH COLUMBIA
The Best Place on Earth
GeoBC

Ground overlays without distortion

With | **Without**

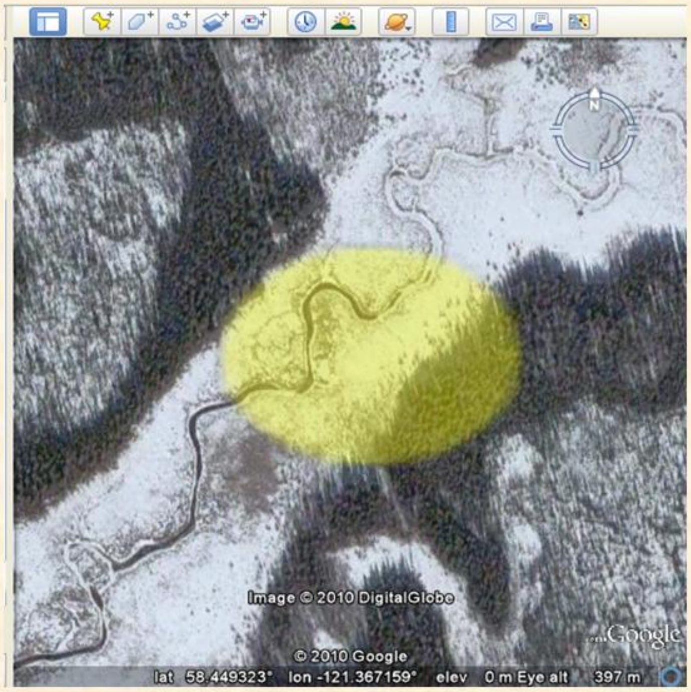


Image © 2010 DigitalGlobe
© 2010 Google
Google
lat 58.449323° lon -121.367159° elev 0 m Eye alt 397 m

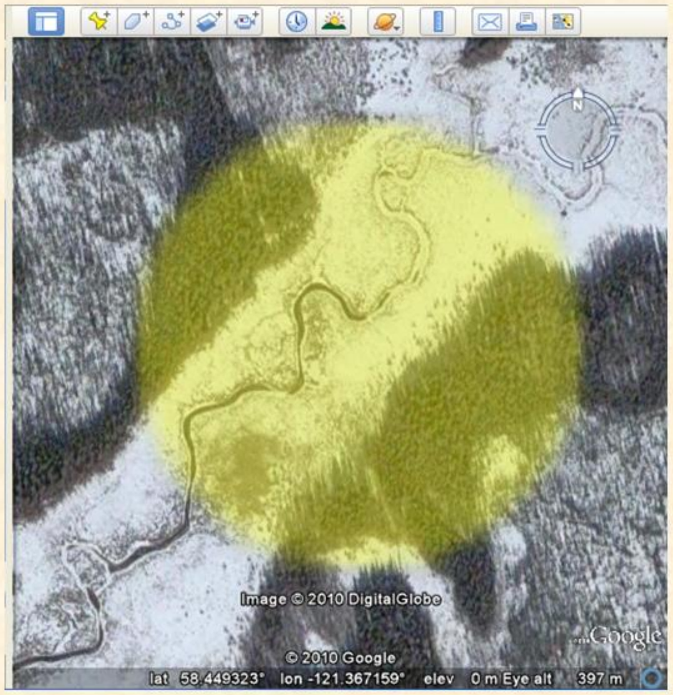
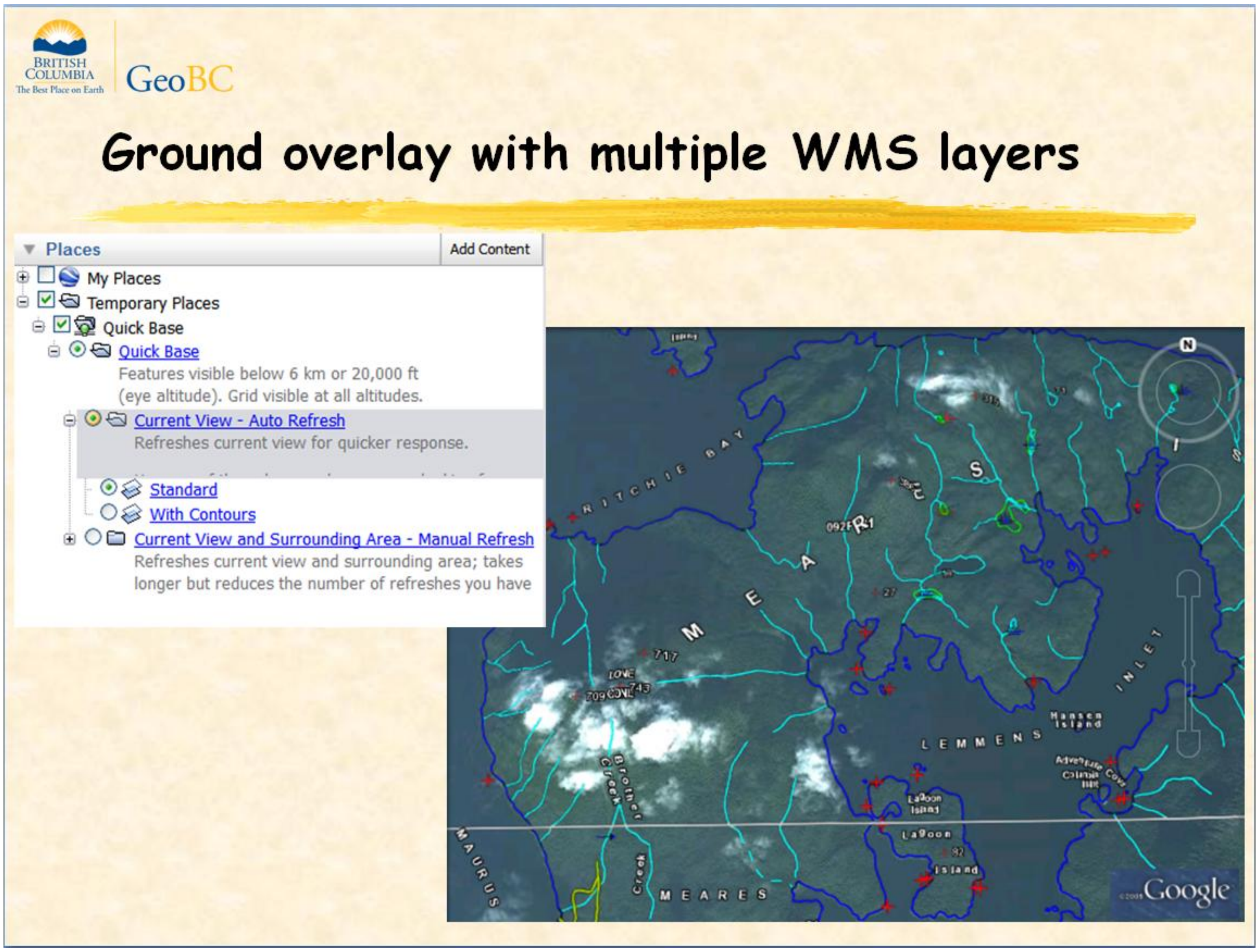


Image © 2010 DigitalGlobe
© 2010 Google
Google
lat 58.449323° lon -121.367159° elev 0 m Eye alt 397 m

- On the left is a yellow circular disk symbol. It is skewed and the wrong size because the ground overlay specifies constants for width and height in its getMap request instead of the actual dimensions of the current map view. Unfortunately, this is how google earth creates ground overlays by default.
- The disk on the right is circular because the associated ground overlay includes a viewFormat element to specify the width and height of the current map view. Google Earth doesn't let you define a viewFormat element through its interface so you have to edit the kml in a text editor..



Ground overlay with multiple WMS layers

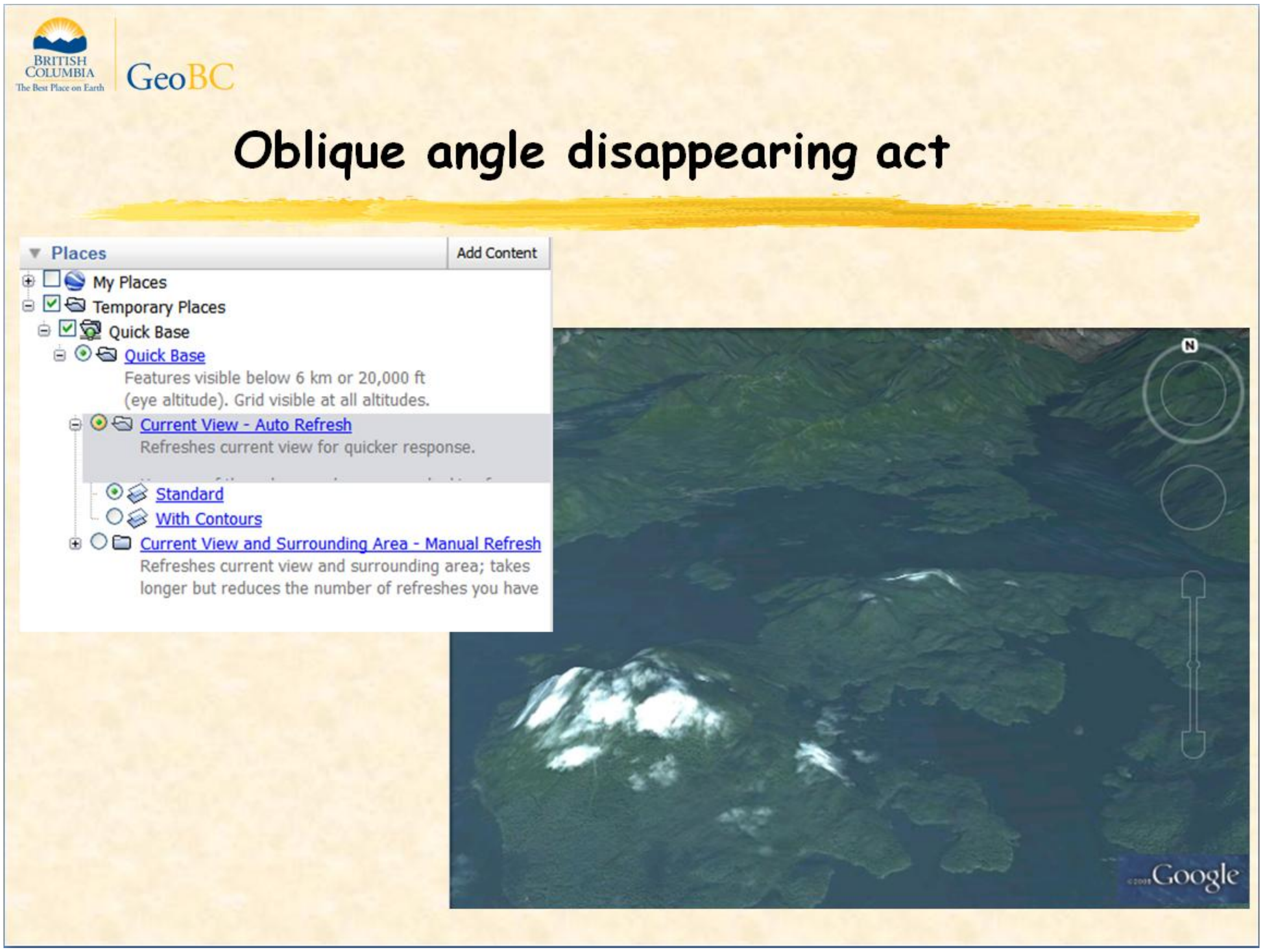
Places | Add Content

- My Places
- Temporary Places
  - Quick Base
    - Quick Base
      Features visible below 6 km or 20,000 ft (eye altitude). Grid visible at all altitudes.
      - Current View - Auto Refresh
        Refreshes current view for quicker response.
        - Standard
        - With Contours
      - Current View and Surrounding Area - Manual Refresh
        Refreshes current view and surrounding area; takes longer but reduces the number of refreshes you have

Grouping multiple map layers into a single ground overlay speeds up refresh because every GE layer is refreshed independently.

This ground overlay includes seventeen map layers from our basemap WMS. That would be seventeen separate getMap requests if they weren't combined.

Now look at the map carefully. We're going to slightly tilt our view.

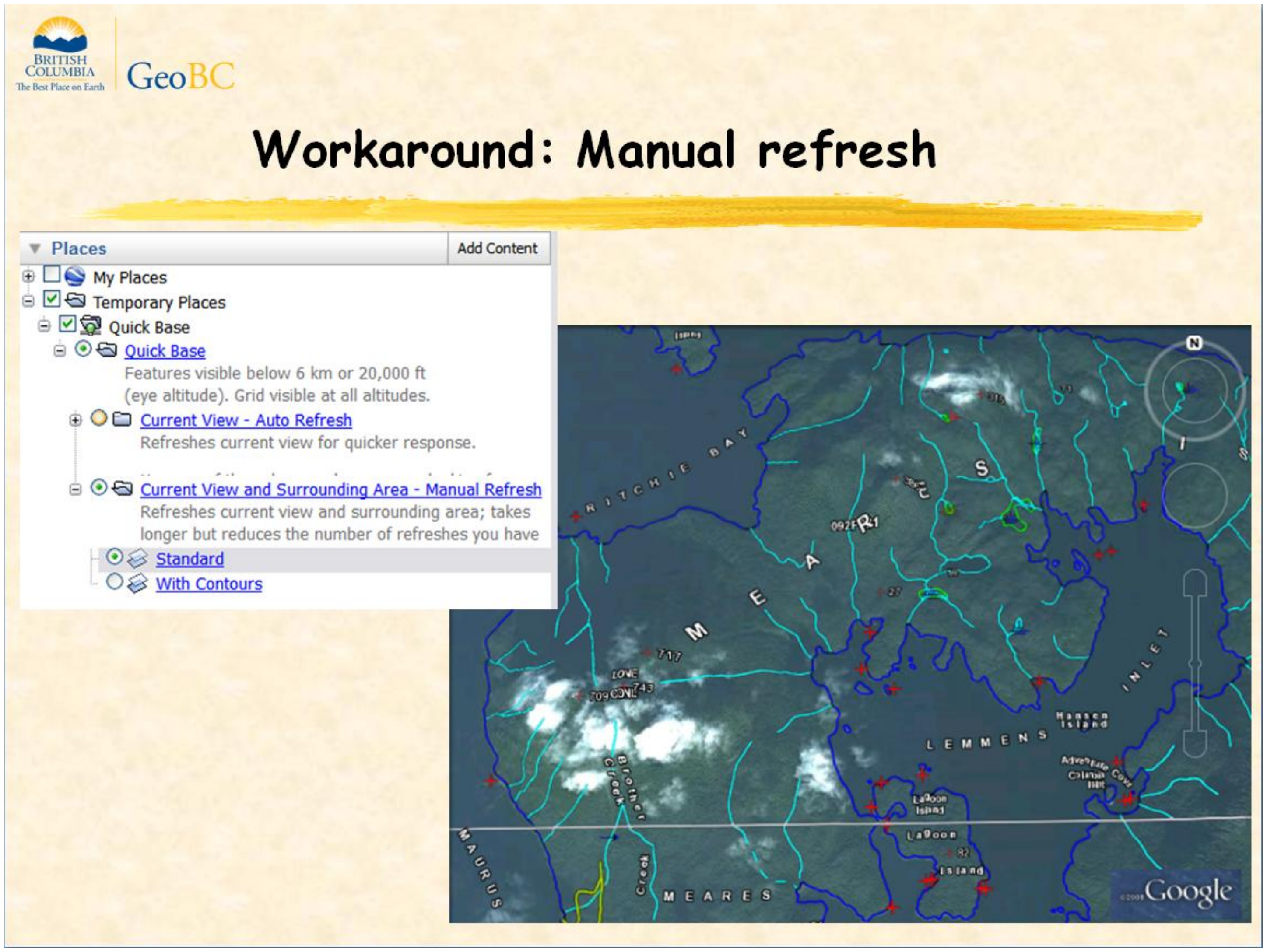


Oblique angle disappearing act

Places | Add Content

- My Places
- Temporary Places
  - Quick Base
    - Quick Base
      Features visible below 6 km or 20,000 ft (eye altitude). Grid visible at all altitudes.
      - Current View - Auto Refresh
        Refreshes current view for quicker response.
        - Standard
        - With Contours
      - Current View and Surrounding Area - Manual Refresh
        Refreshes current view and surrounding area; takes longer but reduces the number of refreshes you have

When you tilt your view, you change the effective scale of the next getMap request. In this case, GE thinks you are too far away to see the detailed WMS layers.



Workaround: Manual refresh

Places | Add Content

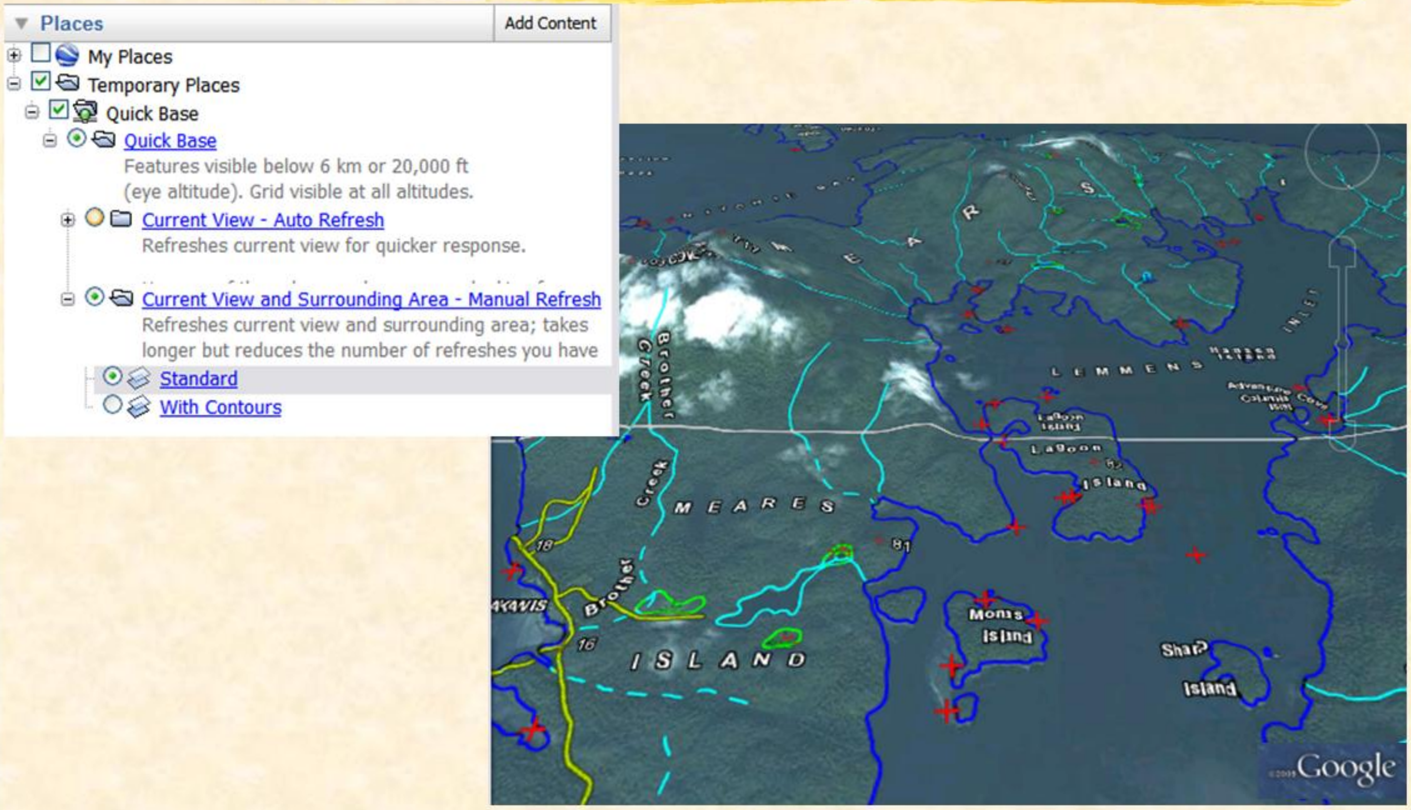
- My Places
- [✓] Temporary Places
  - [✓] Quick Base
    - Quick Base
      Features visible below 6 km or 20,000 ft (eye altitude). Grid visible at all altitudes.
      - Current View - Auto Refresh
        Refreshes current view for quicker response.
      - Current View and Surrounding Area - Manual Refresh
        Refreshes current view and surrounding area; takes longer but reduces the number of refreshes you have
        - Standard
        - With Contours

The workaround is to offer a ground overlay of the same WMS layer but with auto-refresh turned off.

First, level the view then do a manual refresh (right-click on layer name and click Refresh) so when you tilt your view, GE won’t try to update the layer...

BRITISH COLUMBIA
The Best Place on Earth
GeoBC

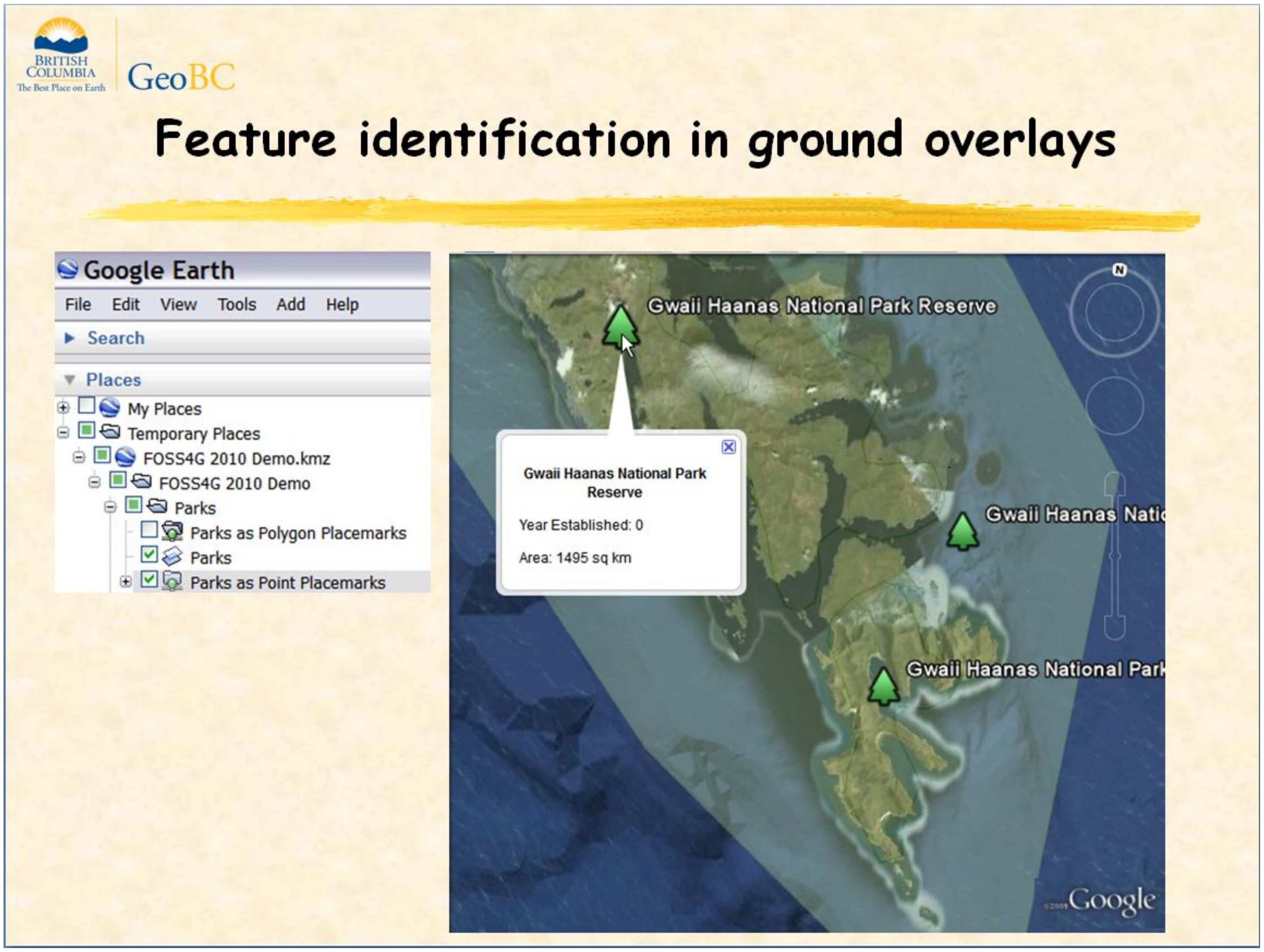
Workaround: Manual refresh



▼ Places Add Content

- ☐ My Places
- ✓ Temporary Places
  - ✓ Quick Base
    - Quick Base
      Features visible below 6 km or 20,000 ft (eye altitude). Grid visible at all altitudes.
      - Current View - Auto Refresh
        Refreshes current view for quicker response.
      - Current View and Surrounding Area - Manual Refresh
        Refreshes current view and surrounding area; takes longer but reduces the number of refreshes you have
        - [✓ Standard]
        - With Contours

...Now tilt the view. The ground overlay is cached and doesn't disappear because this layer doesn't auto-refresh.



Feature identification in ground overlays

Gwaii Haanas National Park Reserve

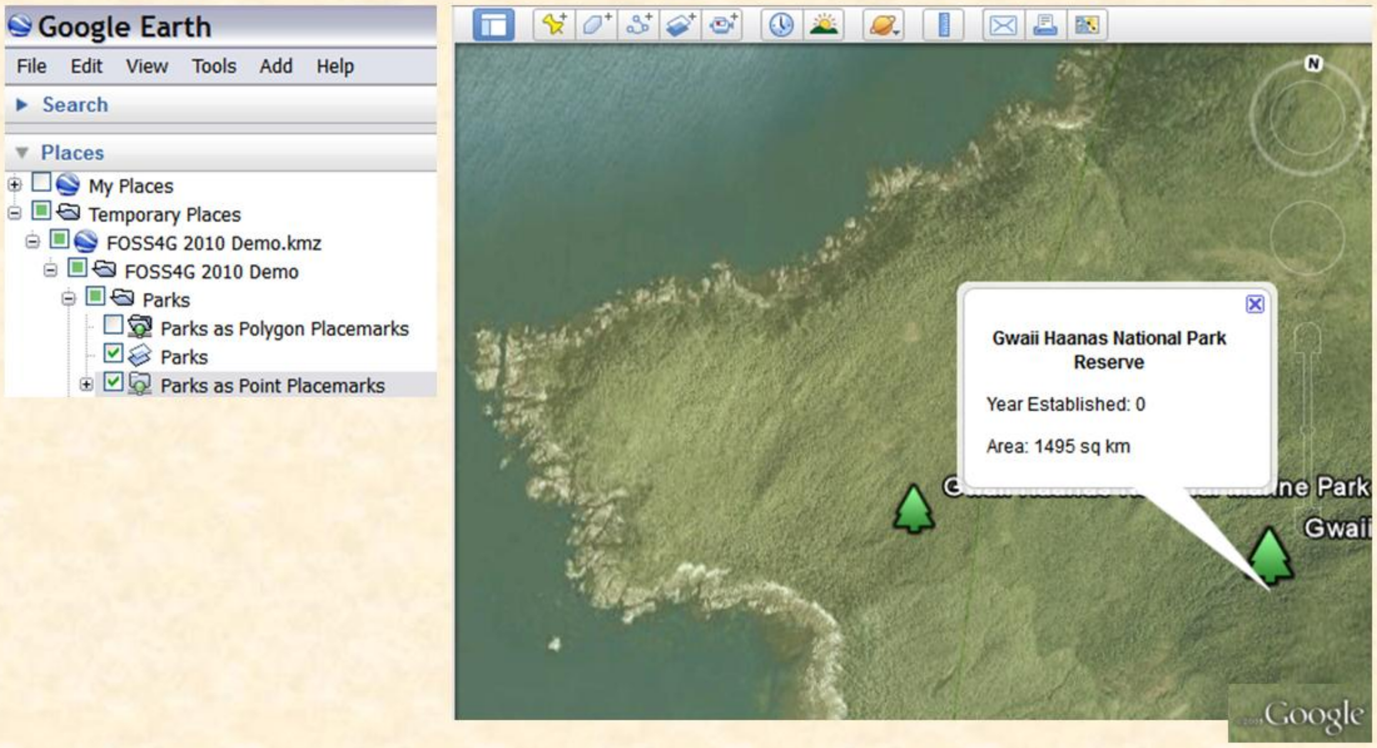
Year Established: 0

Area: 1495 sq km

Google Earth doesn't have a feature identify tool for ground overlays. To make up for this, use a getFeatureInfo request for KML output. Radius, x, and y parameters should be set to cover the current view. The request should be embedded in a NetworkLink.

Each point placemark in the response is positioned where a label would go and contains attribute information in its description balloon...

Feature identification in ground overlays



Gwaii Haanas National Park Reserve

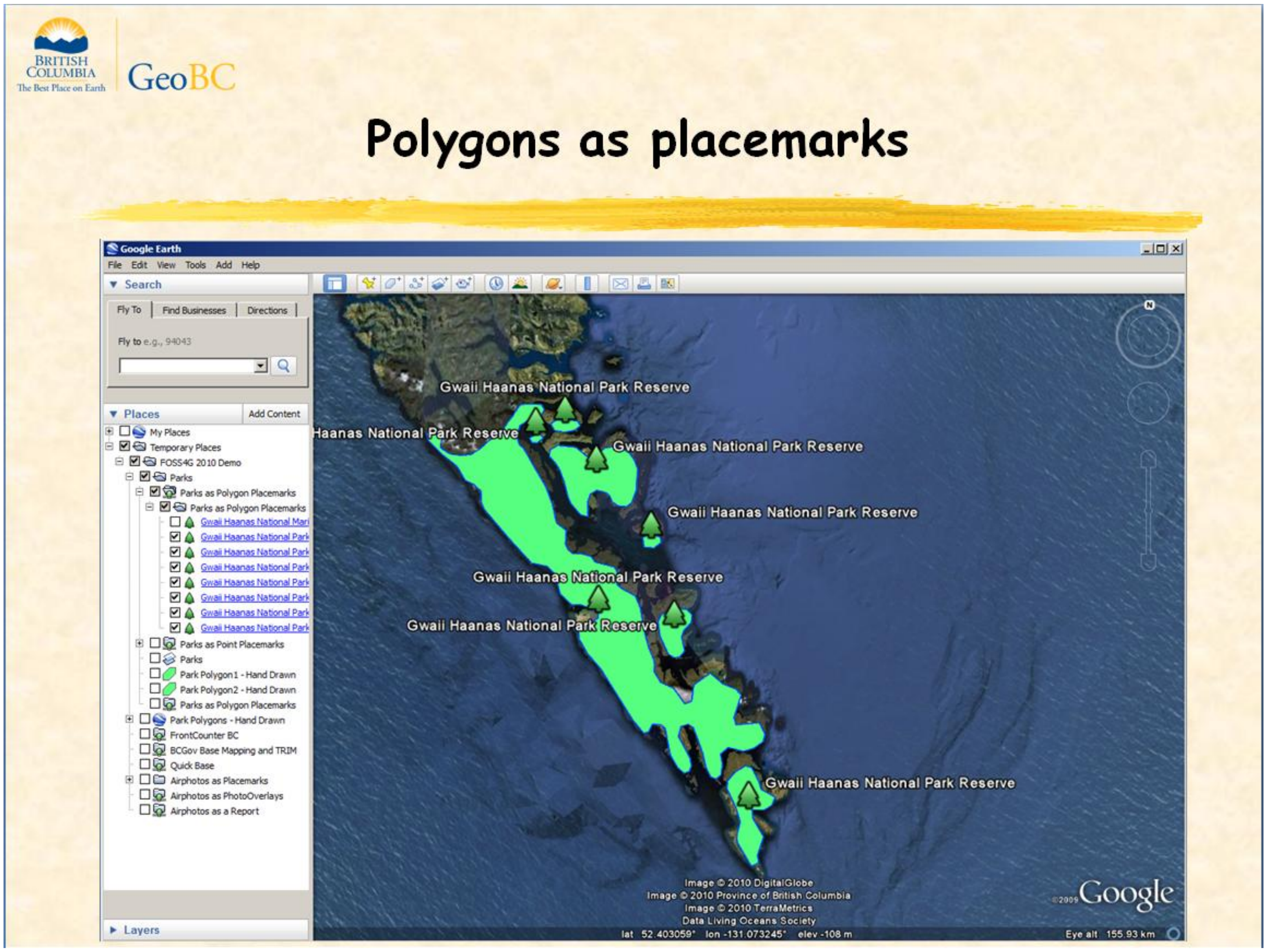
Year Established: 0

Area: 1495 sq km

...And here we are zoomed right in and the point placemarks still label the polygons within the much smaller bbox.

The shplabel template macro makes getFeatureInfo work like this and is new in MapServer 6.0.

GeoServer also supports feature identification in ground overlays using the KMPLACEMARK:TRUE option in the &format_options parameter of a getMap request.

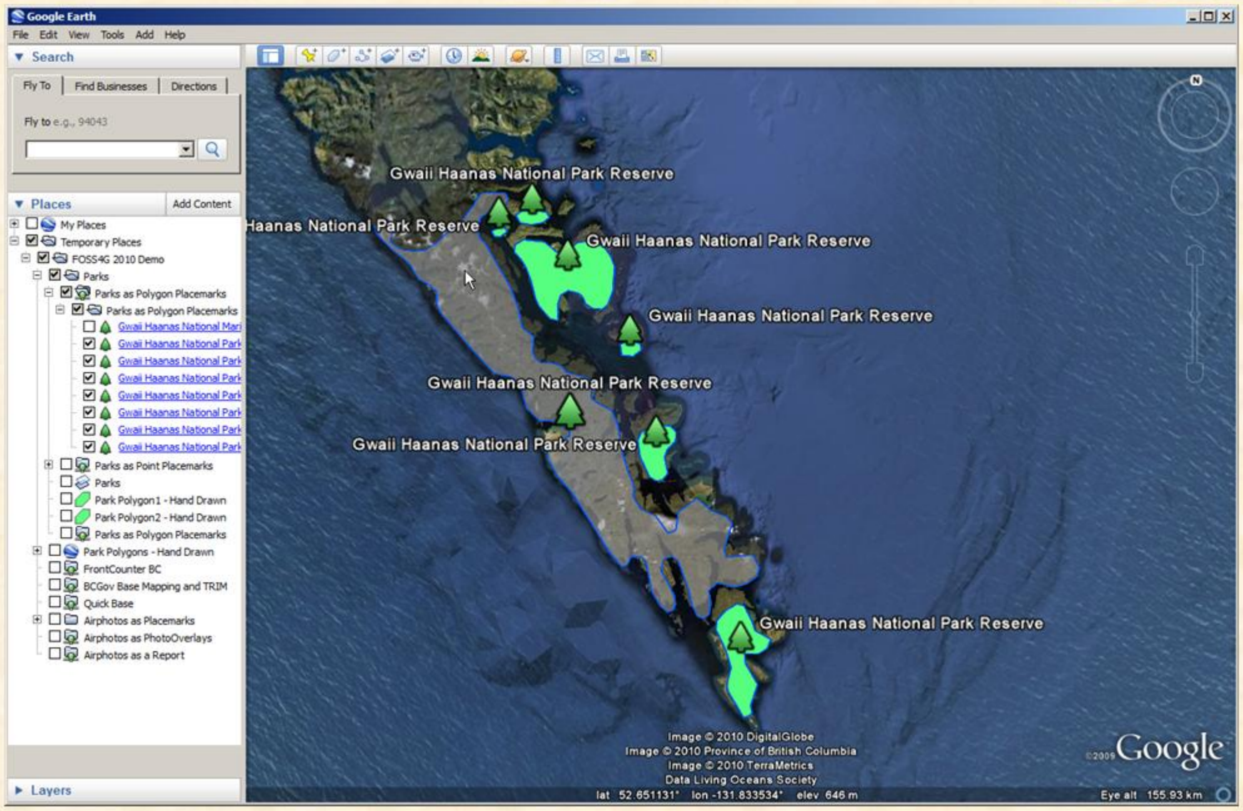

British Columbia
The Best Place on Earth
GeoBC

Polygons as placemarks

Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 94043
Places
Add Content
My Places
Temporary Places
FOSS4G 2010 Demo
Parks
Parks as Polygon Placemarks
Parks as Polygon Placemarks
Gwaii Haanas National Mari
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Parks as Point Placemarks
Parks
Park Polygon1 - Hand Drawn
Park Polygon2 - Hand Drawn
Parks as Polygon Placemarks
Park Polygons - Hand Drawn
FrontCounter BC
BCGov Base Mapping and TRIM
Quick Base
Airphotos as Placemarks
Airphotos as PhotoOverlays
Airphotos as a Report
Layers
Gwaii Haanas National Park Reserve
Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Image © 2010 DigitalGlobe
Image © 2010 Province of British Columbia
Image © 2010 TerraMetrics
Data Living Oceans Society
©2009 Google
lat 52.403059° lon -131.073245° elev -108 m
Eye alt 155.93 km

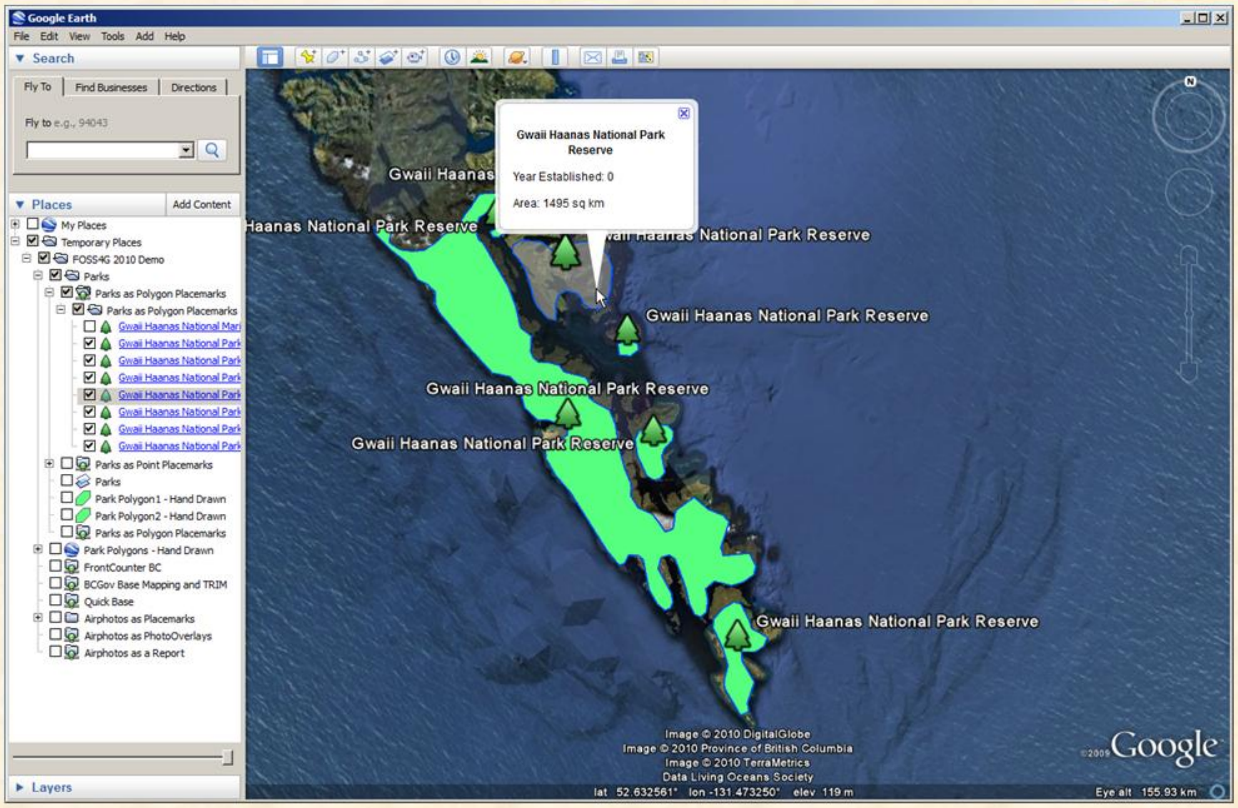
Why not use polygon placemarks instead? You can. This example was produced by a custom kml template in response to a getFeatureInfo request. It has lovely rollover effects...

Polygons as placemarks


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 94043
Places
Add Content
My Places
Temporary Places
FOSS4G 2010 Demo
Parks
Parks as Polygon Placemarks
Parks as Polygon Placemarks
Gwaii Haanas National Mari
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Gwaii Haanas National Park
Parks as Point Placemarks
Parks
Park Polygon1 - Hand Drawn
Park Polygon2 - Hand Drawn
Parks as Polygon Placemarks
Park Polygons - Hand Drawn
FrontCounter BC
BCGov Base Mapping and TRIM
Quick Base
Airphotos as Placemarks
Airphotos as PhotoOverlays
Airphotos as a Report
Layers
Gwaii Haanas National Park Reserve
Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Image © 2010 DigitalGlobe
Image © 2010 Province of British Columbia
Image © 2010 TerraMetrics
Data Living Oceans Society
©2009 Google
lat 52.651131° lon -131.833534° elev 646 m
Eye alt 155.93 km

...Here we move the mouse cursor inside one polygon...

Polygons as placemarks


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Places
Add Content
My Places
Temporary Places
FOSS4G 2010 Demo
Parks
Parks as Polygon Placemarks
Parks as Polygon Placemarks
Parks as Point Placemarks
Parks
Park Polygon1 - Hand Drawn
Park Polygon2 - Hand Drawn
Parks as Polygon Placemarks
Park Polygons - Hand Drawn
FrontCounter BC
BCGov Base Mapping and TRIM
Quick Base
Airphotos as Placemarks
Airphotos as PhotoOverlays
Airphotos as a Report
Layers
Gwaii Haanas National Park Reserve

Gwaii Haanas National Park Reserve

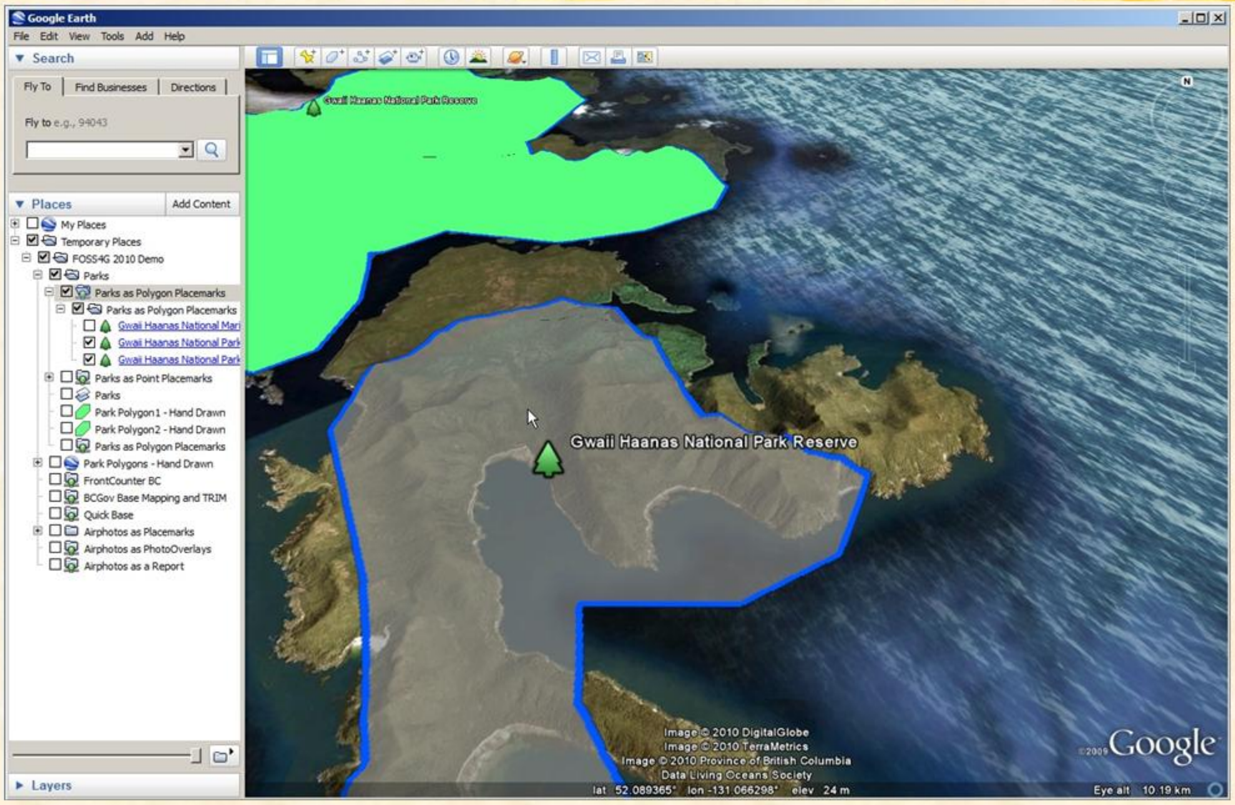
Year Established: 0

Area: 1495 sq km

...then into another.

You also get feature identification by clicking anywhere inside the polygon and...

The perils of polygon placemarks


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 94043
Places
Add Content
My Places
Temporary Places
FOSS4G 2010 Demo
Parks
Parks as Polygon Placemarks
Parks as Polygon Placemarks
Gwaii Haanas National Mari
Gwaii Haanas National Park
Gwaii Haanas National Park
Parks as Point Placemarks
Parks
Park Polygon1 - Hand Drawn
Park Polygon2 - Hand Drawn
Parks as Polygon Placemarks
Park Polygons - Hand Drawn
FrontCounter BC
BCGov Base Mapping and TRIM
Quick Base
Airphotos as Placemarks
Airphotos as PhotoOverlays
Airphotos as a Report
Layers
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Image © 2010 DigitalGlobe
Image © 2010 TerraMetrics
Image © 2010 Province of British Columbia
Data Living Oceans Society
lat 52.089365° lon -131.066298° elev 24 m
©2009 Google
Eye alt 10.19 km

Polygon placemarks don't do the oblique angle disappearing act. What's not to like?

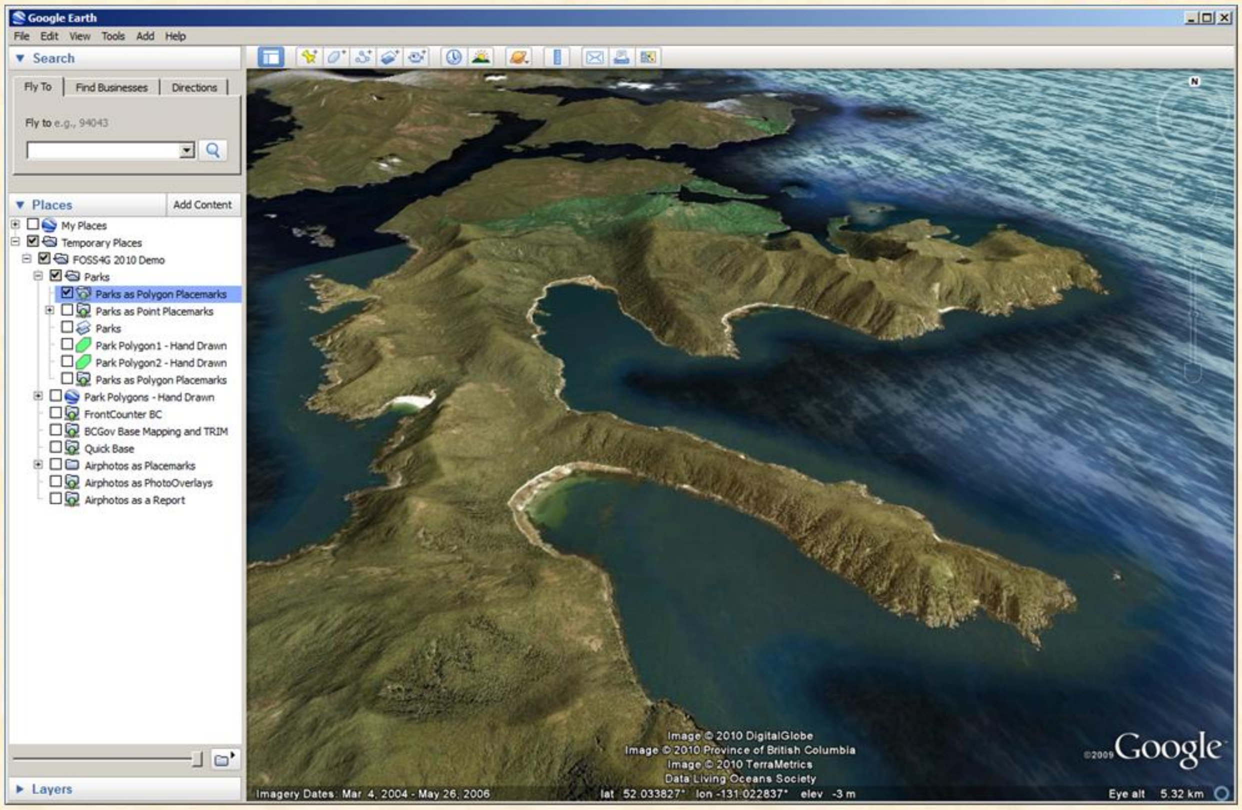
Well, here are some polygon placemark perils to watch for:

Placemarks can take up a lot of memory and make Google Earth sluggish. Just a few polygons with thousands of points in their boundaries or thousands of simple polygons will generate a multimegabyte response. With ground overlays, google earth never gets bloated and there is a fairly short and constant refresh time.

Placemarks can't support fancy styling like dashed lines, arrows, patterned and hatched fills although it does support the nice roll-over effects shown here.

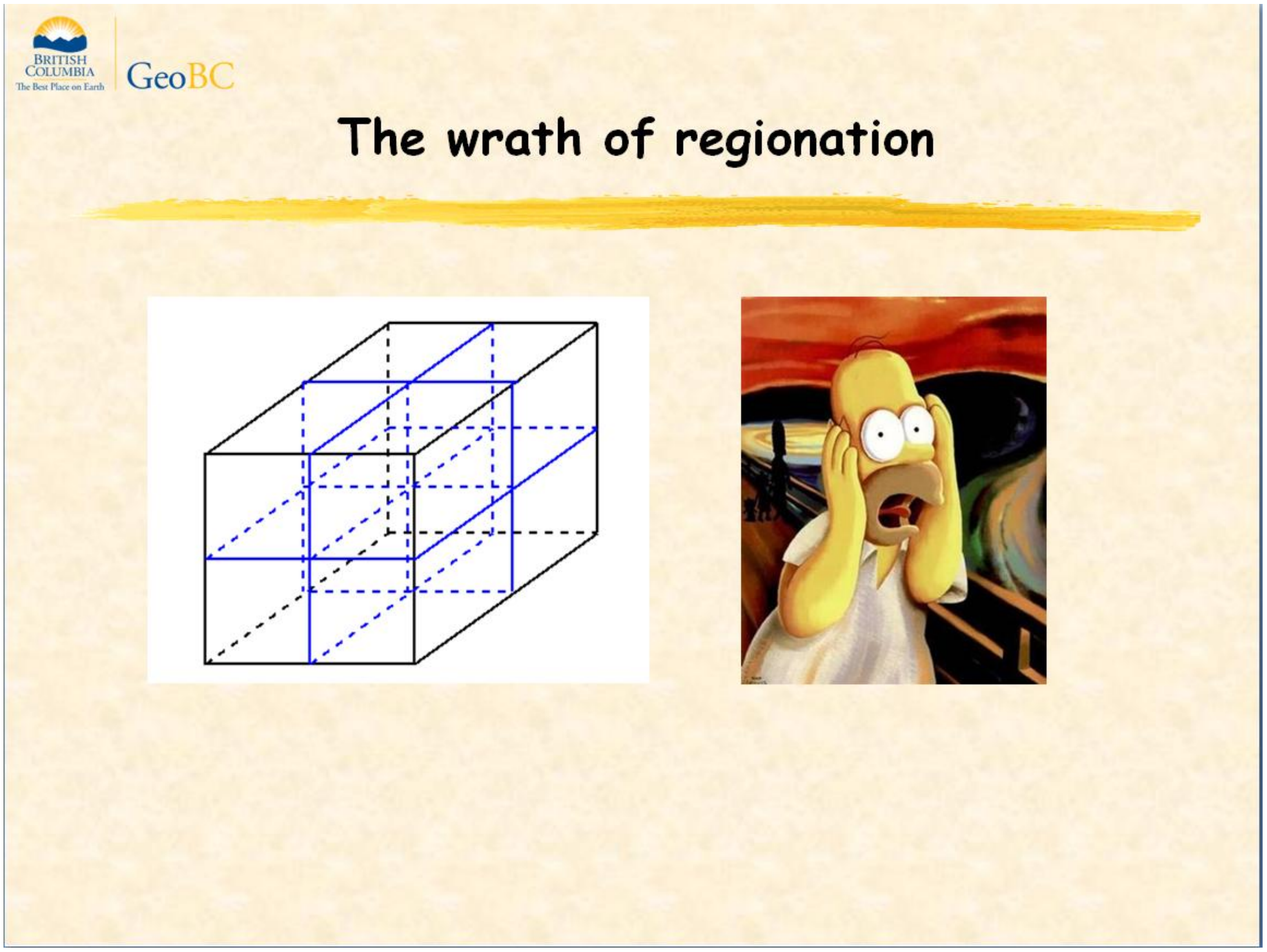
British Columbia
The Best Place on Earth
GeoBC

The perils of polygon placemarks

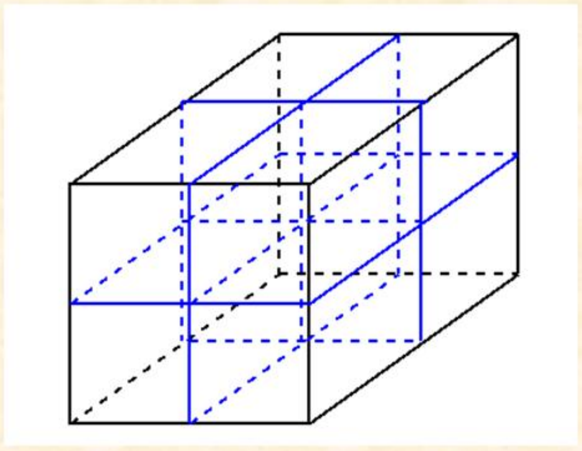

Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 94043
Places
Add Content
My Places
Temporary Places
FOSS4G 2010 Demo
Parks
Parks as Polygon Placemarks
Parks as Point Placemarks
Parks
Park Polygon1 - Hand Drawn
Park Polygon2 - Hand Drawn
Parks as Polygon Placemarks
Park Polygons - Hand Drawn
FrontCounter BC
BCGov Base Mapping and TRIM
Quick Base
Airphotos as Placemarks
Airphotos as PhotoOverlays
Airphotos as a Report
Layers
Image © 2010 DigitalGlobe
Image © 2010 Province of British Columbia
Image © 2010 TerraMetrics
Data Living Oceans Society
©2009 Google
Imagery Dates: Mar 4, 2004 - May 26, 2006
lat 52.033827° lon -131.022837° elev -3 m
Eye alt 5.32 km

... and Placemarks can still do the oblique angle disappearing act. We just weren't zoomed out enough in the previous slide to see it happen.

So carefully consider the tradeoffs between ground overlays and polygon placemarks for each WMS map layer. That's the key to good performance.



The wrath of regionation



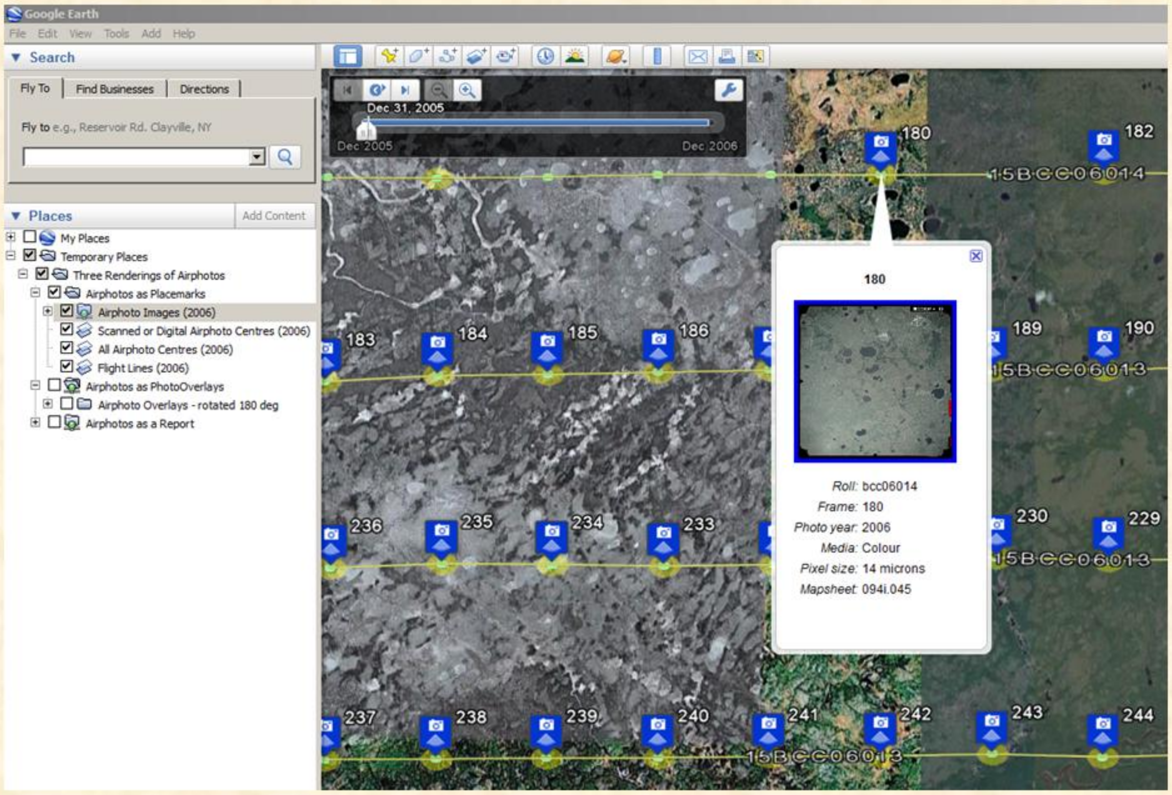
1. If a user loads a region containing subregions (as shown on the left) then quickly flies around, this will trigger all of the subregions to load at virtually the same time and crush your server.

2. Google Earth caches the map data for every activated Region so as more regions get activated, Google Earth gets more sluggish.

Regions may be a flawed concept but they are brilliantly supported by GeoServer if you would to do some experiments with your data. Here's an excerpt from the GeoServer docs explaining the four regionation strategies:

- **Best guess** (*default*) The actual strategy is determined by the type of data being operated on. If the data consists of points, the random strategy is used. If the data consists of lines or polygons, the geometry strategy is used. external-sorting Creates a temporary auxiliary database within GeoServer. It takes slightly extra time to build the index upon first request.
- **Native-sorting** uses the default sorting algorithm of the backend where the data is hosted. It is faster than external-sorting, but will only work with PostGIS datastores.
- **Geometry** externally sorts lines by length and polygons by area.
- **Random** uses the existing order of the data and does not sort.

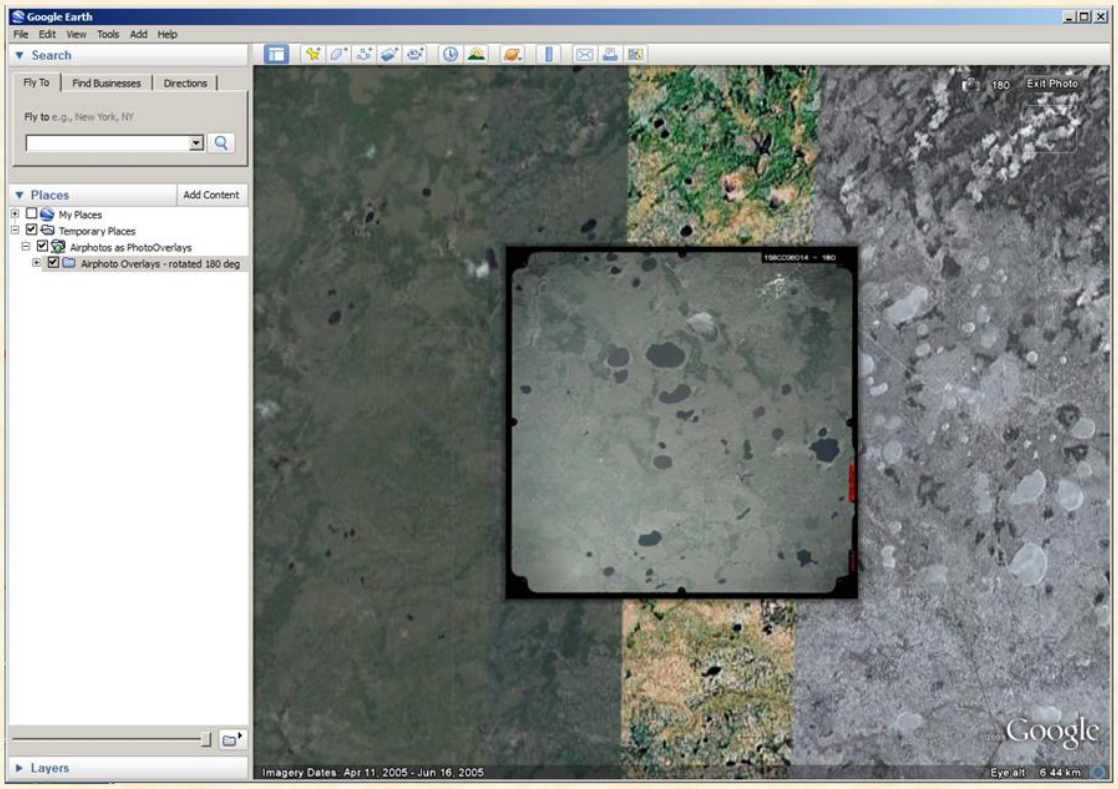
Airphotos as point placemarks


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., Reservoir Rd. Clayville, NY
Places
Add Content
My Places
Temporary Places
Three Renderings of Airphotos
Airphotos as Placemarks
Airphoto Images (2006)
Scanned or Digital Airphoto Centres (2006)
All Airphoto Centres (2006)
Flight Lines (2006)
Airphotos as PhotoOverlays
Airphoto Overlays - rotated 180 deg
Airphotos as a Report
Dec 31, 2005
Dec 2005
Dec 2006
15BCC06014
15BCC06013
180

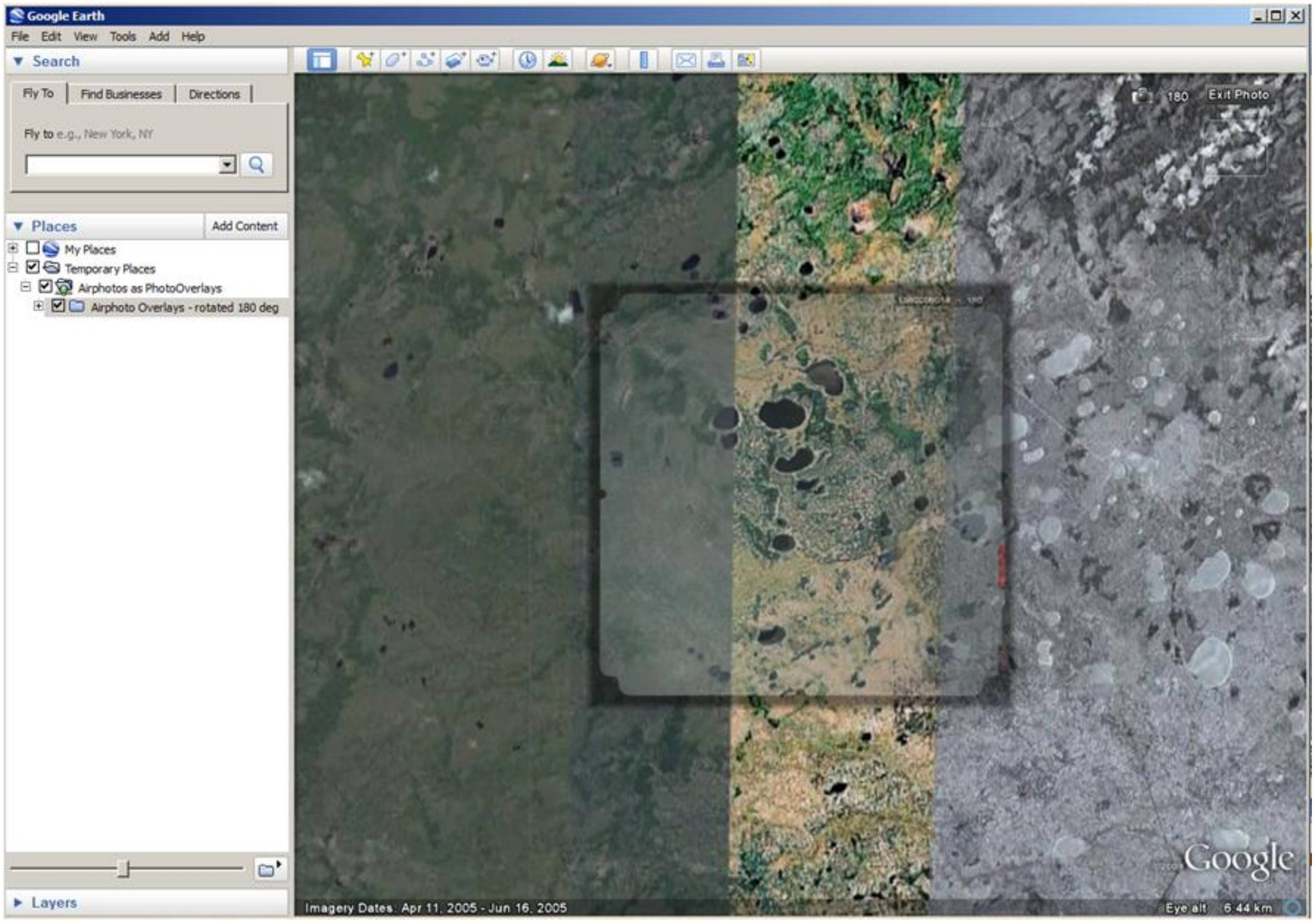
Roll: bcc06014
Frame: 180
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.045

Now we're going to look at three different ways to display the same data using custom templates in MapServer 6.0. In this first example, each airphoto is a placemark with the photo year attribute mapped to a KML TimeSpan element so the time slider will display the photos throughout the 2006 range on the slider. GeoServer can generate placemarks with time stamps but not time spans.

Airphotos as photo overlays

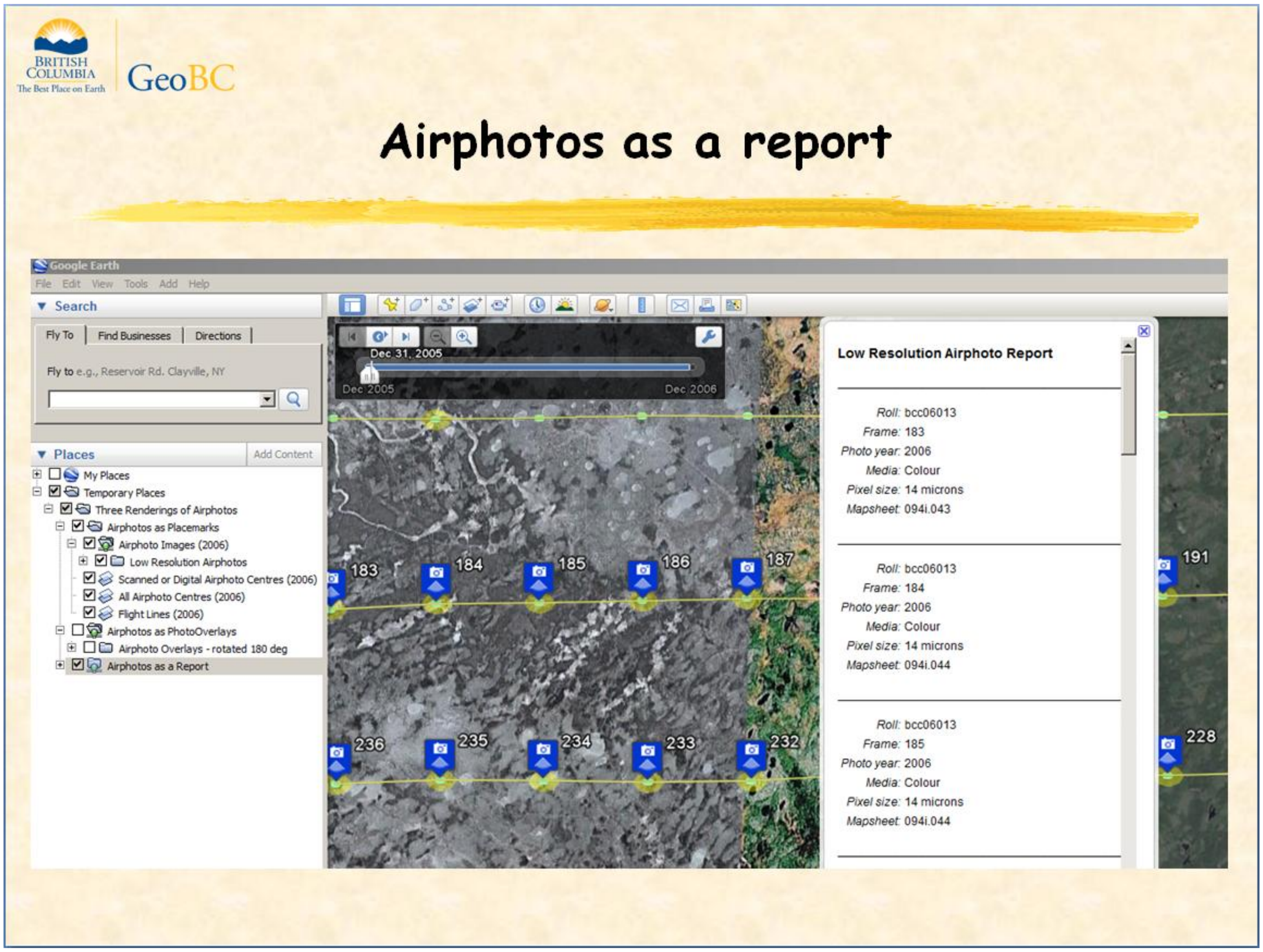

Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., New York, NY
Places
Add Content
My Places
Temporary Places
Airphotos as PhotoOverlays
Airphoto Overlays - rotated 180 deg
Layers
180
Exit Photo
Google
Imagery Dates: Apr 11, 2005 - Jun 16, 2005
Eye alt 6.44 km

And here’s an example of airphotos as photoOverlays you can pan,zoom, ...


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., New York, NY
Places
Add Content
My Places
Temporary Places
Airphotos as PhotoOverlays
Airphoto Overlays - rotated 180 deg
Layers
180
Exit Photo
Google
Imagery Dates: Apr 11, 2005 - Jun 16, 2005
Eye alt 6.44 km

...And compare to the backdrop using the transparency slider in Google Earth.

GeoServer doesn’t support PhotoOverlay output.



Airphotos as a report

Low Resolution Airphoto Report

Roll: bcc06013
Frame: 183
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.043

Roll: bcc06013
Frame: 184
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.044

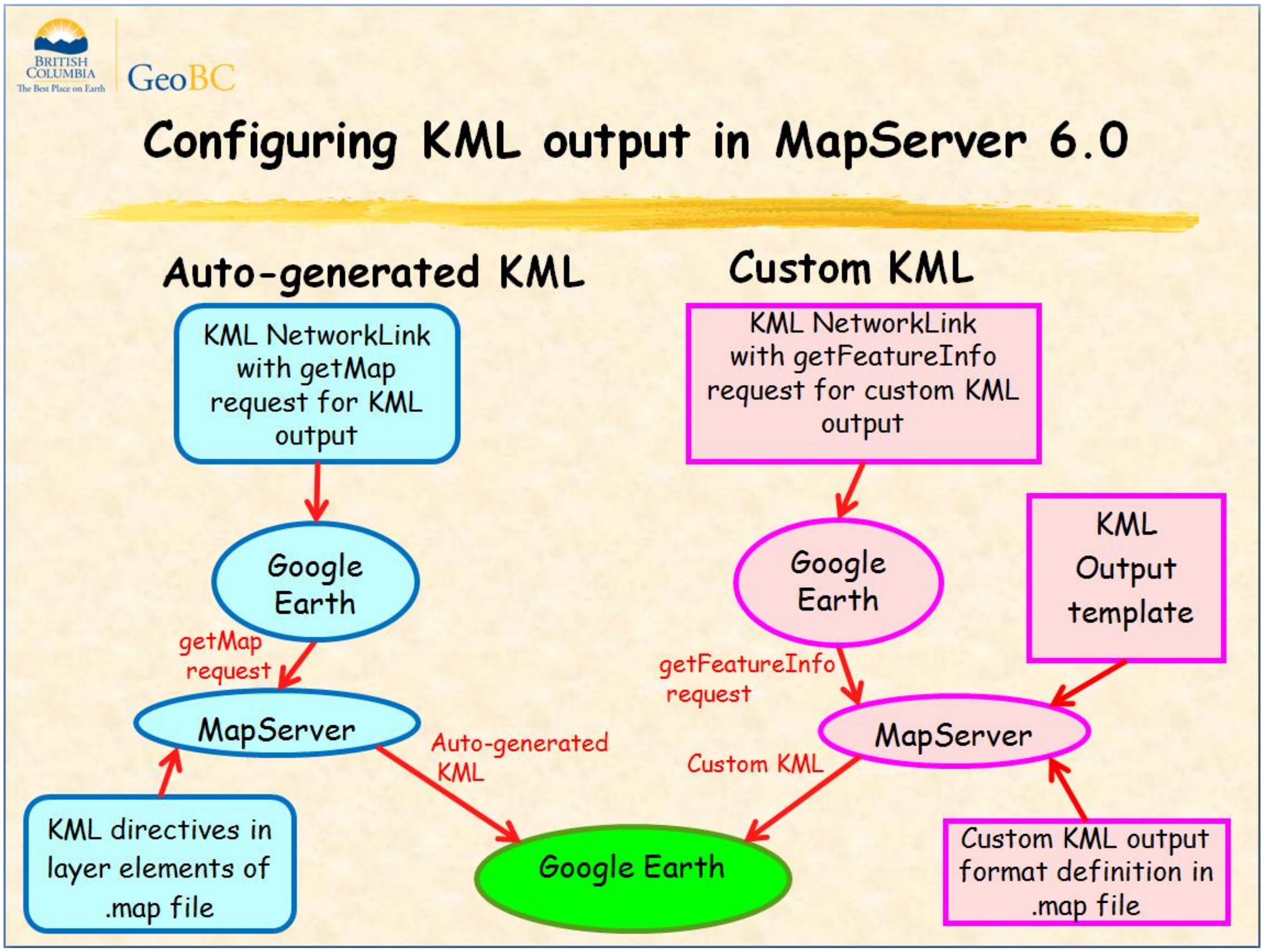
Roll: bcc06013
Frame: 185
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.044

And here's an example of an attribute report that automatically pops up in a balloon every time the camera stops.

The description element of the balloon contains attribute information for all features within the current map view. Each time you pan and zoom, a new report is generated. The report includes a LookAt element so you can save the report, reload it at some time in the future, and zoom to the report's spatial extent again.

This example also shows how custom KML output is future proof. The BalloonVisible element specifies a KML feature should have its balloon visible when first opened and is a proprietary extension that is new to Google Earth v5.1. We can use it in our template now whereas GeoServer users will have to wait until it is supported in a new GeoServer release.

GeoServer doesn't support the output of a KML feature with a table in a description element that contains the attributes of all selected features.



BRITISH COLUMBIA The Best Place on Earth
GeoBC
Configuring KML output in MapServer 6.0
Auto-generated KML
Custom KML
KML NetworkLink with getMap request for KML output
Google Earth
getMap request
MapServer
Auto-generated KML
KML directives in layer elements of .map file
Google Earth
KML NetworkLink with getFeatureInfo request for custom KML output
Google Earth
KML Output template
getFeatureInfo request
MapServer
Custom KML
Custom KML output format definition in .map file

To get KML out of MapServer 6.0, you need to create a KML network link in Google Earth that makes either a getMap request or a getFeatureInfo request. The getMap request should specify an output format of KML. The getFeatureInfo request should specify the name of the output format you've defined in your .map file that calls your custom KML output template.

When a getMap request is received, MapServer will generate placemarks based on the existing styles defined in your .map file. To refine the output, you can add metadata elements to the layer definitions in your .map file. These elements control what attributes are displayed, how they are formatted, whether vectors or a single raster is returned, etc. Placemark elements not supported include TimeSpan, TimeStamp, LookAt, Camera, and ExtendedData. MapServer won't generate a legend but GeoServer will.

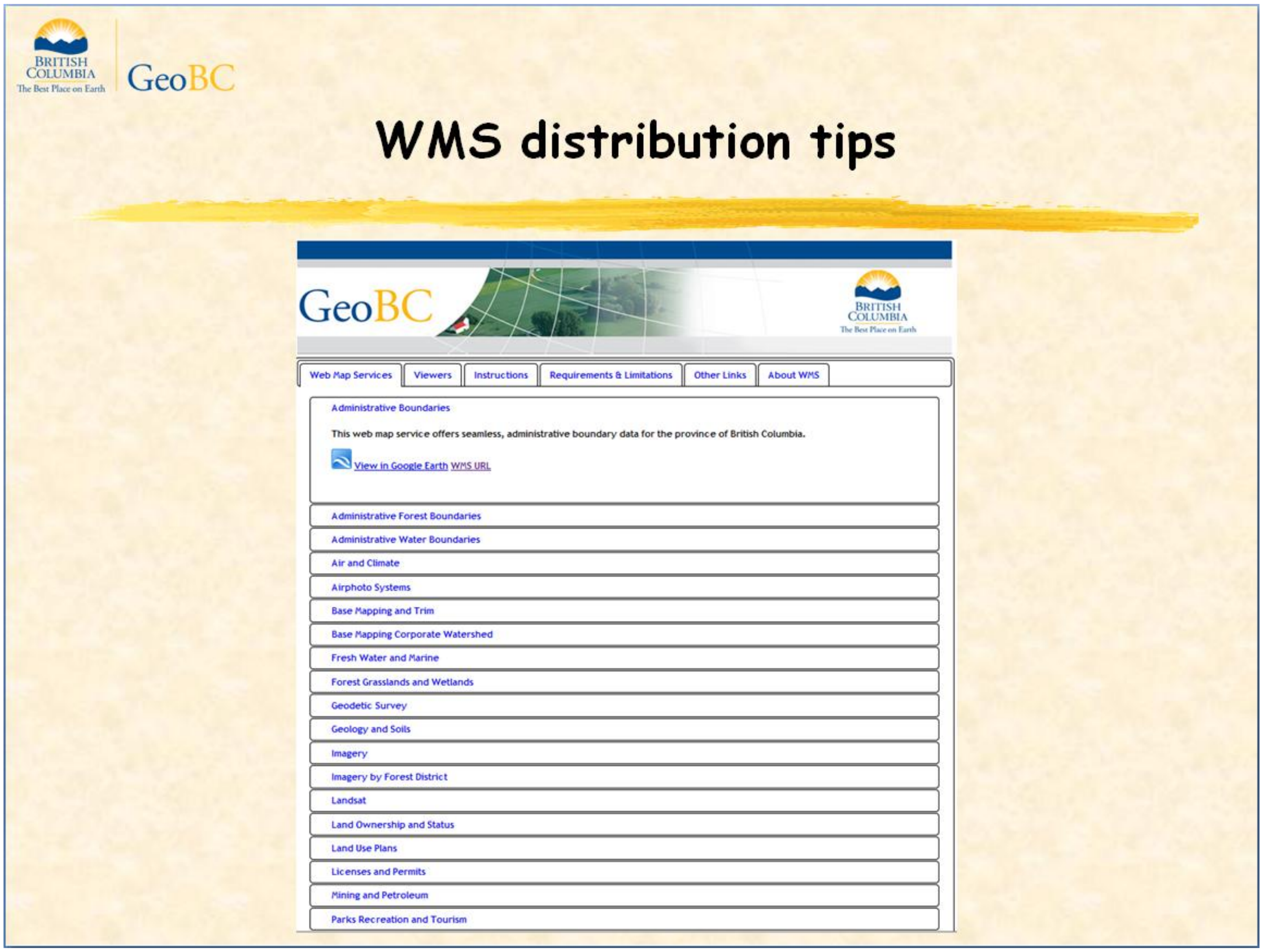
When a getFeature request is received, MapServer will look for an output format definition that matches the output format parameter in the request. If found, it will then generate kml based on the output template you've defined. This template must specify all aspects of styling and feature structure but it gives you complete control.

To refine the auto-generated KML, you can define the following layer-level metadata elements in your .map file:

KML_INCLUDE_ITEMS - to list attributes to display using a default table layout
or KML_DESCRIPTION - define layout of Description element; can use HTML
KML_OUTPUTASRASTER "true" - vector layers rendered as a ground overlay with href pointing to generated image.
KML_FOLDER_DISPLAY 'check' | 'radioFolder'| ‘checkOffOnly’ | ‘checkHideChildren’   - can use at map level too
KML_ALTITUDEMODE 'absolute' | 'relativeToGround' | 'clampToGround' - how altitude component of <coordinates> is interpreted
KML_EXTRUDE - if 'true', connect LinearRing to the ground.
KML_TESSELLATE - if 'true', allow polygon to follow terrain.

We advise setting KML_OUTPUTASRASTER to “true” for all map layers then checking each one to see if it impacts Google Earth

Placemark elements not supported include TimeSpan, TimeStamp, LookAt, Camera, and ExtendedData


WMS distribution tips

Administrative Boundaries

This web map service offers seamless, administrative boundary data for the province of British Columbia.

View in Google Earth WMS URL

Administrative Forest Boundaries
Administrative Water Boundaries
Air and Climate
Airphoto Systems
Base Mapping and Trim
Base Mapping Corporate Watershed
Fresh Water and Marine
Forest Grasslands and Wetlands
Geodetic Survey
Geology and Soils
Imagery
Imagery by Forest District
Landsat
Land Ownership and Status
Land Use Plans
Licenses and Permits
Mining and Petroleum
Parks Recreation and Tourism

Create a KML folder for each WMS you want to publish.

In each KML folder, create one of the following choices for each layer in your WMS:

a. A GroundOverlay when no feature identification is required OR

b. A GroundOverlay and a network link containing a getFeatureInfo request for custom kml output OR

c. A network link containing a getMapRequest for KML output..

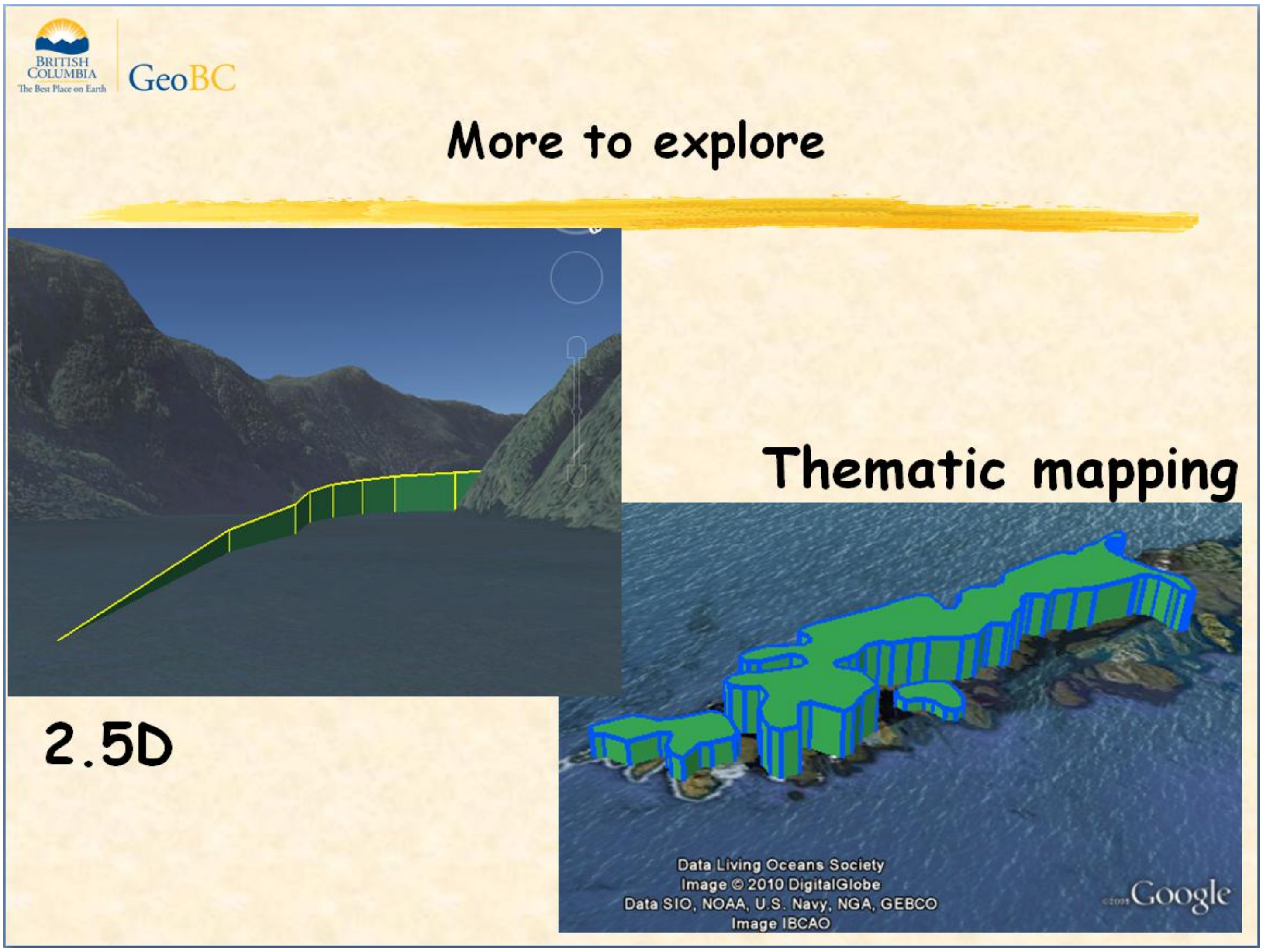
Don't publish your KML folders directly. Provide a KML NetworkLink, to each KML folder. This lets you change the folder of GroundOverlays while ensuring everyone that ever loaded your NetworkLink will get the latest version of the folder the next time they start up Google Earth. This KML NetworkLink is called View in Google Earth in the screenshot shown here.

Create a geo sitemap listing all your WMS services so your users can find your wms in a google search.

Here’s what the NetworkLink to Administrative Forest Boundaries looks like:

```
<?xml version="1.0" encoding="UTF-8"?>
```

```
<kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2"
xmlns:kml="http://www.opengis.net/kml/2.2" xmlns:atom="http://www.w3.org/2005/Atom">

<NetworkLink xsi:schemaLocation="http://www.opengis.net/kml/2.2 ogckml22.xsd">

        <name>BCGov Administrative Forest Boundaries</name>

        <open>1</open>

        <LookAt>

                <longitude>-124.2007629128597</longitude>

                <latitude>54.24685845490458</latitude>

                <altitude>0</altitude>

                <range>1646949.958927546</range>

                <tilt>0</tilt>

                <heading>0.7179964782516244</heading>

                <altitudeMode>relativeToGround</altitudeMode>

        </LookAt>

        <refreshVisibility>1</refreshVisibility>

        <flyToView>1</flyToView>

        <Link>

        <href>http://openmaps.gov.bc.ca/kml/BCGov_Administrative_Forest_Boundaries_WMS.kmz</href>

        </Link>

</NetworkLink>

</kml>
```



Here are some KML elementsthat we plan to test in custom templates this fall:

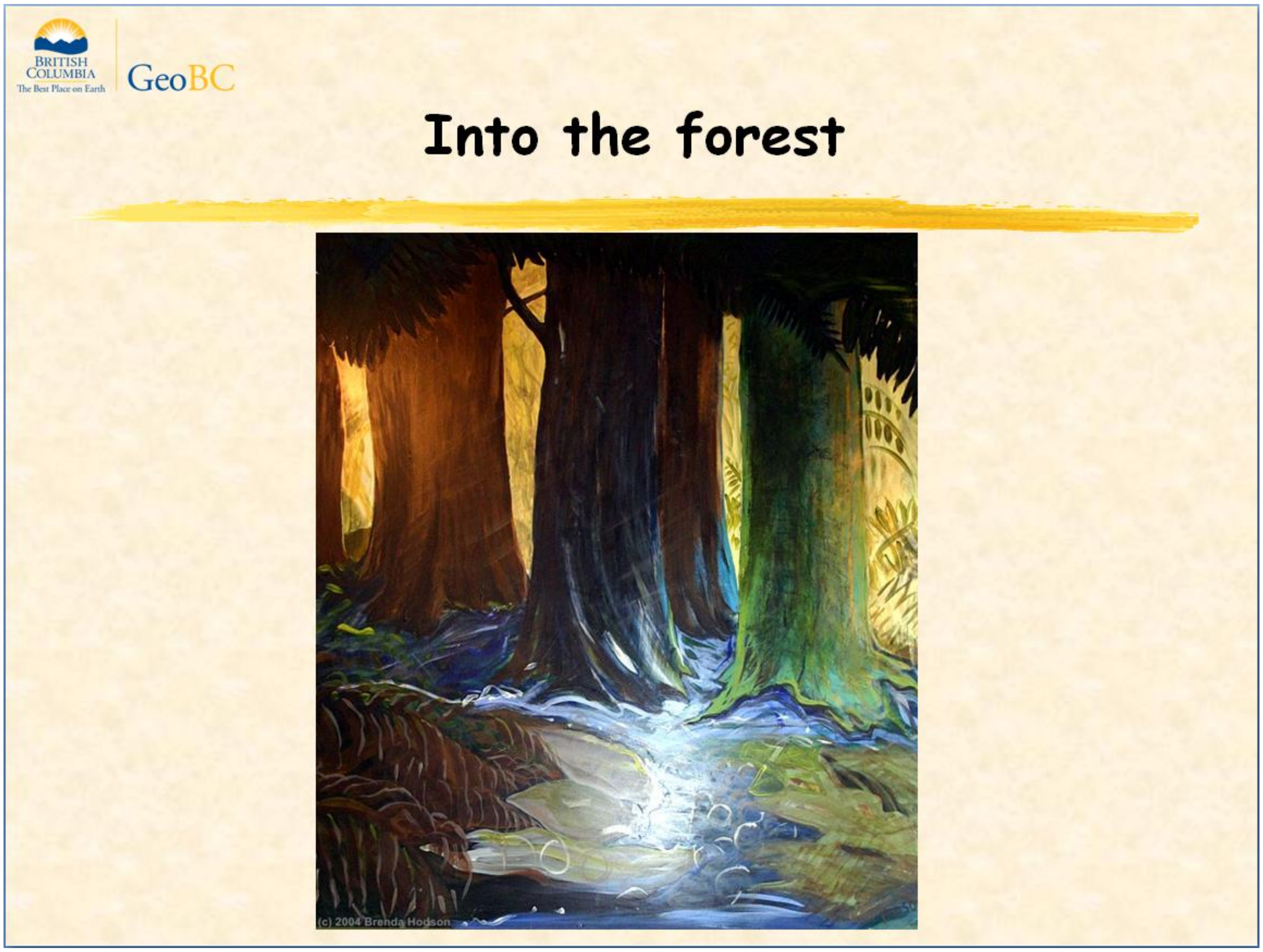
1. 2.5D features (e.g., with x,y,z coordinates), This example shows the world's largest water ski ramp as an extruded 2.5D linestring. 2.5D is useful for visualizing 3D stereo digitized roads, streams, elevation surfaces (e.g., TINs) and other topographic features.

2. Thematic mapping. Height can be mapped to an attribute value, in this case, park area.

3. Models (e.g., buildings)

4. Tracks (new in GE 5.2)

5. Tours (new in GE 5.1)

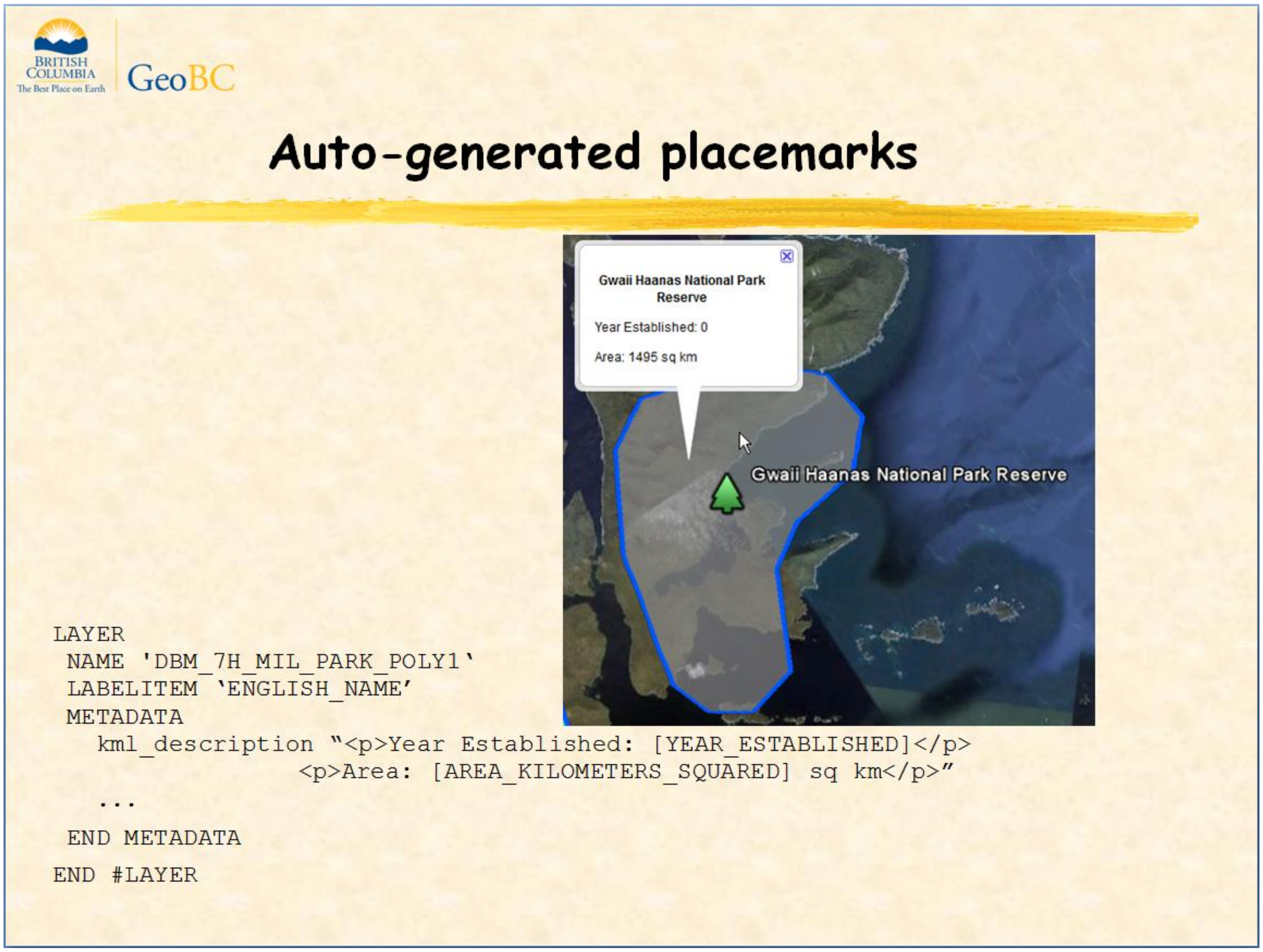


Into the forest

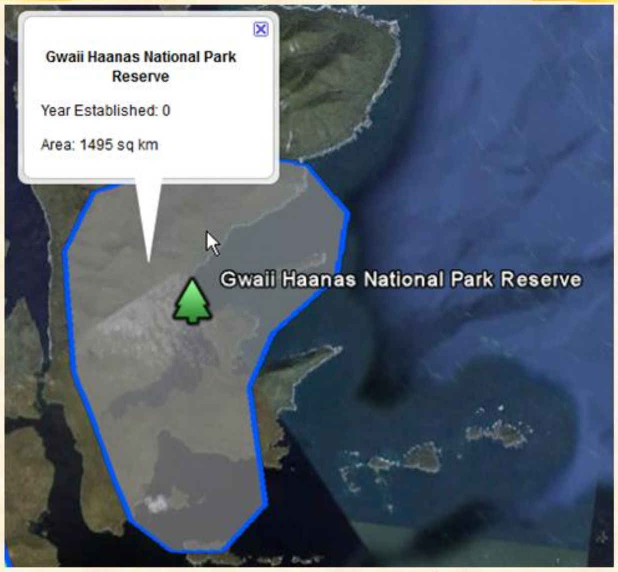
To summarize so far, Google Earth is a pretty solid wms platform. Its major weakness is the oblique angle disappearing trick.

MapServer can support KML output quite nicely in both GroundOverlay and Placemark forms. It lets you configure auto-generated KML output for thousands of WMS layers with minimal effort. For WMS layers that require complete control over KML output, custom templates can be used. GeoServer doesn't offer this level of control.

Now, if there’s time and inclination, we can wander into the deep forest of kml and mapserver configuration details. Otherwise, feel free to explore the rest of the slides on your own.



Auto-generated placemarks

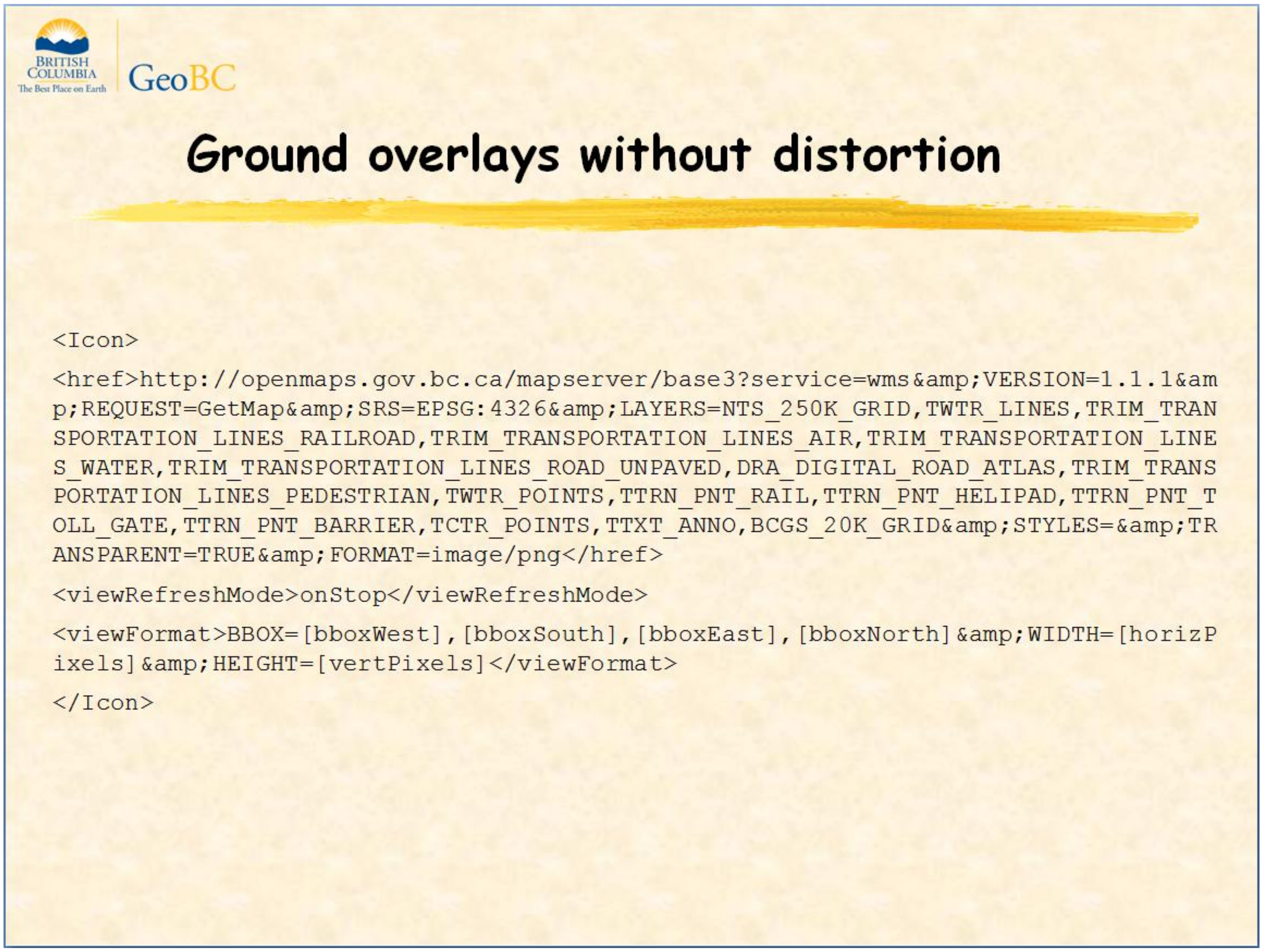

Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve

Year Established: 0

Area: 1495 sq km

```
LAYER
 NAME 'DBM_7H_MIL_PARK_POLY1'
 LABELITEM 'ENGLISH_NAME'
 METADATA
   kml_description "<p>Year Established: [YEAR_ESTABLISHED]</p>
                    <p>Area: [AREA_KILOMETERS_SQUARED] sq km</p>"
   ...
 END METADATA
END #LAYER
```

Here's an example of using the kml_description metadata tag in a map layer definition to specify the content and layout of balloon text in placemarks. The value of the ENGLISH_NAME attribute will be used as the icon label.



BRITISH COLUMBIA
The Best Place on Earth
GeoBC

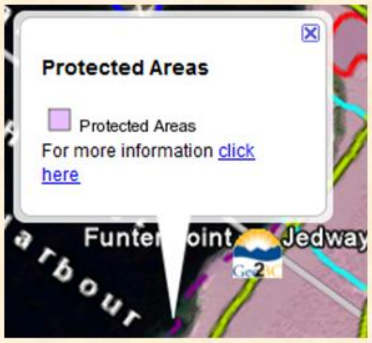
Ground overlays without distortion

```
<Icon>
<href>http://openmaps.gov.bc.ca/mapserver/base3?service=wms&amp;VERSION=1.1.1&am
p;REQUEST=GetMap&amp;SRS=EPSG:4326&amp;LAYERS=NTS_250K_GRID,TWTR_LINES,TRIM_TRAN
SPORTATION_LINES_RAILROAD,TRIM_TRANSPORTATION_LINES_AIR,TRIM_TRANSPORTATION_LINE
S_WATER,TRIM_TRANSPORTATION_LINES_ROAD_UNPAVED,DRA_DIGITAL_ROAD_ATLAS,TRIM_TRANS
PORTATION_LINES_PEDESTRIAN,TWTR_POINTS,TTRN_PNT_RAIL,TTRN_PNT_HELIPAD,TTRN_PNT_T
OLL_GATE,TTRN_PNT_BARRIER,TCTR_POINTS,TTXT_ANNO,BCGS_20K_GRID&amp;STYLES=&amp;TR
ANSPARENT=TRUE&amp;FORMAT=image/png</href>
<viewRefreshMode>onStop</viewRefreshMode>
<viewFormat>BBOX=[bboxWest],[bboxSouth],[bboxEast],[bboxNorth]&amp;WIDTH=[horizP
ixels]&amp;HEIGHT=[vertPixels]</viewFormat>
</Icon>
```

In the icon element of a GroundOverlay, instead of specifying constant width and height values in the href element, define a <viewFormat> element that tells google earth to set the width and height to the number of horizontal and vertical pixels in the current map view.

BRITISH COLUMBIA
The Best Place on Earth
GeoBC

Legends as balloons

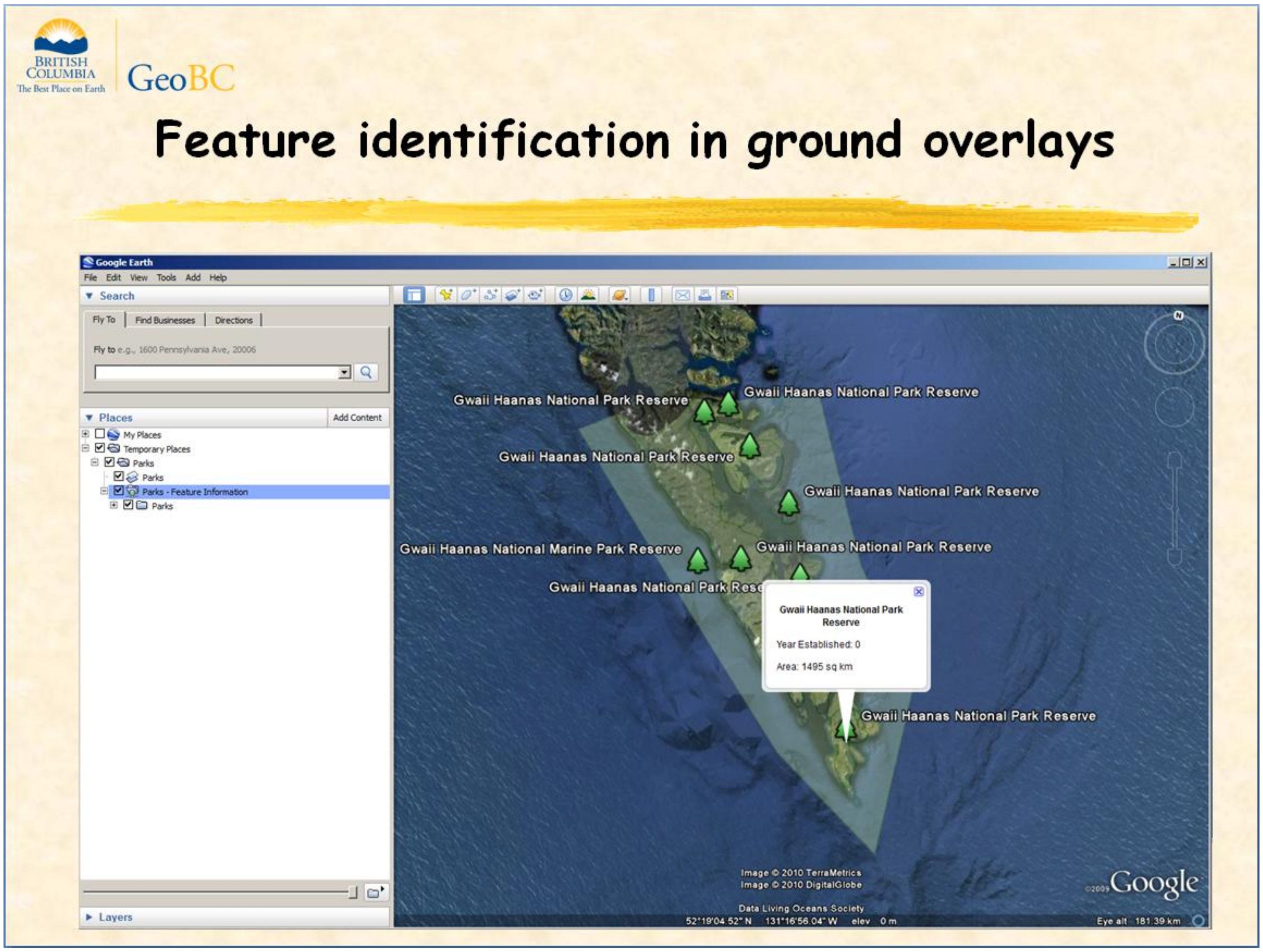

Protected Areas

▨ Protected Areas
For more information click here

```
<description>
   <![CDATA[<img src="http://openmaps.gov.bc.ca/mapserver/parks-and-recreation?
service=wms&version=1.1.1&service=WMS&request=GetLegendGraphic&layer=TA_PARK_EC
ORES_PA_PROTECTED_C&format=image/png"><br>


For more information <A
HREF="https://apps.gov.bc.ca/pub/geometadata/metadataDetail.do?recordUID=54259&
recordSet=ISO19115">click here</A></P>]]>


</description>
```

You can use getLegendGraphic requests to construct a legend in the Description element.

You can also include a metadata hyperlink.



Feature identification in ground overlays

British Columbia
The Best Place on Earth
GeoBC
Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 1600 Pennsylvania Ave, 20006
Places
Add Content
My Places
Temporary Places
Parks
Parks
Parks - Feature Information
Parks
Layers
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Marine Park Reserve
Gwaii Haanas National Park Reserve
Gwaii Haanas National Park Rese
Gwaii Haanas National Park Reserve
Image © 2010 TerraMetrics
Image © 2010 DigitalGlobe
Data Living Oceans Society
52°19'04.52" N 131°16'56.04" W elev 0 m
©2009 Google
Eye alt 181.39 km

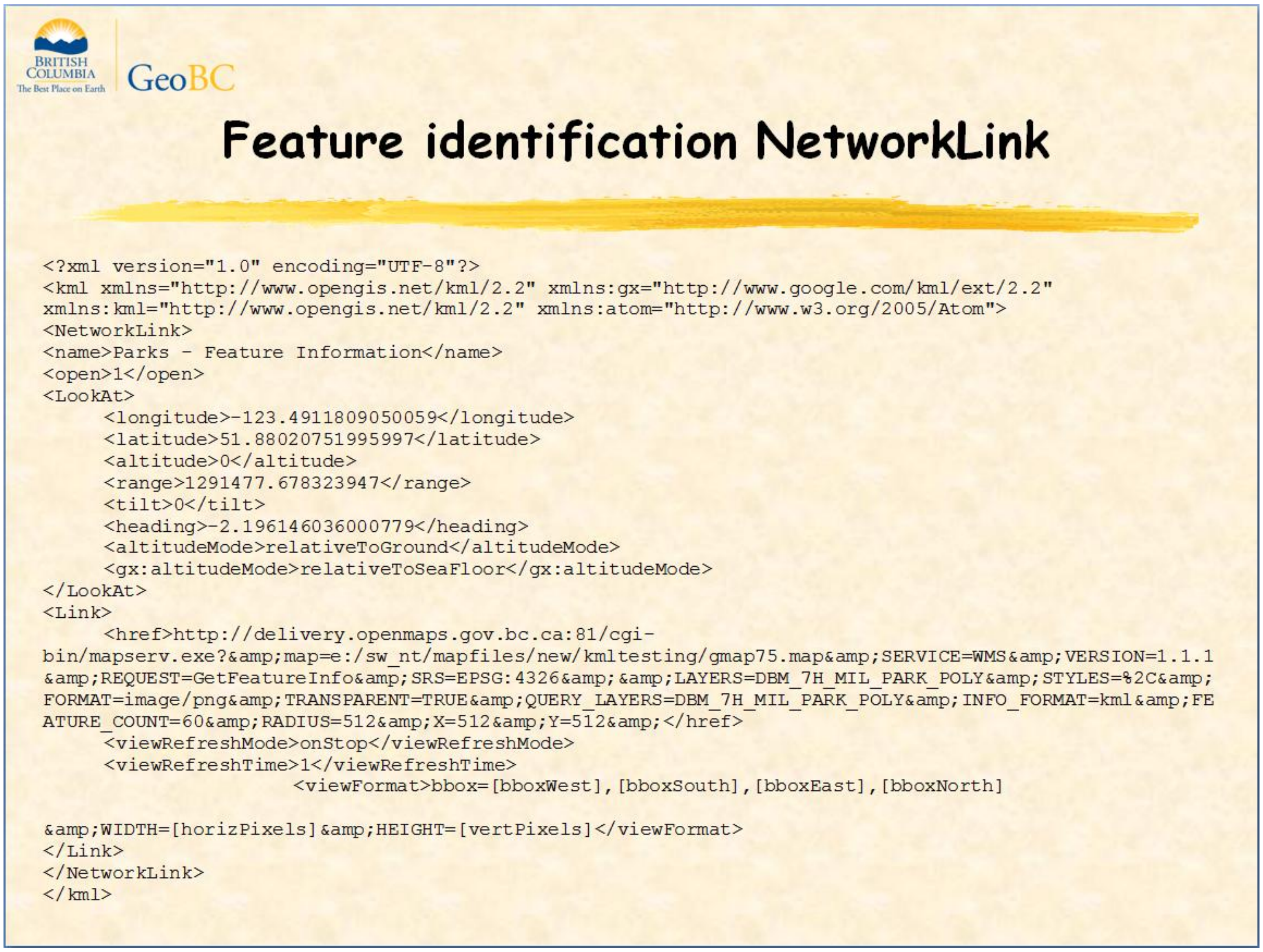
Gwaii Haanas National Park Reserve

Year Established: 0

Area: 1495 sq km

Let’s take a look at the network link and kml output template needed to get feature identification to work.

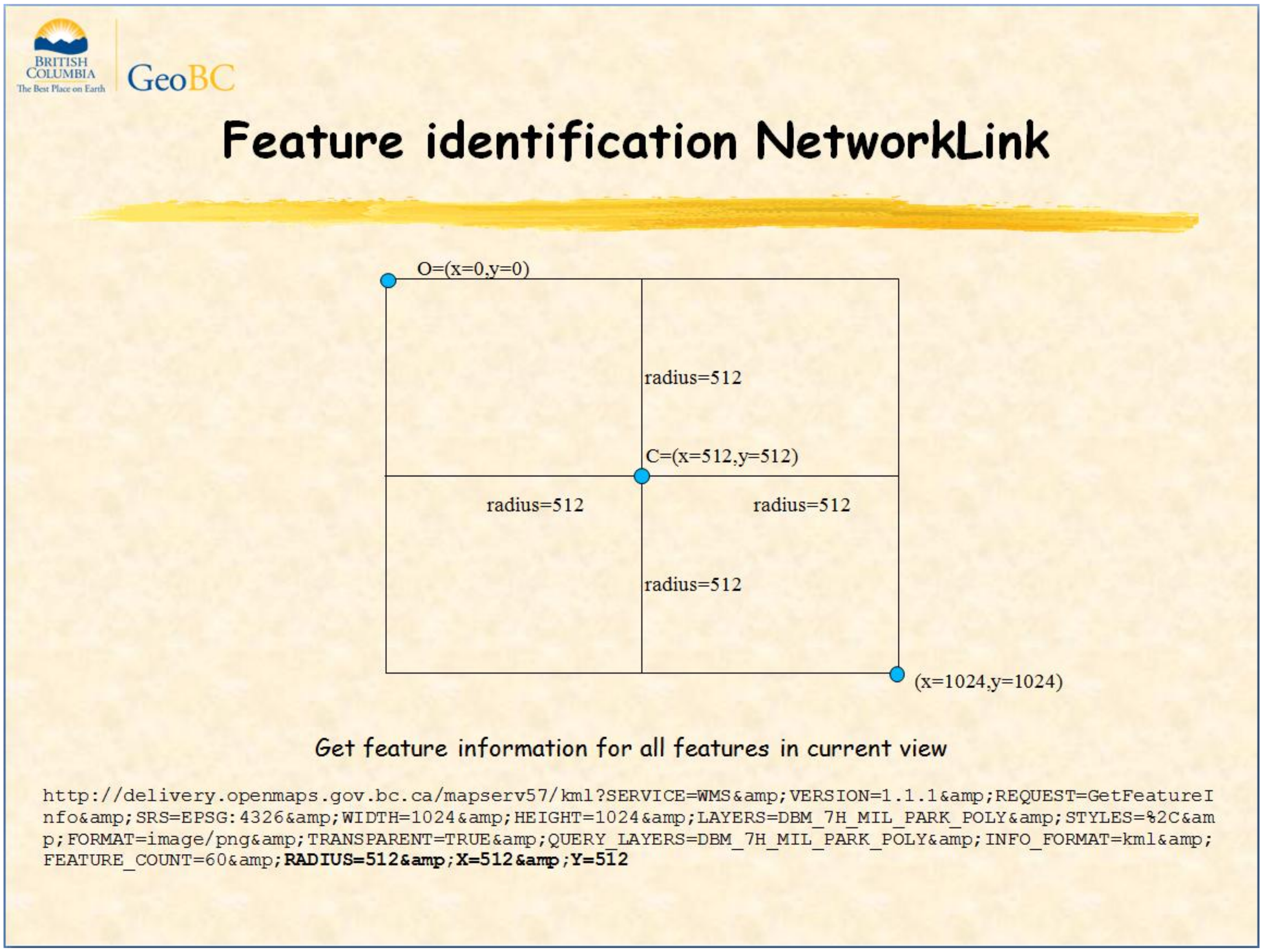
The network link name is highlighted in blue...



Feature identification NetworkLink

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2"
xmlns:kml="http://www.opengis.net/kml/2.2" xmlns:atom="http://www.w3.org/2005/Atom">
<NetworkLink>
<name>Parks - Feature Information</name>
<open>1</open>
<LookAt>
      <longitude>-123.4911809050059</longitude>
      <latitude>51.88020751995997</latitude>
      <altitude>0</altitude>
      <range>1291477.678323947</range>
      <tilt>0</tilt>
      <heading>-2.196146036000779</heading>
      <altitudeMode>relativeToGround</altitudeMode>
      <gx:altitudeMode>relativeToSeaFloor</gx:altitudeMode>
</LookAt>
<Link>
      <href>http://delivery.openmaps.gov.bc.ca:81/cgi-
bin/mapserv.exe?&amp;map=e:/sw_nt/mapfiles/new/kmltesting/gmap75.map&amp;SERVICE=WMS&amp;VERSION=1.1.1
&amp;REQUEST=GetFeatureInfo&amp;SRS=EPSG:4326&amp;&amp;LAYERS=DBM_7H_MIL_PARK_POLY&amp;STYLES=%2C&amp;
FORMAT=image/png&amp;TRANSPARENT=TRUE&amp;QUERY_LAYERS=DBM_7H_MIL_PARK_POLY&amp;INFO_FORMAT=kml&amp;FE
ATURE_COUNT=60&amp;RADIUS=512&amp;X=512&amp;Y=512&amp;</href>
      <viewRefreshMode>onStop</viewRefreshMode>
      <viewRefreshTime>1</viewRefreshTime>
                    <viewFormat>bbox=[bboxWest],[bboxSouth],[bboxEast],[bboxNorth]

&amp;WIDTH=[horizPixels]&amp;HEIGHT=[vertPixels]</viewFormat>
</Link>
</NetworkLink>
</kml>
```

...And here is the KML definition of the NetworkLink. It contains a getFeatureInfo request.



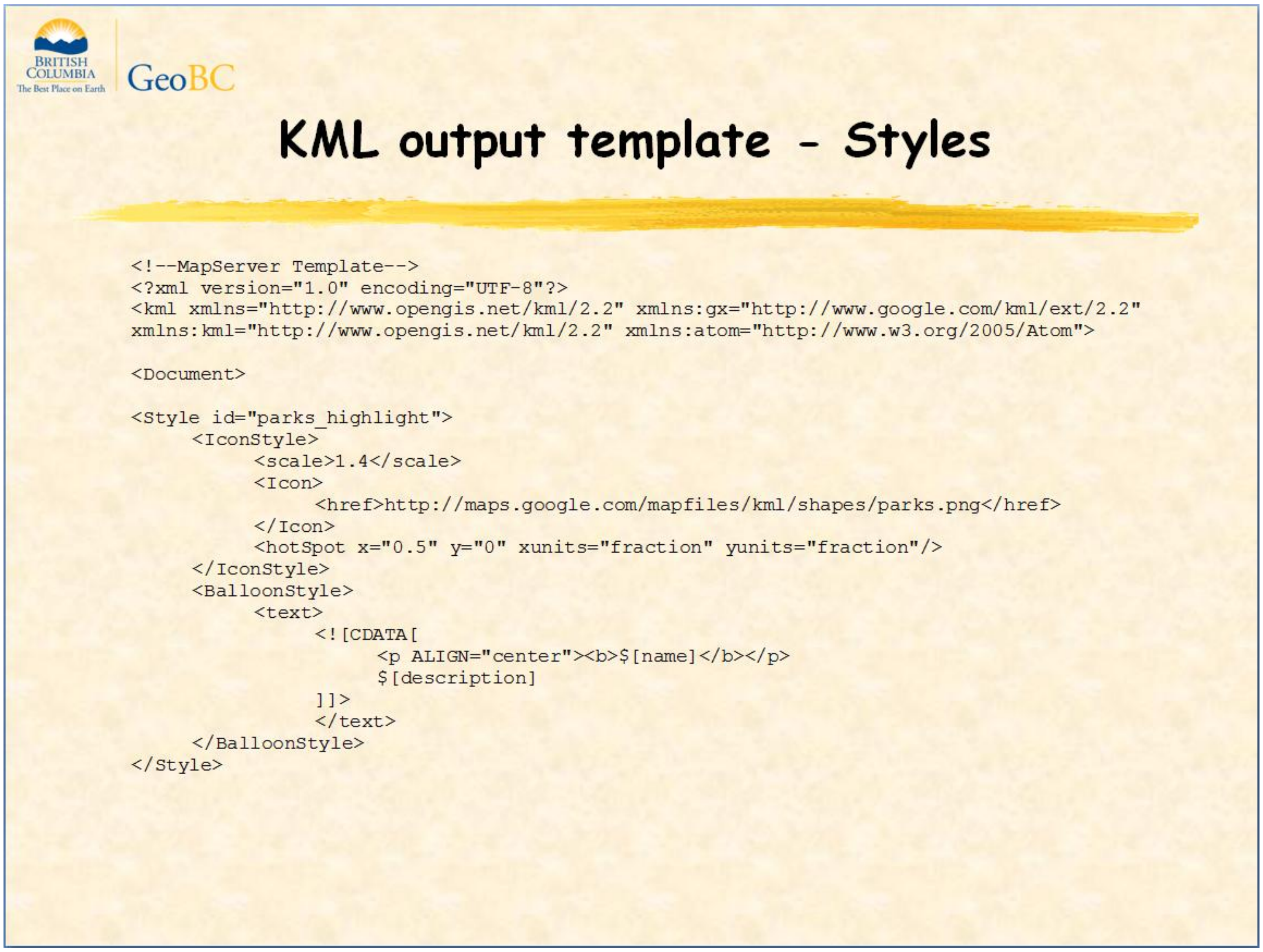
Feature identification NetworkLink

Get feature information for all features in current view

```
http://delivery.openmaps.gov.bc.ca/mapserv57/kml?SERVICE=WMS&amp;VERSION=1.1.1&amp;REQUEST=GetFeatureI
nfo&amp;SRS=EPSG:4326&amp;WIDTH=1024&amp;HEIGHT=1024&amp;LAYERS=DBM_7H_MIL_PARK_POLY&amp;STYLES=%2C&am
p;FORMAT=image/png&amp;TRANSPARENT=TRUE&amp;QUERY_LAYERS=DBM_7H_MIL_PARK_POLY&amp;INFO_FORMAT=kml&amp;
FEATURE_COUNT=60&amp;RADIUS=512&amp;X=512&amp;Y=512
```

Lets look at the radius, x, and y parameters. Usually, our map viewer has a feature identify tool that the user places directly over a given feature and we set the radius to a few pixels in each direction so the user doesn't have to be too precise when positioning the cursor. Since Google Earth doesn't have an Identify tool, we want to set radius, x, and y so that the getFeatureInfo request returns all features within the current view. Given that our requested map dimensions are usually within 1024 x 1024 pixels, we use a centre point of (x=512,y=512) and a radius of 512.

We have asked the MapServer team to support a new parameter SEARCHALLPIXELS. If set to true, would direct MapServer to use WIDTH and HEIGHT instead of RADIUS, X, and Y.



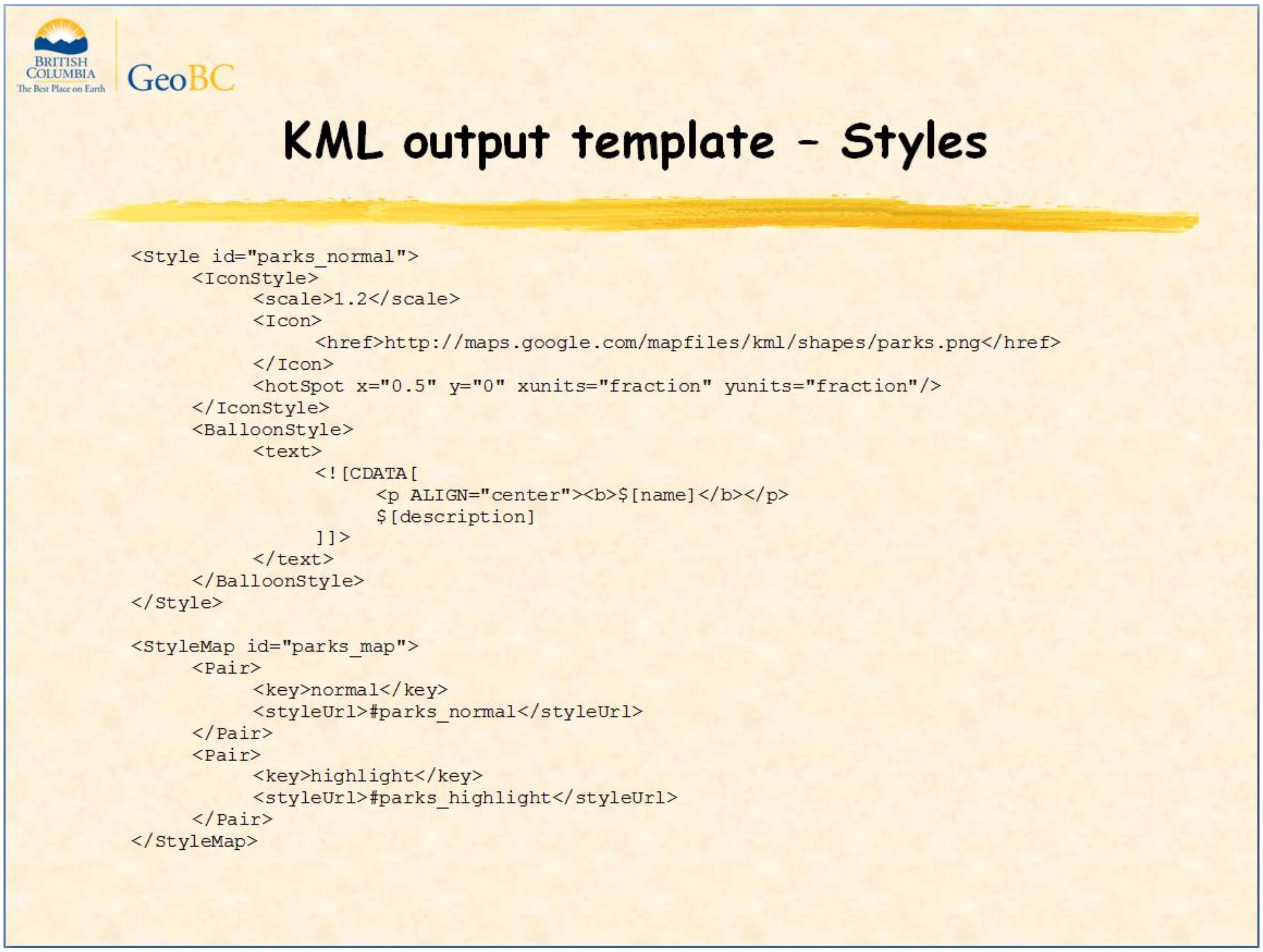
KML output template - Styles

```
<!--MapServer Template-->
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2"
xmlns:kml="http://www.opengis.net/kml/2.2" xmlns:atom="http://www.w3.org/2005/Atom">

<Document>

<Style id="parks_highlight">
     <IconStyle>
          <scale>1.4</scale>
          <Icon>
               <href>http://maps.google.com/mapfiles/kml/shapes/parks.png</href>
          </Icon>
          <hotSpot x="0.5" y="0" xunits="fraction" yunits="fraction"/>
     </IconStyle>
     <BalloonStyle>
          <text>
               <![CDATA[
                    <p ALIGN="center"><b>$[name]</b></p>
                    $[description]
               ]]>
               </text>
     </BalloonStyle>
</Style>
```

... And here is the kml output template

First, there is the magic text that identifies an xml file as a template to MapServer followed by the usual kml header.

Then comes the layer style definitions; Parks highlighted...

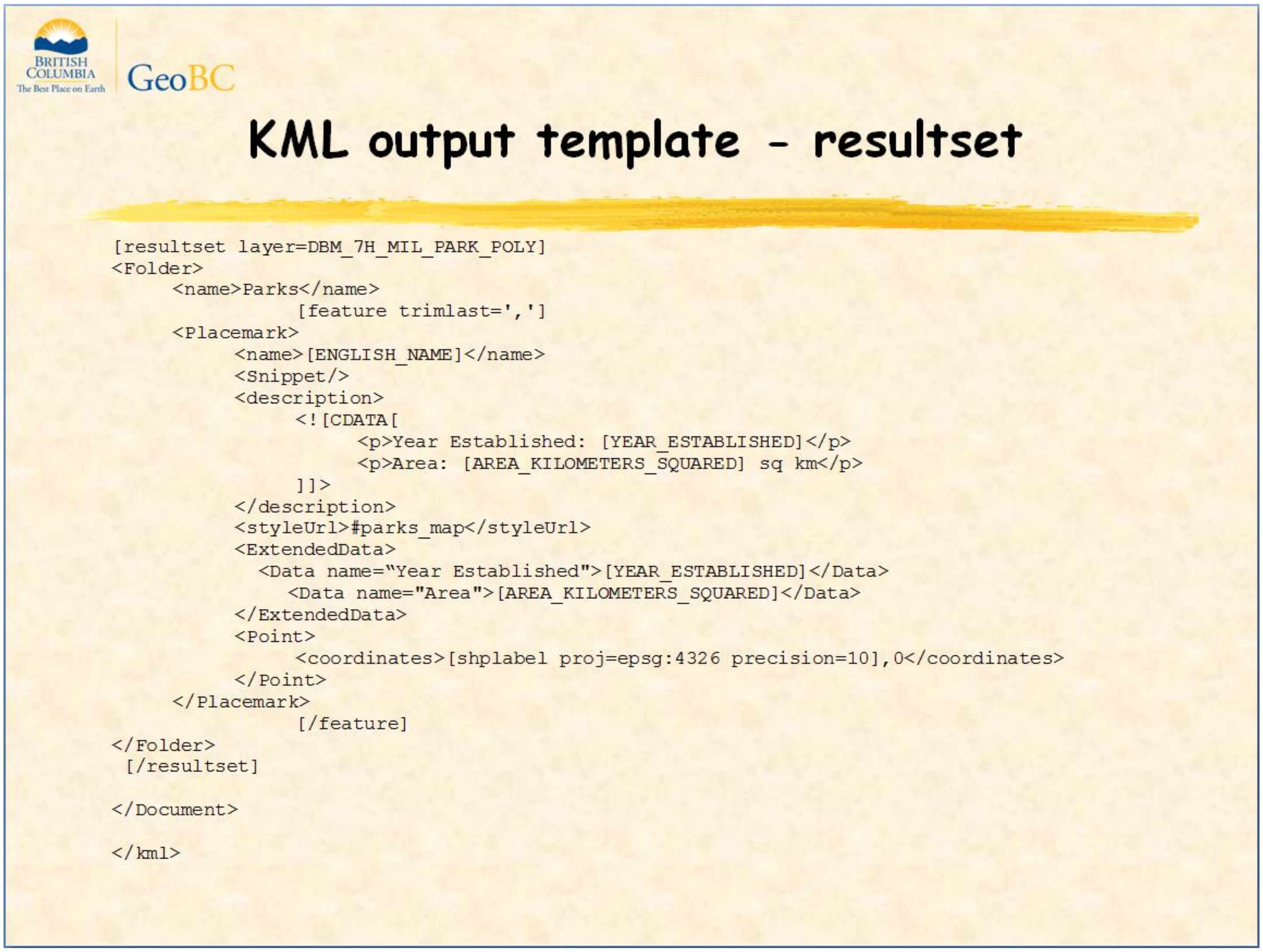


BRITISH COLUMBIA The Best Place on Earth GeoBC

KML output template – Styles

```
<Style id="parks_normal">
     <IconStyle>
          <scale>1.2</scale>
          <Icon>
               <href>http://maps.google.com/mapfiles/kml/shapes/parks.png</href>
          </Icon>
          <hotSpot x="0.5" y="0" xunits="fraction" yunits="fraction"/>
     </IconStyle>
     <BalloonStyle>
          <text>
               <![CDATA[
                    <p ALIGN="center"><b>$[name]</b></p>
                    $[description]
               ]]>
          </text>
     </BalloonStyle>
</Style>

<StyleMap id="parks_map">
     <Pair>
          <key>normal</key>
          <styleUrl>#parks_normal</styleUrl>
     </Pair>
     <Pair>
          <key>highlight</key>
          <styleUrl>#parks_highlight</styleUrl>
     </Pair>
</StyleMap>
```

And Parks normal followed by a style map...


GeoBC

KML output template - resultset

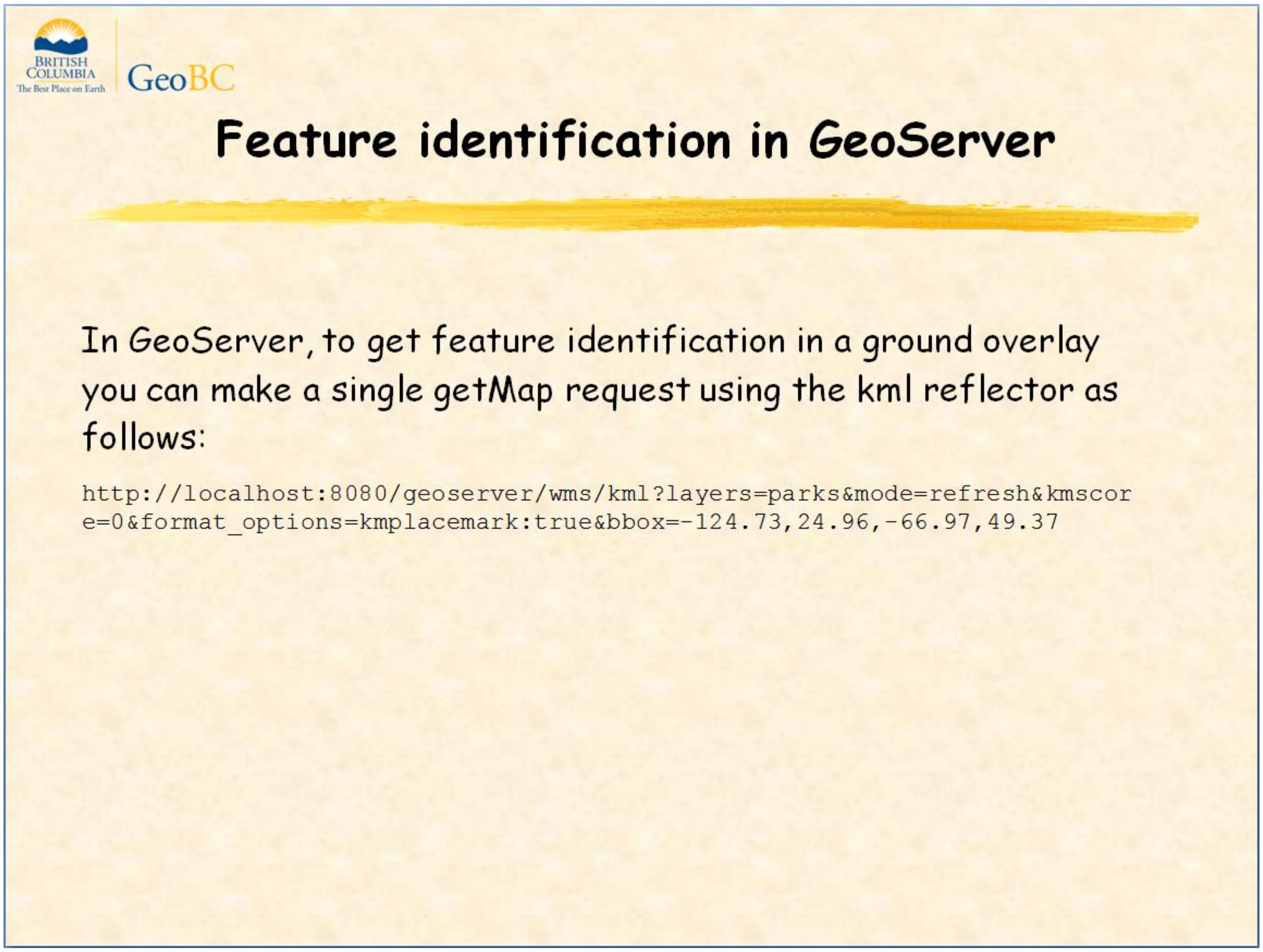
```
[resultset layer=DBM_7H_MIL_PARK_POLY]
<Folder>
     <name>Parks</name>
               [feature trimlast=',']
     <Placemark>
          <name>[ENGLISH_NAME]</name>
          <Snippet/>
          <description>
               <![CDATA[
                    <p>Year Established: [YEAR_ESTABLISHED]</p>
                    <p>Area: [AREA_KILOMETERS_SQUARED] sq km</p>
               ]]>
          </description>
          <styleUrl>#parks_map</styleUrl>
          <ExtendedData>
            <Data name="Year Established">[YEAR_ESTABLISHED]</Data>
               <Data name="Area">[AREA_KILOMETERS_SQUARED]</Data>
          </ExtendedData>
          <Point>
               <coordinates>[shplabel proj=epsg:4326 precision=10],0</coordinates>
          </Point>
     </Placemark>
               [/feature]
</Folder>
 [/resultset]

</Document>

</kml>
```

Each layer in a .map file requires a resultset element. Here’s the resultset for the parks layer.

All macro variables and expressions are enclosed in square brackets.

The [feature] [/feature] tags define a loop that is iterated for each feature found within the radius of the getFeatureInfo request.

The shplabel macro returns the x,y coordinates of where the label should go.



Feature identification in GeoServer

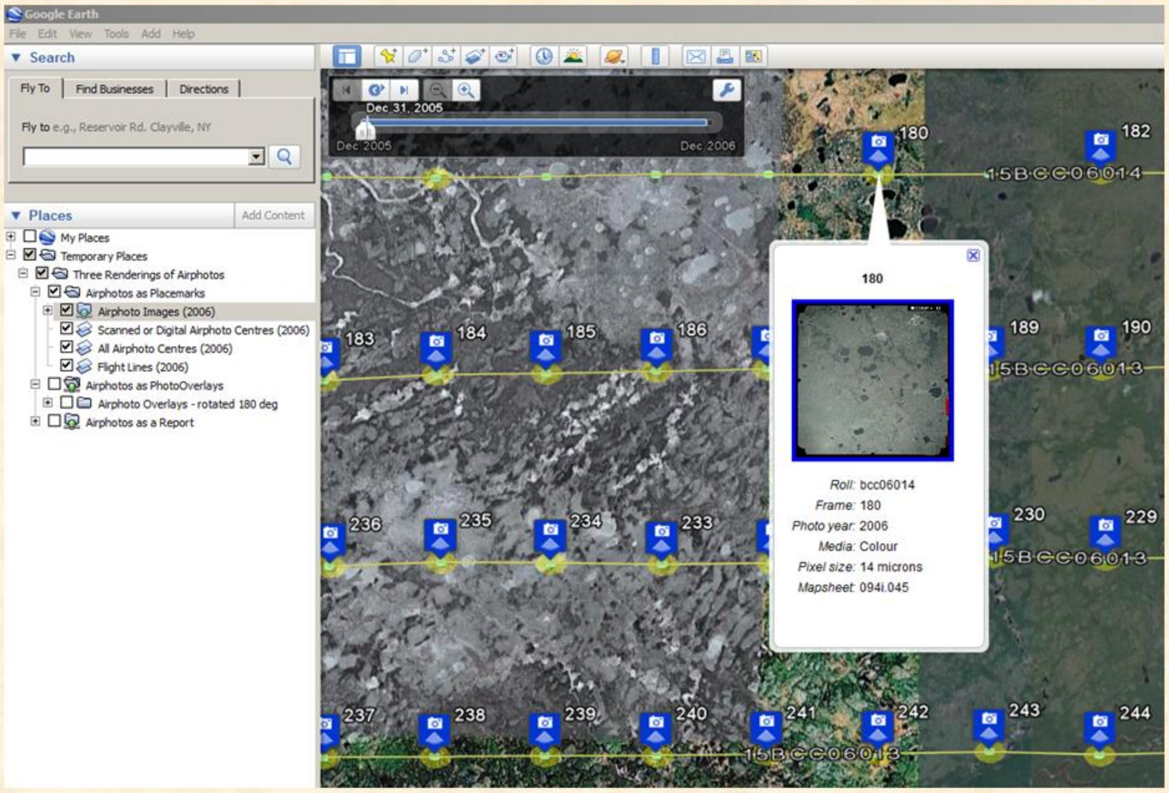
In GeoServer, to get feature identification in a ground overlay you can make a single getMap request using the kml reflector as follows:

```
http://localhost:8080/geoserver/wms/kml?layers=parks&mode=refresh&kmscor
e=0&format_options=kmplacemark:true&bbox=-124.73,24.96,-66.97,49.37
```

Kmplacemark:true instructs GeoServer to label each polygon in the ground overlay with a point placemark containing the non-spatial attributes of the polygon. The contents of the point placemark can be defined by a description.ftl macro containing appropriate html.

Kmscore is the value of a formula based on the number of features selected and can range from 0 to 100. At 0, features are rendered into a single ground overlay. At 100, every feature is returned as a distinct placemark. Other values represent a cutoff level; if below a given number of features selected, placemarks are returned; otherwise a single ground overlay is returned

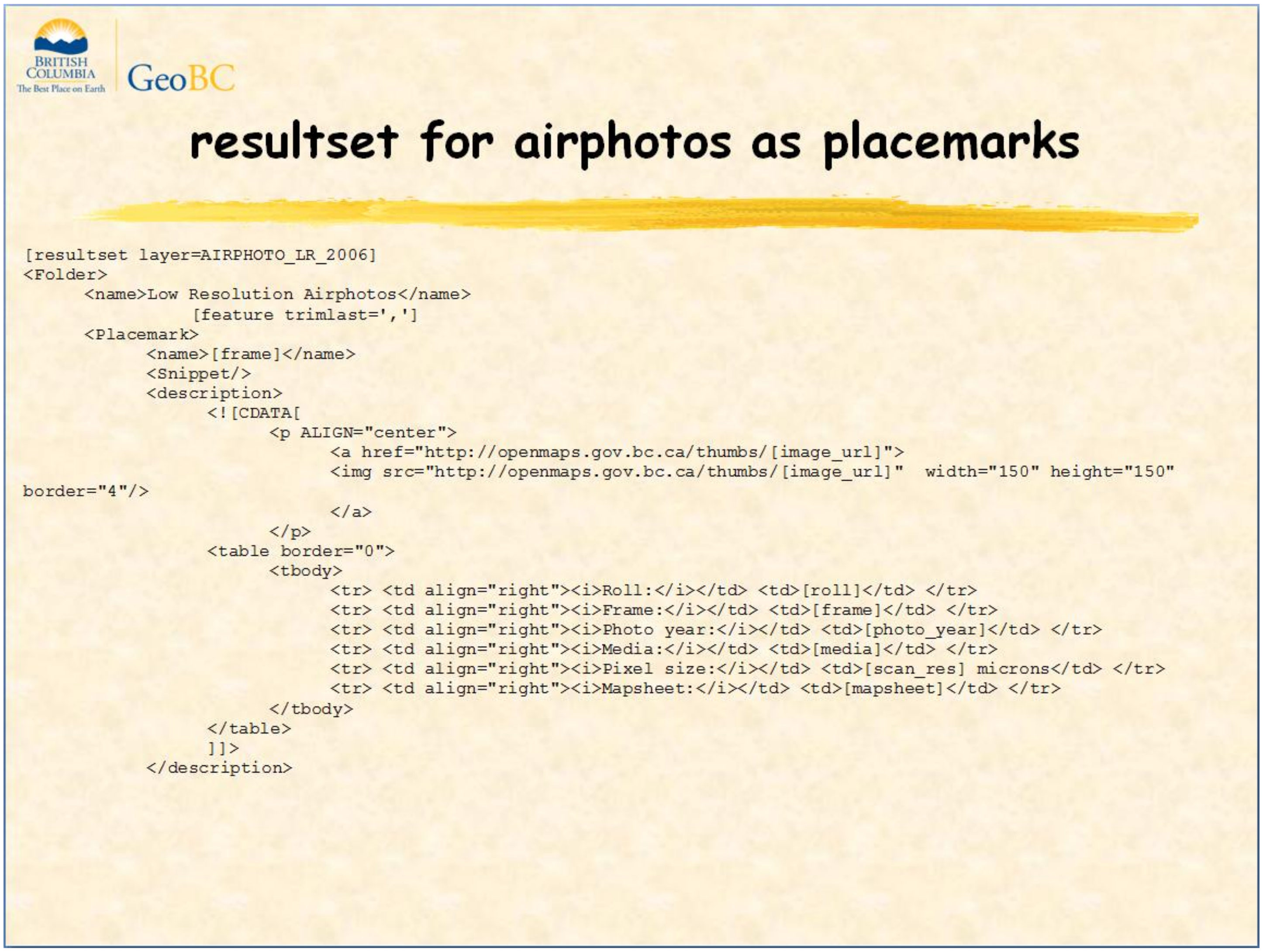
Airphotos as placemarks



180

Roll: bcc06014
Frame: 180
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.045

Now let’s look at the output template for airphotos as point placemarks.

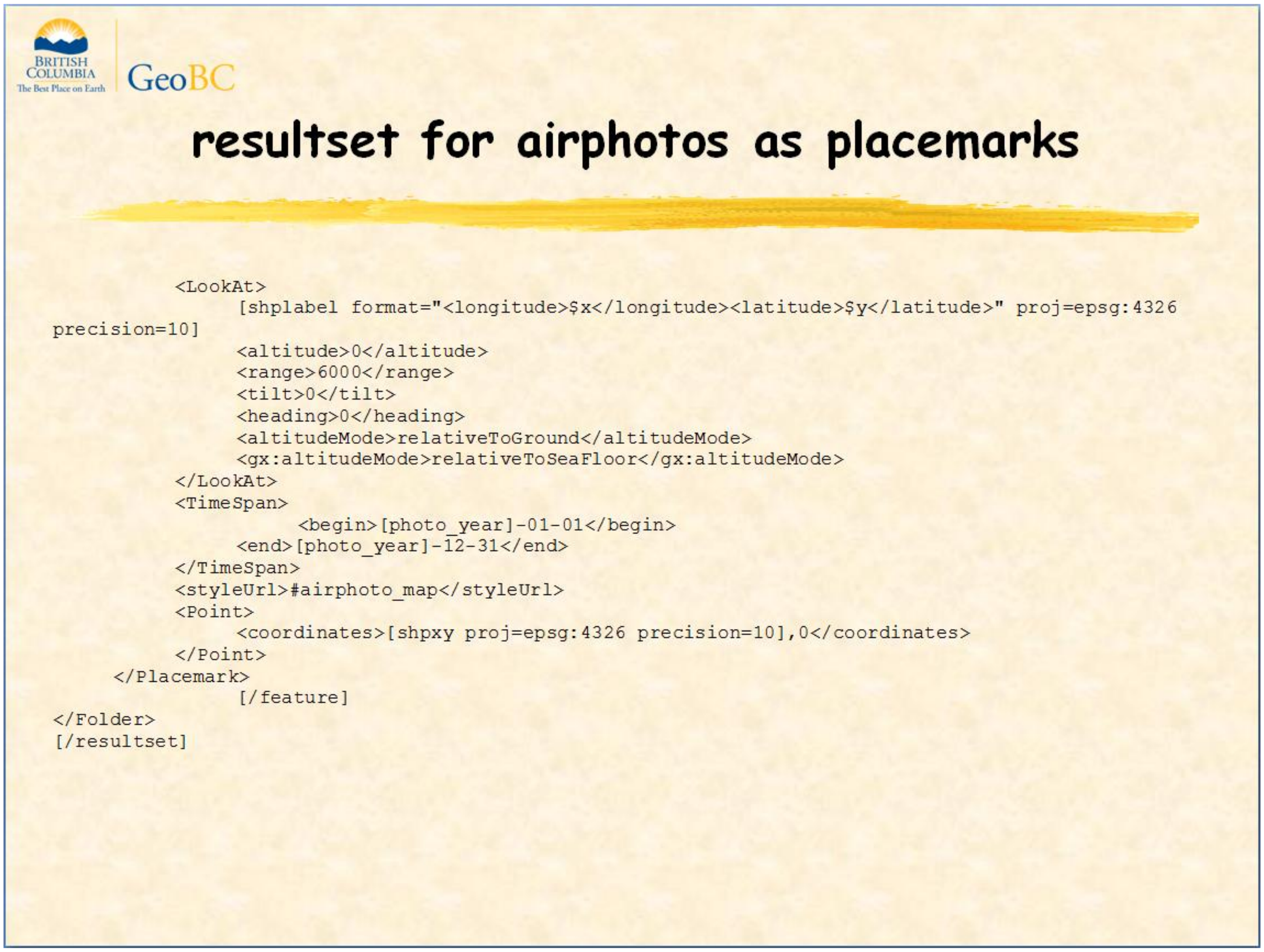


resultset for airphotos as placemarks

```
[resultset layer=AIRPHOTO_LR_2006]
<Folder>
      <name>Low Resolution Airphotos</name>
                [feature trimlast=',']
      <Placemark>
            <name>[frame]</name>
            <Snippet/>
            <description>
                  <![CDATA[
                        <p ALIGN="center">
                              <a href="http://openmaps.gov.bc.ca/thumbs/[image_url]">
                              <img src="http://openmaps.gov.bc.ca/thumbs/[image_url]"  width="150" height="150"
border="4"/>
                              </a>
                        </p>
                  <table border="0">
                        <tbody>
                              <tr> <td align="right"><i>Roll:</i></td> <td>[roll]</td> </tr>
                              <tr> <td align="right"><i>Frame:</i></td> <td>[frame]</td> </tr>
                              <tr> <td align="right"><i>Photo year:</i></td> <td>[photo_year]</td> </tr>
                              <tr> <td align="right"><i>Media:</i></td> <td>[media]</td> </tr>
                              <tr> <td align="right"><i>Pixel size:</i></td> <td>[scan_res] microns</td> </tr>
                              <tr> <td align="right"><i>Mapsheet:</i></td> <td>[mapsheet]</td> </tr>
                        </tbody>
                  </table>
                  ]]>
            </description>
```

This resultset will generate a folder full of placemarks, one for each feature selected. The [feature] element defines the loop around the Placemark definition.

The description element of each placemark will contain an airphoto image url which will load the image into a web browser for printing, and a table of attributes and their values.



resultset for airphotos as placemarks

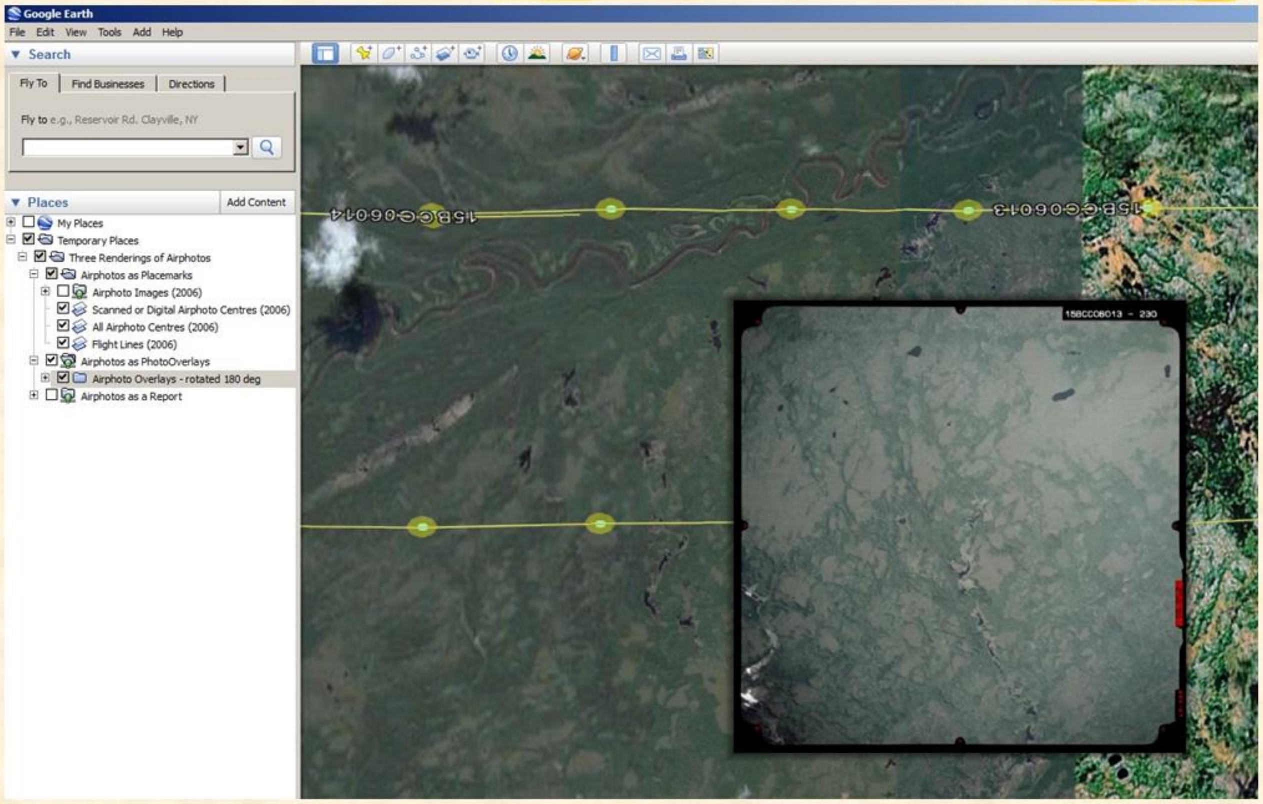
```
          <LookAt>
               [shplabel format="<longitude>$x</longitude><latitude>$y</latitude>" proj=epsg:4326
precision=10]
               <altitude>0</altitude>
               <range>6000</range>
               <tilt>0</tilt>
               <heading>0</heading>
               <altitudeMode>relativeToGround</altitudeMode>
               <gx:altitudeMode>relativeToSeaFloor</gx:altitudeMode>
          </LookAt>
          <TimeSpan>
                    <begin>[photo_year]-01-01</begin>
               <end>[photo_year]-12-31</end>
          </TimeSpan>
          <styleUrl>#airphoto_map</styleUrl>
          <Point>
               <coordinates>[shpxy proj=epsg:4326 precision=10],0</coordinates>
          </Point>
     </Placemark>
               [/feature]
</Folder>
[/resultset]
```

The LookAt element sets the range high enough to match the approximate scale of the airphoto.

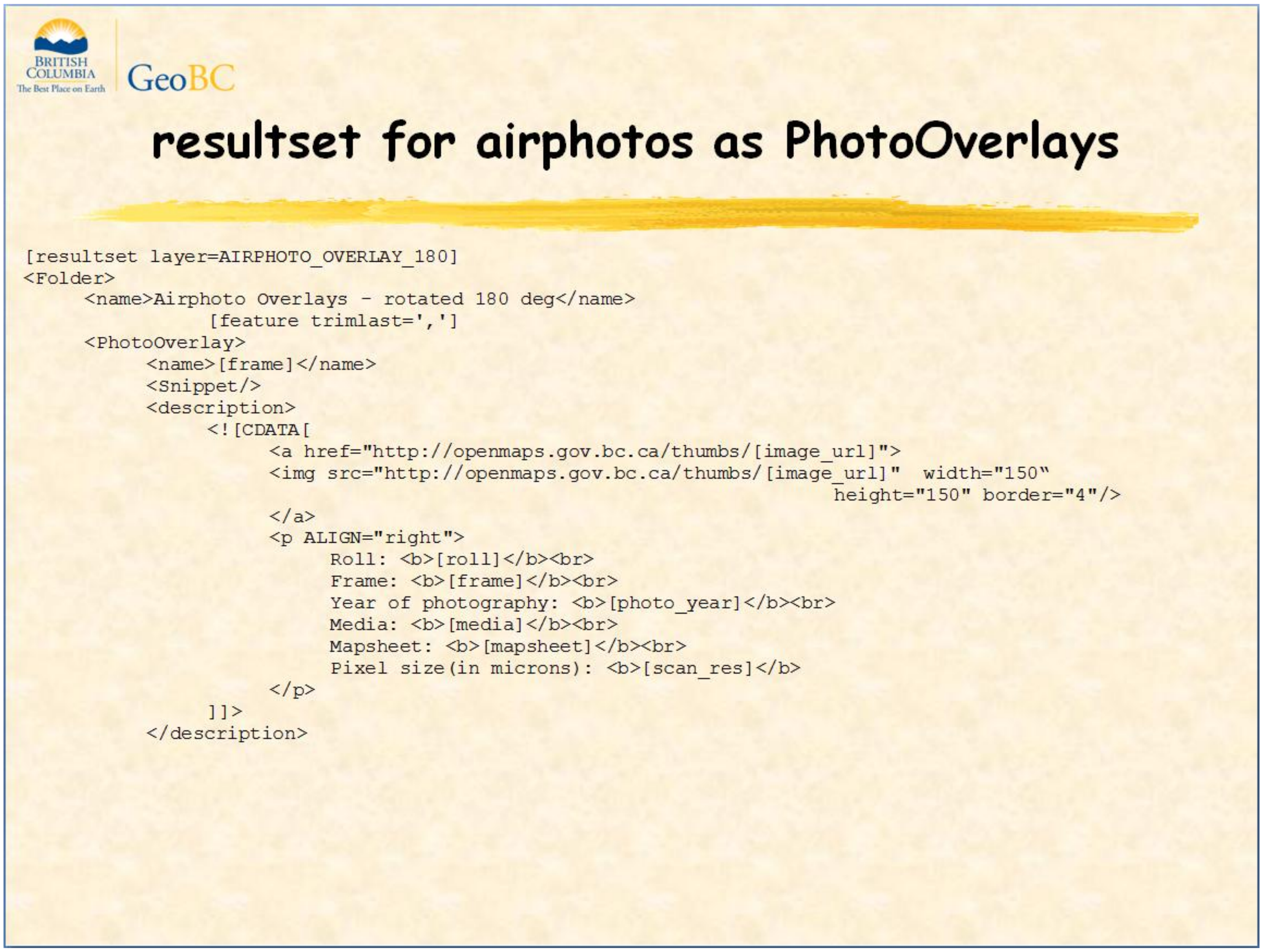
The TimeSpan element converts the airphoto year into a time period so the photo will remain visible when the Google Earth time slider is anywhere within the year. TimeSpans are not supported in GeoServer.

BRITISH COLUMBIA
The Best Place on Earth
GeoBC

Airphotos as PhotoOverlays


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., Reservoir Rd. Clayville, NY
Places
Add Content
My Places
Temporary Places
Three Renderings of Airphotos
Airphotos as Placemarks
Airphoto Images (2006)
Scanned or Digital Airphoto Centres (2006)
All Airphoto Centres (2006)
Flight Lines (2006)
Airphotos as PhotoOverlays
Airphoto Overlays - rotated 180 deg
Airphotos as a Report
15BCC06013 - 230

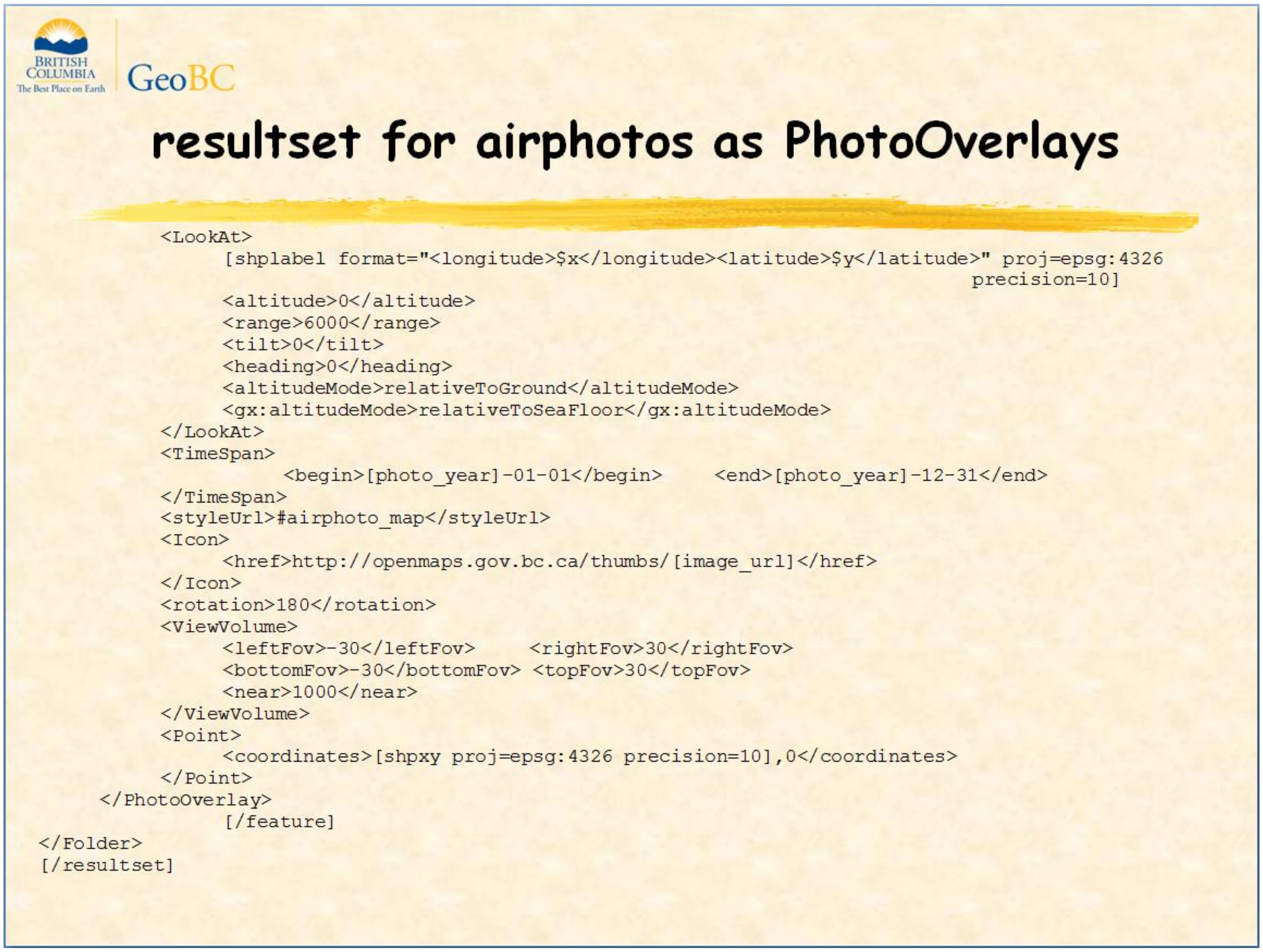
Now the output template for airphotos as PhotoOverlays that a user can pan and zoom around while staying in Google Earth.



resultset for airphotos as PhotoOverlays

```
[resultset layer=AIRPHOTO_OVERLAY_180]
<Folder>
     <name>Airphoto Overlays - rotated 180 deg</name>
                [feature trimlast=',']
     <PhotoOverlay>
          <name>[frame]</name>
          <Snippet/>
          <description>
               <![CDATA[
                    <a href="http://openmaps.gov.bc.ca/thumbs/[image_url]">
                    <img src="http://openmaps.gov.bc.ca/thumbs/[image_url]"  width="150"
                                                                height="150" border="4"/>
                    </a>
                    <p ALIGN="right">
                         Roll: <b>[roll]</b><br>
                         Frame: <b>[frame]</b><br>
                         Year of photography: <b>[photo_year]</b><br>
                         Media: <b>[media]</b><br>
                         Mapsheet: <b>[mapsheet]</b><br>
                         Pixel size(in microns): <b>[scan_res]</b>
                    </p>
               ]]>
          </description>
```

This resultset is similar to the previous one except there is a PhotoOverlay element instead of a Placemark.



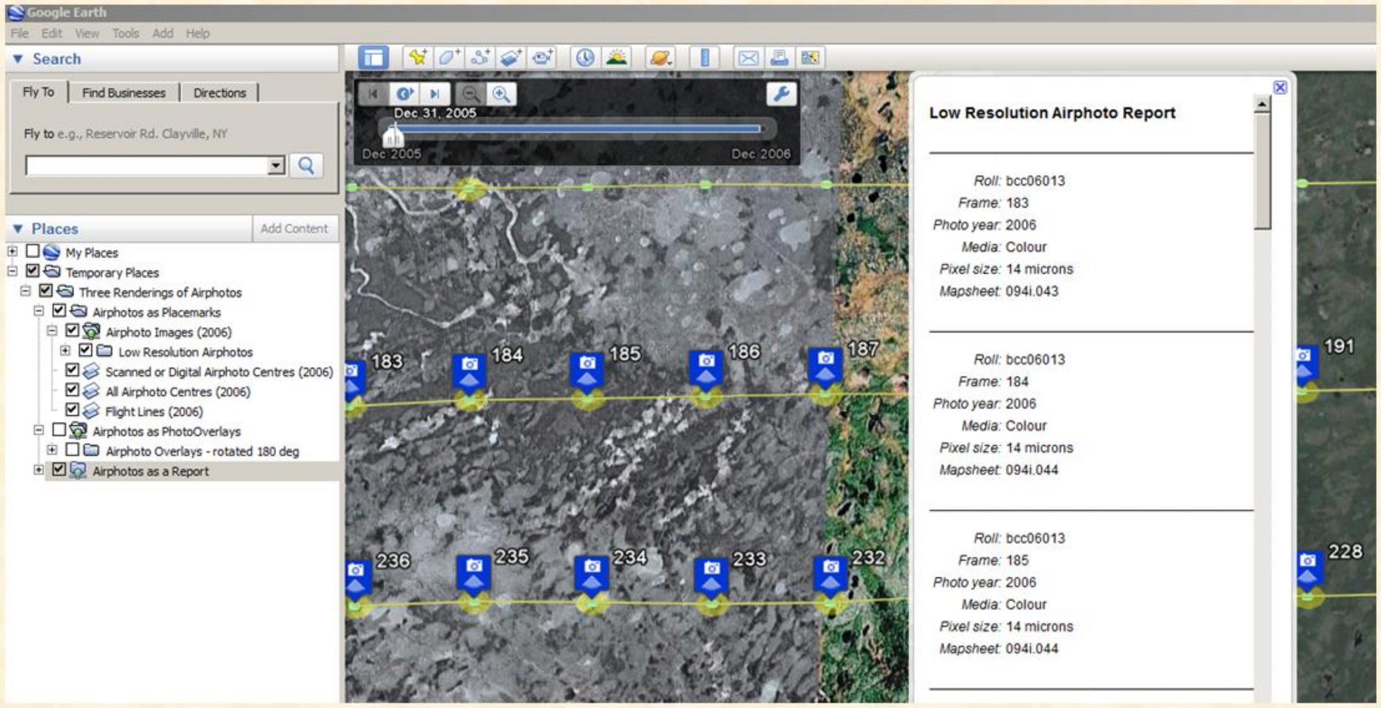
resultset for airphotos as PhotoOverlays

```
          <LookAt>
               [shplabel format="<longitude>$x</longitude><latitude>$y</latitude>" proj=epsg:4326
                                                                               precision=10]
               <altitude>0</altitude>
               <range>6000</range>
               <tilt>0</tilt>
               <heading>0</heading>
               <altitudeMode>relativeToGround</altitudeMode>
               <gx:altitudeMode>relativeToSeaFloor</gx:altitudeMode>
          </LookAt>
          <TimeSpan>
                    <begin>[photo_year]-01-01</begin>    <end>[photo_year]-12-31</end>
          </TimeSpan>
          <styleUrl>#airphoto_map</styleUrl>
          <Icon>
               <href>http://openmaps.gov.bc.ca/thumbs/[image_url]</href>
          </Icon>
          <rotation>180</rotation>
          <ViewVolume>
               <leftFov>-30</leftFov>     <rightFov>30</rightFov>
               <bottomFov>-30</bottomFov> <topFov>30</topFov>
               <near>1000</near>
          </ViewVolume>
          <Point>
               <coordinates>[shpxy proj=epsg:4326 precision=10],0</coordinates>
          </Point>
     </PhotoOverlay>
               [/feature]
</Folder>
[/resultset]
```

Not all airphotos have the same orientation since the plane flies back and forth so the rotation corrects the upside-down photos. To be useful, we need to offer a photooverlay layer that doesn't rotate the airphoto so a user can choose the required layer.

The view volume determines the field of view.

Airphotos as a report



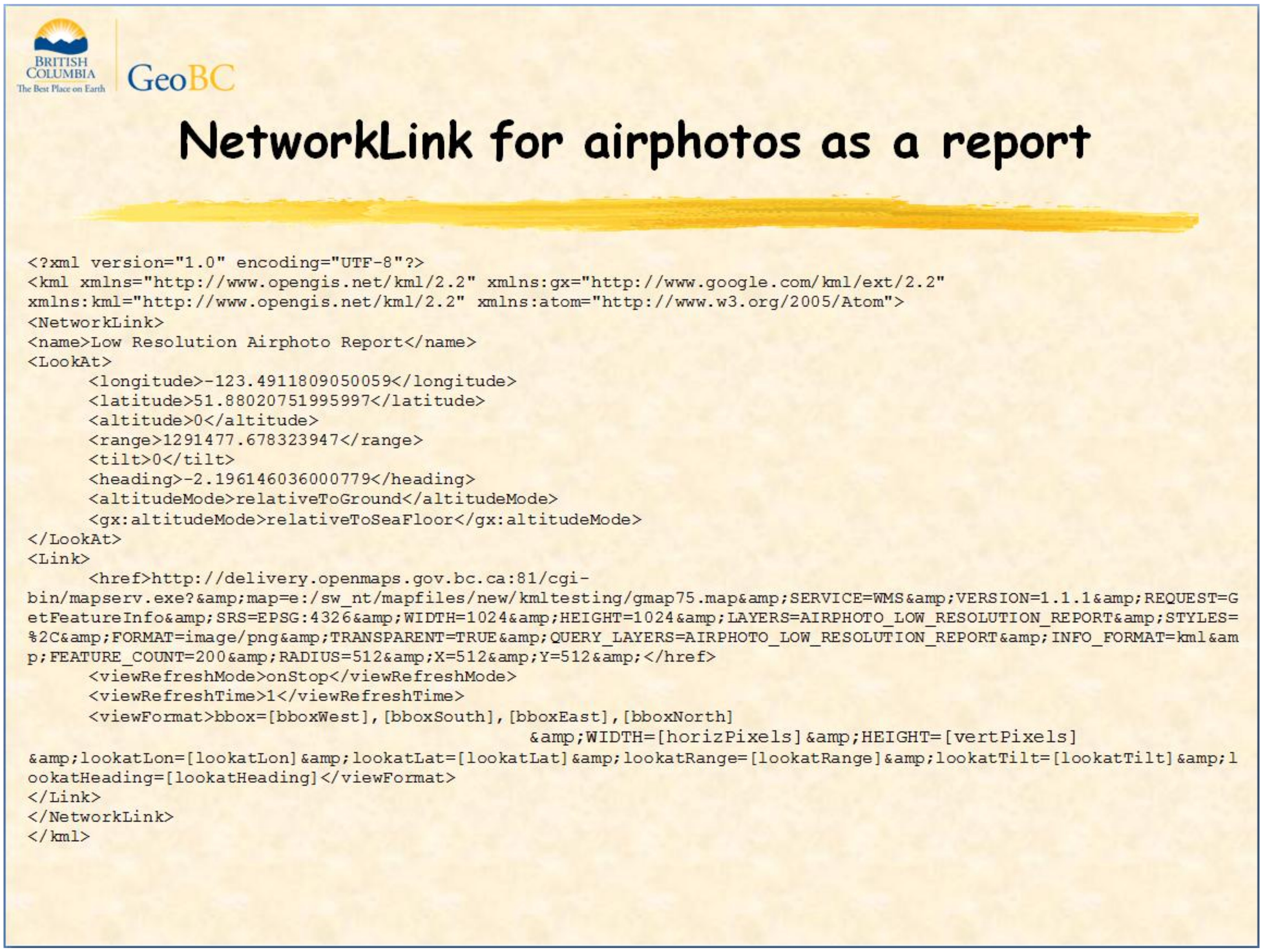
Low Resolution Airphoto Report

Roll: bcc06013
Frame: 183
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.043

Roll: bcc06013
Frame: 184
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.044

Roll: bcc06013
Frame: 185
Photo year: 2006
Media: Colour
Pixel size: 14 microns
Mapsheet: 094i.044

Let’s look at the output template for airphotos as a report instead of some kind of geometry.

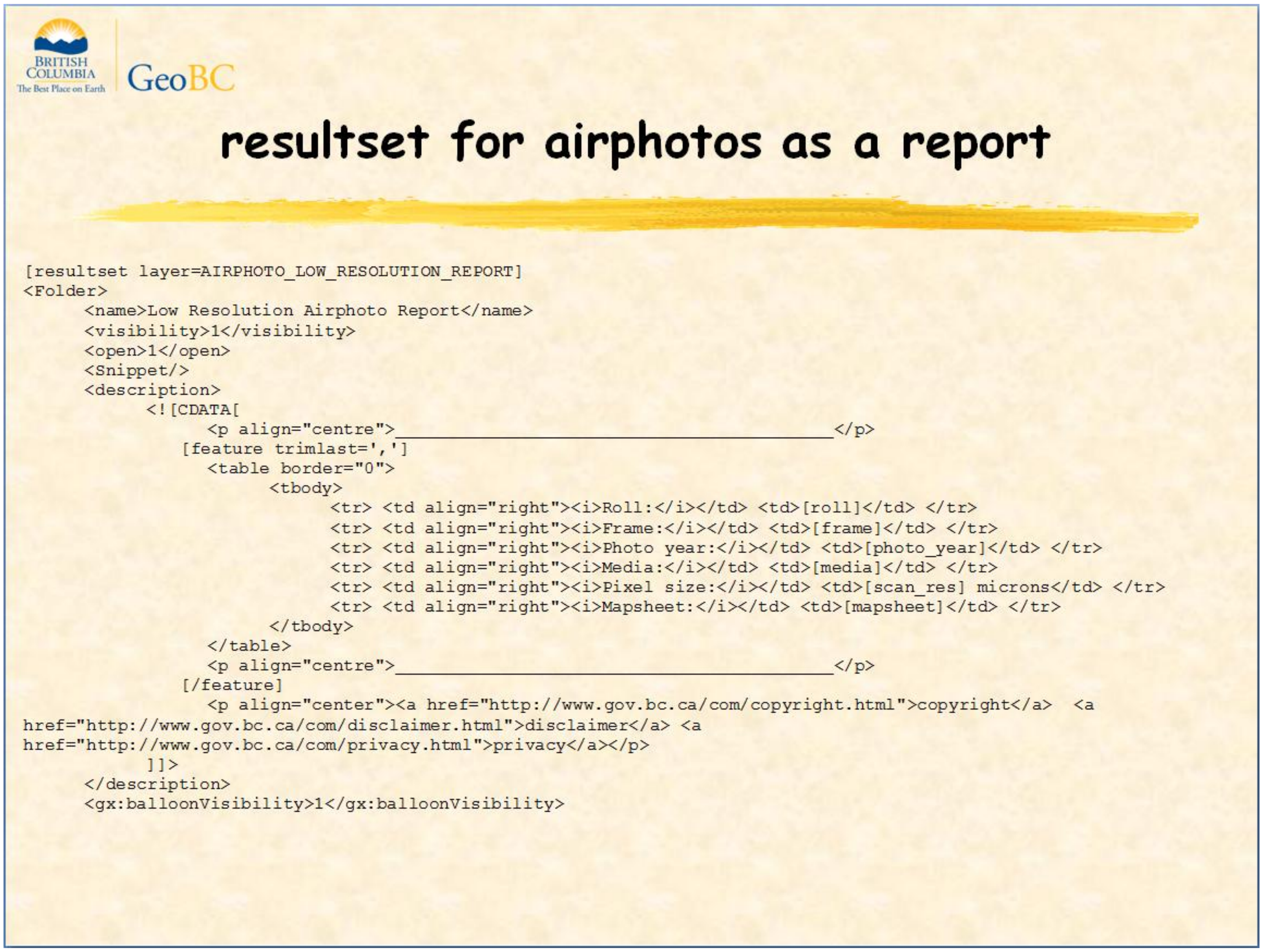


NetworkLink for airphotos as a report

```
<?xml version="1.0" encoding="UTF-8"?>
<kml xmlns="http://www.opengis.net/kml/2.2" xmlns:gx="http://www.google.com/kml/ext/2.2"
xmlns:kml="http://www.opengis.net/kml/2.2" xmlns:atom="http://www.w3.org/2005/Atom">
<NetworkLink>
<name>Low Resolution Airphoto Report</name>
<LookAt>
      <longitude>-123.4911809050059</longitude>
      <latitude>51.88020751995997</latitude>
      <altitude>0</altitude>
      <range>1291477.678323947</range>
      <tilt>0</tilt>
      <heading>-2.196146036000779</heading>
      <altitudeMode>relativeToGround</altitudeMode>
      <gx:altitudeMode>relativeToSeaFloor</gx:altitudeMode>
</LookAt>
<Link>
      <href>http://delivery.openmaps.gov.bc.ca:81/cgi-
bin/mapserv.exe?&amp;map=e:/sw_nt/mapfiles/new/kmltesting/gmap75.map&amp;SERVICE=WMS&amp;VERSION=1.1.1&amp;REQUEST=G
etFeatureInfo&amp;SRS=EPSG:4326&amp;WIDTH=1024&amp;HEIGHT=1024&amp;LAYERS=AIRPHOTO_LOW_RESOLUTION_REPORT&amp;STYLES=
%2C&amp;FORMAT=image/png&amp;TRANSPARENT=TRUE&amp;QUERY_LAYERS=AIRPHOTO_LOW_RESOLUTION_REPORT&amp;INFO_FORMAT=kml&am
p;FEATURE_COUNT=200&amp;RADIUS=512&amp;X=512&amp;Y=512&amp;</href>
      <viewRefreshMode>onStop</viewRefreshMode>
      <viewRefreshTime>1</viewRefreshTime>
      <viewFormat>bbox=[bboxWest],[bboxSouth],[bboxEast],[bboxNorth]
                                               &amp;WIDTH=[horizPixels]&amp;HEIGHT=[vertPixels]
&amp;lookatLon=[lookatLon]&amp;lookatLat=[lookatLat]&amp;lookatRange=[lookatRange]&amp;lookatTilt=[lookatTilt]&amp;l
ookatHeading=[lookatHeading]</viewFormat>
</Link>
</NetworkLink>
</kml>
```

When making a request, Google Earth will include both the <href> and the <viewFormat> elements in the request.

Note the inclusion of additional view parameters such as lookAtRange, lookAtTilt, and lookAtHeading



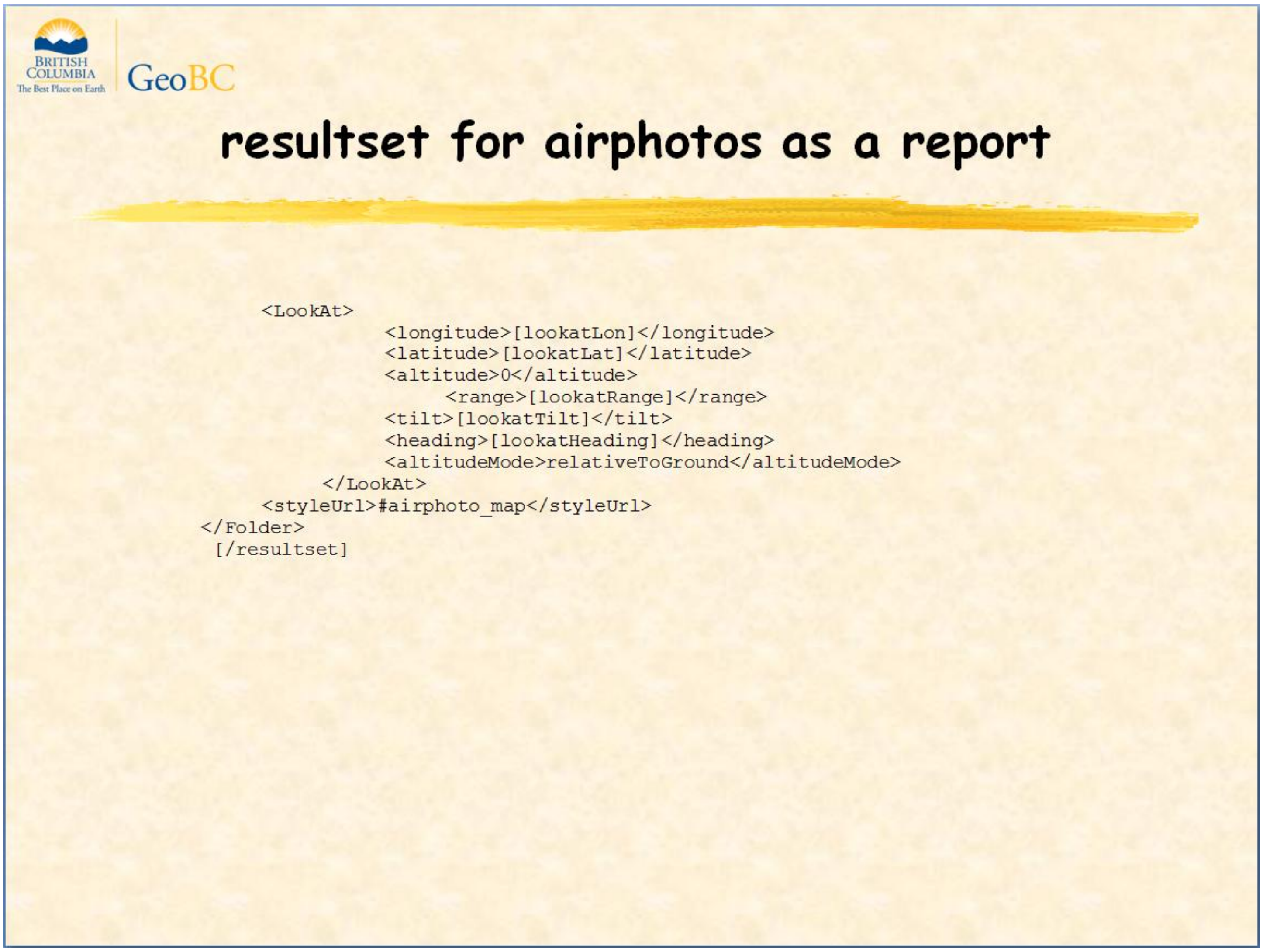
resultset for airphotos as a report

```
[resultset layer=AIRPHOTO_LOW_RESOLUTION_REPORT]
<Folder>
      <name>Low Resolution Airphoto Report</name>
      <visibility>1</visibility>
      <open>1</open>
      <Snippet/>
      <description>
            <![CDATA[
                  <p align="centre">__________________________________________</p>
               [feature trimlast=',']
                  <table border="0">
                        <tbody>
                              <tr> <td align="right"><i>Roll:</i></td> <td>[roll]</td> </tr>
                              <tr> <td align="right"><i>Frame:</i></td> <td>[frame]</td> </tr>
                              <tr> <td align="right"><i>Photo year:</i></td> <td>[photo_year]</td> </tr>
                              <tr> <td align="right"><i>Media:</i></td> <td>[media]</td> </tr>
                              <tr> <td align="right"><i>Pixel size:</i></td> <td>[scan_res] microns</td> </tr>
                              <tr> <td align="right"><i>Mapsheet:</i></td> <td>[mapsheet]</td> </tr>
                        </tbody>
                  </table>
                  <p align="centre">__________________________________________</p>
               [/feature]
                  <p align="center"><a href="http://www.gov.bc.ca/com/copyright.html">copyright</a>  <a
href="http://www.gov.bc.ca/com/disclaimer.html">disclaimer</a> <a
href="http://www.gov.bc.ca/com/privacy.html">privacy</a></p>
            ]]>
      </description>
      <gx:balloonVisibility>1</gx:balloonVisibility>
```

This template generates a kml folder containing a Description element with a table inside.

The [feature] element defines a loop that generates one table row for each feature selected. This control structure is quite different from that used in generating placemarks or photo overlays and not possible in GeoServer.

Because output templates give you complete control, you can easily include new kml extensions such as the gx:balloonVisibility element which came out in mid 2009.

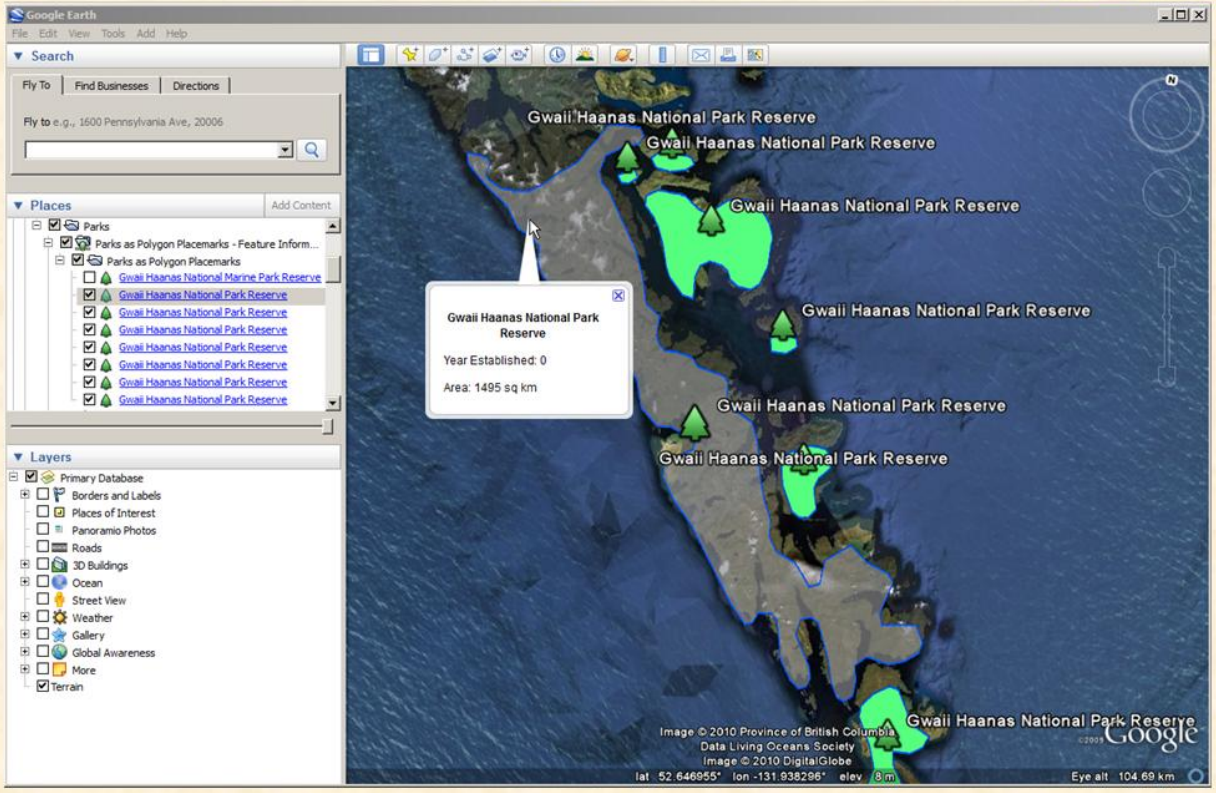

resultset for airphotos as a report

```
      <LookAt>
                <longitude>[lookatLon]</longitude>
                <latitude>[lookatLat]</latitude>
                <altitude>0</altitude>
                     <range>[lookatRange]</range>
                <tilt>[lookatTilt]</tilt>
                <heading>[lookatHeading]</heading>
                <altitudeMode>relativeToGround</altitudeMode>
           </LookAt>
      <styleUrl>#airphoto_map</styleUrl>
 </Folder>
  [/resultset]
```

...The LookAt view is set to the orientation parameters provided by Google Earth in the getFeatureInfo request

BRITISH COLUMBIA
The Best Place on Earth
GeoBC

Polygons as placemarks

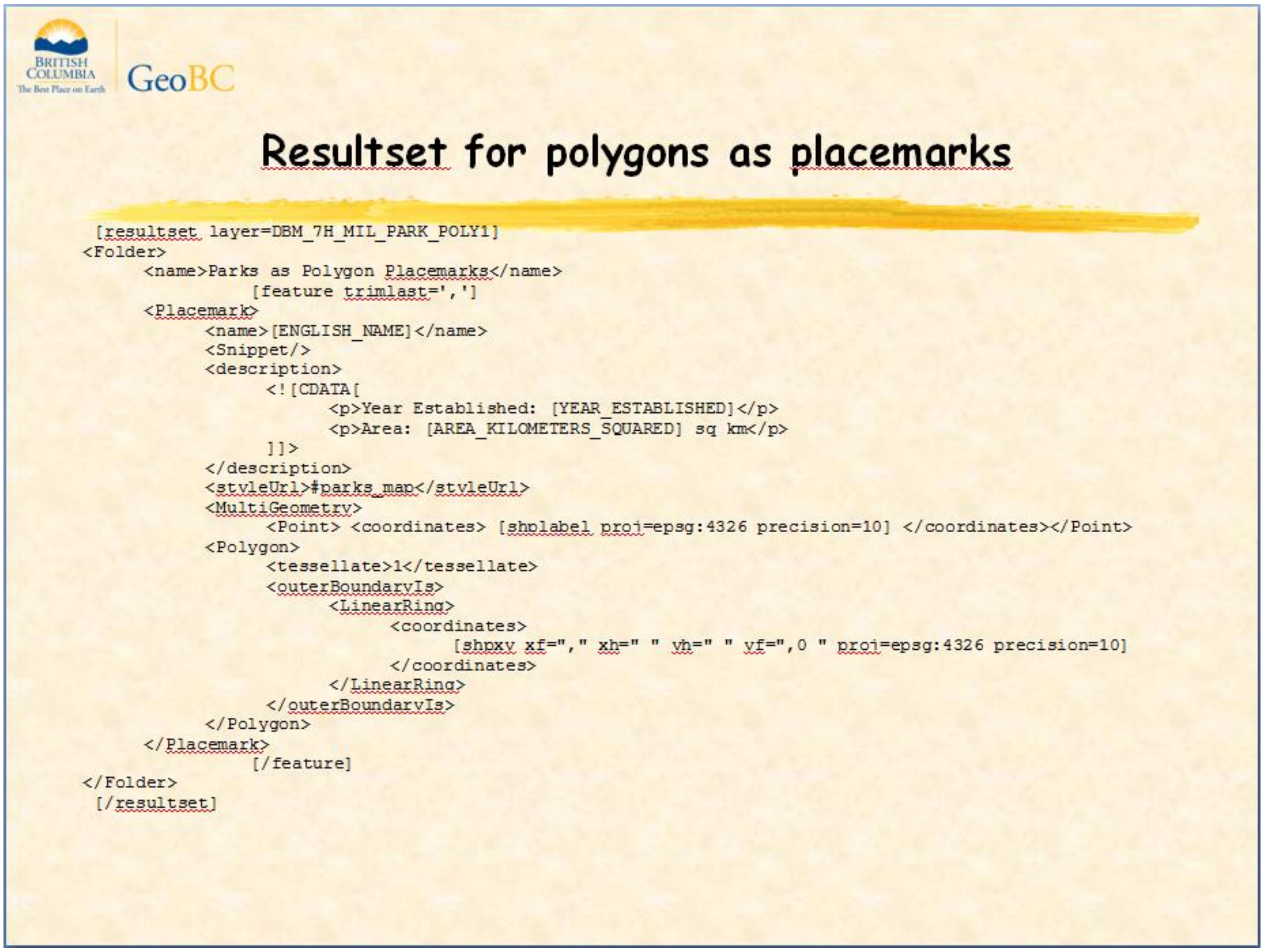

Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 1600 Pennsylvania Ave, 20006
Places
Add Content
Parks
Parks as Polygon Placemarks - Feature Inform...
Parks as Polygon Placemarks
Gwaii Haanas National Marine Park Reserve
Gwaii Haanas National Park Reserve
Layers
Primary Database
Borders and Labels
Places of Interest
Panoramio Photos
Roads
3D Buildings
Ocean
Street View
Weather
Gallery
Global Awareness
More
Terrain
Gwaii Haanas National Park Reserve
Image © 2010 Province of British Columbia
Data Living Oceans Society
Image © 2010 DigitalGlobe
lat 52.646955° lon -131.938296° elev 8 m
Eye alt 104.69 km
Google

Gwaii Haanas National Park Reserve

Year Established: 0

Area: 1495 sq km

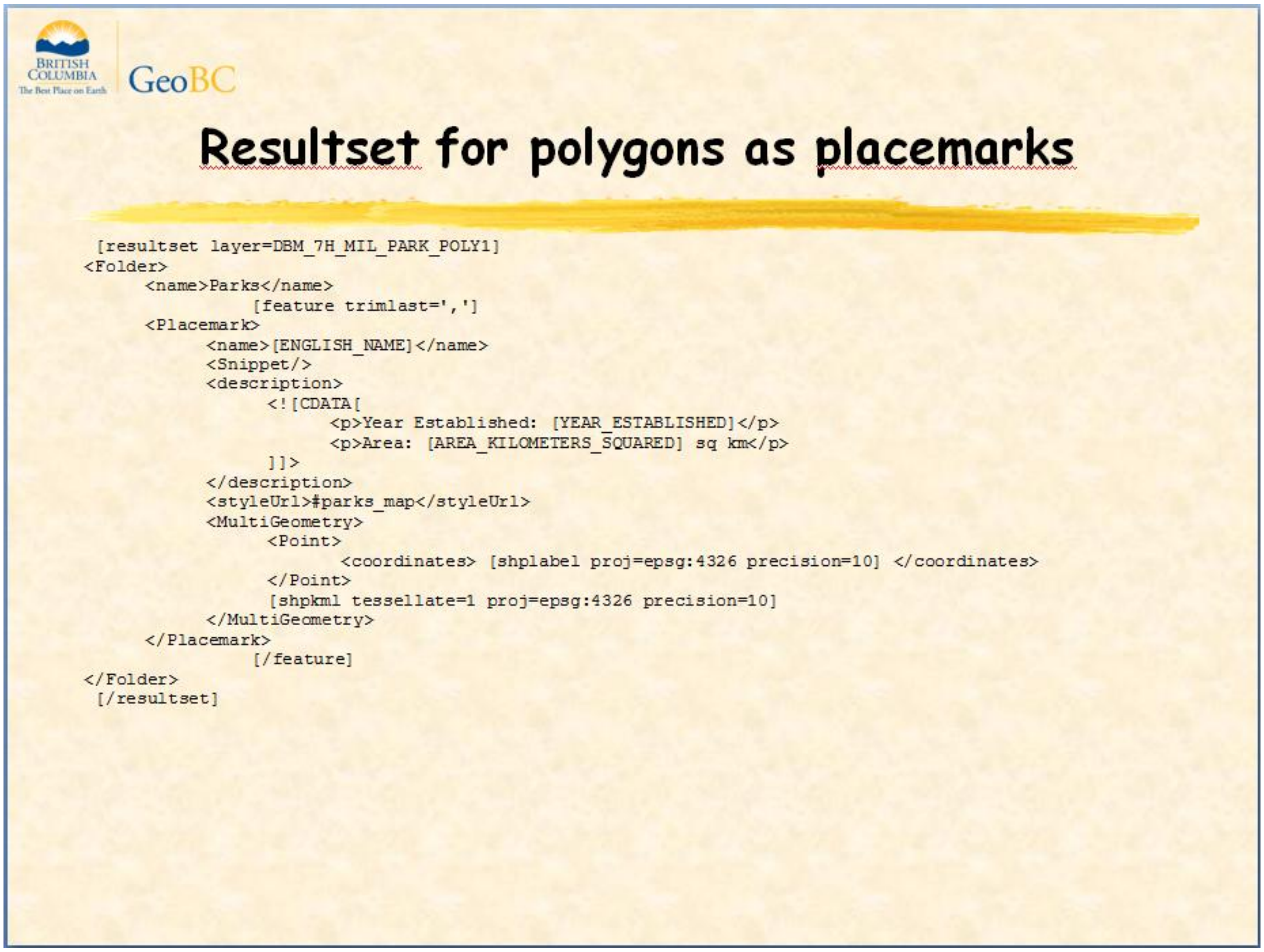
Let’s look at the output template for polygons as polygon placemarks.



Resultset for polygons as placemarks

```
 [resultset layer=DBM_7H_MIL_PARK_POLY1]
<Folder>
      <name>Parks as Polygon Placemarks</name>
                 [feature trimlast=',']
      <Placemark>
            <name>[ENGLISH_NAME]</name>
            <Snippet/>
            <description>
                  <![CDATA[
                        <p>Year Established: [YEAR_ESTABLISHED]</p>
                        <p>Area: [AREA_KILOMETERS_SQUARED] sq km</p>
                  ]]>
            </description>
            <styleUrl>#parks_map</styleUrl>
            <MultiGeometry>
                  <Point> <coordinates> [shplabel proj=epsg:4326 precision=10] </coordinates></Point>
            <Polygon>
                  <tessellate>1</tessellate>
                  <outerBoundaryIs>
                        <LinearRing>
                              <coordinates>
                                    [shpxy xf="," xh=" " yh=" " yf=",0 " proj=epsg:4326 precision=10]
                              </coordinates>
                        </LinearRing>
                  </outerBoundaryIs>
            </Polygon>
      </Placemark>
                 [/feature]
</Folder>
 [/resultset]
```

The shpxy macro returns feature coordinates with appropriate delimiting syntax. Since the coordinates are all within the LinearRing of the polygon’s outer boundary, this template will only work for polygons without holes.



Resultset for polygons as placemarks

```
 [resultset layer=DBM_7H_MIL_PARK_POLY1]
<Folder>
      <name>Parks</name>
                [feature trimlast=',']
      <Placemark>
            <name>[ENGLISH_NAME]</name>
            <Snippet/>
            <description>
                  <![CDATA[
                        <p>Year Established: [YEAR_ESTABLISHED]</p>
                        <p>Area: [AREA_KILOMETERS_SQUARED] sq km</p>
                  ]]>
            </description>
            <styleUrl>#parks_map</styleUrl>
            <MultiGeometry>
                  <Point>
                         <coordinates> [shplabel proj=epsg:4326 precision=10] </coordinates>
                  </Point>
                  [shpkml tessellate=1 proj=epsg:4326 precision=10]
            </MultiGeometry>
      </Placemark>
                [/feature]
</Folder>
 [/resultset]
```

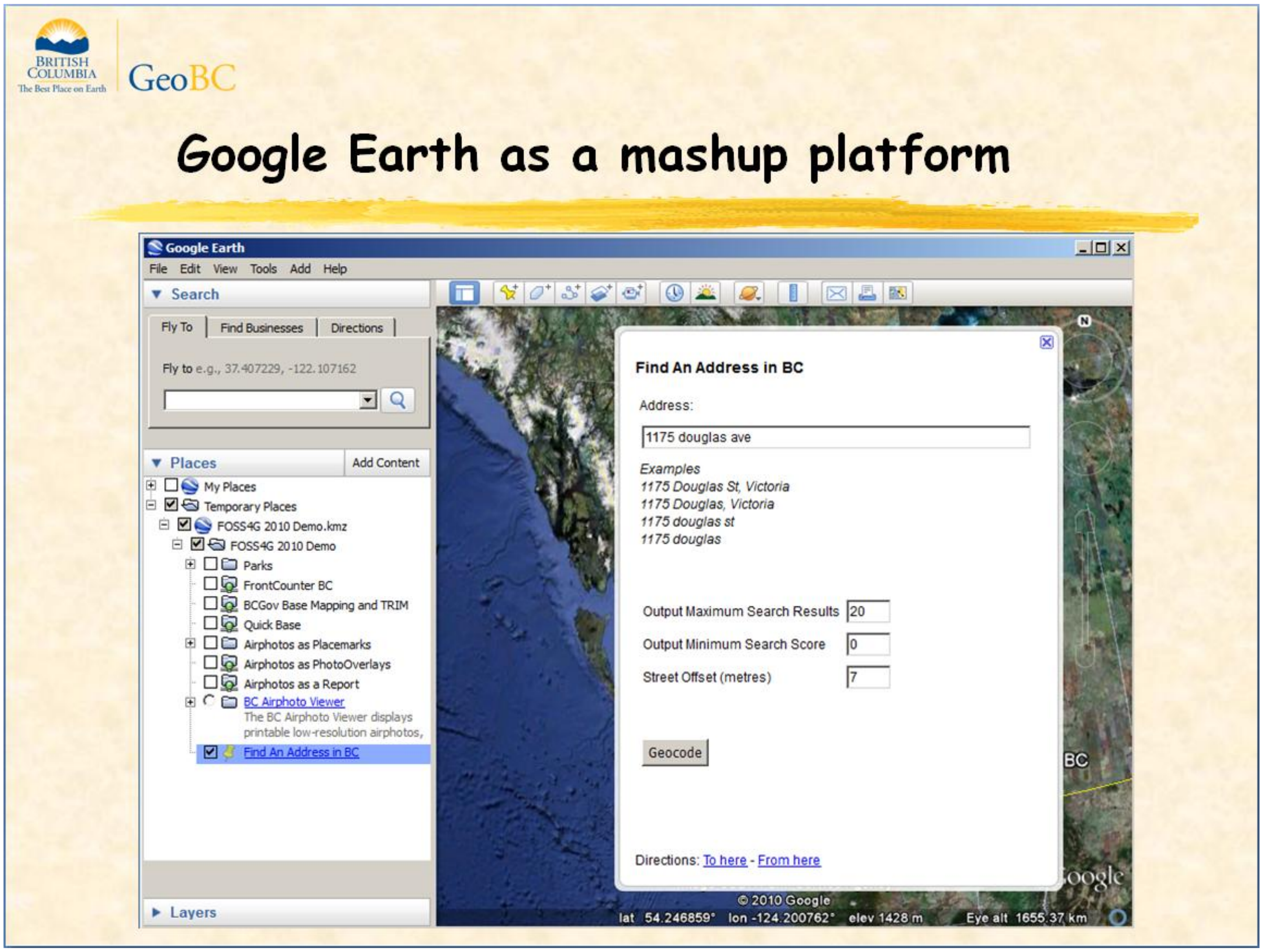
A new macro called shpkml has been proposed that will return feature coordinates in the appropriate KML Geometry object. Here is the template recast using shpkml so it will support polygons with holes or multigeometries containing polygons.

With shpkml, you will be able to customize your linestring and polygon placemarks to meet the most specialized of requirements.

More tips

You can do per class kml styles using the [shpclass] macro

You can do per attribute value styles by including the attribute value in the style name (e.g., parks_type_1)



Google Earth as a mashup platform

Find An Address in BC

Address:

1175 douglas ave

Examples
1175 Douglas St, Victoria
1175 Douglas, Victoria
1175 douglas st
1175 douglas

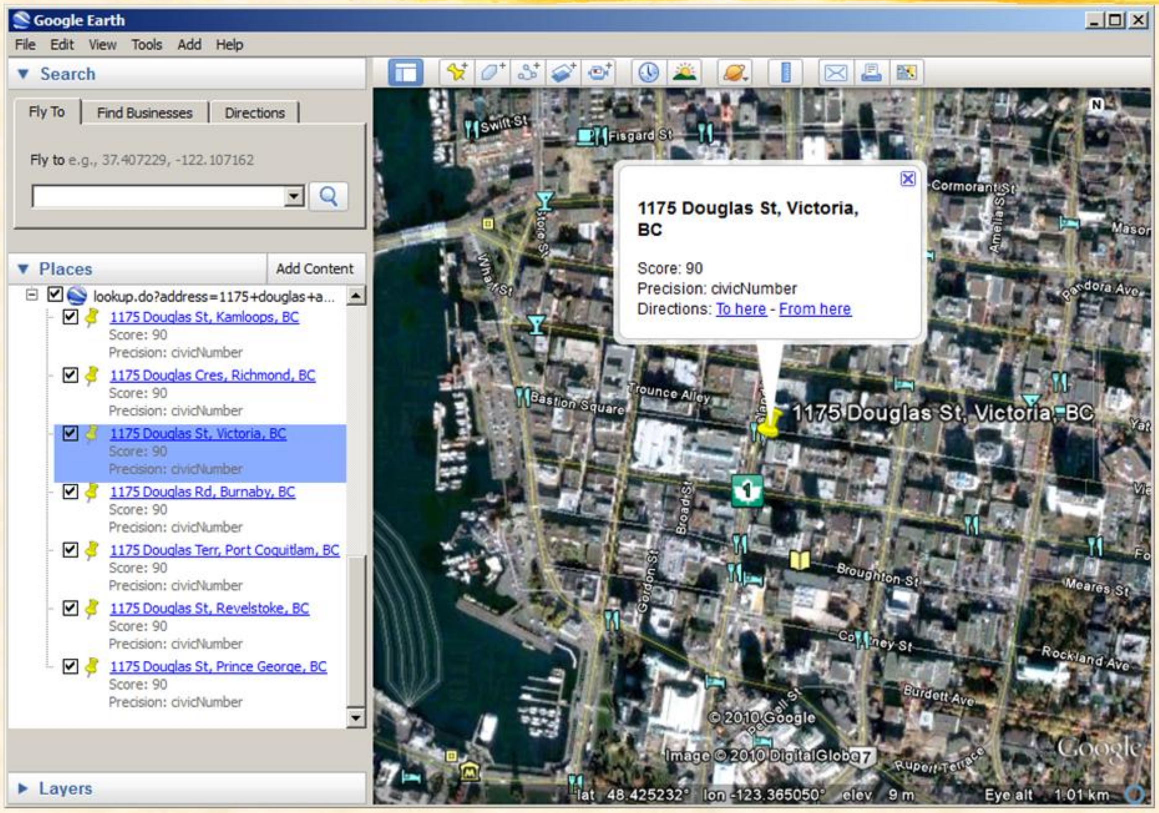
Output Maximum Search Results	20
Output Minimum Search Score	0
Street Offset (metres)	7

Geocode

Directions: To here - From here

You can integrate restful web services using NetworkLinks. A NetworkLink can make an HTTP Get request to any public URL that returns a valid KML file. The Geographical Names layer makes requests to the BC Geographical Names Web Services for all official geographical names within the current view and refreshes itself every time you stop panning and zooming.

Google Earth as a mashup platform


Google Earth
File Edit View Tools Add Help
Search
Fly To
Find Businesses
Directions
Fly to e.g., 37.407229, -122.107162
Places
Add Content
Layers
1175 Douglas St, Victoria, BC
lat 48.425232° lon -123.365050° elev 9 m
Eye alt 1.01 km
© 2010 Google
Image © 2010 DigitalGlobe

lookup.do?address=1175+douglas+a...

1175 Douglas St, Kamloops, BC
Score: 90
Precision: civicNumber

1175 Douglas Cres, Richmond, BC
Score: 90
Precision: civicNumber

1175 Douglas St, Victoria, BC
Score: 90
Precision: civicNumber

1175 Douglas Rd, Burnaby, BC
Score: 90
Precision: civicNumber

1175 Douglas Terr, Port Coquitlam, BC
Score: 90
Precision: civicNumber

1175 Douglas St, Revelstoke, BC
Score: 90
Precision: civicNumber

1175 Douglas St, Prince George, BC
Score: 90
Precision: civicNumber

1175 Douglas St, Victoria, BC

Score: 90
Precision: civicNumber
Directions: To here - From here

For restful web service requests that need user input, you can use an html form in the Description element of a placemark or folder. In this screenshot, the Find An Address in BC placemark offers up a HTML form then makes a HTTP Get request to the BC Civic Address Geocoder.

...

BRITISH COLUMBIA
The Best Place on Earth
GeoBC

¿Questions?

Links

- RFC 58 - KML Output in MapServer
- MapServer Templating
- KML Reference
- KML Output in GeoServer
- GeoBC Web Map Services
- The Homeric Scream
- **Fast Hierarchical Methods for the N-body Problem**
- Into The Forest