BASE MATERIALS - EXISTING MAPS

Atlas of Canada Toporama web page
www.atlas.gc.ca/toporama/en/index.html
Here you can view and take screen shots of topographic maps
that have detail equivalent to a 1:50,000 map.
They are not suitable for orienteering base maps but can be
useful for georeferencing when the UTM grid is included.

City basemaps -
Often cities and towns have basemaps with scales and contour
intervals that are excellent for orienteering basemaps.
Contact your local publications or GIS department.

Many municipalities have online maps and photos.

City of Calgary Municipal Topographic Series
- covers the entire city in 1 square mile sections
- 0.5 m contours
- detail equivalent to a 1:2500 map
- cost of one section map in PDF format is $23.81 + GST

City of Red Deer
- maps generated by special order
- show building and river outlines
- contour interval 1 m
- cost $50 + GST

Town of Cochrane
- orthophotos with 0.5 m contours by special order
- cost $85 + GST per quarter section for contours + orthophoto

BASE MATERIALS - AIR PHOTOS

A normal air photo is a perspective image, meaning that the image of an object will be larger when the object is closer to the camera. Therefore scale varies throughout an air photo, depending on the ground elevation.

A pair of photos with overlapping coverage can be viewed in 3D in a stereoplotting machine. This was how orienteering basemaps were produced before Lidar became available.

Orthophotos are air photos that have been digitally processed so that they have uniform scale.

Sources of air photos and/or orthophotos:
- Google Maps
- Google Earth
- Municipal web sites
- Provincial web sites

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# BASE MATERIALS - DIGITAL ELEVATION MODELS

A digital elevation model (DEM) is a set of Easting, Northing and Elevation coordinates for points on the ground surface.

Data points in an AltaLIS Lidar15 DEM file are spaced on a 15 metre grid. AltaLIS Lidar15 data costs $100 per Township. A township is 36 square miles or about 93 square km.

An excerpt from a DEM file:

```
661247.500 5643437.500 1637.960
661262.500 5643437.500 1635.130
661277.500 5643437.500 1630.010
661292.500 5643437.500 1623.370
661307.500 5643437.500 1616.600
661322.500 5643437.500 1610.700
661337.500 5643437.500 1604.850
661352.500 5643437.500 1600.150
661367.500 5643437.500 1594.260
661382.500 5643437.500 1592.430
661397.500 5643437.500 1596.260
661412.500 5643437.500 1597.880
```

Programs such as OCAD and QGIS can read the DEM files and generate contour plots. Contours below, 2.5 m interval, were made from Lidar15 DEM data with QGIS.
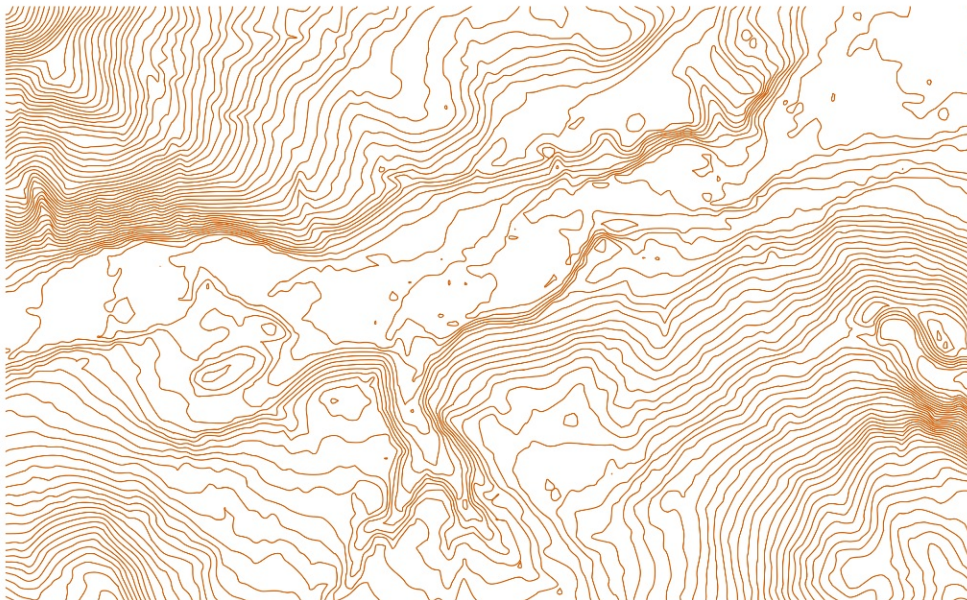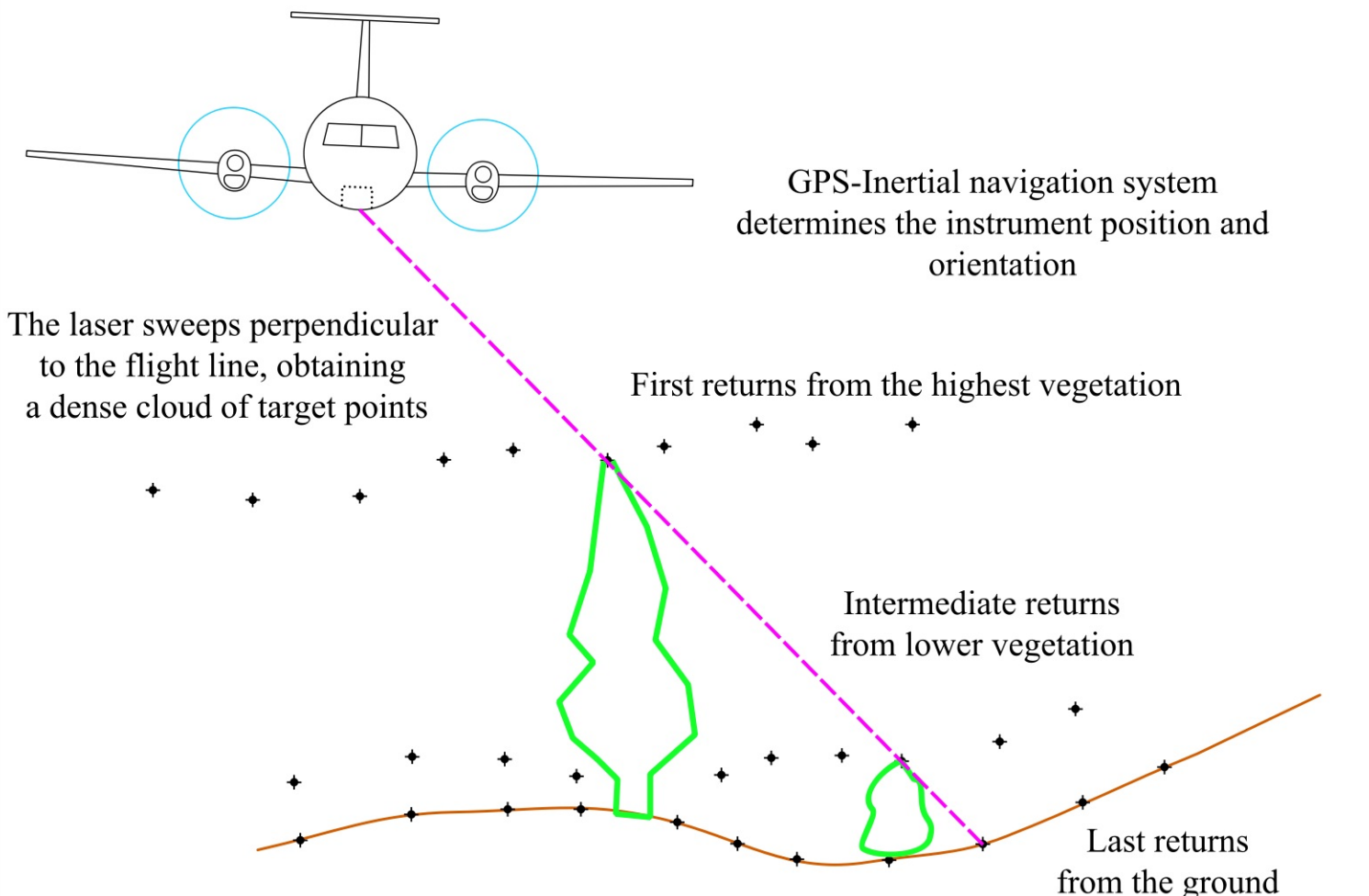
BASE MATERIALS - LIDAR

The acronym Lidar stands for Light Detection and Ranging.

A laser sends out a pulse of light, which reflects off a distant object. A detector registers the return pulse. Distance to the target is calculated from the elapsed time between sending the pulse and receiving the reflection.

Detecting weak return signals and timing them accurately is amazing enough, but other sophisticated techniques are needed to create a laser scanner that operates from an aircraft and gathers the huge volume of data for mapping.

GPS-Inertial navigation system determines the instrument position and orientation

The laser sweeps perpendicular to the flight line, obtaining a dense cloud of target points

First returns from the highest vegetation

Intermediate returns from lower vegetation

Last returns from the ground

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Lidar data with 1 metre grid spacing is excellent for producing orienteering base maps. In some provinces and countries it is available for free. In Alberta the cost is $440 per square km, and a discount is applied for larger areas.

The programs OCAD (subscription required) and QGIS (free) have lidar processing functions based on lastools subroutines by rapidlasso GmbH. Contour plots, vegetation plots and hillshade images are among the possible outputs.

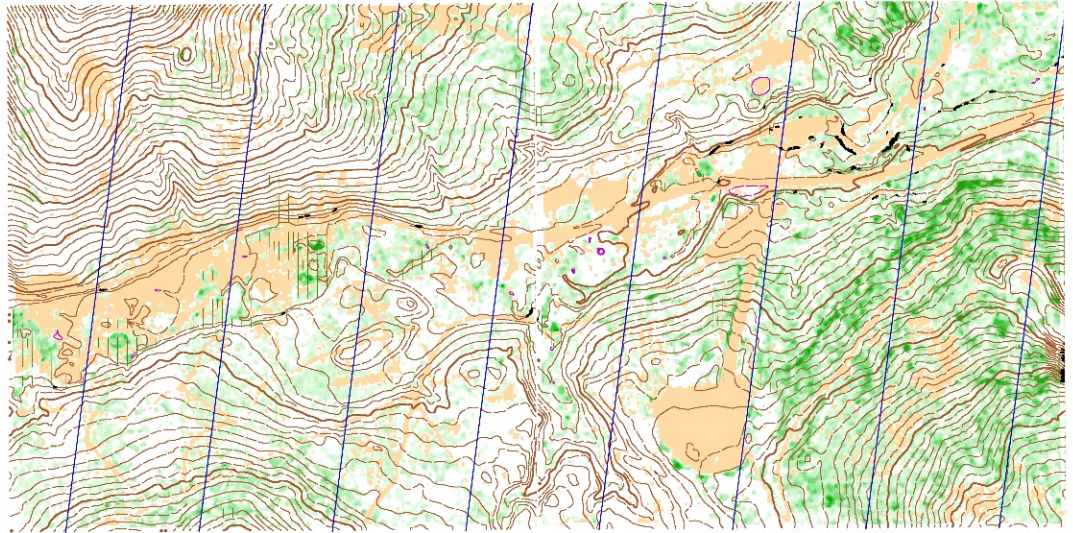Hillshade plot and 1 m contours by OCAD
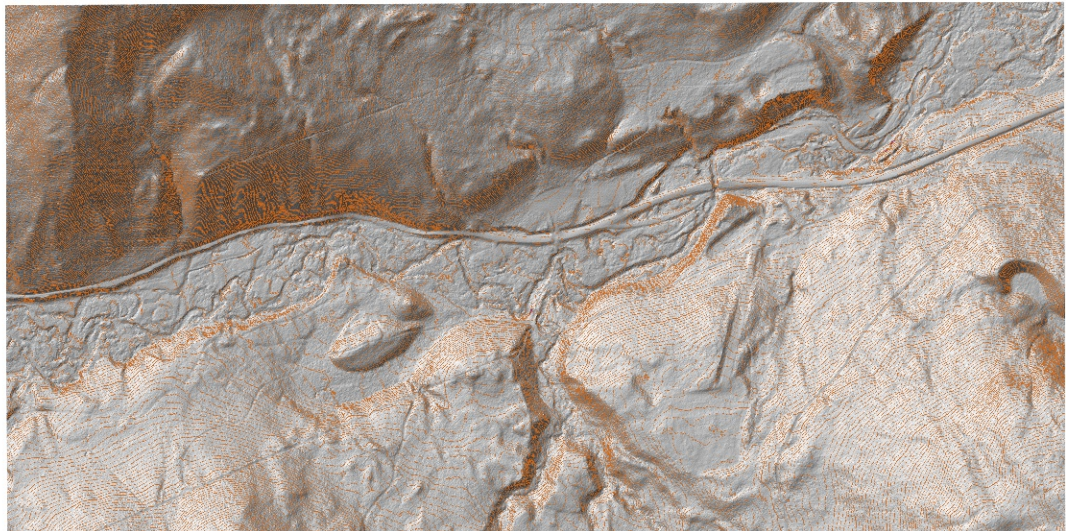
Vegetation height plot by OCAD
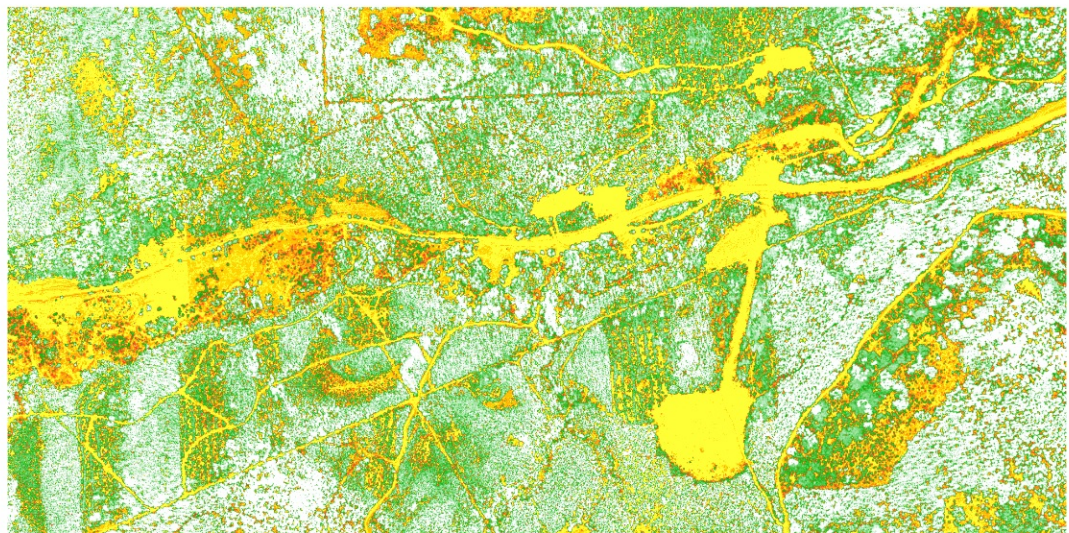
karttapullautin, a program written by Jarkko Ryyppo, produces contours and vegetation plots from lidar data and is free for non-commercial use and for navigation sport mapping.

2.5 m contours and vegetation plot by karttapullautin

Map with 5 m contours after part of the area was field checked