



# NatureWatch

## A guide to the exchange of GPS data

*How to transfer, share and display geographic information  
using free software*

**Version 1.0**

**5 July 2010**

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# 1. INTRODUCTION

## 1.1 Purpose

This guide is designed to enable VNPA volunteers to transfer, share and display GPS data (eg. waypoints, tracks etc) using free software available on the internet.

## 1.2 Assumptions

This guide is designed to be used with any brand of GPS unit, provided it uses 'gpx' files (most GPS units). It is assumed the user knows how to collect waypoints or tracks in the field. It is also assumed that the user planning to download any software has access to broadband internet. Dial-up can work with some programs but will take much more time to download and operate, depending on the file size.

## 1.3 Background to GPS usage

Global Positioning System (GPS) is a means of determining location and navigation. Further information on GPS can be found online in the document GPS a guide for users, which provides a useful overview. This can be downloaded at: [http://www.land.vic.gov.au/CA256F310024B628/0/4A6A885CAF3F2078CA257452000327C5/\\$File/GPS\\_AGuideForUsers.pdf](http://www.land.vic.gov.au/CA256F310024B628/0/4A6A885CAF3F2078CA257452000327C5/$File/GPS_AGuideForUsers.pdf)

## 1.4 Coordinate formats

To avoid discrepancies in data, you must ensure that your GPS is set to the same datum used on the mapping software you are using. For consistency and to minimise the potential for errors, you should set the coordinate format on your GPS and mapping software (where possible) to:

- Geocentric Datum of Australia 1994 (GDA94)

If requested in the GPS or software, the grid coordinates are:

- Universal Transverse Mercator (UTM) using the GRS80 ellipsoid - Map Grid of Australia 1994 (MGA94)

For more information on datums see the Australian Government website Geoscience Australia <http://www.ga.gov.au/geodesy/datums/aboutdatums.jsp>. Also, see Appendix 1 for explanation of coordinate formats.

## 1.5 Glossary

GIS	Geographic Information System. GIS is the merging of cartography and database technology. It is any system that captures, stores, analyzes, manages, and presents data that are linked to a location.
GPS	Global Positioning System. The GPS is a space-based global navigation satellite system that provides a means of determining location and navigation. It works best when there is an unobstructed line of sight to four or more GPS satellites.
GPS unit	A GPS navigation unit, device or receiver is any device that receives GPS signals for the purpose of determining the present location. These devices are used widely in military, aviation, marine and environmental activities.
gpx	The GPS Exchange Format. This is a data format designed for the interchange of GPS data (waypoints, routes and tracks) between GPS units and software applications (such as web services).
KML	Keyhole Markup Language. KML is used for expressing geographic annotation and visualization on internet-based earth browsers (eg Google Earth). KML file types can be used to display GPS data on Google Earth or Google Maps.
KMZ	Keyhole Markup Zip. KML files are very often distributed in KMZ files, which are zipped files with a .kmz extension.
Track	A track is a recording of your path you are walking or driving. GPS tracks are recorded at intervals which can be selected (eg. a point taken every 10m traversed).
Waypoint	A waypoint is a reference point in physical space used for purposes of when using a GPS unit.

## 2. OVERVIEW OF FREE SOFTWARE

This section presents a small selection of the freely available software on the internet and does not attempt a detailed review. The software programs selected here have been tested by the author on different computers and are relatively easy to use and require little familiarisation.

### 2.1 EasyGPS

EasyGPS is a fast and easy way to transfer waypoints, routes, and tracks between your computer and your Garmin, Magellan, or Lowrance GPS. EasyGPS lists all of your waypoints on the left side of the screen, and shows a plot of your GPS data on the right (TopoGrafix 2010). Use EasyGPS to back up and organize your GPS data, print maps, or load new waypoints onto your GPS for your next VNPA adventure!

EasyGPS works with every popular handheld GPS receiver, and it is free to download. See the [website](http://www.easygps.com/default.asp) <http://www.easygps.com/default.asp>

### 2.2 Google Earth

Google Earth is a virtual globe, map and geographic information program (Wikipedia 2010). GPS points, tracks and routes can be uploaded and viewed over aerial photography. GPS data and maps can also be saved and emailed to be loaded onto another computer using kmz/kml file types.

Google Earth works with Garmin, Magellan and Wintec brand GPS units and can be downloaded for free. See the website <http://earth.google.com/>

### 2.3 Google Maps

Google Maps is a web mapping service application that powers many map-based services, including embedded third-party websites. It offers street maps, route planners for travelling by car or foot and

street view. Google Maps is similar to Google Earth, however Google Earth is a stand-alone program which offers more globe-viewing features including showing polar areas.

Whilst there is no way to directly import GPS data directly from your GPS unit, it is possible to import data from Google Earth using kmz/kml file types. See the [website](http://maps.google.com.au/) <http://maps.google.com.au/>

### 2.4 GPS Visualizer

GPS Visualizer is a free, easy-to-use online utility that creates maps and profiles from GPS data (tracks and waypoints, including GPX files), driving routes, street addresses, or simple coordinates. Use it to see where you've been, plan where you're going, or visualize geographic data (business locations, scientific observations, events, customers, real estate, geotagged photos, "GPS drawing," etc.). You need to download GPS data prior to using this software.

See the [website](http://www.gpsvisualizer.com/) <http://www.gpsvisualizer.com/>

### 2.5 DNR Garmin

This extension was built to provide users the ability to directly transfer data between Garmin GPS handheld receivers and various GIS software packages. Using this program a user can use point features (graphics or shapefile) and upload them to the GPS as Waypoints. Line and Polygon Graphics or shapes can be uploaded to the GPS as Track Logs or Routes. Conversely, Waypoints, Track Logs, and Routes collected using the GPS can be transferred directly to ArcView/ArcMap/Google Earth/Landview and saved as Graphics or Shapefiles (Minnesota Department of Natural Resources 2010).

See the [website:](http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html) <http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html>



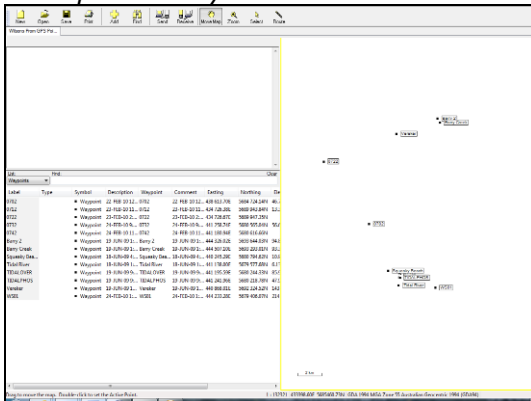
## 3. INSTRUCTIONS

### 3.1 How to download GPS data collected in the field onto a computer

#### 3.1.1 Using EasyGPS

1. Firstly you'll have to install EasyGPS onto the computer you are using. Go to <http://www.easygps.com/default.asp> - installation is fast and simple.
2. After the program is installed, ensure that you have set the coordinate format as mentioned in Section 1.3.
3. Plug in GPS with cord and click **Receive** from the toolbar menu
4. Click 'save as' to a gpx file.
5. This can be saved or sent to a recipient via email. This can also be viewed in different programs which can open gpx files.

Example of EasyGPS screen:



#### 3.1.2 Using Google Earth

1. Firstly you'll have to install Google Earth onto the computer you are using. Go to <http://earth.google.com/> - installation can take some time but is worth the wait!
2. After the program is installed, ensure that you have set the appropriate coordinate format as mentioned in Section 1.3.

3. Plug in GPS with cord and click **Tools** from the toolbar menu
4. Then go down the menu and click **GPS**.
5. Select the GPS you have and click **Import**. This will display your GPS data over aerial photography. With this data, you have many ways to display, change or add map data to the GPS data.
6. Your data will appear under My Places in the left hand window. From here you can save or share (email) data. This will then give you two choices to save as a kmz (default) or kml file. Choose kmz file type.

#### 3.1.3 Google Maps

You cannot download GPS data directly from your GPS into Google Maps. However, GPS data can be viewed in Google Maps – see Section 3.3.

#### 3.1.4 GPS Visualizer

You cannot download GPS data directly from your GPS into GPS Visualizer.

#### 3.1.5 Using DNR Garmin

1. Firstly you'll have to install DNR Garmin onto the computer you are using. Go to <http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html> - installation is quick.
7. After the program is installed, ensure that you have set the appropriate coordinate format as mentioned in Section 1.3.
8. Set the port on your computer (eg USB cable)
9. Plug in GPS with cord and click **Waypoint, Track or Route** (depending on your data) from the toolbar menu
10. Then go down the menu and click **Download**. Your data should appear in a table.
11. Then go to File and click Save To. You can save a various file types

including ArcGIS files (shapefile), text, Google (kml) and GPS (gpx)

*Example of data table in DNR Garmin:*

Type	Id	Name	Lat	Long	Alt	Desc	S	Desc	Comment
1	WAYPOINT	Geology Balan Rd	-37.5623680964864817	144.23389509442678	-20596761	4192293	-34143	800991	0529
2	WAYPOINT	Kangaroo Track	-37.794595786795953	144.27778227476918	-20718542	8707067	-86436	3841	189766
3	WAYPOINT	Leese Road and Durdwarah Rd	-37.841663158017862	144.132531438303095	-20888250	581995	-19512	6895	26614
4	WAYPOINT	Loggin Track and Leese Rd	-37.843077399210905	144.170161681125017	-2063915	4179865	-10112	1940	21801
5	WAYPOINT	Marshall Road	-37.821548441424966	144.28205649191436	-2063033	6645862	-59836	4428	72797
6	WAYPOINT	Old Thompson Track	-37.781241713091731	144.2789541464298	-20734761	0043296	-84018	5466	31988
7	WAYPOINT	Switch Pt	-37.854689370503307	144.29016689893642	-20643703	0378905	-45427	0340	17464

## 3.2 How to upload GPS data onto your GPS

### 3.2.1 Using EasyGPS

1. Open Easy GPS as above in Section 3.1
2. Plug in GPS and click **Send** from the toolbar menu
3. Your GPS should now show the points/tracks
4. This can be used in the field to find the points/tracks etc.

### 3.2.2 Using Google Earth

You cannot upload GPS data directly from Google Earth onto your GPS. However, data exported from a kmz/kml file and converted using GPS Visualizer.

### 3.2.3 Google Maps

You cannot upload GPS data directly from Google Maps onto your GPS. However, data exported from Google Maps to .gpx by:

1. Copying the link just above where the Map / Satellite / Terrain buttons are on your map (top right corner)
2. Paste that link into [http://www.gpsvisualizer.com/convert\\_input](http://www.gpsvisualizer.com/convert_input) where it states **Or provide the URL of a file on the Web**. This will generate a .gpx file which can be uploaded to your GPS unit using whatever method you like.

3. You can upload to your GPS by simply by opening the file of the GPS unit in the computer (similar to a memory stick), that is if your unit has that capacity. You can then copy and paste the data into the folder.

## 3.2.4 GPS Visualizer

You cannot upload GPS data directly from GPS Visualizer. However, you can use EasyGPS or the method mentioned for Google Maps.

## 3.2.5 Using DNR Garmin

1. Open DNR Garmin as above in Section 3.1
2. Plug in GPS and click **Waypoint, Track** or **Route** (depending on your data) from the toolbar menu.
3. Click Upload. Your GPS should now show the points/tracks/routes.

## 3.3 How to display GPS data

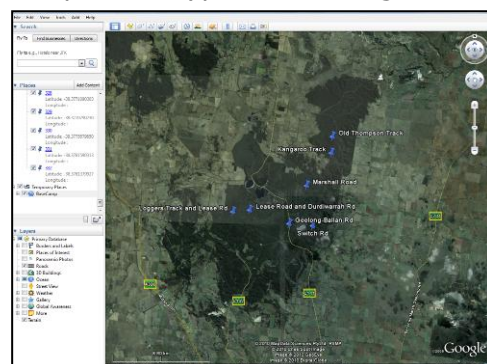
### 3.3.1 Using EasyGPS

EasyGPS will show the data points but doesn't have its own mapping capabilities.

### 3.3.2 Using Google Earth

Upload GPS data directly, as explained in Section 3.1.2 or upload via GPS Visualizer.

*Example of waypoints in Google Earth:*



### 3.3.3 Google Maps

GPS data can be converted using GPS Visualizer.

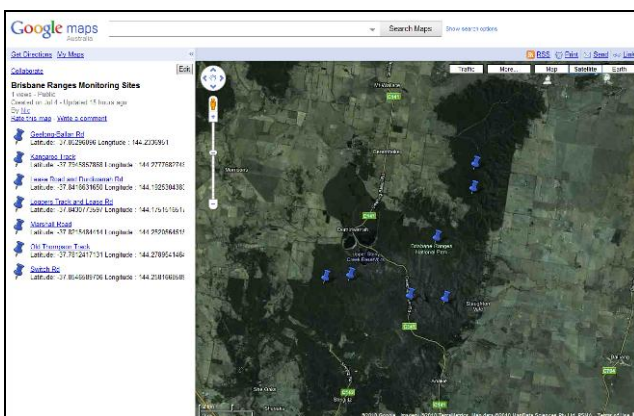
1. Go to the link [http://www.gpsvisualizer.com/map\\_in\\_put?form=google](http://www.gpsvisualizer.com/map_in_put?form=google). Using that site, you can convert a .gpx file to .kml and save it to your computer.
2. Then you can upload it to Google Maps. You'll need to create a Google account (free) if you haven't already got one (eg Gmail).
3. When you have done this, go to Google Maps then click **My Maps**.
4. Click **Create new map** then click **Import**. Upload the kml file you made in GPS Visualizer. This will display your map of GPS data.

For an example of map data generated using GPS data, click on the link below from the Brisbane Ranges Dieback Community Monitoring Project.

<http://maps.google.co.nz/maps/ms?hl=en&ie=UTF8&msa=0&ll=-37.819548,144.249115&spn=0.194998,0.307274&z=12&msid=102426256103771208740.00048a8abc8fa8b1e118b>

This information is easily shared between users and can be edited or added to if needed. You can also add photos which are georeferenced to the place where you took the photo.

*Example of GPS waypoints in Google Maps:*



### 3.3.4 GPS Visualizer

GPS Visualizer converts files to be viewed in other programs such as Google Earth. It doesn't appear to have its own mapping capabilities.

### 3.3.5 Using DNR Garmin

DNR Garmin converts files to be viewed in other programs such as GIS. It doesn't have its own mapping capabilities.

## 3.4 Use of GPS data in GIS programs

GIS use is not covered in this guide as it generally requires some level of training to use the programs. However, there are a number of freely available GIS programs available on the internet with varying degrees of technical expertise required for their use. A summary of free GIS programs and other converting programs is provided in Appendix 2 for those interested in pursuing more advanced geographic software.

## **4. REFERENCES**

Wikipedia (2010) Google Earth. [http://en.wikipedia.org/wiki/Google\\_Earth](http://en.wikipedia.org/wiki/Google_Earth)

TopoGrafix (2010) EasyGPS website. <http://www.easygps.com/default.asp>

Minnesota Department of Natural Resources (2010) DNR Garmin website. <http://www.dnr.state.mn.us/mis/gis/tools/arcview/extensions/DNRGarmin/DNRGarmin.html>



## APPENDIX 1. Coordinate formats

Brief explanation of coordinate formats:

**UTM zone** – Universal Transverse Mercator (apparently this is the most convenient way to identify points on a curved surface, but isn't the world flat?). Victoria is covered by two zones; Zone 55 covers east of a gridline directly north and south of Ballarat. Zone 54 is west of Ballarat.

**Easting and Northing** – These are the grid coordinates in MGA94 (earlier versions called AMG).

Easting (E) (e.g. 342873)

Northing (N) (e.g. 5774343)

To display MGA94 format on your GPS, change the position format from lat-long to UTM.

**Latitude and longitude** – These are the geographical coordinates displayed as:

Latitude or southing (S) (e.g. -37°39'24")

Longitude or easting (E) (e.g. +145°07'46")

There are a number of different formats used for lat-long.

## APPENDIX 2. Free GIS programs and geographic data converters

Many GIS software programs which are commercially used (eg ArcGIS; MapInfo) can be expensive to buy and require a reasonable to high level of training to become competent to use them. There are however a number of free programs available which vary in their complexity and ability. A small sample of these are shown below. There are also links to converter programs.

### Free GIS programs

#### ArcGIS Arc Explorer Java Edition

ArcExplorer is a freely available lightweight GIS data viewer that lets you perform a variety of basic GIS functions. With ArcExplorer, you can display, query, and retrieve data in ESRI shapefile format. See:

<http://www.esri.com/software/arcexplorer/index.html>

#### Quantum GIS

Quantum GIS (QGIS) is a user friendly Open Source Geographic Information System (GIS) that runs on Linux, Unix, Mac OSX, and Windows. QGIS supports vector, raster, and database formats. See:

[http://www.google.com.au/#hl=en&source=hp&q=quantum+gis+software&meta=&aq=0&aqi=g10&aql=&oq=quantum+gis&gs\\_rfai=&fp=367b179f441840ce](http://www.google.com.au/#hl=en&source=hp&q=quantum+gis+software&meta=&aq=0&aqi=g10&aql=&oq=quantum+gis&gs_rfai=&fp=367b179f441840ce)

#### DIVA-GIS

*DIVA-GIS* is a **free** computer program for mapping and geographic data analysis (a geographic information system (GIS)). This is a use-friendly program. See:

<http://www.diva-gis.org/>

#### GRASS

Commonly referred to as GRASS, this is free Geographic Information System (GIS) software used for geospatial data management and analysis, image processing, graphics/maps production, spatial modeling, and visualization.

To use this software, some degree of training is required.

<http://grass.itc.it/>

### Converter programs

#### csv files to kml

A free utility to convert csv files (Excel file type) to kml file format for Google Earth. For example, information from Victoria's Flora Site Database or the Atlas of Victorian Wildlife can be displayed in Google Earth. See:

<http://www.tchartdev.com/csv2kml.htm>

<http://kmlcsv.pbworks.com/>

#### Tiles2kml Pro 2.3

Converts GIS files to Google KML files. See:

<http://www.giveawayoftheday.com/soft/746351/>

#### Shape2Earth

Converts Shapefiles to KML, quickly and easily – but its uncertain if its free.

<http://shape2earth.com/default.aspx>

## AutoCAD file reader

### DWG TrueView 2009 17.2

This official Autodesk free application allows the user to publish, plot and view Autodesk AutoCAD drawings such as DWG, that are the standard formats for Autodesk programs, as well as DXF. See:

<http://dwg-trueview-2009.software.informer.com/17.2/>

## GIS courses

Virtual classes using ESRI software (eg ArcView, ArcGIS). There are both free and cheap online course where you get certified for the course you do. See:

<http://training.esri.com/gateway/index.cfm?fa=search.results&searchterm=&softwaretype=All+Software&trainingformat=2>

or:

[http://training.esri.com/acb2000/showdetl.cfm?DID=6&Product\\_ID=915](http://training.esri.com/acb2000/showdetl.cfm?DID=6&Product_ID=915)