

MAP READING and NAVIGATION

Why? The ability to read a map (interpret the information it provides) is an essential skill for safe and enjoyable bush travel. No one wants to get lost, and maps can provide information on things to see and places to visit on your trip. A map will also give an indication of the type of terrain you are likely to encounter. How steep are the hills? Are there creeks to cross? What are the distances involved. With this, important skills to develop are your sense of direction, being able to visualize terrain by looking at a map, and relating what you see in the bush to the features on a map. A GPS (even one with a moving map) is not really a substitute for a good paper map. You need both and cross check one with the other. Besides, what happens if your GPS stops working?

Types of maps: There are many different maps e.g. tourist maps with limited detail; 4WD touring maps (eg HEMA, Rooftop, WestPrint) with good track detail; and topographic maps from NatMap. Different maps serve different purposes.

Care of maps: Never write on paper maps with pen – only use pencil. Always fold correctly along original fold lines.

Map identification: The map will always have a name for the area covered. The map may also name adjoining maps. Always check the **date** of publication and the age of the information used to create the map because over time things change e.g. roads may be different or man-made features may change. Remember that the map may show tracks which no longer exist, or there may be tracks in the bush that are not shown on the map. Digital maps loaded on computers or GPS may not have a date so you will need to check when they were made.

Cardinal points: The top of the map is always north but be aware there are 3 “norths”: *True north* (the north pole), *magnetic north* (where a compass points) and *grid north* (where the artificial lines drawn on a map point). Topographic maps show the variation between these but usually for touring the difference does not matter. If using a compass be aware that local magnetic forces or influence of the metal in a vehicle can mean that the north arrow may not point to the correct magnetic north.

Map Scale: Maps will always show the scale e.g. large scale (1:50,000), small scale (1:250,000) etc. They will have a ruler drawn in the margin showing the distances. On a map of scale 1:1,000,000, one cm equals 10 km. On a 1:100,000 map 1 cm = 1 km.

Legend: In the margin there will be a legend showing what all the symbols mean e.g. quality of road, houses, bridges, water holes, sand dunes etc.

Colours and shading: Different colours and shading may indicate different land uses (e.g. conservation areas); different vegetation (forest, light timber, plantations); or maybe the relief (hills, valleys etc).

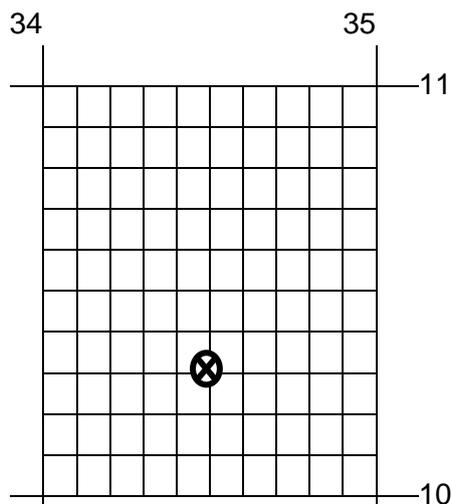
Contour lines: Topographic maps show contour lines (usually in brown). Each contour line is drawn at exactly the same height above sea level at a set height difference apart (like taking horizontal slices). These lines will indicate hills, valleys, the steepness of slopes (steep when lines are close together), the height of hills and so on. This can be useful when planning trips because you know what sort of terrain you will be traversing as you travel along a road.

Co-ordinates: A co-ordinate is a numerical way to indicate a location on a map. This is important because when planning trips we often want to mark *waypoints*. If using a GPS, it will tell you where you are but you have to convert this co-ordinate to a location on a map. There are two ways to do this – *grid references (UTM)*, and *latitude/longitude*. A GPS may be set to either or both. Check your map to see if it is showing grid lines, or latitude/longitude lines or markers on the edge.

Latitude is the distance from the equator in degrees, minutes and seconds. Each line of latitude is a concentric ring around the world and they increase in value from the equator to the pole. The equator is zero degrees, and the south pole is 90 degrees south (north pole is 90 degrees north). Wagga sits roughly 35 degrees south. I call latitude “*ladder-tude*” so I can remember that they are the horizontal lines

like rungs on a ladder. **Longitude** is the distance from Greenwich Mean Time if you travel in an easterly direction. There are 360 degrees in a circle, so there are 360 degrees of longitude round the world represented by lines drawn top to bottom from pole to pole – each 1 degree apart. Greenwich Mean Time is zero and longitude increases in value as you travel east. Wagga is roughly 147 degrees E. There are 60 minutes to a degree, and 60 seconds to a minute, so positions can be located more accurately than just using degrees. For example, my location in Wagga is $35^{\circ} 08' 58''$ S, $147^{\circ} 22' 46''$ E. Finding this on a map may not be easy unless the map has lat/long lines drawn. Most 4WD touring maps are pretty good at this but you still have to estimate your position on the map using the co-ordinate plus other features like hills, creeks or track intersections. If calling emergency services then give them your lat/long co-ordinates. Most 4WD maps and trip notes etc will give lat/long co-ordinates for points of interest so that you can load them into your GPS as waypoints. Big Red is $25^{\circ} 53' 45''$ S, $138^{\circ} 03' 11''$ E. To confuse things, sometimes lat/long is written in decimal format. Your GPS may be set to this as well. For example: 20.55° equals $20^{\circ} 30' 30''$.

A more accurate (and easier?) way of locating your position on a large scale map is to use grid lines & **grid references** called **UTM** (Universal Transverse Mercator). Topographical and some other maps have numbered parallel vertical and horizontal lines (grid lines) drawn on them (not to be confused with tourist maps which have squares with numbers and letters). Vertical lines are called *eastings* and increase in value going east. The top of the vertical lines point to *grid north*. Horizontal lines are *northings* and increase in value going north. These then create *grid squares*. Each grid square can be further divided into 100 smaller squares by visualizing 10 vertical lines between eastings, and 10 horizontal lines between northings. These grid lines are used to determine grid references using a six digit number. The first 3 numbers are eastings and the second three numbers are northings (I was taught to remember this



by: "Go across the creek before climbing the tree"). In the example here, the UTM of the feature would be 345,103 i.e 5 small lines past easting 34, and 3 small lines above northing 10. If reporting your location to emergency services you should also give the *grid zone designation* for the map you are using or the *map sheet reference number*. These will be written on topographic maps. We are in zone 55. It just so happens that UTM 55 345 103 is the same location as lat/long $35^{\circ} 08' 58''$ S, $147^{\circ} 22' 46''$ E.

You can set your GPS to give you these UTM grid reference co-ordinates but you must make sure the GPS is set to the same DATUM as the map. The DATUM (or convention) determines the position of the grid lines on the map. The world standard DATUM is WGS84 which is the same as GDA94 (the Geodetic Datum Australia). Old maps may follow Australia's old Datum

AGD66 which places grid references 200 m south west of WGS84. This becomes important because new and old maps of the same area may have grid lines in different places. When using a GPS make sure it is set to the correct Datum for the map to find the grid reference and your location on the map.

Map reading can be as simple or as complex as you like to make it. There is a lot more than this basic guide and there are some excellent reference books available (the RFS have a good manual). I don't know about you but I love poring over maps and dreaming about places I would like to visit and so on, and then getting on Google Earth and having a look at satellite photos of the places, and then dreaming some more. All I have to do now is go visit them, and learn how to get the best out of my GPS to assist.

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