**Geographical Information Systems (GIS)**

**What is GIS?**

* Geographic Information System ***GIS***?
* Geographic Information Science ***GISc***?
* A system that provides the ability to work with information that is referenced to the surface of the earth.
* Is a paper map a GIS?

**What is a GIS**

* **GIS**: a particular form of information system applied to geographical data; It was developed from the need to handle and manipulate geographically referenced data.
* **A system**: a group of connected entities and activities that interact for a common purpose;
* **An information system**: a set of processes, executed on raw data, to produce information that will be useful for decision making;
* **Geographical data**: spatial geo-referenced data with one type of coordinate systems.
* **Geographic**: refers to the Earth’s surface and near-surface
* **Spatial (locational):** refers to any space;
* A **GIS** contains at least:
	+ A Computer
	+ A Software Application (ArcGIS, ArcView,)
	+ Some Spatial Data
	+ A User
* And works together to perform some geospatial function
	+ What does “geospatial” mean?

**What can GIS do?**

* Make a ***map***
* Find ***directions*** to known location
* Find local a Star Bucks
* Determine ***cost*** of roads, developments
* Predict the ***extent*** of an invasive species
* ***Map*** ancient civilizations
* ***Help*** manage natural resources!

**Change detection**

* Changes in a particular area or feature over time can be measured. For example, land use change can be monitored using [remote sensing](http://www.gispeople.com.au/remote-sensing/) technology to identify increases and decreases in vegetation cover, waterways and urban areas over 10, 20, 30 etc years.

Production of interactive maps with a customisable timeline make it easy visualise the changes over different periods.

**Flood risk mapping**

* A local government needing to map flood risk areas can use a combination of historical flooding data and modelling techniques to produce a map showing all waterways and the potential flooding levels in the surrounding area.
* By making real-time updates to the model during a flood event, the public can be kept up to date with if and when their homes will be affected.

**Site selection**

* GIS for [selecting a site](http://www.gispeople.com.au/portfolio-item/transpacific/) to place a new feature in the landscape can be highly useful.
* For example, a local council wanting to find the best location to site a new hospital can use geospatial analysis to identify current hospital locations, examine suburb population sizes, calculate distances/drive times to existing hospitals from different suburbs, and study the demographics of areas to see where has the greatest need for a new hospital.

**Weed and pest management**

* Invasive weeds and pests can lead to massive economic costs.
* GIS is used to determine the areas infested by mapping in the field (recording perimeters of infested areas or recording individual points/sightings) or using satellite imagery/remote sensing.
* This helps in the development of weed/pest management plans and means that changes over time can be measured to identify how effective the management is.

**Who uses GIS? Everyone! GIS is used globally of all sizes and in all sectors**.

* The following is a list of some industries and sectors that benefit from GIS:
* Local government, National government, Fleet managers, Marketers, Emergency response, Transport, Military defence, Healthcare, Oil and gas, Agriculture, Forestry, Telecommunications.

**Steps in GIS**

1. Acquiring data
2. Preparing data
3. Assembling data (making electronic maps)
4. Analysis
5. Preparing final documents (inc. Cartography)
6. Publication / Distribution



**Current GIS**

1. Acquire: Maps, GPS, Aerial & Satellites, Internet!
2. Preparation, Assembly, Analysis, Cartography: ArcGIS and other software
3. Distribution: Printing, Publication, the Internet!

**Acquire Data**

* Existing Maps: USGS Topographic Map Series (1:24k)
* Geographic Positioning System (GPS)
* Aerial Photography
	+ Digital Orthographic Quarter Quads
* Satellite Photography
	+ LandSat
	+ MODIS
	+ QuickBird

**Preparation**

* Decompression (unzip)
* File Format Conversion
* Projection and Datum Conversion
* Data Organization

**Assembly**

* Adding Layers in ArcGIS
* Checking goereferencing
* Editing?



**Analysis**

* Vector operations: union, intersection
* Vector measurements: Distance, area
* Raster calculations
* Raster transformations
* Raster measurements: histograms

**Preparation (inc. Cartography)**

* Cartography:
	+ Colors and symbols
	+ Labels
	+ Legends
	+ North arrows, scale bars
	+ Titles and credits
	+ Regional Maps
* Preparing Reports
* Posters
* Journal Articles