PDHonline Course L154G (5 PDH)

Data in GIS

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2020

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Slide 1

Lecture 2 Content

- **Geographic Information Systems (GIS)**

Data in GIS – Acquisition and input

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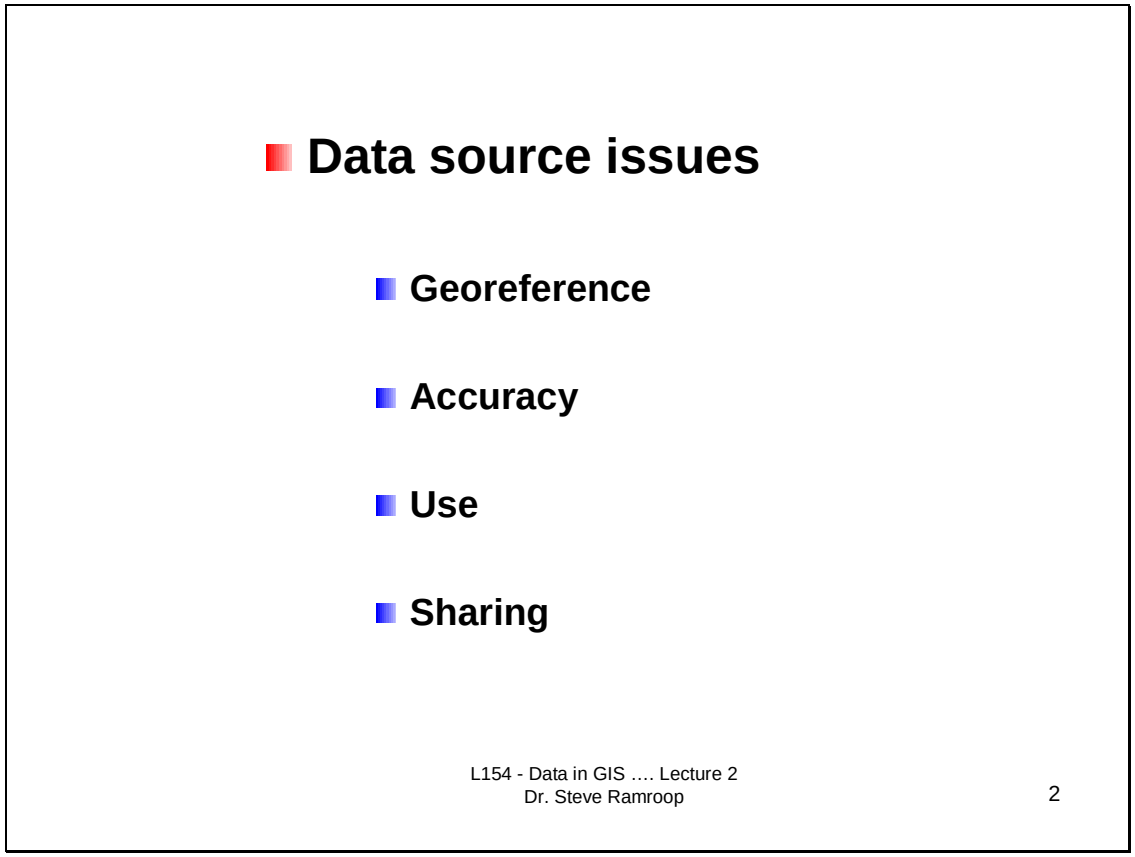
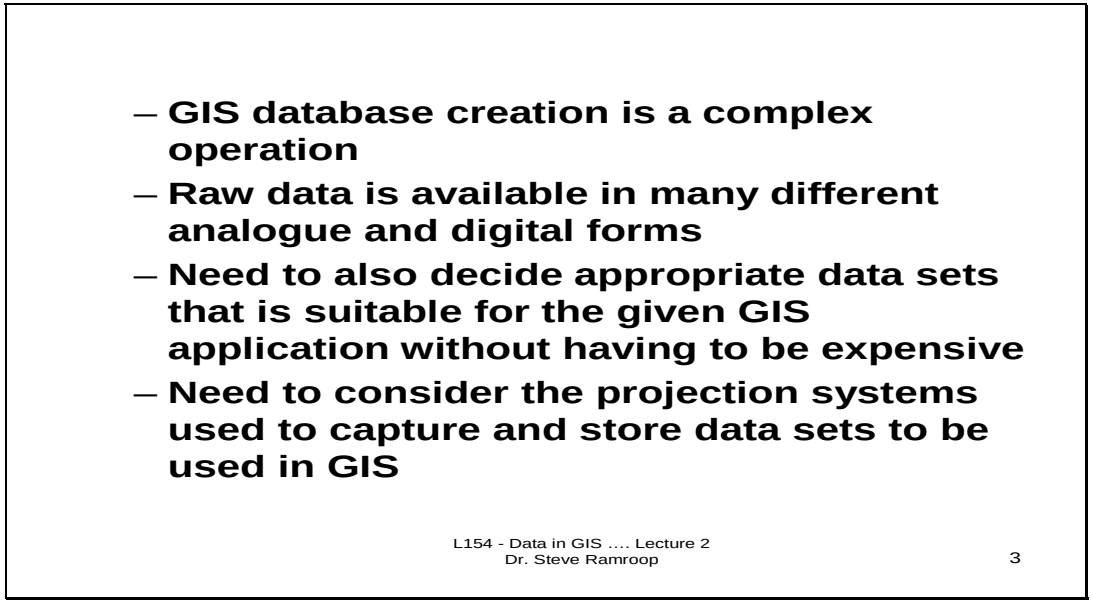
This lecture is a continuation of the data in GIS topics identified in the course description, that is data in GIS – Acquisition and input. In this lecture we discuss some data source issues.

Slide 2



This slide shows the content of lecture. Each one of the data source issues will be discussed in this lecture in further detail.

Slide 3



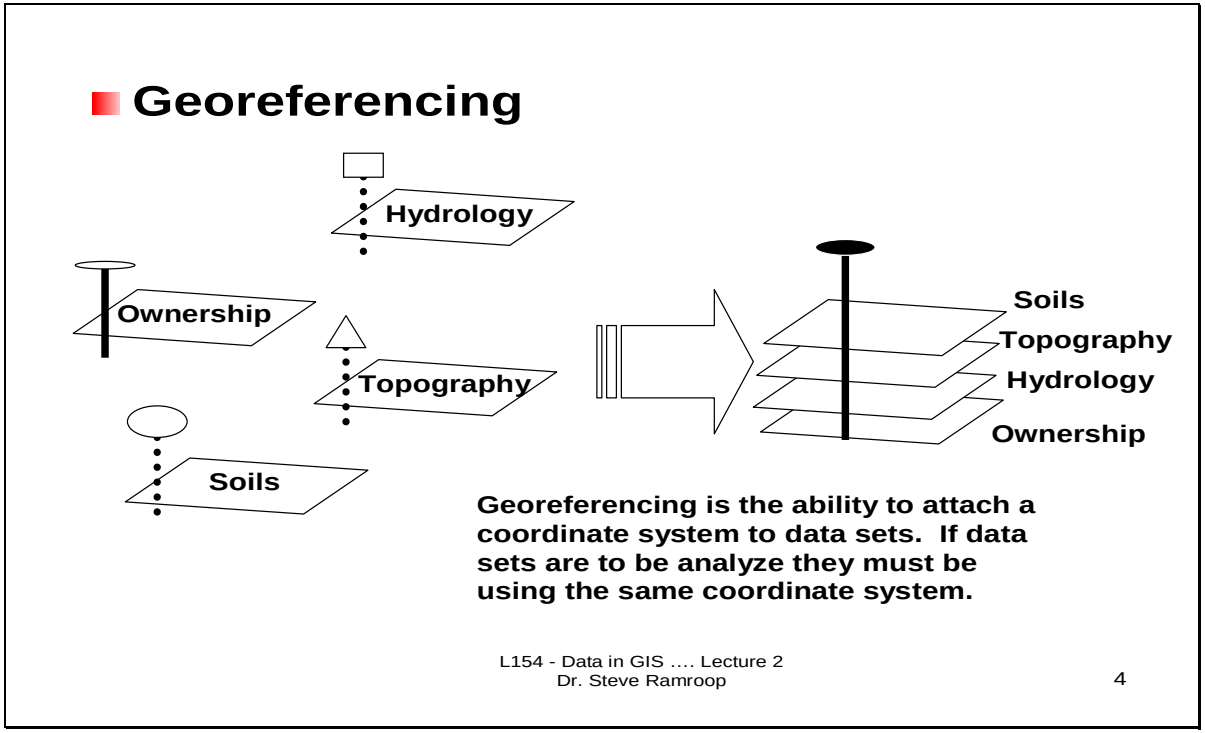
This slide gives some general remarks regarding the collection of GIS data to create GIS databases. These remarks are related to the issues regarding data sources.

A GIS database is very complex and depends upon the database model and the data model used to represent graphic features (the drawing) and its attributes (the drawing descriptive information). Raw data is the original observed data collected out in the field.

The quantity of data sets needs consideration in light of the intended GIS application. A balance is sought between the amount of data sets needed and the amount of money available to satisfy the intended GIS application.

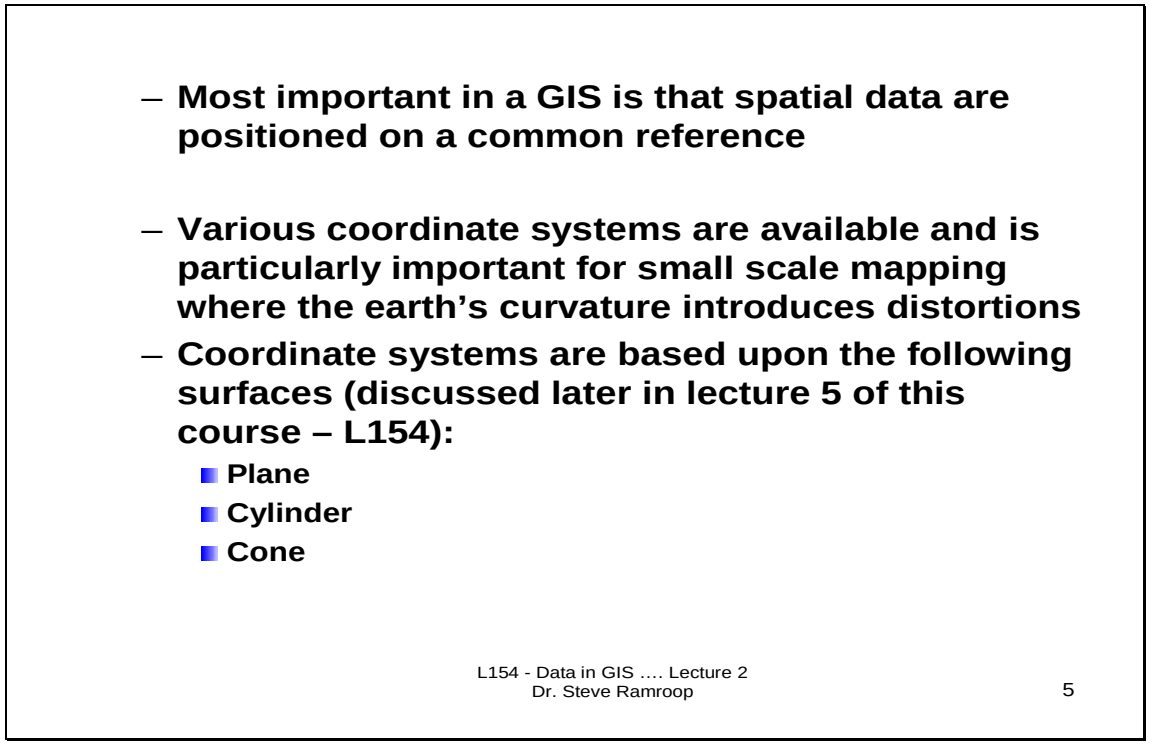
Also, each data set has a coordinate system that is defined by projection system. Typically, to work with data sets of the same area of interest would require all of the data sets to be defined or transformed into the same projection system.

Slide 4



This slide show the reality of acquiring data sets from different sources and usually would be defined using different projection systems. All is the data sets would be georeferenced but to work with them collectively all of the data sets need to be transformed into the same coordinate system. In the above slide we have four data sets that have different coordinate system, and in order for us to collectively analyze the data for a given application, we will need to transform the different coordinate systems into one common coordinate system.

Slide 5



This slide gives more general remarks about what are the essential requirements of data sets before they can be used in a GIS application.

The coordinate systems discussed later in lecture 5 are an important consideration. Two approaches can be taken. Either collect all data sets using the same projection system or perform transformations between a projection system of a source data set to a destination data set projection system. The destination data set projection system will be the common projection system which will be used by all of the data sets of the intended GIS application.

Slide 6

– **Large scale mapping, a convenient coordinate system is that of a plane**

Cylindrical projections ➔ Tropical regions
Conical projections ➔ Temperate regions
Azimuthal projections ➔ Polar regions

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Depending upon the scale of the map different projection surfaces can be adopted.

- Cylindrical projections are typically used to map Tropical Regions.
- Conical projections are typically used to map Temperate Regions.
- Azimuthal (or plane) projections are typically used to map Tropical Regions.

Slide 7

- **If there is no georeferencing, then GIS analyses are halted**
- **If there is little similarity between data layers, errors will be introduced such as:**
  - **Slivers, new polygons, incorrect distances and directions, and so on**
- **Methods used to georeference:**
  - **Capture and store data sets using a common projection system**
  - **Transformation of different projection systems to a common projection system**

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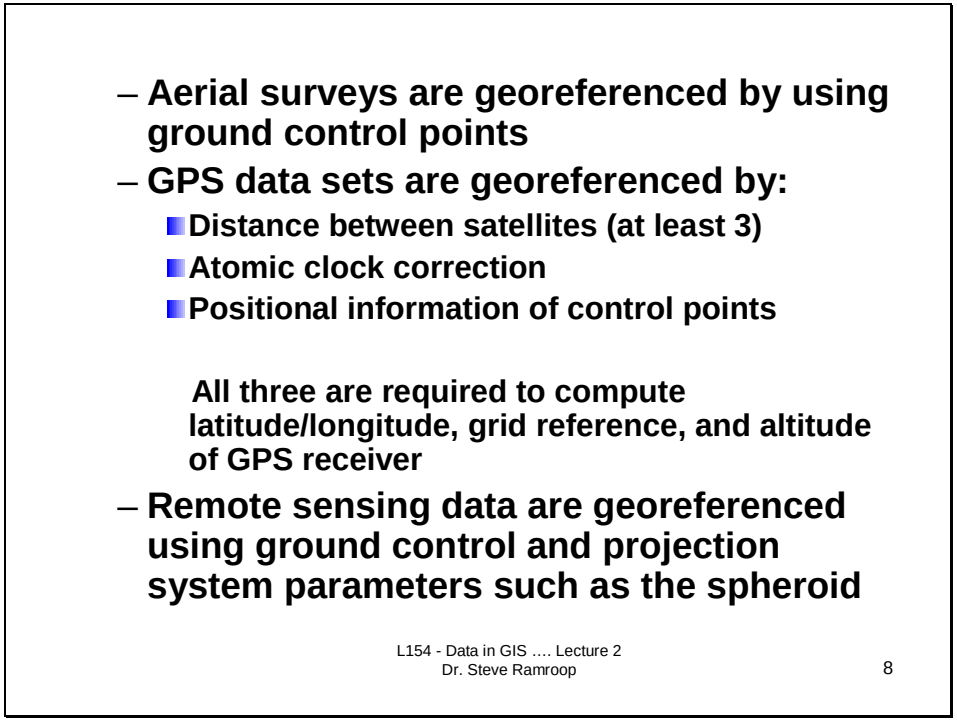
If there is no projection system then the analysis done will not have realistic coordinates and the use of a GIS will be insignificant. When overlaying similar areas which have different projection systems the output will introduce polygons that are cause by the mis-alignment of same lines. When these lines do not align, then small polygons will be created due to the mis-alignment. These polygons are called slivers.

This slide also identifies two methods of how data is georeferenced. Either define the common coordinate system at the beginning of the GIS application development or later transform from one known coordinate system to another.

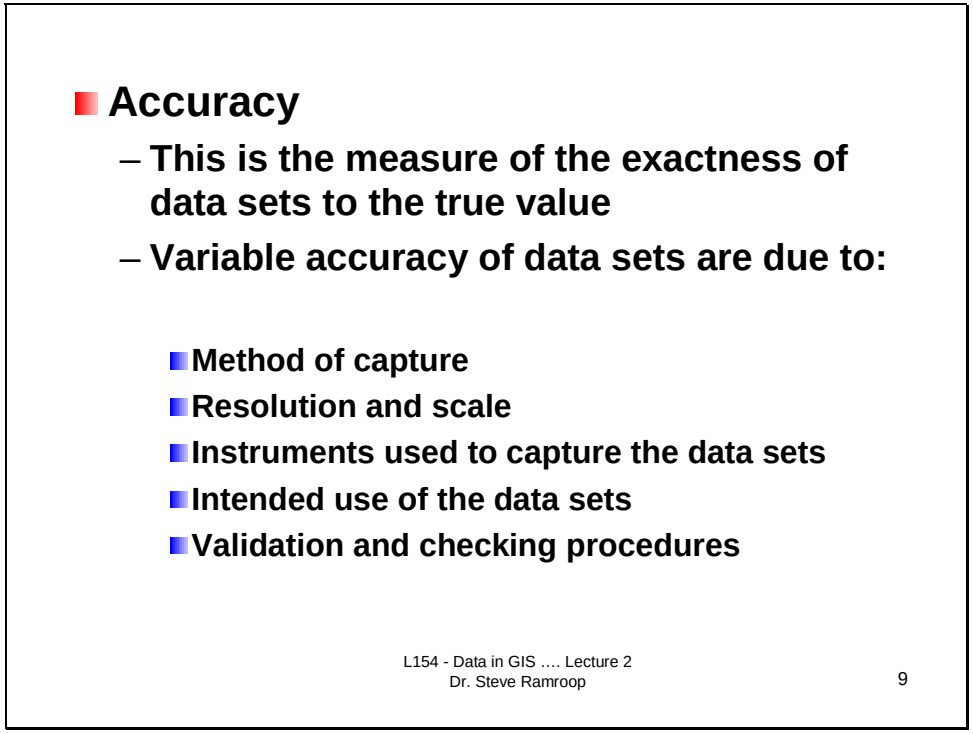
Slide 8



This slide shows the how aerial surveys, GPS, and Remote Sensing data are georeferenced. The role of ground control, and the mathematical formulae representation are major considerations.

For remote sensing done by satellites, the spherical nature of the earth must be taken into consideration using the mathematics that defines the shape of the earth. The earth can be defines as a spheroid, ellipsoid, or a geoid. There are various mathematical approaches in defining the earth and each has their accuracy limitations.

Slide 9



The second issue discussed in this lecture is accuracy. It is a measure to its true value. There are various reasons which influence the variable accuracy of data sets. A few of these reasons are listed on this slide. They are self explanatory and you are required to expand on each of the reasons.

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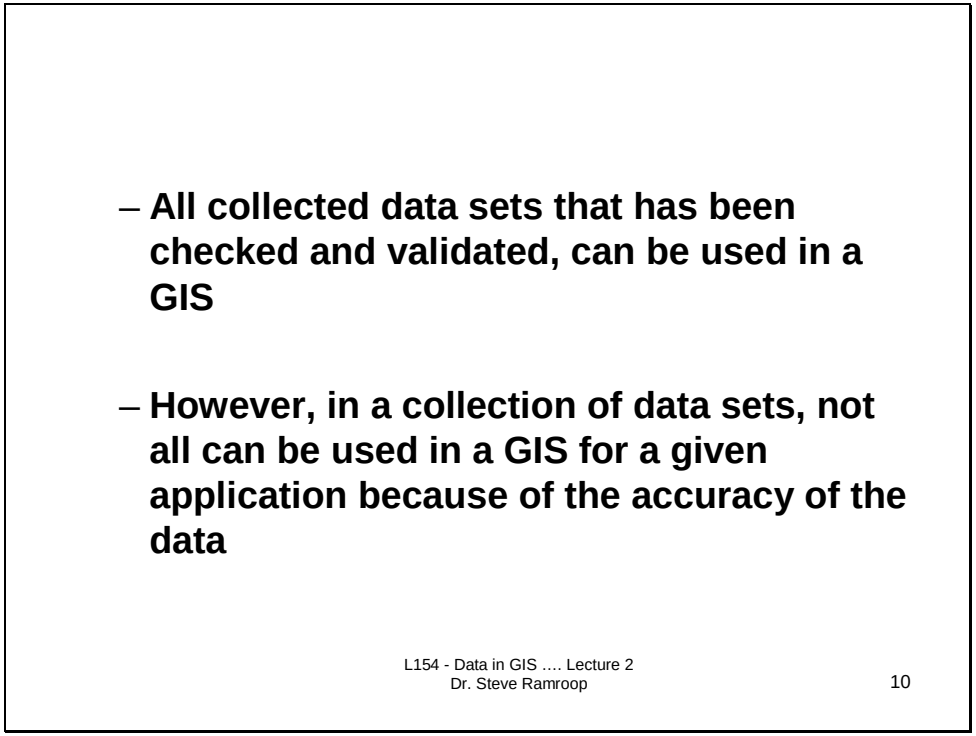
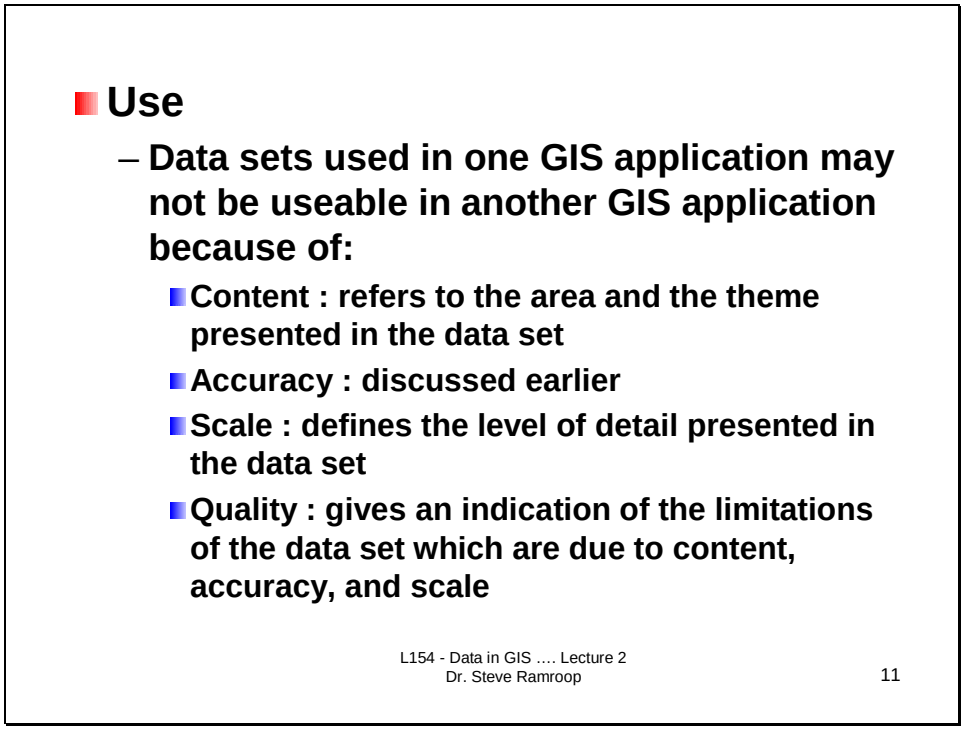


Continuing the issue with accuracy, this slide indicates that data sets need to be checked and validated out in the field which is a measure of accuracy.

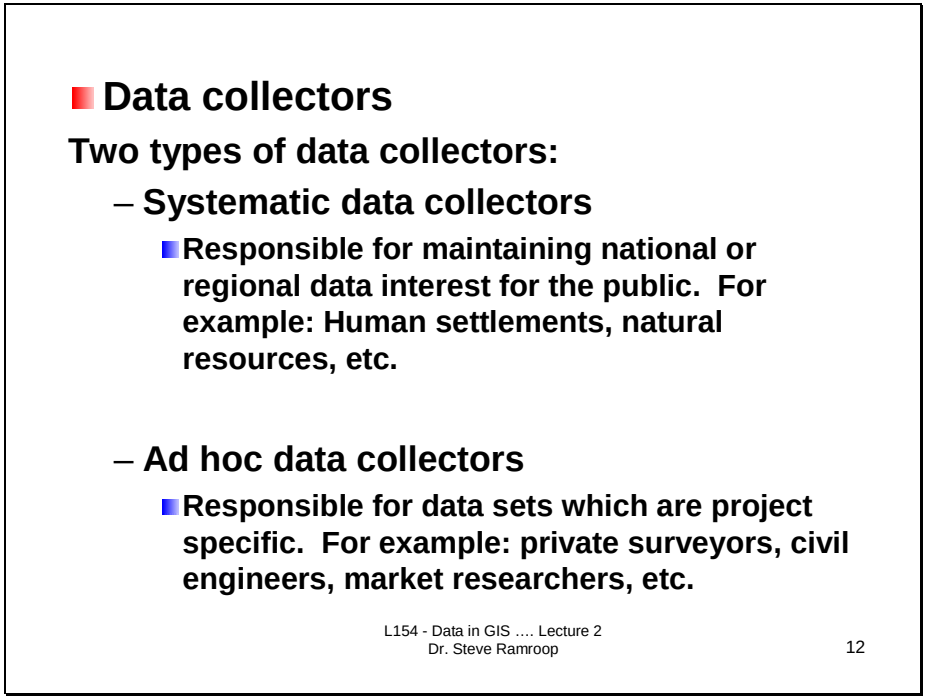
Note that one GIS application may not be suitable for another GIS application. This typically implies that, all data sets for one application may not be suitable for another. The reason for this is the accuracy of the data sets will influence the quality. For example the data used in by a tourist will not be suitable for a LIS.

Slide 11



The third data source issue is “Use”. This slide explores and extends the use of data from the last slide which explored the issue of ‘Accuracy’. The use of data sets can be variable due to content, accuracy, scale, and quality. Each of these is presented on this slide.

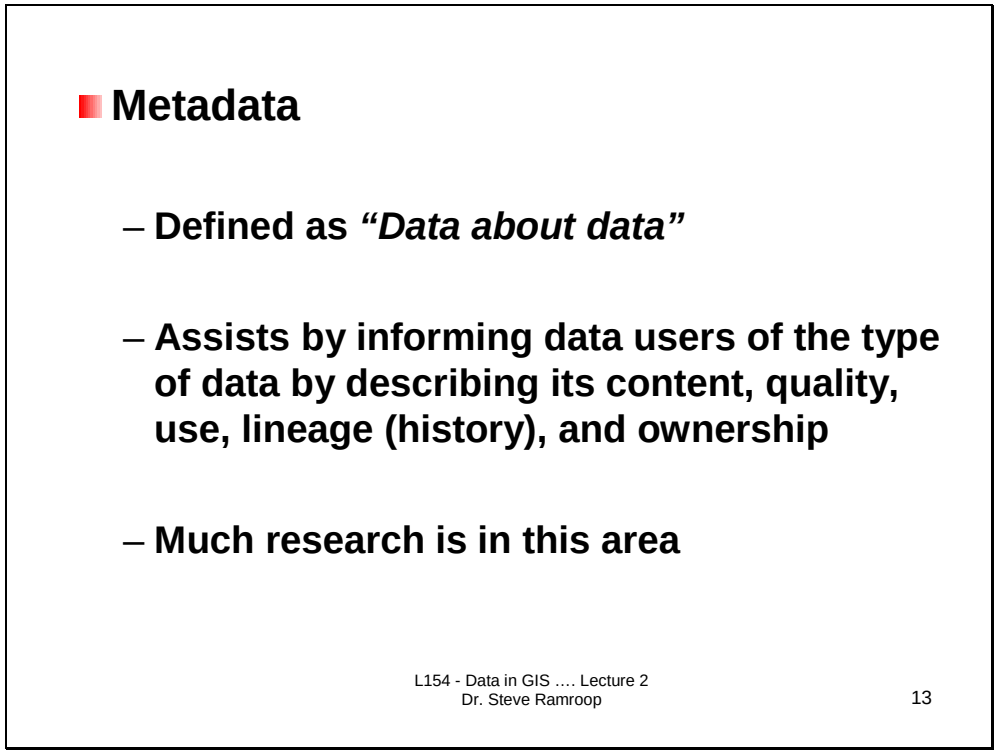
Slide 12



Another data issue is Data Collectors. **NOTE:** The data collectors referred to here are NOT the people who collects the data but more at a higher national level.

Two types are identified. The ideal is to have systematic data collectors but in reality we typically have to deal with Ad hoc data collectors because organizations tend to be autonomous. This of course introduces many problems when data is shared between organizations. Systematic data collectors supports national and international data sharing while ad hoc data collectors work in a vacuum with no insight in support of further data sharing strategies.

Slide 13



This is an area of continuous research interest. Metadata provides a method for describing geographic data sets so that interested users can locate suitable data sets. The metadata describes each data set. Many metadata standards exists and only recently (2003) there is an international standard which is used by all GIS users.

Slide 14

– **Metadata provides the user with the ability to search for data sets based upon:**

- **The currency of data**
- **Length of record**
- **Scale of data**
- **Georeference system**
- **Data collection technique**
- **Data quality**
- **Classification and interpolation methods**
- **And so on….**

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The items listed on this slide are examples of metadata attributes in which interested users can search for their suitable data sets. Each metadata standard describes GIS data as shown in the slide. The international metadata standard has over 200 metadata attributes which can be used to describe GIS data.

Slide 15

Sharing

– **Issues considered are shown in the table below:**

Geodata	**Data formats**
Geoservice	**Royalties**
Standards	**Ownership**
Metadata	**Accuracy**
Data structures	**Quality**

Students: You are required to write short notes on each of the issues listed in the table.

This slide identifies some of the issues regarding the sharing of data among organizations. Students need to find out online more about the issues listed within the context of data set sharing in GIS.

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… The End …