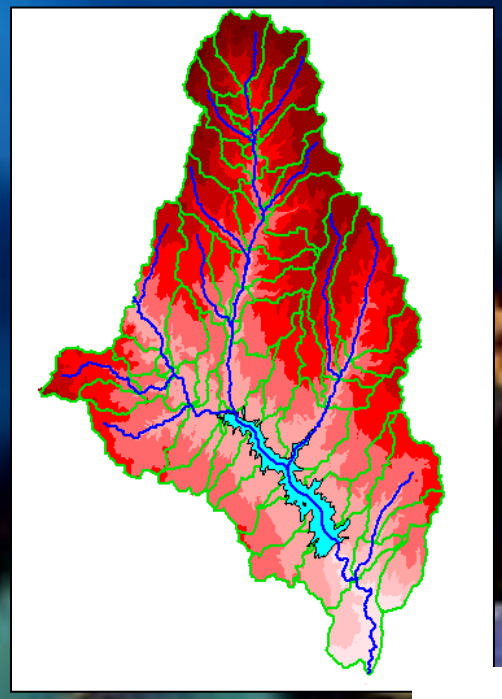
Course Title: Advances in Remote Sensing and GIS

Course Code: ENV-652

Topic: Introduction to ArcGIS



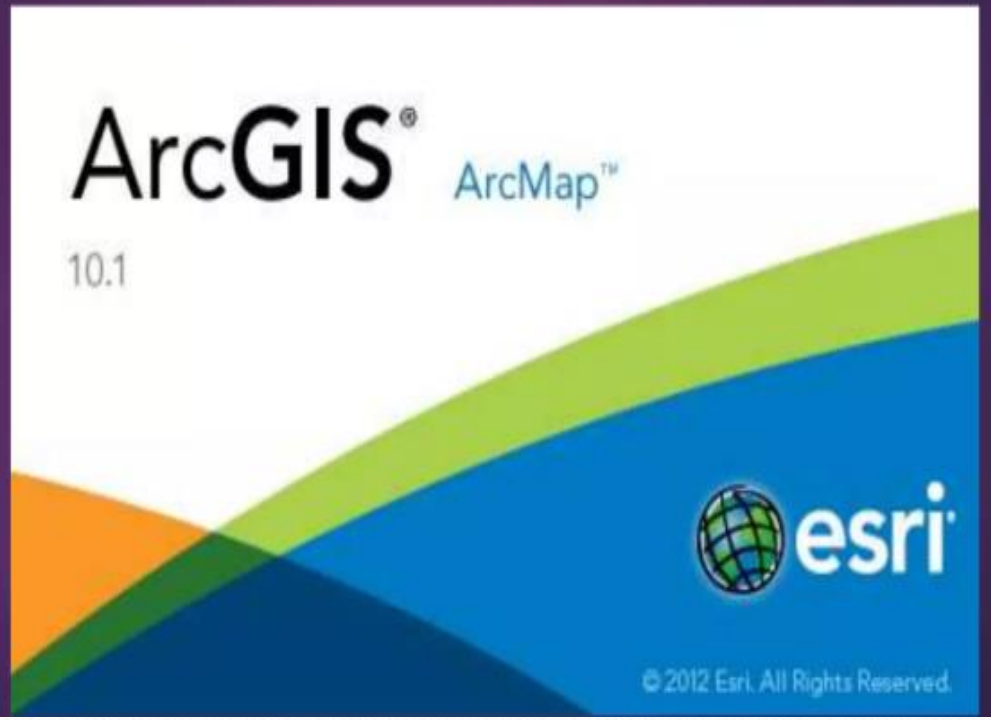
Dr. Asif Sajjad

Assistant Professor

Department of Environmental Sciences

Quaid-I-Azam University Islamabad

INTRODUCTION TO ArcGIS SOFTWARE



ArcGIS is a Product of

ESRI

ENVIRONMENTAL SYSTEM RESEARCH INSTITUTE

ArcGIS Desktop Software

It is available in three license level.....

- Basic, ArcView
- Standard, ArcEditor
- Advanced, ArcInfo

Exploring ArcGIS Desktop

- **ArcView:** viewing, map production, spatial analysis, basic editing
- **ArcEditor:** ArcView, plus specialized editing
- **ArcInfo:** ArcView & ArcEditor plus special analysis and conversions

- All three software products look and work the same. They differ only in how much they can do.
- ArcEditor does more than ArcView, and ArcInfo does more than ArcEditor.

Main components of ArcGIS

- **ArcMap**

  Mapping, editing, analysis

- **ArcCatalog**

  Manage spatial data, database designs, creation and management of metadata

- **ArcToolbox**

  GIS data conversion and geoprocessing

- **ArcScene**

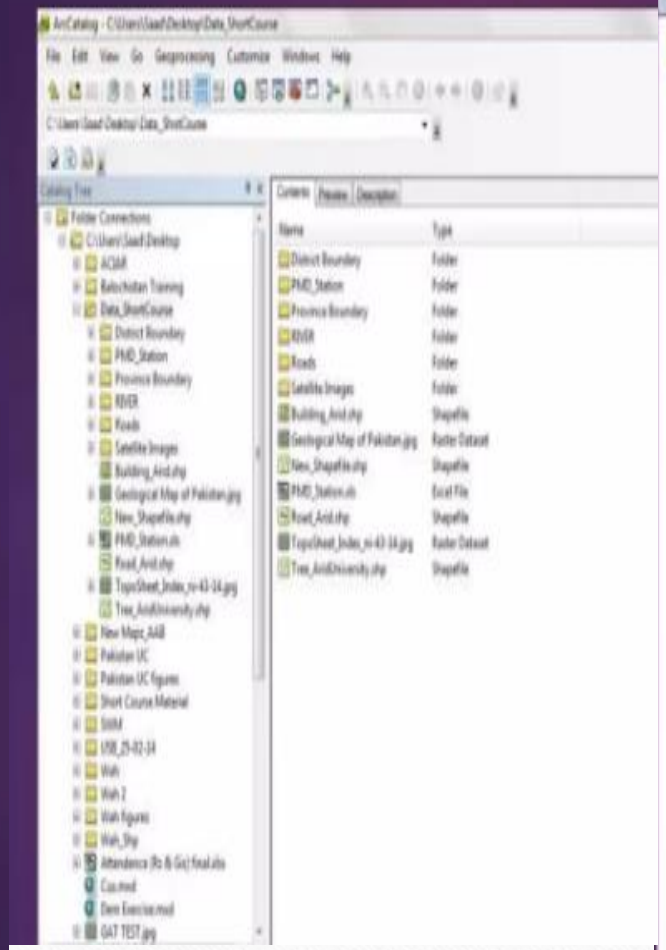
  3-D display

ArcMap

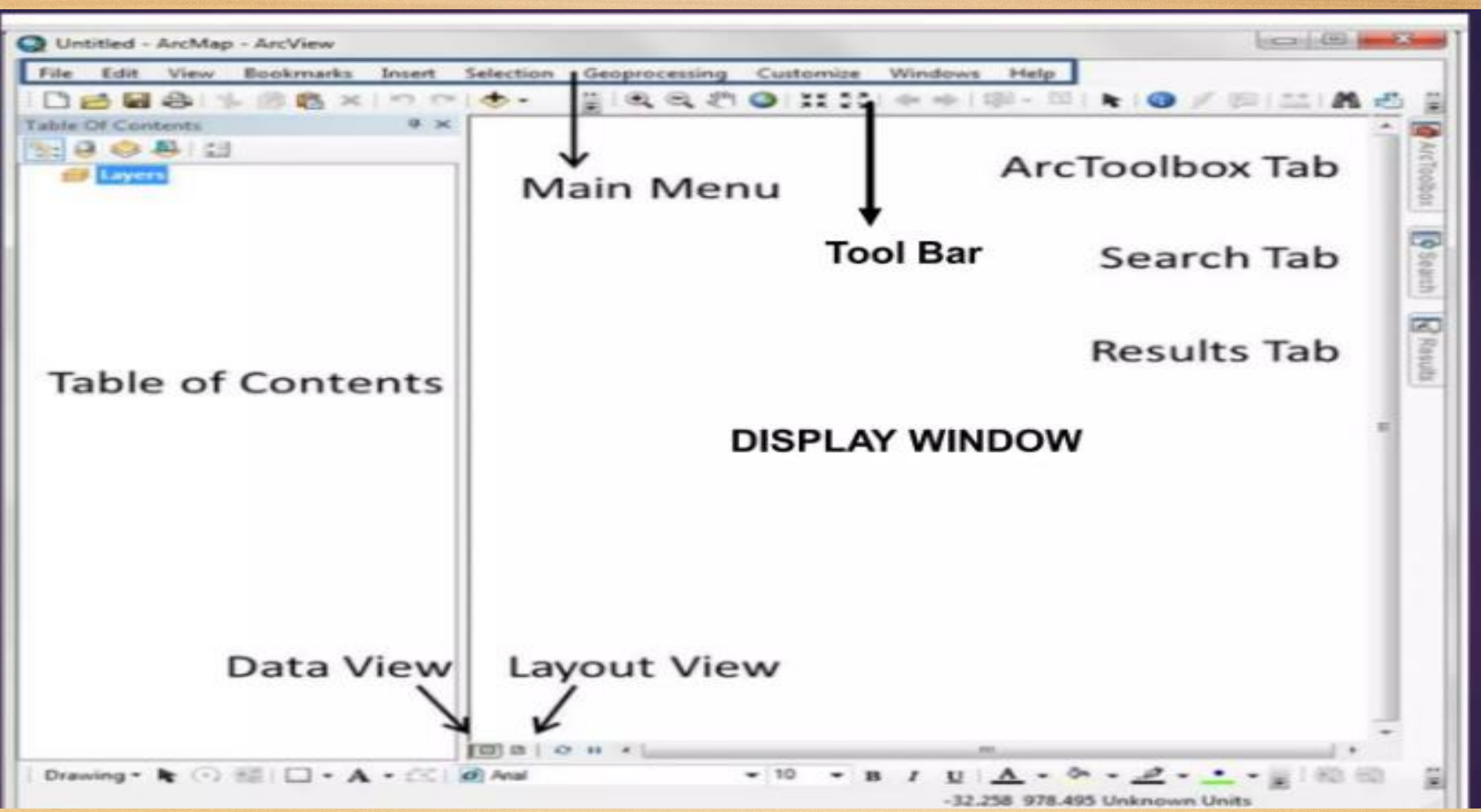
Powerful *map creation and spatial data editing.*

ArcMap is the main interface for conducting analysis and creating maps. Here, feature classes and shapefiles can be populated, data can be edited, calculations can be performed, and finally, maps can be created for displaying the results of the GIS analysis

ArcCatalog



Arc Tool Box


Untitled - ArcMap - ArcView
File Edit View Bookmarks Insert Selection Geoprocessing Customize Windows Help
Table Of Contents
Layers
Main Menu
Tool Bar
ArcToolbox Tab
Search Tab
Results Tab
Table of Contents
DISPLAY WINDOW
Data View
Layout View
Drawing
Arial
10
-32.258 978.495 Unknown Units

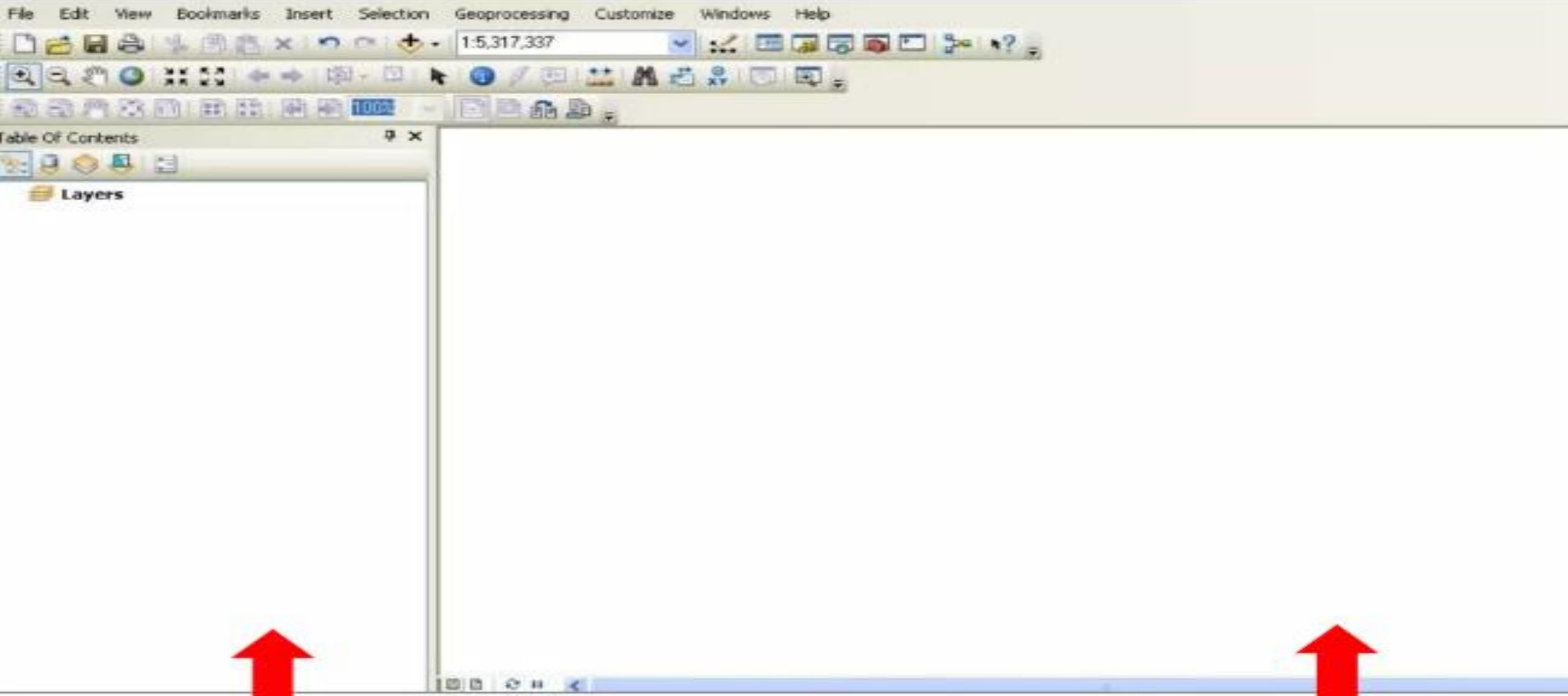
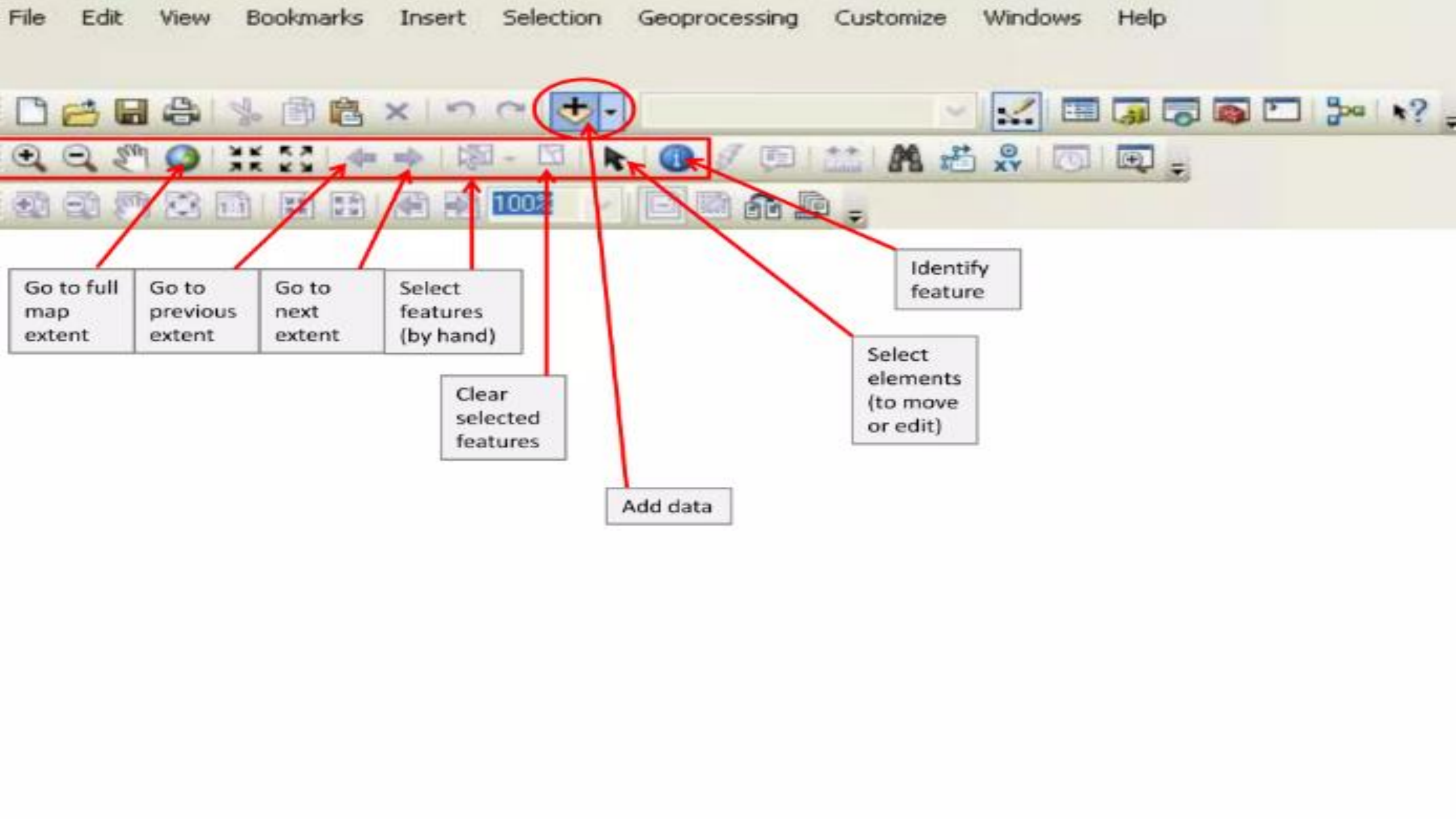


Table of contents that shows the doc's layers.

The "data frame" that displays the spatial data.


File
Edit
View
Bookmarks
Insert
Selection
Geoprocessing
Customize
Windows
Help
Go to full map extent
Go to previous extent
Go to next extent
Select features (by hand)
Clear selected features
Add data
Select elements (to move or edit)
Identify feature

Georeferencing

- 'To georeference' is the act of **assigning accurate locations** to spatial information
- Is essential in GIS, since all information must be **linked to the Earth's surface**
- The method of georeferencing must be:
  - Unique, linking information to exactly one location
  - Shared, so different users understand the meaning of a georeference
  - Persistent through time, so today's georeferences are still meaningful tomorrow

Georeferences as Measurements

- Some georeferences are metric
  - They define location using measures of distance from fixed places

  E.g. distance from the Equator or from the Greenwich Meridian
- Others are based on ordering
  - E.g. street addresses in most parts of the world order houses along streets
- Others are only nominal
  - Placenames do not involve ordering or

Metric references

- Essential to the making of maps and the display of mapped information in GIS
- Provide the potential for **infinitely fine spatial resolution** (provided we have sufficiently accurate measuring devices)
- From measurements of two or three locations it is possible to compute **distances**

Georeferencing systems

- Place names
- Postal addresses and postal codes
- Linear referencing systems
- Cadastres
- Latitude and longitude
- Projections and coordinate systems
- The Global Positioning System

Cadastral Maps

- Defined as the map of land ownership in an area, maintained for the purposes of taxing land, or of creating a public record of ownership

- Parcels of land
  - Are uniquely identified by number or code (PIN)
  - Are reasonably persistent through time, **but**

- Very few people know the identification code of their home parcel, so the use of the cadaster as georeferencing is thus limited to local officials, with one major exception

- The Public Land Survey System (PLSS) in the US and similar systems in other countries provide a method of georeferencing linked to the cadastre (Township,

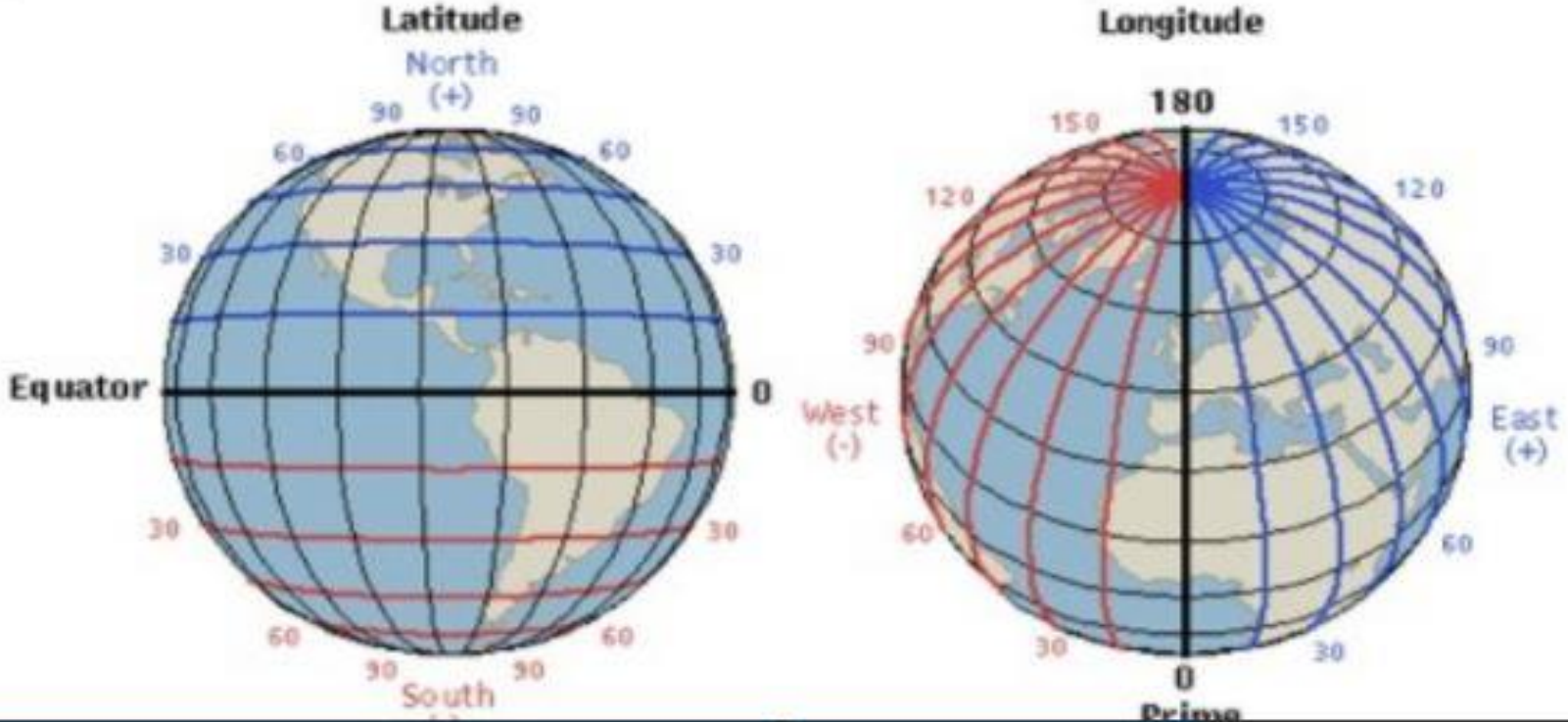
Latitude and Longitude

- The most comprehensive and powerful method of georeferencing
  - Provides potential for very fine spatial resolution
  - Allows distance to be computed between pairs of locations
  - Supports other forms of spatial analysis
- Uses a well-defined and fixed reference frame
  - Based on the Earth's rotation and center of mass, and the Greenwich Meridian

Latitude and Longitude

Latitude: is the angular distance, in degrees, minutes, and seconds of a point north or south of the Equator. Lines of latitude are often referred to as parallels.

Longitude: is the angular distance, in degrees, minutes, and seconds, of a point east or west of the Prime (Greenwich) Meridian. Lines of longitude are often referred to as meridians.



Projections and Coordinates

- There are many reasons for wanting to project the Earth's surface onto a plane, rather than deal with the curved surface
  - The paper used to output GIS maps is flat
  - Flat maps are scanned and digitized to create GIS databases
  - Square and rectangular rasters are flat
  - The Earth has to be projected to see all of it at once
  - It's much easier to measure distance on a plane