Introduction to ArcGIS Software

ArcGIS Desktop
Tools for Authoring, Editing, and Analyzing Geographic Information

ArcGIS Spatial Analyst
Advanced Raster Spatial Analysis

ArcGIS Online
Maps and Apps for Everyone

Slides Adapted from David Maidment
Introduction to GIS Software

• Conceptual framework of ArcGIS
• How data are stored in ArcGIS
• ArcGIS Desktop
• Extensions of ArcGIS – spatial analyst, 3D analyst
Readings

• Geodatabase
  http://resources.arcgis.com/en/help/main/10.2/#/What_is_a_geodatabase/003n00000001000000/
  – “What is a Geodatabase” to “Raster Basics”

• ArcMap
  – “Introduction” to “Essential ArcMap Vocabulary”
Online Book about Image Analysis in ArcGIS

Geospatial Systems Are Helping Us Understand

Understanding
Knowledge
Information
Data

Integration
Mapping

Sharing and Collaboration

... Helping Us Make Better Decisions
Good Information Products Are Timely

Tsunami Forecast

Help Us Understand . . .
. . . And Support Action
Good Information Products Disseminate Knowledge . . .

Help Us Understand . . .

Fukushima Radiation Exposure

Help Us Understand . . .

. . . And Support Action
Good Information Products Communicate Importance

Help Us Understand . . .

. . . And Support Action

Suitability For Conservation
Good Information Products Show Status

Government Expenditures vs. Need

Situation Awareness

CGI Grants

Haiti AID Funding

Help Us Understand . . .

. . . And Support Action
Good Information Products Support Decision Making

Leveraging Spatial Analysis

Wind Turbine Suitability

Hydrocarbons

Help Us Understand . . .
. . . And Support Action
Good Information Products Illustrate Change

Help Us Understand . . .

And Support Action
Good Information Products Can Show The Future

Help Us Understand . . .

. . . And Support Action

Gombe, Tanzania

Texas Border

Oregon
Good GeoInformation Products

- Provide Timely Information
- Disseminate Knowledge
- Communicate Importance
- Show Status and Performance
- Support Decision Making
- Illustrate Change
- Show The Future

Effectively Telling a Story . . .

Helping Us Understand . . .
. . . And Make Better Decisions
GIS Dictionary

Definitions for GIS terms related to operations such as analysis, GIS modeling and web-based GIS, cartography, and Esri software.

Now available for purchase: A to Z GIS: An illustrated dictionary of geographic information systems.

Search the GIS Dictionary:

Browse the GIS Dictionary:

# A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

Lisa

- abbreviation
- Abbreviation Dictionary
- abscissa
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ESRI GIS Development

Arc/Info (coverage model)
Versions 1-7 from 1980 – 1999
Arc Macro Language (AML)

ArcView (shapefile model)
Versions 1-3 from 1994 – 1999
Avenue scripting language

ArcGIS (geodatabase model)
Version 8.0, …, 10.2 from 2000 – Python scripting
A collection of rows, each containing the same fields. Feature classes are tables with shape fields.

A table with a shape field containing point, line, or polygon geometries for geographic features. Each row is a feature.

Contains rasters which represent continuous geographic phenomena.
Common Geospatial Information Types

- **Tables**: A collection of rows, each containing the same fields.
- **Feature classes**: A table with a shape field containing point, line, or polygon geometries and other fields for descriptive attributes.
- **Raster datasets**: Satellite and aerial imagery and other cell based datasets.

Image: Michael Zeiler, ESRI
Geodatabase – a store for all types of geospatial information
ArcGIS Geodatabase

Workspace
Geodatabase
Feature Dataset
Feature Class
Geometric Network
Relationship
Object Class

<table>
<thead>
<tr>
<th>OBJECTID*</th>
<th>CrossSectionID*</th>
<th>CrossSectionM</th>
<th>Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>3931</td>
<td>Colorado/Lbj Middle 06</td>
<td>3464</td>
<td>801</td>
</tr>
<tr>
<td>3932</td>
<td>Colorado/Lbj Middle 06</td>
<td>3482</td>
<td>800</td>
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<td>3934</td>
<td>Colorado/Lbj Middle 06</td>
<td>3511</td>
<td>799</td>
</tr>
<tr>
<td>3935</td>
<td>Colorado/Lbj Middle 06</td>
<td>3527</td>
<td>799</td>
</tr>
</tbody>
</table>
Object Class

- An object class is a collection of objects in tabular format that have the same behavior and the same attributes.

An object class is a table that has a unique identifier (ObjectID) for each record.
Feature Class

- A feature class is a collection of geographic objects in tabular format that have the same behavior and the same attributes.

Feature Class = Object class + spatial coordinates
A **relationship** is an association or link between two objects in a database.

A relationship can exist between spatial objects (features in feature classes), non-spatial objects (objects in object classes), or between spatial and non-spatial objects.
Relationship between non-spatial objects

Water Quality Data

Water Quality Parameters
Relationship between spatial and non-spatial objects

Water quality data (non-spatial)

Measurement station (spatial)
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ArcGIS for Desktop has three applications that can be used for mapping and visualization:

- **ArcMap** is the main application used in ArcGIS for Desktop for mapping, editing, analysis, and data management. ArcMap is used for all 2D mapping work and visualization.

- **ArcGlobe** is used for seamless 3D visualization of geographic data using a continuous global view. This application is generally
ArcGIS Desktop

- Data visualization, integration, and management
- Spatial modeling and analysis
- High-end cartography
- Specialized GIS tools

**ArcGIS Desktop**

ArcGIS Desktop provides data and tools to help you create, edit, import, map, query, analyze, and publish geographic information. ArcGIS Desktop products include ArcInfo®, ArcEditor™, ArcView®, and the ArcGIS Desktop extensions.
ArcMap – primary work interface
Arc Catalog – view the geodatabase allows file management (renaming, copying, deleting)
ArcToolbox – processing functions
Search – to find functions in TB
Model Builder - automates

Toolbox tools linked together using the model builder to automate data processing
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  • *Extensions of ArcGIS – Spatial Analyst, 3D Analyst, Geostatistical Analyst, Arc Scene*
Spatial Analyst

http://resources.arcgis.com/en/help/main/10.2/#/What_is_the_ArcGIS_Spatial_Analyst_extension/00590000001000000/
Geostatistical Analyst and Interpolation

3-D Analyst

- Analysis of land surface terrain as triangulated irregular network (TIN)
- Visualization in 3-D using Arc Scene

Stream channel of Pecan Bayou, TX
3D Analyst and ArcScene

ArcScene is a 3D visualization application that allows you to view your GIS data in three dimensions.

ArcScene allows you to overlay many layers of data in a 3D environment. Features are placed in 3D by providing height information from feature geometry, feature attributes, layer properties, or a defined 3D surface, and every layer in the 3D view can be handled differently. Data with different spatial references will be projected to a common projection, or data can be displayed using relative coordinates only. ArcScene is also fully integrated with the geoprocessing environment, providing access to many analysis tools and functions.

Much of the functionality of ArcScene is shared with the ArcGlobe 3D display environment, though there are several key differences between the two 3D environments.
ArcGIS Online
Mapping on the web
Sign In to Organizational Account associated with your institution

Don't have an ArcGIS account?
Sign up for a 60-day trial.

TRY ARCGIS

ArcGIS Public Account
An ArcGIS Public Account is a personal account with limited usage and capabilities and is meant for non-commercial use only.

CREATE A PUBLIC ACCOUNT

Use of services is paid for with “credits”
Make a Map
Select a base map and add things to it
Living Atlas

http://www.arcgis.com/home/gallery.html
Earth Observations

Featured Maps from the Living Atlas

Maps
- Show
  - All
  - Imagery
  - Basemaps
  - Historical Maps
  - Demographics & Lifestyle
  - Landscape
- Earth Observations
  - Urban Systems
  - Transportation
  - Boundaries & Places
  - Story Maps
  - Scenes

Area
- All
- United States
- World

Apps
- Search the website or visit the ArcGIS Marketplace

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