

ArcGIS[®] Desktop II: Tools and Functionality

Copyright © 2008-2010 Esri

All rights reserved.

Course version 2.1. Version release date July 2010.

Printed in the United States of America.

The information contained in this document is the exclusive property of Esri. This work is protected under United States copyright law and other international copyright treaties and conventions. No part of this work may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying and recording, or by any information storage or retrieval system, except as expressly permitted in writing by Esri. All requests should be sent to Attention: Contracts and Legal Services Manager, Esri, 380 New York Street, Redlands, CA 92373-8100 USA.

EXPORT NOTICE: Use of these Materials is subject to U.S. export control laws and regulations including the U.S. Department of Commerce Export Administration Regulations (EAR). Diversion of these Materials contrary to U.S. law is prohibited.

The information contained in this document is subject to change without notice.

U. S. GOVERNMENT RESTRICTED/LIMITED RIGHTS

Any software, documentation, and/or data delivered hereunder is subject to the terms of the License Agreement. The commercial license rights in the License Agreement strictly govern Licensee's use, reproduction, or disclosure of the software, data, and documentation. In no event shall the U.S. Government acquire greater than RESTRICTED/LIMITED RIGHTS. At a minimum, use, duplication, or disclosure by the U.S. Government is subject to restrictions as set forth in FAR §52.227-14 Alternates I, II, and III (DEC 2007); FAR §52.227-19(b) (DEC 2007) and/or FAR §12.211/12.212 (Commercial Technical Data/Computer Software); and DFARS §252.227-7015 (NOV 1995) (Technical Data) and/or DFARS §227.7202 (Computer Software), as applicable. Contractor/Manufacturer is Esri, 380 New York Street, Redlands, CA 92373-8100, USA.

@esri.com, 3D Analyst, ACORN, Address Coder, ADF, AML, ArcAtlas, ArcCAD, ArcCatalog, ArcCOGO, ArcData, ArcDoc, ArcEdit, ArcEditor, ArcEurope, ArcExplorer, ArcExpress, ArcGIS, ArcGlobe, ArcGrid, ArcIMS, ARC/INFO, ArcInfo, ArcInfo Librarian, ArcLessons, ArcLocation, ArcLogistics, ArcMap, ArcNetwork, ArcNews, ArcObjects, ArcOpen, ArcPad, ArcPlot, ArcPress, ArcReader, ArcScan, ArcScene, ArcSchool, ArcScripts, ArcSDE, ArcSdl, ArcSketch, ArcStorm, ArcSurvey, ArcTIN, ArcToolbox, ArcTools, ArcUSA, ArcUser, ArcView, ArcVoyager, ArcWatch, ArcWeb, ArcWorld, ArcXML, Atlas GIS, AtlasWare, Avenue, BAO, Business Analyst, Business Analyst Online, BusinessMAP, CommunityInfo, Database Integrator, DBI Kit, EDN, Esri, Esri—Team GIS, Esri—The GIS Company, Esri—The GIS People, Esri—The GIS Software Leader, FormEdit, GeoCollector, Geographic Design System, Geography Matters, Geography Network, GIS by Esri, GIS Day, GIS for Everyone, GISData Server, JTX, MapIt, Maplex, MapObjects, MapStudio, ModelBuilder, MOLE, MPS—Atlas, PLTS, Rent-a-Tech, SDE, SML, Sourcebook-America, Spatial Database Engine, StreetMap, Tapestry, the ARC/INFO logo, the ArcGIS logo, the ArcGIS Explorer logo, the ArcPad logo, the Esri globe logo, the Esri Press logo, the GIS Day logo, the MapIt logo, The Geographic Advantage, The Geographic Approach, The World's Leading Desktop GIS, Water Writes, www.esri.com, www.geographynetwork.com, www.gis.com, www.gisday.com, and Your Personal Geographic Information System are trademarks, registered trademarks, or service marks of Esri in the United States, the European Community, or certain other jurisdictions.

Other companies and products mentioned herein may be trademarks or registered trademarks of their respective trademark owners.

Introduction

- Introduction
- Course goals
- Using the course workbook
- Additional resources
- Installing the course data

1 Introducing map layers

- Lesson introduction
- GIS and maps
- ArcMap: mapping application
- Maps and layers
- Feature classes and layers
- Feature class organization
- Exercise 1: Explore data in ArcMap
 - Start ArcMap
 - Work with layers
 - Change symbology
 - Add layers to ArcMap
 - Explore the Tools toolbar
 - Make selections on features and records
 - Save the map
- Lesson review
 - Answers to Lesson 1 questions

2 Managing map layers

- Lesson introduction
- Zooming using commands and tools
- Controlling which features display
- Controlling when layers display
- Grouping layers
- Creating basemap layers
- Making new map layers
- Saving layers
- Exercise 2: Manage map layers
 - Open a map document
 - Zoom to features and layers
 - Create a bookmark
 - Create a definition query
 - Set a scale range for the Airports layer
 - Add a layer and write another definition query
 - Compare the Water layer to the Lakes layer
 - Import the Lakes layer symbology
 - Create a selection layer
 - Examine the Lakes selection layer
 - Create a group layer

- Create a basemap layer
- Set layer properties
- Save a layer as a layer file
- Create a layer package

Lesson review

- Answers to Lesson 2 questions

3 Symbolizing categorical data

Lesson introduction

Symbology based on attributes

Categorical data

Exercise 3: Symbolize categorical data

- Open a map document
- Symbolize provinces by name
- Change color ramps
- Add headings to the table of contents
- Add a layer of major cities
- Symbolize cities by type
- Change the symbology of the cities
- Reorder values and edit labels
- Remove values from the symbology
- (Optional) Symbolize on more than one attribute

Lesson review

- Answers to Lesson 3 questions

4 Symbolizing quantitative data

Lesson introduction

What is quantitative data?

Symbolizing quantitative data

Classification methods

Test your knowledge

What is normalization?

Choosing a classification method

Exercise 4: Symbolize quantitative data

- Open a map document and examine population data
- Symbolize provinces by population using graduated colors
- Symbolize provinces by population using graduated symbols
- Normalize population by area
- Symbolize population density by census division
- Change the classification method
- Use the classification histogram
- Symbolize population density by census subdivision
- Compare the population maps

Lesson review

- Answers to Lesson 4 questions

5 Working with labels and annotation

- Lesson introduction
- Where does map text come from?
- What are labels?
- Dynamic label placement
- Placement rules for different feature types
- Label symbology
- SQL query
- Scale range
- Label classes
- Label expressions
- Ranks and weights
- Exercise 5A: Work with labels
 - Open a map document
 - Label the provinces
 - Remove duplicate labels
 - Change the attribute used for labels
 - Change label symbology
 - Explore placement properties for polygons
 - Explore label weight ranking
 - Add and symbolize a symbol class
 - Set scale ranges
 - Label major cities using a query
 - Choose label symbology for major cities
 - Adjust label weight ranking
 - Explore placement properties for points
 - (Optional) Experiment with labeling line features
 - (Optional) Add a label expression
- What is annotation?
- Geodatabase annotation
- Map annotation
- Creating annotation from labels
- Choosing the right type of map text
- Exercise 5B: Work with annotation
 - Open a map document
 - Convert labels to geodatabase annotation
 - Examine an annotation feature class
 - View the effect of reference scale
 - Create map document annotation
 - Manage map document annotation
 - (Optional) Convert labels to map document annotation
- Lesson review
 - Answers to Lesson 5 questions

6 Making a map layout

- Lesson introduction
- Map content considerations
- What is the purpose, situation, and audience?
- Data view vs. layout view
- Map elements
- Legend and scale bar
- Other map elements
- Arranging map elements
- Data frame properties for layouts
- Exporting maps
- What if you want to update or reuse a map?
- Exercise 6: Making a map layout
 - Open a map document
 - Switch to layout view
 - Set page properties
 - Set rulers and guides
 - Resize the data frame
 - Zoom in on the data and freeze the map scale
 - Move map annotation
 - Insert a title
 - Insert a legend
 - Modify the legend
 - Insert a scale bar
 - Insert text
 - Insert text for the map projection and current date
 - Export and save the map
 - View your map in data view
- Lesson review
 - Answers to Lesson 6 questions

7 Investigating geographic data

- Lesson introduction
- Vector model
- List examples of real-world vector features
- Vector data organization
- Raster data model
- Raster data organization
- How is geographic data stored?
- ArcCatalog: data management application
- Exercise 7: Explore data in ArcCatalog
 - Start ArcCatalog
 - Use different views to display data
 - Preview data
 - View metadata
 - Search for data

- Explore feature class properties
- Preview data outside the geodatabase
- Manage data
- Update layer paths to data
- Lesson review
- Answers to Lesson 7 questions

8 Using coordinate systems and map projections

- Lesson introduction
- Two types of coordinate systems
- Spatial reference lines
- Latitude and longitude
- Shape of the earth
- Datum
- Map projection
- Projected coordinate system
- Spatial distortion
- Three key concepts
- Exercise 8A: Project data on the fly
 - Examine a feature class coordinate system
 - Examine the coordinate system of another feature class
 - Examine coordinate systems in ArcMap
 - Add another layer to the data frame
 - Insert a new data frame with a different coordinate system
 - Add more layers to the data frame
 - Change the coordinate system of the data frame
 - Get help on map projections and coordinate systems
 - Add the CanadaProvinces layer
 - (Optional) Project data on disk
- Exercise 8B: Work with an unknown coordinate system
 - Open a map document
 - Add data to the map
 - Investigate the CanadaMountains layer
 - Define the CanadaMountains coordinate system
- Lesson review
- Answers to Lesson 8 questions

9 Managing tables

- Lesson introduction
- Getting information from tables
- Field properties, aliases, and table display options
- Exercise 9A: Set table properties
 - Open a map document
 - Open the States layer attribute table
 - Sort a field and select records
 - Format a field
 - Return statistics on a field

- Sort on multiple fields
- Set visibility and alias properties
- Adjust field widths
- (Optional) Change the appearance of an attribute table
- (Optional) Create a graph
- Spatial tables
- Nonspatial tables
- Compare fields in spatial and nonspatial tables
- What if...
- Table joins
- Table relates
- What type of association is needed?
- Exercise 9B: Join and relate tables
 - Start ArcMap and review the data
 - Add a nonspatial table
 - Compare the two tables
 - Join tables
 - Examine the joined table
 - Symbolize on joined data
 - Remove the join
 - Add another nonspatial table to the map
 - Compare the tables
 - Export the crime table to dBASE format
 - Examine the new table
 - Relate tables
 - Explore the relate and remove it
- Lesson review
 - Answers to Lesson 9 questions

10 Editing features and attributes

- Lesson introduction
- Types of data you can edit
- Ways to create and edit data
- Preparing a map for editing
- Feature templates
- Snapping
- Editing workflow
- Editing attributes
- Calculating attribute values
- Editing tips
- Exercise 10: Edit features and attributes in ArcMap
 - Open a map document and prepare a background layer
 - Prepare for editing
 - Digitize a new point feature and update attributes
 - Create a new point feature from coordinate values and update attributes
 - Update an attribute for multiple features
 - Digitize a new line feature and update an attribute
 - Explore snapping properties
 - Modify feature vertices

- Digitize a new polygon feature and update an attribute
- (Optional) Calculate attribute values
- Lesson review
- Answers to Lesson 10 questions

11 Creating geodatabases and feature classes

- Lesson introduction
- Organizing data in a geodatabase
- Organizing data into feature classes
- Workflow for creating new data
- Defining feature class properties (schema)
- Defining attributes
- Why document your data?
- Exercise 11: Create and document data
 - Create a new geodatabase
 - Explore the OSU data
 - Add and delete fields
 - Add values to the new field
 - Create a new feature class and set its properties
 - Define attributes for the new feature class
 - Find the football stadium
 - Add a new feature to your feature class
 - Add attribute values to your feature
 - Document your new feature class
- Lesson review
- Answers to Lesson 11 questions

12 Getting locations from tabular data

- Lesson introduction
- Adding x,y data
- Finding places and addresses
- Geocoding
- Geocoding components
- Address matching
- How addresses are matched
- Geocoding output
- Rematching addresses
- Geocoding workflow
- Exercise 12A: Build an address locator
 - Examine data
 - Create an address locator
- Exercise 12B: Geocode addresses
 - Open a map document
 - Geocode addresses
 - Examine geocoding results
 - Rematch addresses
 - (Optional) Match the last unmatched address

Lesson review
Answers to Lesson 12 questions

13 Solving spatial problems with analysis

Lesson introduction
Analysis process
Common analysis operations
Working with attribute queries
Working with spatial (location) queries
Extracting features using the Clip tool
Buffering features
Overlay analysis
Intersect
Union
Exercise 13A: Analyze habitat data
 Open a map document
 Explore habitat layers
 Clip rivers to the habitat area
 Buffer rivers
 Union the habitat layers
 Intersect habitats and river buffer
 Query habitats within 1 mile of rivers
 Add the Louisiana image to your map (self-directed)
Exercise 13B: Analyze soils data
 Open a map document
 Select features by attribute
 Create a shapefile from a selection
 Select features spatially
 Summarize an attribute table
 Find the area of soil types in the study area
Exercise 13C: (Optional) Symbolize your map and create a layout (Self-directed)
 Create and export a map layout
Lesson review
 Answers to Lesson 13 questions

Appendixes

Appendix A: ESRI data license agreement