

GIS CONCEPTS
AND
ARCGIS METHODS

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GIS Concepts and ArcGIS Methods

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Preface

A relatively recent trend in the geographical information systems (GIS) industry is *desktop GIS* that utilizes graphical user interface components, and ArcGIS v8 is the most recent version of software produced by Environmental Systems Research Institute (ESRI). A natural outgrowth of desktop GIS is that the user base has become broader and more diverse. One of the consequences of the broadening of the user base is that documentation has become more general and less technical, even though the software is becoming more flexible and powerful. Much of the reasoning has been lost from user manuals behind why a certain option should be selected or which algorithm should be used. There are numerous good GIS textbooks that discuss basic concepts, but increasingly many users of GIS software are not aware of this foundation.

In the GIS field, as in other areas that are strongly influenced by technology, there seem to be two types of books available. First, *training* books provide a mechanical tutorial for specific software products. *Educational* textbooks, on the other hand, provide a conceptual basis and understanding for generic methods and techniques, and lend scientific rigor to the content. Students in formal GIS courses are provided general descriptions of analytical procedures through textbooks, but are left to determine which algorithm has been implemented and how it works. The result is that users frequently understand general principles, but lack knowledge of specific, technical details.

Four years ago I wrote the precursor to this book—*GIS Concepts and ArcView Methods*—to fill the void between textbooks and user manuals by fusing a grounded presentation of *ArcView* GIS software. Encouraged by the success of that book and stimulated by the significant changes that ArcGIS has brought, I have written the present one—*GIS Concepts and ArcGIS Methods*—in very much the same spirit, but addressing ESRI's recent flagship software, *ArcGIS*. As the book title suggests, I have attempted to organize and frame the methods and techniques used in ArcGIS within the context of GIS concepts and principles. I attempt to describe *why* you should choose a particular method or technique, in addition to how to do it—without crossing the line where the forest is lost for the trees.

The Internet is a great mechanism to provide feedback so this book can grow and constantly improve *with your help*. Please drop me a note at: David.Theobald@colostate.edu.

Cheers!

Dave Theobald
Fort Collins, Colorado
January 2003

Book organization

This book is organized roughly from basic to advanced concepts. I have chosen to provide fairly detailed information even in introductory chapters so that the text provides a full, cohesive reference book. Some of the information may be a bit too detailed for first-time users of ArcGIS and GIS in general. Please simply note that “there is something more there” and refer back to it at a later reading.

Chapter 1 introduces some basic geographical concepts and describes terms and concepts specific to ArcGIS. Chapter 2 describes data models and structures and provides detailed discussion about shapefiles and geodatabases. Chapter 3 provides a review of projections and concludes with specific projections supported in ArcGIS. Chapter 4 describes the basic steps of visualizing geographic phenomena with maps and printing maps. Chapter 5 describes the numerous ways you can query map and attribute data. Chapter 6 describes in detail how to create and edit both spatial and attribute data, including procedures for topological and non-topological editing. Chapter 7 describes raster-based modeling and the Spatial Analyst extension, including an in-depth section on the Raster Calculator. Chapter 8 describes how to analyze a single map, while Chapter 9 describes how to analyze the relationships and features between two or more maps.

Technical details are provided as footnotes at the end of each chapter, as are numerous citations to primary and secondary references. I have also commented on parallels to ArcView v3.x throughout in various footnotes. I conclude most sections with step-by-step instructions, rather than including them directly in the text.

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