Contents

Preface xi
Introduction xiii

Chapter 1 Identifying coordinate systems for data using ArcMap 1
Using vector datasets 2
Identifying the type of coordinate system for data using ArcMap 4
Summary 18

Chapter 2 Identifying the correct geographic coordinate system 21
Example of datum offset between NAD 1927 and NAD 1983 datums in a GCS 22
Example in which data with the unknown coordinate system is in a GCS, and reference data is in a projected coordinate system 32
Other issues to consider 37
Summary 40

Chapter 3 Identifying the projected coordinate system 41
State plane coordinate system 41
Universal transverse Mercator coordinate system 49
Testing to identify the PCS for data 51
If state plane options do not align the data, test for UTM 56
Other PCS options 62
Summary 64

Chapter 4 Applying nonstandard units—when standard coordinate systems don’t work 65
Customizing the state plane coordinate system with units of inches 66
Comparing units of international feet with US survey feet 81
Saving the custom projection file to disk for future use 82
Defining the projection using the custom projection file 83
Summary 83
Chapter 5  Aligning CAD data—modifying a standard coordinate system ____________________ 85
Working with CAD files in ArcMap ___________________________ 88
Procedures to address misaligned CAD data ___________________________ 89
  1. Identifying units of measure ___________________________ 90
  2. CAD files created with references attached ___________________________ 93
  3. If CAD data is in nonrotated local coordinates ___________________________ 93
  4. Rotated CAD files ___________________________ 97
  5. Improving layer/level visibility ___________________________ 98
  6. If the CAD files were created in ground coordinates ___________________________ 99
  7. The scale factor may be applied to the false easting and false northing ________ 101
  8. If the data lies below sea level ___________________________ 102
  9. Applying the custom projection definition to the CAD file ___________________________ 103
Saving the custom projection file to disk ___________________________ 103
Summary ________________________________________________________________ 103

Chapter 6  Aligning rotated CAD data ___________________________ 105
Adjusting for the azimuth or rotation parameters ___________________________ 105
Using other custom coordinate system options ___________________________ 124
Summary ________________________________________________________________ 126

Chapter 7  Analyzing geographic (datum) transformations and why we need them ________ 129
What are geographic transformations? ___________________________ 130
Geographic transformation methods __________________________________________ 132
Creating and saving a custom geographic transformation in ArcToolbox ________ 140
Summary ________________________________________________________________ 143

Chapter 8  Applying geographic transformations ___________________________ 145
Applying composite geographic transformations in ArcGIS® Desktop 10.x ________ 145
Applying composite geographic transformations in the ArcMap data frame ________ 146
Applying geographic transformations in the Project tool in ArcToolbox ________ 159
Summary ________________________________________________________________ 162

Chapter 9  Working with vertical coordinate systems ___________________________ 163
Types of vertical datums ___________________________ 164
GNSS data and VCSs ________________________________________________________ 167
Requirements for applying vertical datum transformations ___________________________ 167
  Evaluating height values for unknown vertical data ___________________________ 168