Contents

Preface xi

What You Will Learn xii

The Right Frame of Mind xiv

How to Use This Book xv

Conventions xvi

Before You Begin xvii

1 Look at Data 1

1.1 Why Look at Data? 2

1.2 What Makes Bad Figures Bad? 5

1.3 Perception and Data Visualization 14

1.4 Visual Tasks and Decoding Graphs 23

1.5 Channels for Representing Data 26

1.6 Problems of Honesty and Good Judgment 27

1.7 Think Clearly about Graphs 29

1.8 Where to Go Next 31

2 Get Started 32

2.1 Work in Plain Text, Using RMarkdown 32

2.2 Use R with RStudio 35

2.3 Things to Know about R 38

2.4 Be Patient with R, and with Yourself 48

2.5 Get Data into R 49

2.6 Make Your First Figure 51

2.7 Where to Go Next 52

3 Make a Plot 54

3.1 How Ggplot Works 54

3.2 Tidy Data 56

3.3 Mappings Link Data to Things You See 56

3.4 Build Your Plots Layer by Layer 59

3.5 Mapping Aesthetics vs Setting Them 63

3.6 Aesthetics Can Be Mapped per Geom 66

3.7 Save Your Work 68

3.8 Where to Go Next 71

4 Show the Right Numbers 73

4.1 Colorless Green Data Sleeps Furiously 74

4.2 Grouped Data and the "Group" Aesthetic 74

4.3 Facet to Make Small Multiples 76

4.4 Geoms Can Transform Data 80

4.5 Frequency Plots the Slightly Awkward Way 82

4.6 Histograms and Density Plots 85

4.7 Avoid Transformations When Necessary 88

4.8 Where to Go Next 91

5 Graph Tables, Add Labels, Make Notes 93

5.1 Use Pipes to Summarize Data 94

5.2 Continuous Variables by Group or Category 102

5.3 Plot Text Directly 115

5.4 Label Outliers 121

5.5 Write and Draw in the Plot Area 124

5.6 Understanding Scales, Guides, and Themes 125

5.7 Where to Go Next 131

6 Work with Models 134

6.1 Show Several Fits at Once, with a Legend 135

6.2 Look Inside Model Objects 137

6.3 Get Model-Based Graphics Right 141

6.4 Generate Predictions to Graph 143

6.5 Tidy Model Objects with Broom 146

6.6 Grouped Analysis and List Columns 151

6.7 Plot Marginal Effects 157

6.8 Plots from Complex Surveys 161

6.9 Where to Go Next 168

7 Draw Maps 173

7.1 Map U.S. State-Level Data 175

7.2 America's Ur-choropleths 182

7.3 Statebins 189

7.4 Small-Multiple Maps 191

7.5 Is Your Data Really Spatial? 194

7.6 Where to Go Next 198

8 Refine Your Plots 199

8.1 Use Color to Your Advantage 201

8.2 Layer Color and Text Together 205

8.3 Change the Appearance of Plots with Themes 208

8.4 Use Theme Elements in a Substantive Way 211

8.5 Case Studies 215

8.6 Where to Go Next 230

Acknowledgments 233

Appendix 235

1 A Little More about R 235

2 Common Problems Reading in Data 245

3 Managing Projects and Files 253

4 Some Features of This Book 257

References 261

Index 267