GIS FOR BIOLOGISTS:
A PRACTICAL INTRODUCTION FOR UNDERGRADUATES

This book provides an introductory foundation for using spatially explicit data within a geographic information system (GIS) to answer simple biological questions. While the problems and associated exercises are basic, they expose new GIS users to the usefulness of GIS and provide a basis for formulating relevant environmental or biological questions that can be addressed with spatial data.

Considering Collin MacLeod's credentials both as a scientist and instructor, developed over many years as a professional, he has a great deal of practical experience and an excellent understanding of spatial ecology, and appears to be proficient in the development of teaching curricula. The combination of the printed book and companion data, stored online and readily accessible, provide an effective opportunity not only for an undergraduate student, but also for a professional biologist wishing to develop basic GIS skills for use in his or her career.

This book consists of two main sections: 1) Background Information on GIS; and 2) Practical Exercises. Additionally, three appendices and companion online training resources are provided.

The Background Information on GIS section consists of 10 concise chapters that provide a foundation for understanding, creating and using spatial data in a science-based project. General topics include basic GIS concepts and terms, data projection-related concerns, types of spatial data, starting a project and statistical analyses. More important for the reader, these concepts are presented and summarized in the context of why each of these topics is relevant to biological tasks that can be accomplished with a GIS. The section is wrapped up with a short list of common open-source and commercial GIS software that is available, and pros and cons for each.

The Practical Exercises section consists of an introduction to the general use of GIS software and six exercises using geospatial data provided online. A number of online videos, currently available or under production, are companion pieces to the six exercises. Each exercise contains a description of the biological question to be addressed, one or more flow diagrams for planning the GIS project, and step-by-step instructions for completing the project. Also included are images for reference to determine whether the project has been completed correctly. For each exercise, instructions are provided for both one commercial (ArcGIS 10.3) and one open-source (QGIS 2.8.3) GIS program.

A range of GIS skills are used in the exercises, including map layout and design, data display, creation of spatial data (vector), use and manipulation of existing spatial data (vector and raster), use of GPS data, data conversion, attribution, and simple vector overlay and raster processing and analysis. The progression through the exercises effectively builds on content and skills learned in earlier exercises.

This book will be useful for anyone who is interested in using GIS in the biological sciences, ranging from aspiring student biologists to career biologists considering using GIS for the first time. The book is well organized and addresses most of the primary factors that should be considered when learning to develop a GIS project. MacLeod does a very effective job of emphasizing the need for documenting a GIS project and presenting an effective organizational structure that uses flow diagrams. Given that the emphasis of the book is the development of GIS skills, and that it does so by addressing a number of biological questions, I would like to point out that the inferences drawn from the example analysis in Chapter 7 (does not consider the water column) and Exercise 6 (diversity does not equal abundance or population-level impacts) are incomplete, and could be misleading to readers inexperienced at forming biological questions to be addressed in GIS.

Since the vast majority of data used answer biological questions are spatial in nature, and GIS is an invaluable tool that can help biologists answer important questions, I consider this book and the associated exercises to be valuable, concise and straightforward. Students and professionals using this resource should be well on their way to developing GIS skills to solve complex problems.

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