

# Preface

Remote sensing is neither a difficult or exotic technology. At its most fundamental level, remote sensing is a form of basic field data collection, an activity common to all physical, natural, and social science and motivated by the same overarching goals: to systematically observe phenomena in order to record useful measurements of the variables that define their characteristic properties. Remote sensing simply acquires those measurements in a very different manner. Anyone with a background in subject areas ranging from geography, Earth science, planning, or resource management, to perhaps less obvious fields such as public policy studies, environmental health, and international development can apply remote sensing methods successfully and produce useful information that can address a myriad of problems and issues. To approach this wider audience, I have elected to title this book using the term “environmental sensing,” where the verb sensing means “to become aware of”; aware of the technology and of the environmental patterns this technology can illuminate.

My interest in remote sensing science dates to my very first course on the topic as an undergraduate geography major at San Francisco State University and continues to develop as this science continues to evolve. In that first course we marveled at the use of exotic equipment such as the additive color viewer that directed red, green and blue light through gray-scale transparencies of imagery acquired from the Landsat MSS. Today we marvel at the speed by which computer algorithms can process this data in digital form revealing details and complexities of the land surface that have extended remote sensing technology beyond a simple mapping tool. It is here where this book takes focus with the intent of reaching an audience that knows something about remote sensing, but has not attempted to exploit its range of capabilities. I was introduced to this audience a few years ago following an invitation to participate in a workshop aimed at promoting remote sensing to policy makers, government administrators and legal analysts working in the environmental sector. During this experience I was surprised by how a large segment of the environmental community still held numerous misconceptions concerning remote sensing and echoed common frustrations centered around “steep” learning curves

of a technology most still regarded as out of reach. My intent in this book is to “reach” this audience and demonstrate that remote sensing science is tamable and can be used with great success when interested parties are equipped with a fundamental appreciation of the theory and methods on which this science is based. Remote sensing no longer requires color additive viewers or other complex and bulky machines, nor does it necessarily require expensive software. Today remote sensing can be practiced on lap top computers with an internet connection and an enterprising user eager to take full advantage of the knowledge contained in the measurements acquired via this technology.

Although it might be convenient to characterize this book as an introductory text on remote sensing, my purpose here is not to replicate what has been done very well elsewhere. Rather, in these pages I have worked to distill the “need to know” information and methods and reassemble them a way that highlights where and how remote sensing can make valuable contributions to the study of our environment. Using a systematic approach, this book explains how remote sensing science can produce pertinent information while at the same time introducing selected methods that are well suited to the situations encountered when contending with the intricacies of human/environmental interaction. Therefore, while not an introductory text, per se, this book is none the less appropriate in a traditional classroom setting in a course that builds on the fundamentals of digital image processing as well as more specialized courses that seek to advance environmental assessment by integrating a remote sensing approach into existing methodologies. Beyond the classroom this book can serve as a resource for those working in the environmental sector that are well grounded in policy matters or the science of the environment, but not well acquainted with remote sensing. To these individuals this book describes a sequenced presentation of the technology and supporting techniques that provide both missing background and the script to follow when developing specific applications where a remote sensing solution is useful.

Whether your focus is the classroom, or professional practice, the paced treatment presented here represents a synopsis of the current approaches to the emerging science of Earth observation. Beginning in Chap. 1 with an overview of what Earth observation means in the context of remote environmental data gathering, the outline of this book continues with the environmental theme by exploring the concept of “environmental sensing” and the areas of concern that direct environmental analysis. From here we explore the tools we can call upon to collect environmental data, describing the expanding array of satellite sensor systems and their products. Chapter 4 introduces the fundamental techniques used to extract information from satellite-based sensors which transitions into a discussion of uncertainty and soft computing (Chap. 5) environmental characterization (Chap. 6), and environmental monitoring (Chap. 7). From there, the book branches out into comparatively new or underutilized applications areas such as thermal analysis and anomaly detection (Chap. 8) followed by an examination of hyperspectral remote sensing in Chaps. 9 and 10. Next we explore object-based image

classification (Chap. 11) and introduce an emerging area I have termed forensic remote sensing (Chap. 12). Finally our treatment of remote sensing concludes with a chapter dedicated to the role and integration of remote sensing in the larger field of geomatics and applied geospatial analysis (Chap. 13).

Obviously, none of this work took place in a vacuum, and I am indebted to numerous people for the opportunity to produce this work. First and foremost I would like to thank my wife Christine for the encouragement and guidance as I embarked on this project. It is always challenging to take on the task of writing a book and it is nice to have the support of family when you feel like giving up. I would also like to thank those reviewers whose comments and suggestions greatly improved my initial draft. Finally, I would like to extend a special thank you to Dr. Richard Beck, whose phone call in 1998 made all of this work possible and truly changed how remote sensing technology could be accessed and enjoyed by a broader range of people. It was a simple question, “Would you be interested in helping to improve access satellite data.” I had the presence of mind to say yes and the Ohio-View (AmericaView) program was born (<http://www.americaview.org>). From that day forward “bringing remote sensing down to earth” became an active part of my teaching and research agenda and I hope that idea translates and communicates within the pages of this book.

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