
Contents

Acknowledgmentsix
Editors.....xi
Contributors..... xiii
Introduction to Remote Sensing of Natural Resources xvii

Section I Remote Sensing Systems

1. Introduction to Remote Sensing Systems, Data, and Applications3
Qihao Weng

Section II Sampling Design and Product Quality Assessment

2. Remote Sensing Applications for Sampling Design of Natural Resources 23
Guangxing Wang and George Z. Gertner

3. Accuracy Assessment for Classification and Modeling 45
Suming Jin

4. Accuracy Assessment for Soft Classification Maps..... 57
Daniel Gómez, Gregory S. Biging, and Javier Montero

5. Spatial Uncertainty Analysis When Mapping Natural Resources Using
Remotely Sensed Data..... 87
Guangxing Wang and George Z. Gertner

Section III Land Use and Land Cover Classification

6. Land Use/Land Cover Classification in the Brazilian Amazon with
Different Sensor Data and Classification Algorithms 111
*Guiying Li, Dengsheng Lu, Emilio Moran, Mateus Batistella, Luciano V. Dutra,
Corina C. Freitas, and Sidnei J. S. Sant’Anna*

7. Vegetation Change Detection in the Brazilian Amazon with
Multitemporal Landsat Images..... 127
Dengsheng Lu, Guiying Li, Emilio Moran, and Scott Hetrick

8. Extraction of Impervious Surfaces from Hyperspectral Imagery:
Linear versus Nonlinear Methods 141
Xuefei Hu and Qihao Weng

9. Road Extraction: A Review of LiDAR-Focused Studies 155
Lindi J. Quackenbush, Jungho Im, and Yue Zuo

Section IV Natural Landscape, Ecosystems, and Forestry

10. Application of Remote Sensing in Ecosystem and Landscape Modeling 173
Chonggang Xu and Min Chen
11. Plant Invasion and Imaging Spectroscopy 191
Kate S. He and Duccio Rocchini
12. Assessing Military Training-Induced Landscape Fragmentation and Dynamics of Fort Riley Installation Using Spatial Metrics and Remotely Sensed Data 207
Steve Singer, Guangxing Wang, Heidi R. Howard, and Alan B. Anderson
13. Automated Individual Tree-Crown Delineation and Treetop Detection with Very-High-Resolution Aerial Imagery 223
Le Wang and Chunyuan Diao
14. Tree Species Classification 239
Ruiliang Pu
15. Estimation of Forest Stock and Yield Using LiDAR Data 259
Markus Holopainen, Mikko Vastaranta, Xinlian Liang, Juha Hyypä, Anttoni Jaakkola, and Ville Kankare
16. National Forest Resource Inventory and Monitoring System 291
Erkki Tomppo, Matti Katila, and Kai Mäkisara

Section V Agriculture

17. Remote Sensing Applications on Crop Monitoring and Prediction 315
Bingfang Wu and Jihua Meng
18. Remote Sensing Applications to Precision Farming 333
Haibo Yao and Yanbo Huang
19. Mapping and Uncertainty Analysis of Crop Residue Cover Using Sequential Gaussian Cosimulation with QuickBird Images 353
Cha-Chi Fan, Guangxing Wang, George Z. Gertner, Haibo Yao, Dana G. Sullivan, and Mark Masters

Section VI Biomass and Carbon Cycle Modeling

20. Remote Sensing of Leaf Area Index of Vegetation Covers	375
<i>Jing M. Chen</i>	
21. LiDAR Remote Sensing of Vegetation Biomass	399
<i>Qi Chen</i>	
22. Carbon Cycle Modeling for Terrestrial Ecosystems	421
<i>Tinglong Zhang and Changhui Peng</i>	
23. Remote Sensing Applications to Modeling Biomass and Carbon of Oceanic Ecosystems	443
<i>Samantha Lavender and Wahid Moufaddal</i>	

Section VII Wetland, Soils, and Minerals

24. Wetland Classification	461
<i>Maycira Costa, Thiago S. F. Silva, and Teresa L. Evans</i>	
25. Remote Sensing Applications to Monitoring Wetland Dynamics: A Case Study on Qinghai Lake Ramsar Site, China	479
<i>Hairui Duo, Linlu Shi, and Guangchun Lei</i>	
26. Hyperspectral Sensing on Acid Sulfate Soils via Mapping Iron-Bearing and Aluminum-Bearing Minerals on the Swan Coastal Plain, Western Australia	495
<i>Xianzhong Shi and Mehrooz Aspandiar</i>	
Index	515