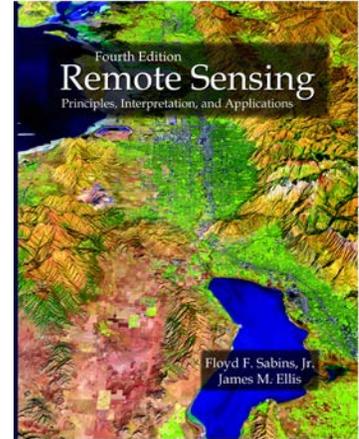


## **Image Processing Lab Manual for ArcGIS Pro and Desktop**

*Supplemental Material for:*

Floyd F. Sabins and James M. Ellis, April 2020,

**Remote Sensing Principles, Interpretation, and Applications**, 4<sup>th</sup> Edition, Waveland Press, 524 pages.



This lab manual is designed for:

- 1) GIS instructors who want to use this textbook and ESRI's ArcGIS *Pro* or ArcGIS *Desktop* for their remote sensing course,
- 2) GIS instructors, students, and users who want to do their own processing, enhancement, and information extraction of satellite and airborne images and DEMs using ArcGIS Pro.

The data used in the lab exercises are discussed in the textbook and shown on figures and plates, thereby helping students gain additional understanding about specific remote sensing principles and technology as they complete the image-processing exercises.

The lab manual provides step-by-step instructions (as .pdf documents) for using *Pro* and *Desktop* software and provides the data used in the exercises. The YouTube videos provide an overview of the twelve ArcGIS Pro exercises and direct you to a website to download the step-by-step instructions and data if you want to process the data while viewing the videos. An interim website using FileSend for the ArcGIS downloadable material will be replaced by the publisher's website that will also include instructor material (answer keys, Microsoft Word documents to facilitate exercise modifications by the instructor).

The topics covered in the twelve labs are listed below:

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|--------|--|
| Lab 1A | Interpretation of Remote Sensing Images              |
| Lab 1B | ArcGIS <i>Pro</i> and <i>Desktop</i> Overview        |
| Lab 2  | Image Enhancement and Plotting                       |
| Lab 3  | Landsat Multispectral Images                         |
| Lab 4  | Vegetation Maps, Density Slice, and Masks            |
| Lab 5  | Heads-up Interpretation                              |
| Lab 6  | Principal Components, Mosaicking, and Pan-Sharpening |
| Lab 7  | Georeferencing                                       |
| Lab 8  | DEMs   |
| Lab 9  | Unsupervised Classification                          |
| Lab 10 | Supervised Classification                            |
| Lab 11 | Change Detection                                     |
| Lab 12 | National Land Cover Database (NLCD) Overview         |

The labs include remote sensing data of Wyoming, Afghanistan, California, New York, Missouri, and Japan that cover urban, suburban, industrial, agricultural, wetland, geologic outcrop, and cirque glacier landscapes. Data types include multispectral Landsat, WorldView-3, and USDA NAIP imagery, color drone and manned aircraft images, Space Shuttle (SRTM) and Lidar DEMs, and USGS NLCD landcover and impervious maps. The labs are in .pdf format and average 18 pages each. Geospatial data is included in each lab's folder, along with a list of questions and lab-generated files to be uploaded to the instructor. Many of the examples have more extensive coverage and geospatial layers in the textbook's downloadable Remote Sensing Digital Database (see [http://waveland.com/Sabins-Ellis/Digital\\_Database/](http://waveland.com/Sabins-Ellis/Digital_Database/) ).

The labs require ArcGIS *Pro* or ArcGIS *Desktop* with the *Spatial Analyst* extension. One lab has optional exercises using the *3D Analyst* extension. Students with some ArcGIS experience will progress more rapidly through ArcGIS's many tools and menus, but hands-on experience with *Pro* or *Desktop* is not a requirement as the labs contain numerous graphics of menus and tool locations along with step-by-step instructions. The lab exercises are pdfs that can be displayed on a smartphone or tablet so there is more space on smaller computer screens for the *Pro* and *Desktop* windows and menus.

ArcGIS students and users who want to implement more powerful and sophisticated image-processing software are encouraged to start hands-on education with professional, commercial remote sensing software (for example, L3Harris ENVI, ERDAS Imagine, Catalyst [formerly PCI], and TNTMips). The textbook provides a comprehensive, remote sensing lab manual for ENVI software (see [www.waveland.com/Sabins-Ellis.com](http://www.waveland.com/Sabins-Ellis.com) website).

The lab manual does not include lidar processing, object-oriented classification, segmentation, hyperspectral or thermal IR data, extensive coding, or online resources.

The lab manual was created with ArcGIS *Pro* 2.6.1 Professional Basic and ArcGIS *Desktop* Basic 10.6.1 (with .mxd and .lyr files saved as 10.6 and 10.2 files) on a Windows 10 operating system. The tasks, data, and assignments (questions and uploads) in each lab exercise are essentially identical for the *Pro* and *Desktop* exercises. Contact James Ellis at [jellis@ellis-geospatial.com](mailto:jellis@ellis-geospatial.com) for questions, recommendations and comments.