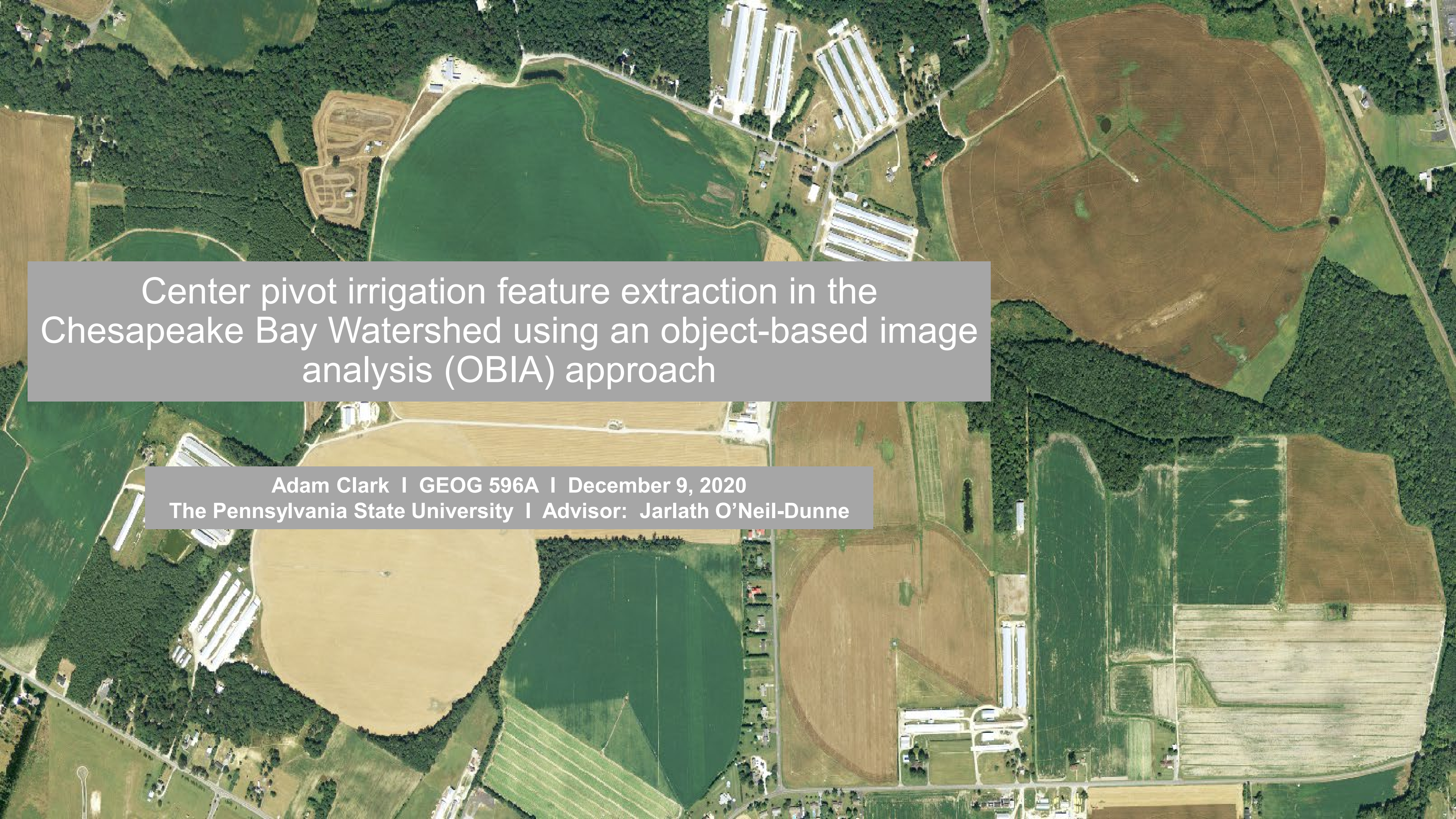
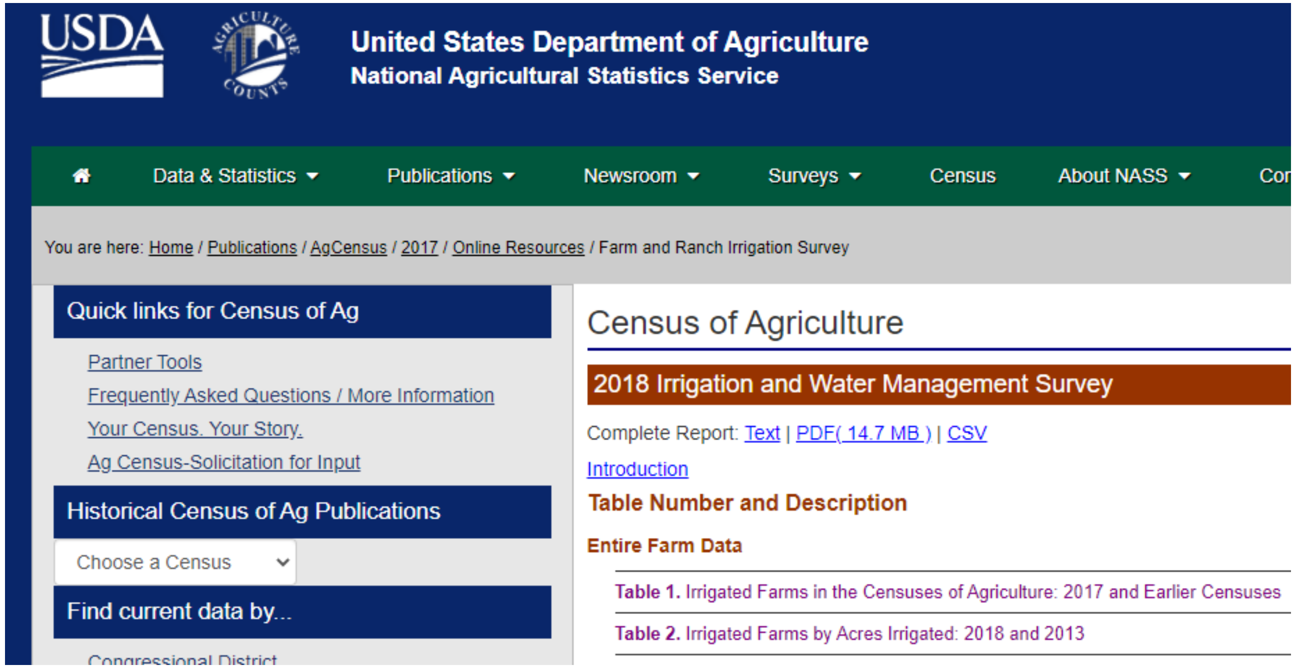


Center pivot irrigation feature extraction in the Chesapeake Bay Watershed using an object-based image analysis (OBIA) approach

Adam Clark I GEOG 596A I December 9, 2020
The Pennsylvania State University I Advisor: Jarlath O’Neil-Dunne


United States Department of Agriculture
National Agricultural Statistics Service

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2018 Irrigation and Water Management Survey

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Introduction

Table Number and Description

Entire Farm Data

Table 1. Irrigated Farms in the Censuses of Agriculture: 2017 and Earlier Censuses

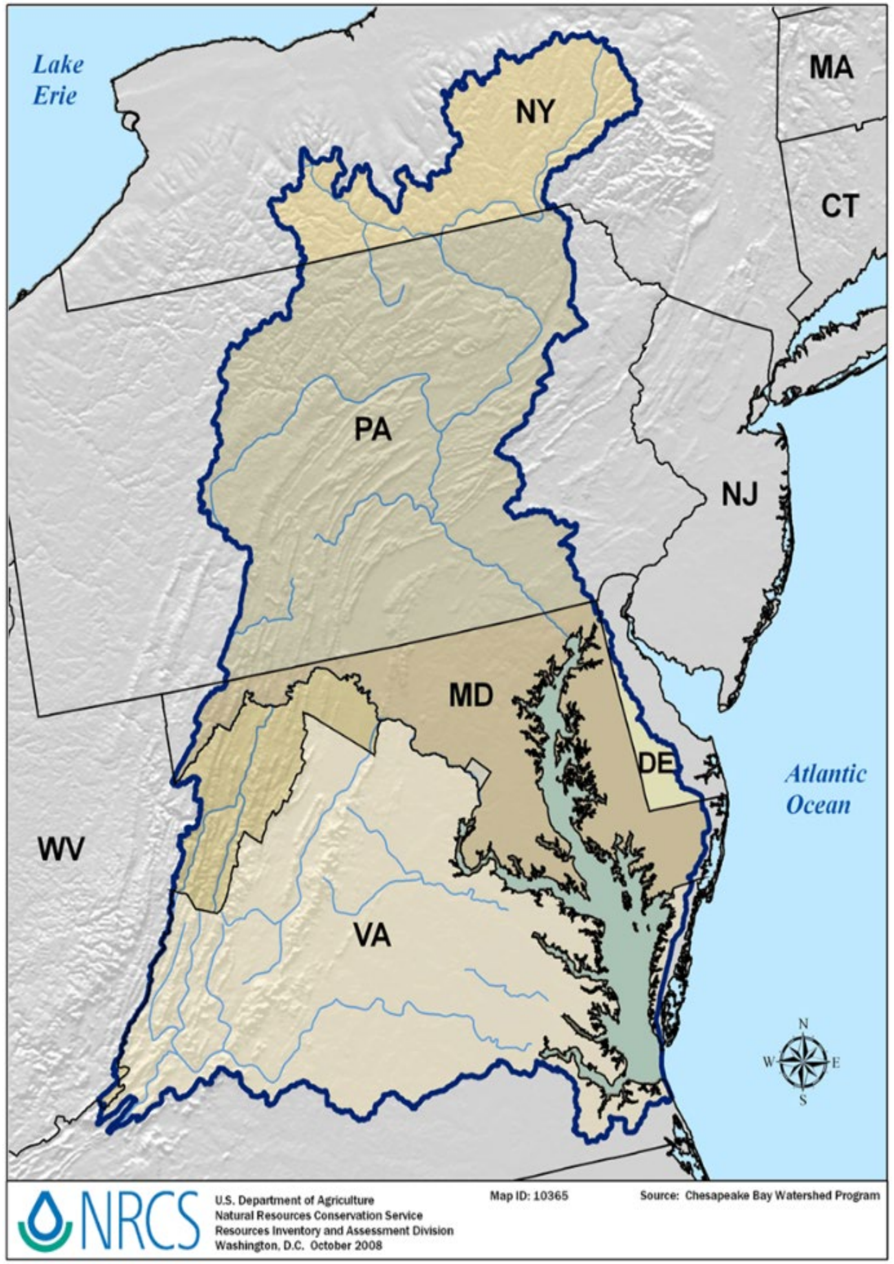
Table 2. Irrigated Farms by Acres Irrigated: 2018 and 2013

Table 2. **Irrigated Farms by Acres Irrigated: 2018**

[Excludes institutional, research, and experimental farms. For meaning of abbreviations

Geographic area	Total		
	Farms	Land in farms (acres)	Acres irrigated
United States 2018	231,474	222,028,954	55,938,795
2013	229,237	213,993,983	55,319,417

USDA National Agricultural Statistics Service. (2019, November). *Table 2. Irrigated Farms by Acres Irrigated: 2018 and 2013.* Retrieved from USDA Census of Agriculture: 2018 Irrigation and Water Management Survey: https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/Farm_and_Ranch_Irrigation_Survey/fris_1_0002_0002.pdf



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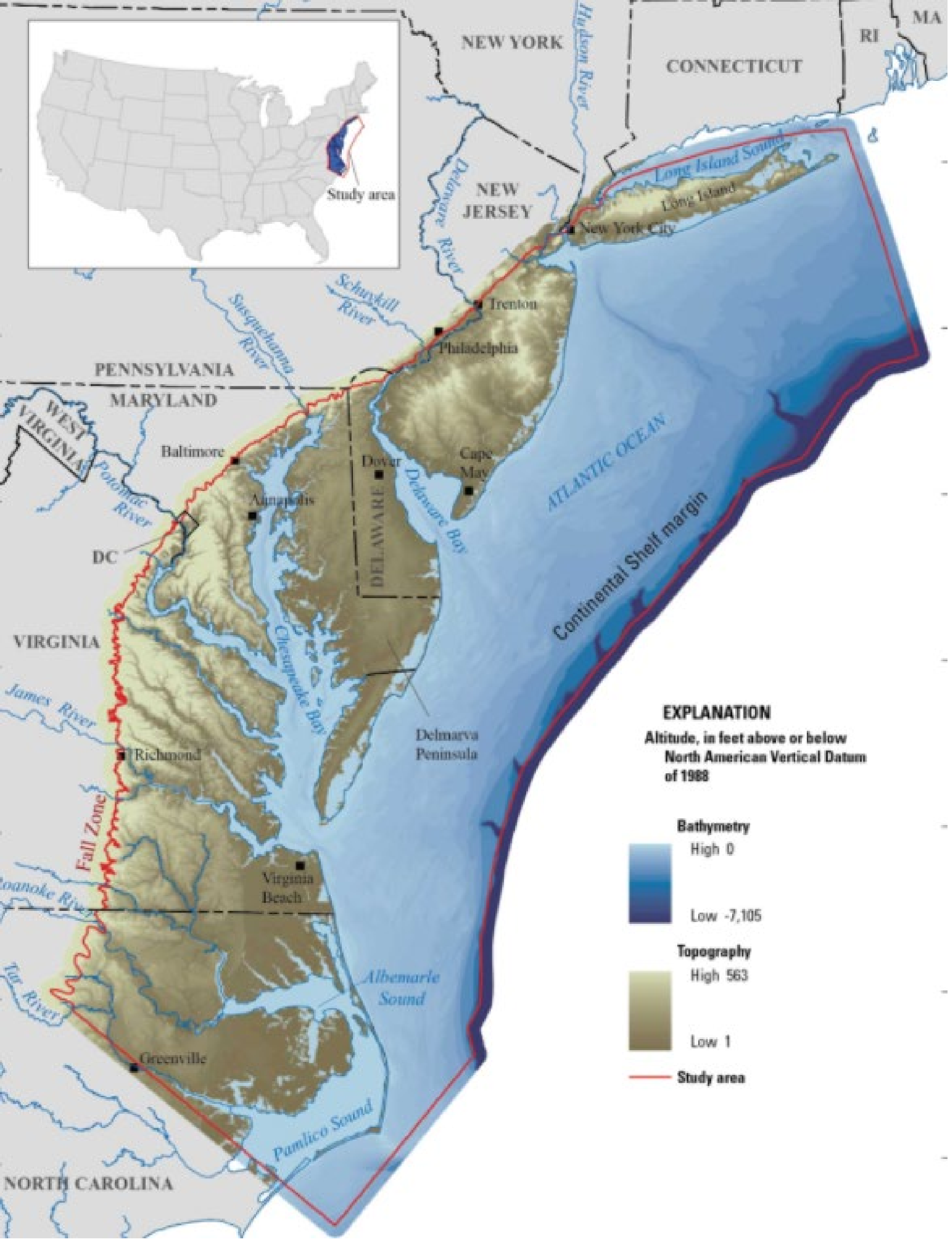

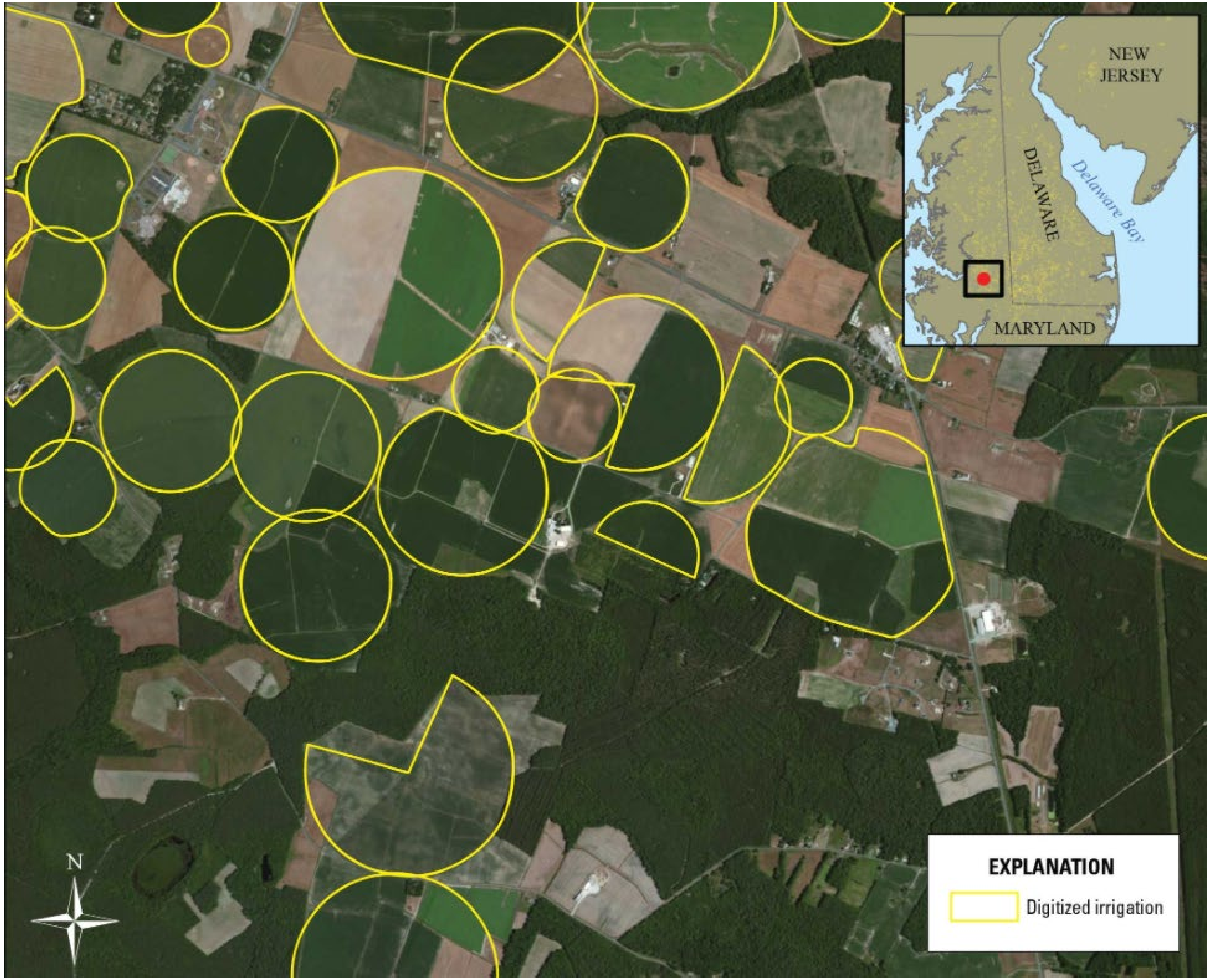

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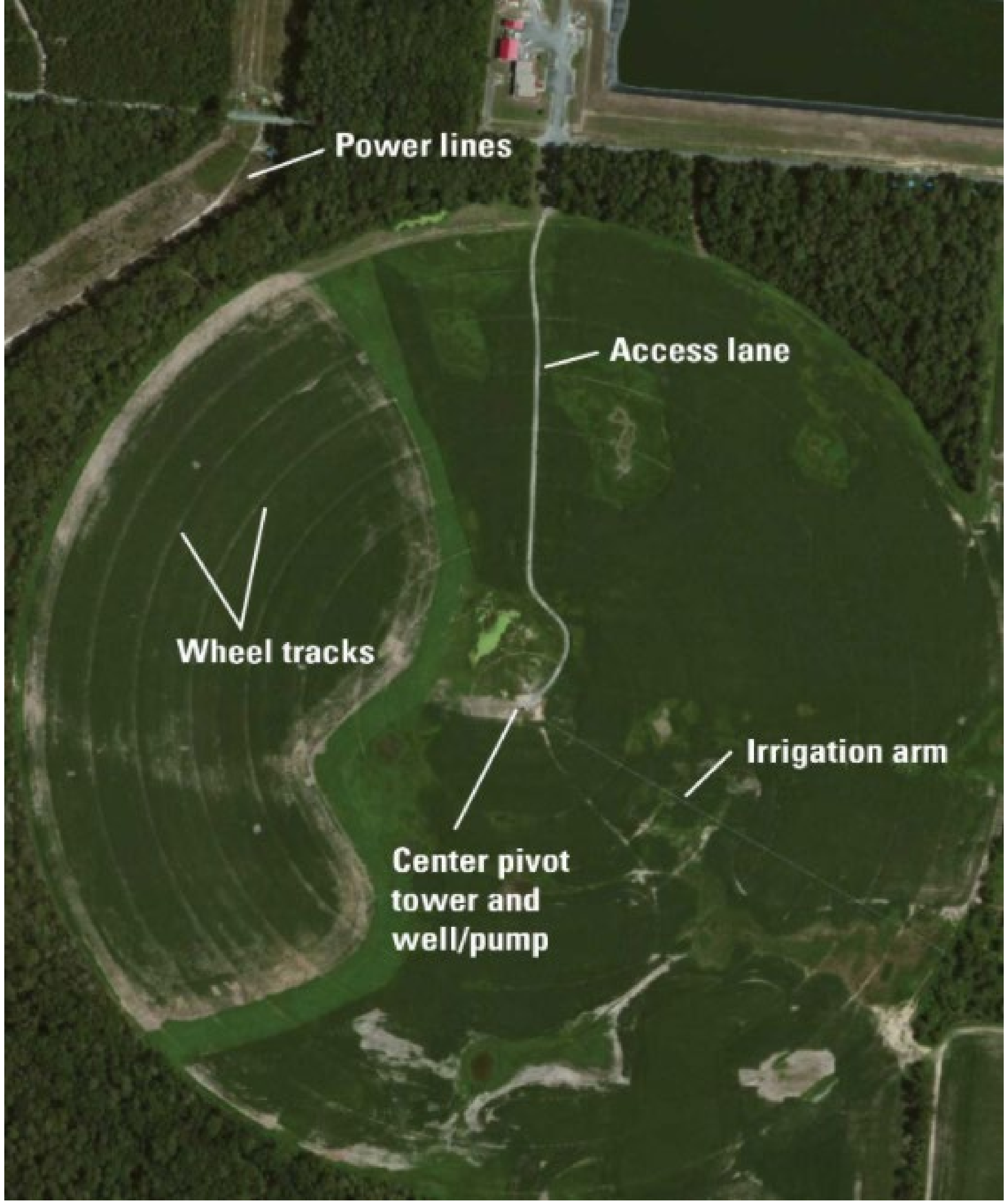

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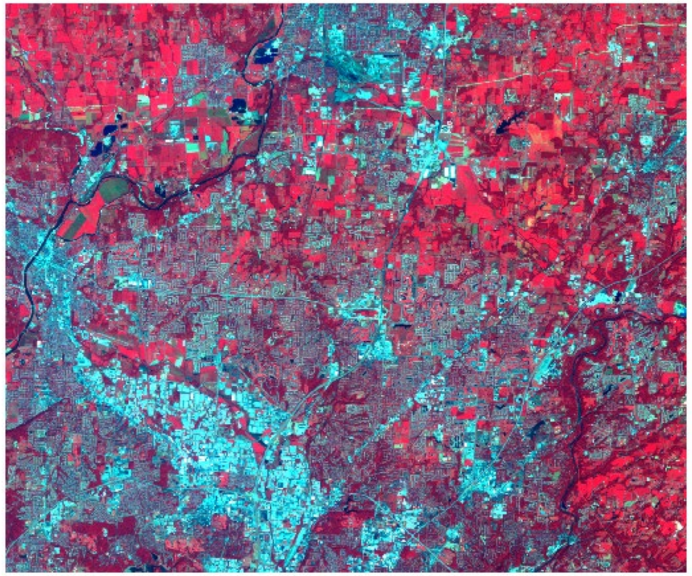

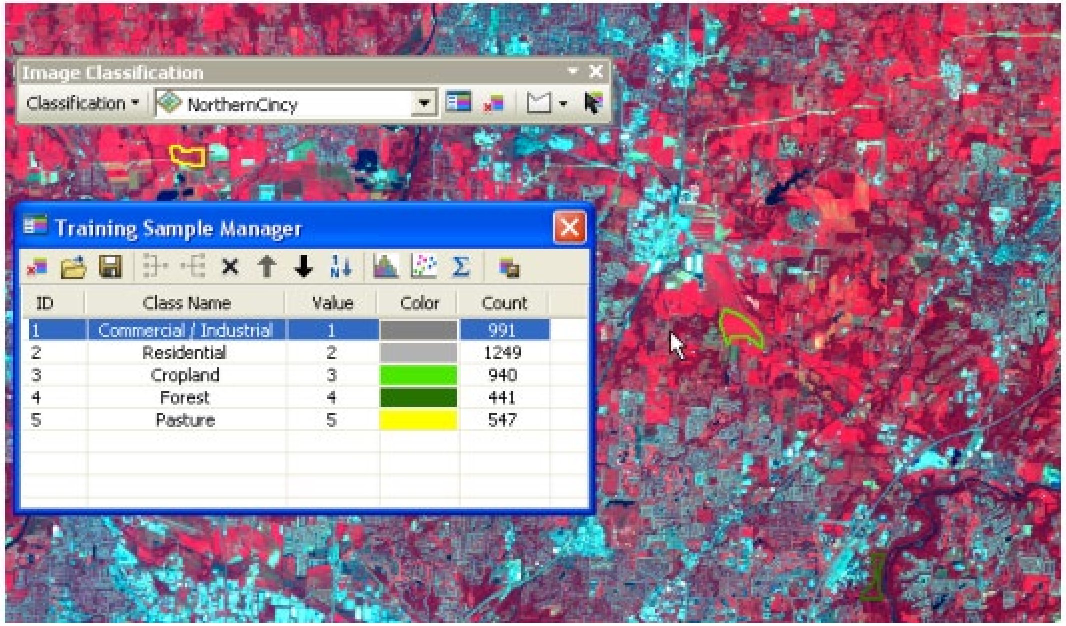

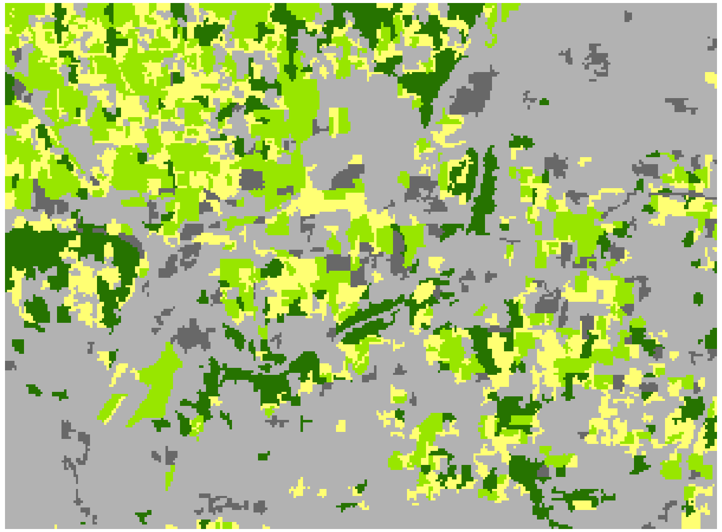

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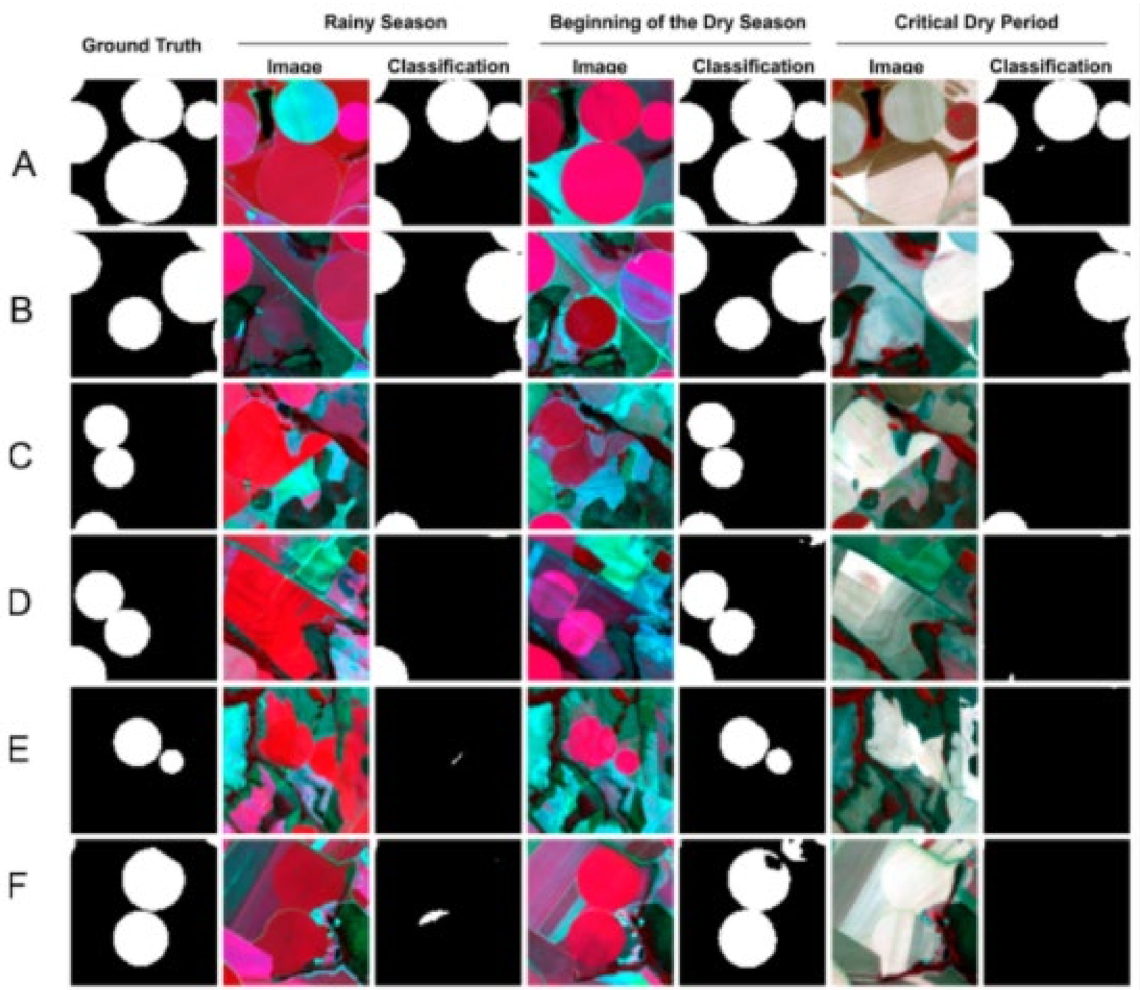
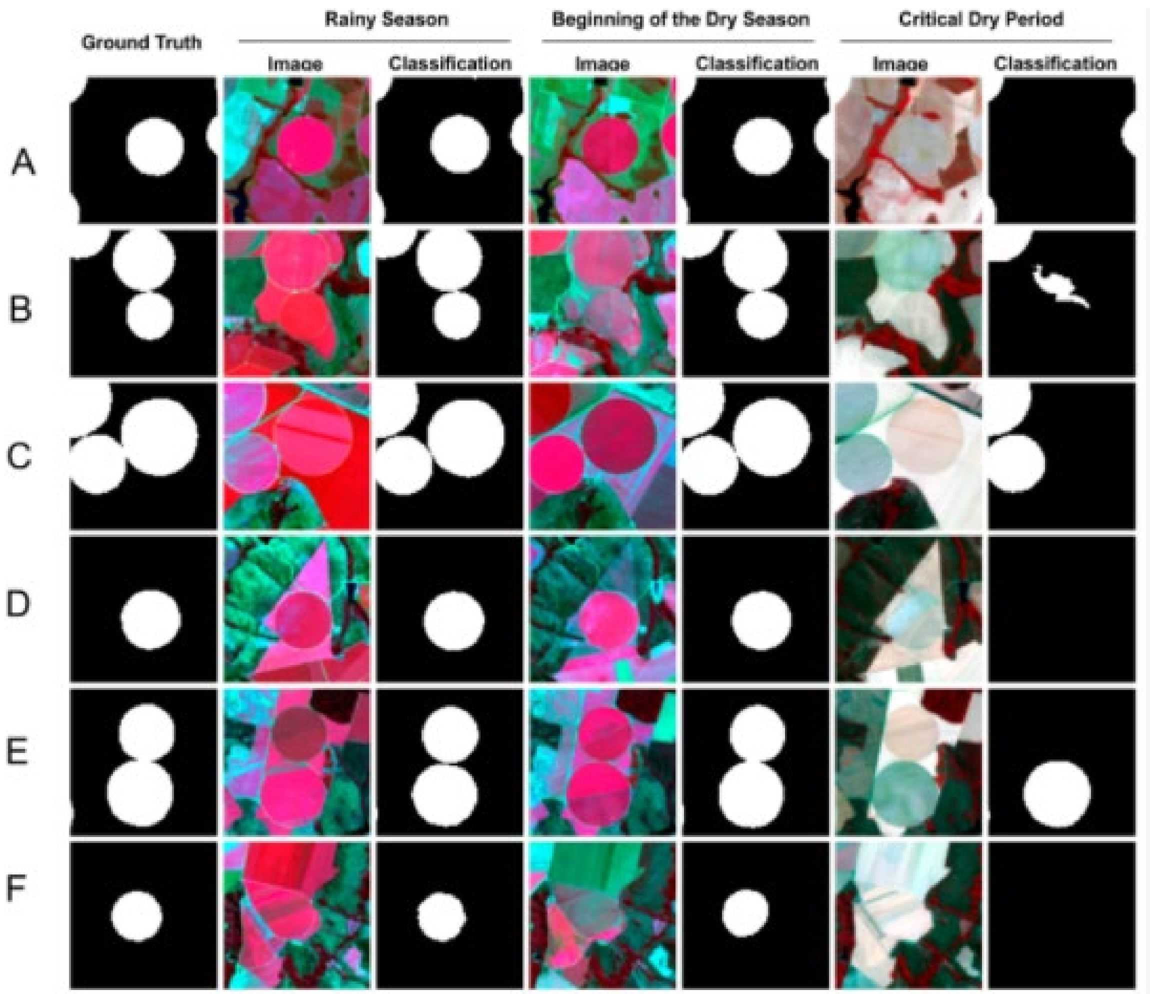
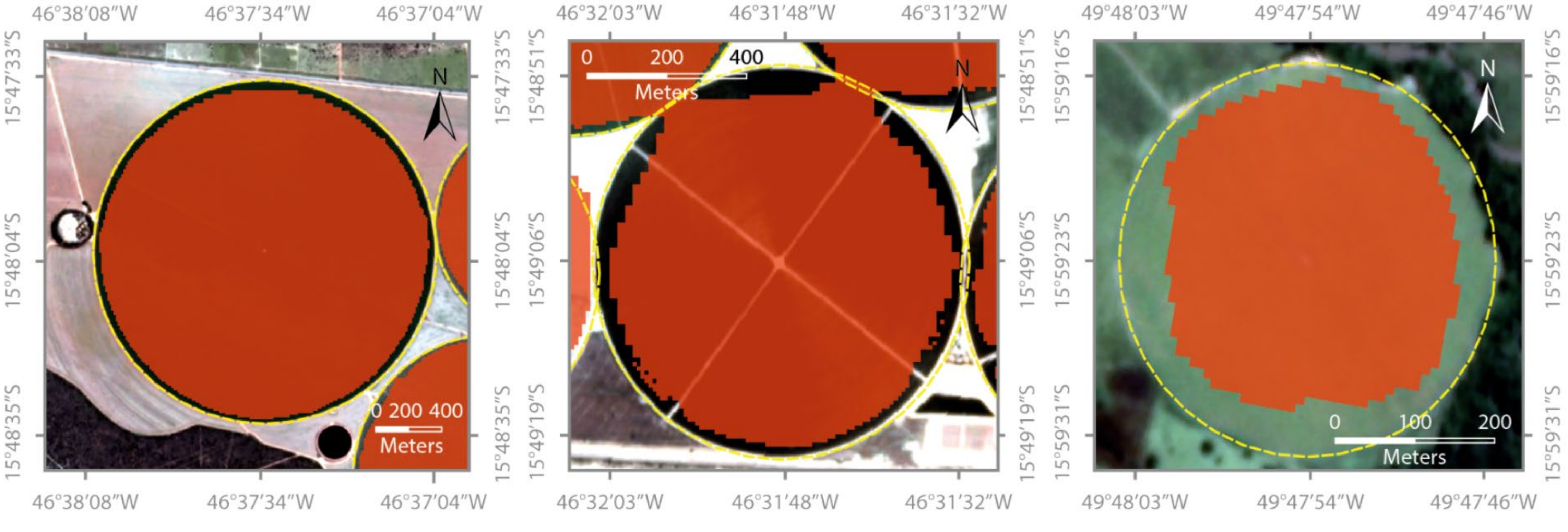


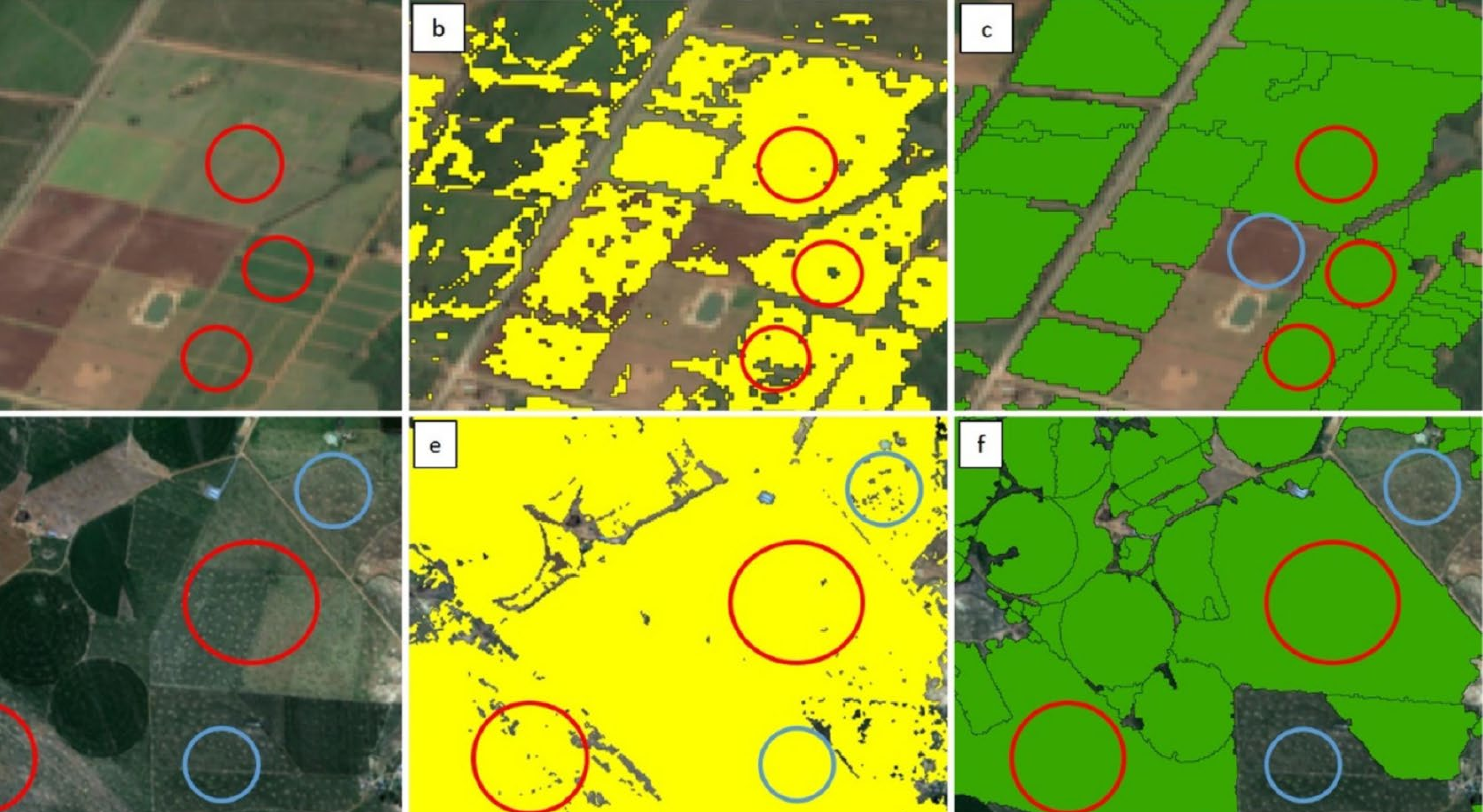


ESRI. (2019). *What is image classification?* Retrieved from ArcMap Extensions: Spatial Analyst: https://desktop.arcgis.com/en/arcmap/latest/extensions/spatial-analyst/image-classification/what-is-image-classification-.htm

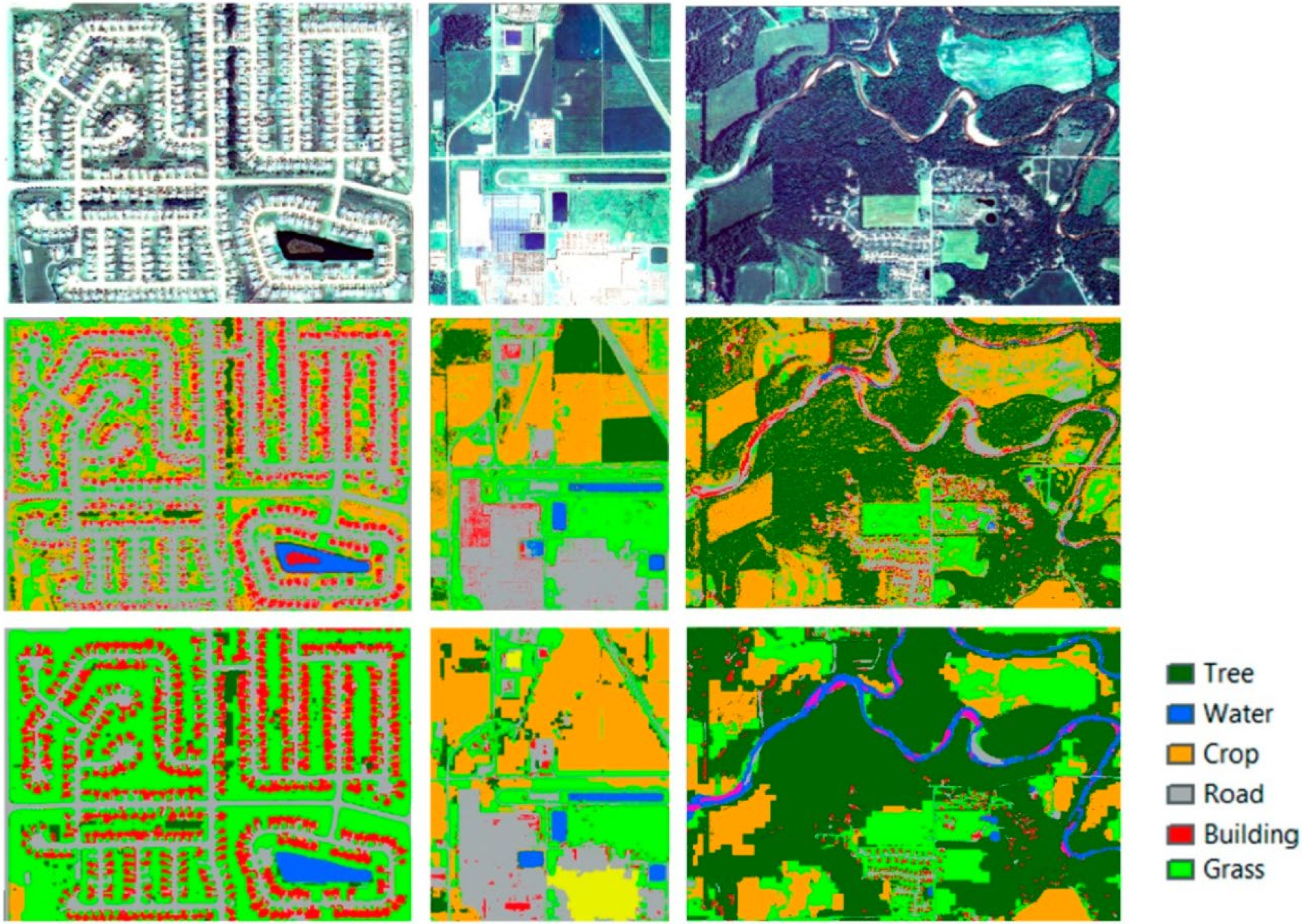


(a) (b) (c)

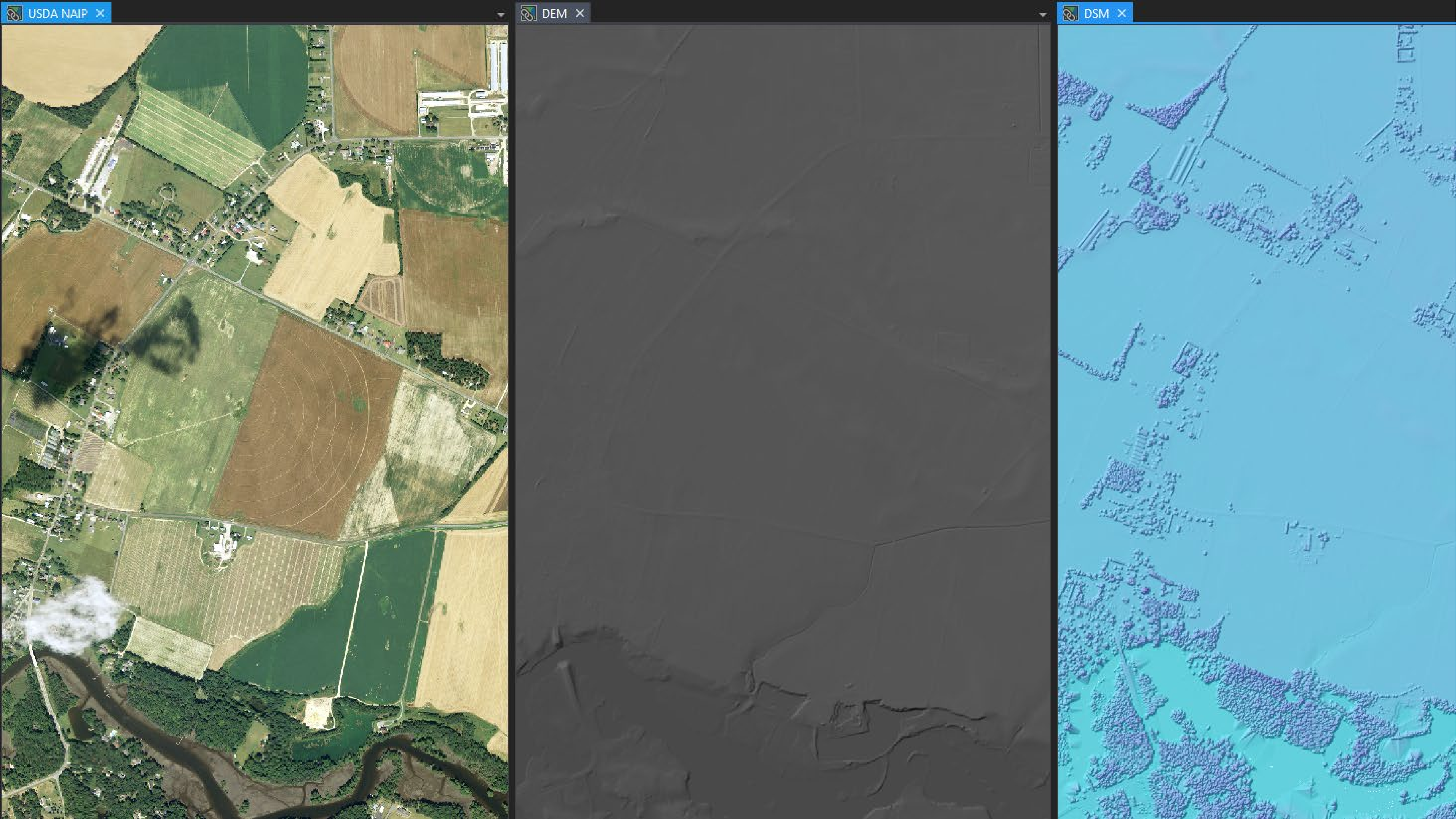
Saraiva, M., Protas, E., Salgado, M., & Souza, C. (2020). Automatic Mapping of Center Pivot Irrigation Systems from Satellite Images Using Deep Learning. *Remote Sensing, 12*(3), 558. Retrieved November 04, 2020, from https://doi.org/10.3390/rs12030558



Watkins, B., & Van Niekerk, A. (2019, December). Automating field boundary delineation with multi-temporal Sentinel-2 imagery. *Computers and Electronics in Agriculture, 167*. Retrieved November 04, 2020, from https://doi.org/10.1016/j.compag.2019.105078



Li, X., & Shao, G. (2014). Object-Based Land-Cover Mapping with High Resolution Aerial Photography at a County Scale in Midwestern USA. *Remote Sensing, 6*(11), 11372-11390. Retrieved November 04, 2020, from https://doi.org/10.3390/rs61111372


USDA NAIP
DEM
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ELEMENTS OF IMAGE INTERPRETATION

by

Charles E. Olson, Jr.

Supplementary notes prepared for use in image interpretation training programs of the University of Michigan School of Natural Resources, Ann Arbor, Michigan.

Nine elements of image interpretation are described in the following paragraphs. This discussion is not intended to be exhaustive. In fact, a separate book could be written about each of the elements mentioned. Appreciation of the importance of these elements will grow with experience and practice. This description serves as an advance look at what is considered in more detail later.

1. Shape. The shape or form of some objects is so descriptive that their images may be identified solely from this criterion. The Pentagon Building near Washington, D.C. is a classic example.

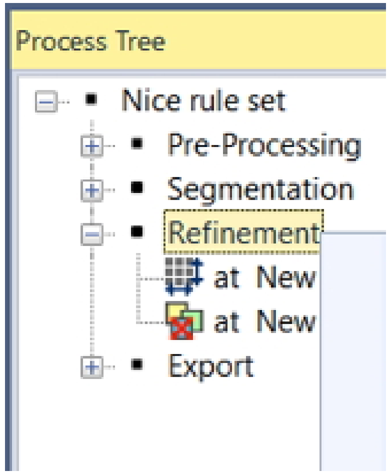
2. Size. In many cases length, width, height, area, or volume are essential to accurate and complete interpretation. The volume of wood which could be cut from the stand in Figure 1 is dependent upon tree-size, stand density, and size (or age) of the stand.

3. Tone. Different objects reflect and emit different amounts and wavelengths of energy. These differences are recorded as tonal, color, or density variations in the record. The stand of mixed hardwoods shown in Figure 1 was photographed in late October at the peak of the fall color change. Species differences show clearly in different tones or shades of gray.

4. Shadow. Shadows can help or hinder the interpreter, for they reveal invisible silhouettes but hide some detail. Shadows in Figure 2 provide information on the size and shape of this building which is not apparent from the image of the building alone. These same shadows obscure detail in the lawn and sidewalk areas in front of the building.

5. Pattern. Pattern, or repetition, is characteristic of many man-made objects and of some natural features. The land-use pattern shown in Figure 3 is typical of areas of deep, wind-blown soils. Orchards and strip cropping are particularly conspicuous because of pattern.

6. Texture. The visual impressions of roughness or smoothness created by some images is often a valuable clue to interpretation. Tree size is often interpreted on the basis of apparent texture. Smooth, velvety textures are commonly associated with young saplings, while rougher, cobbled textures usually indicate older trees of sawtimber size.



Trimble. (2020). *Brainwave*. Retrieved from eCognition: Knowledge Base: https://support.ecognition.com/hc/en-us/categories/360002420679-Brainwave
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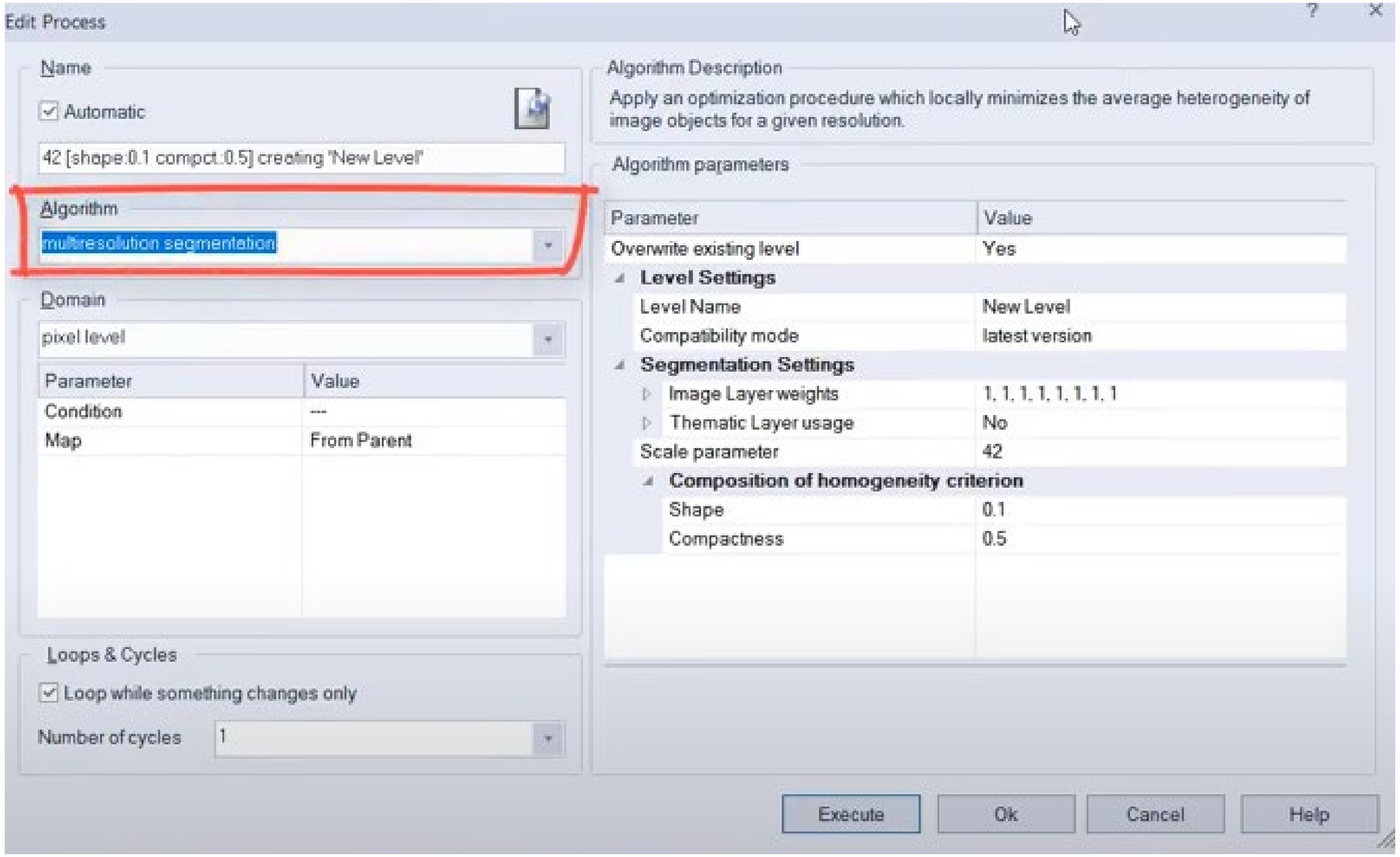

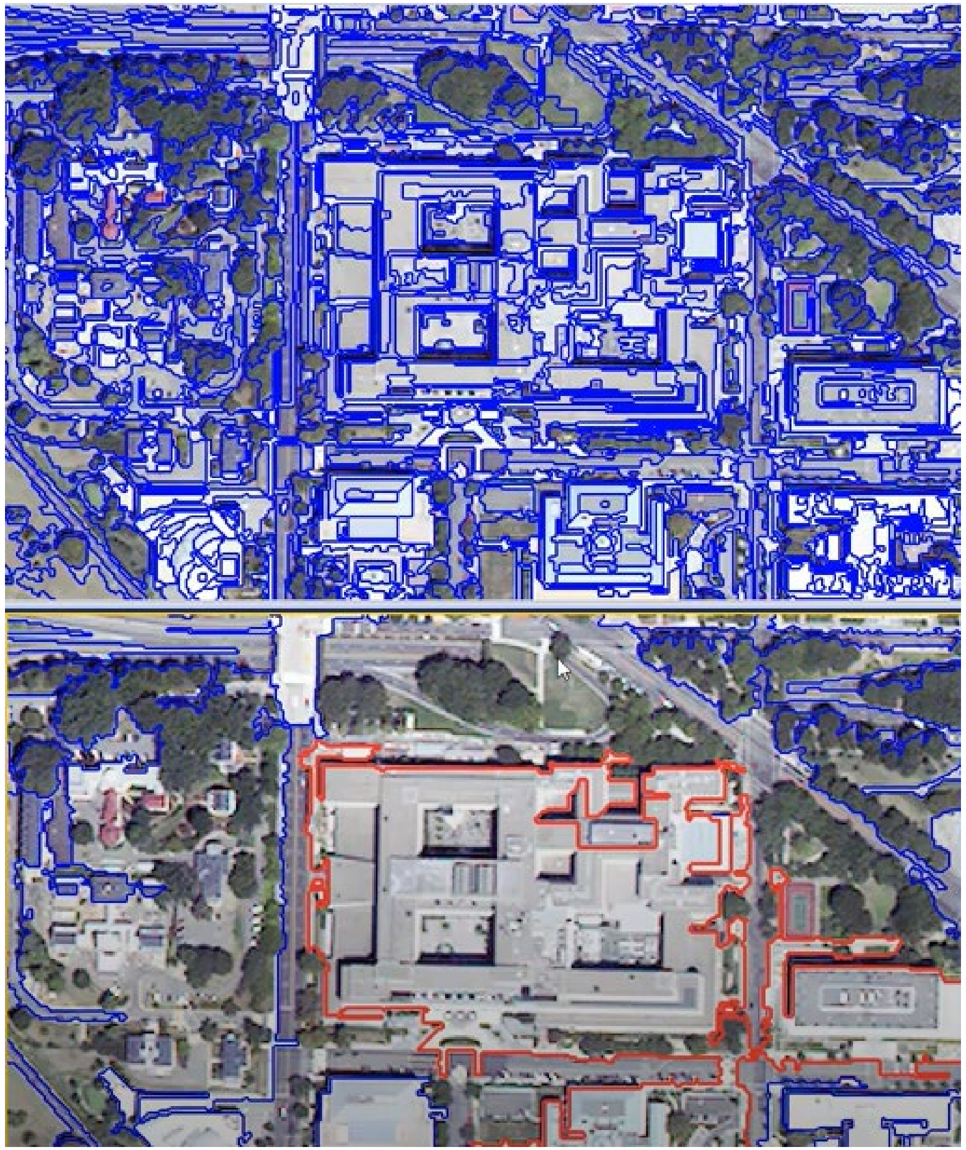

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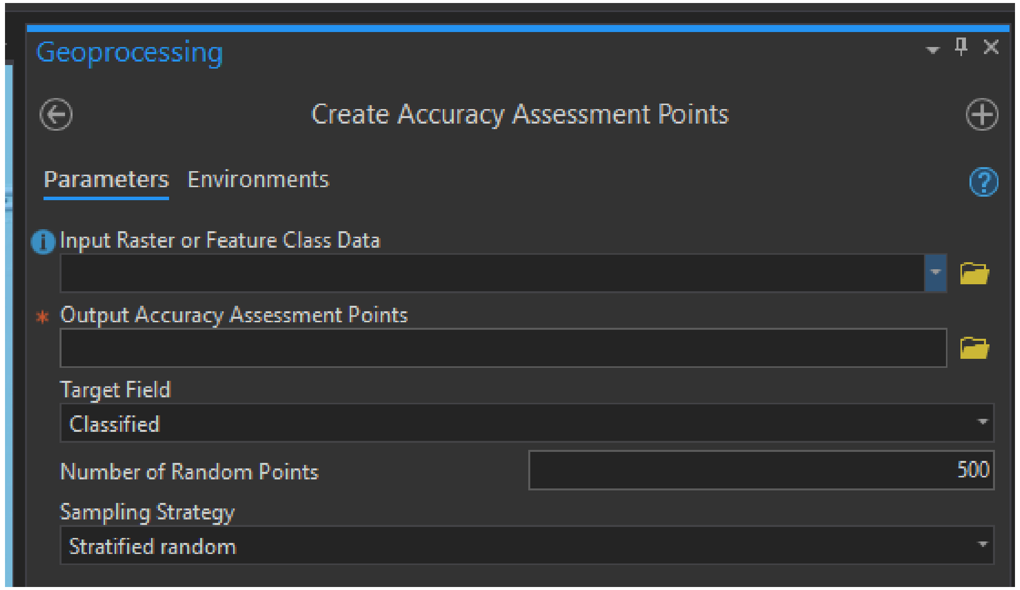


A Review of Assessing the Accuracy of Classifications of Remotely Sensed Data

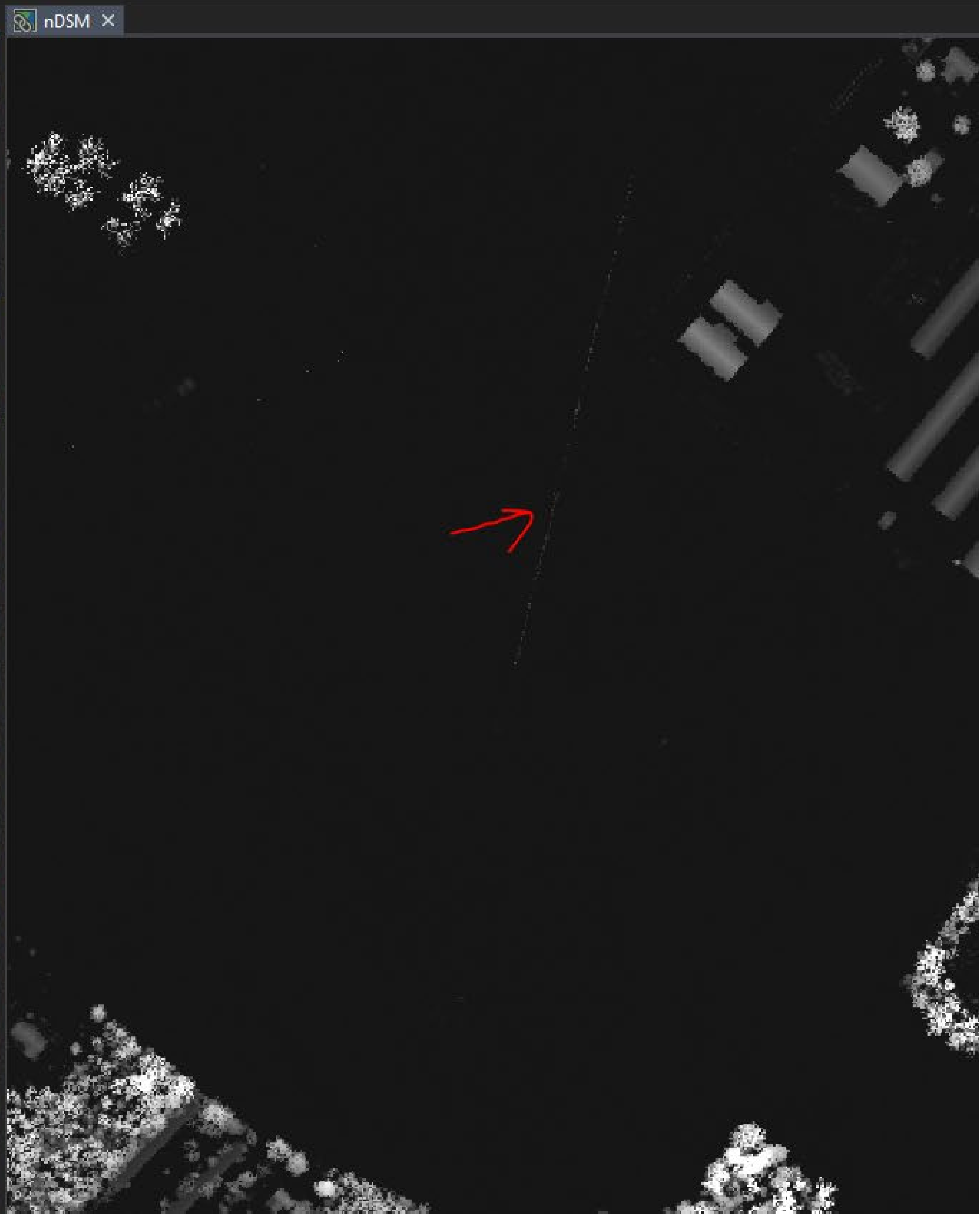
Russell G. Congalton

Department of Forestry and Resource Management, University of California, Berkeley

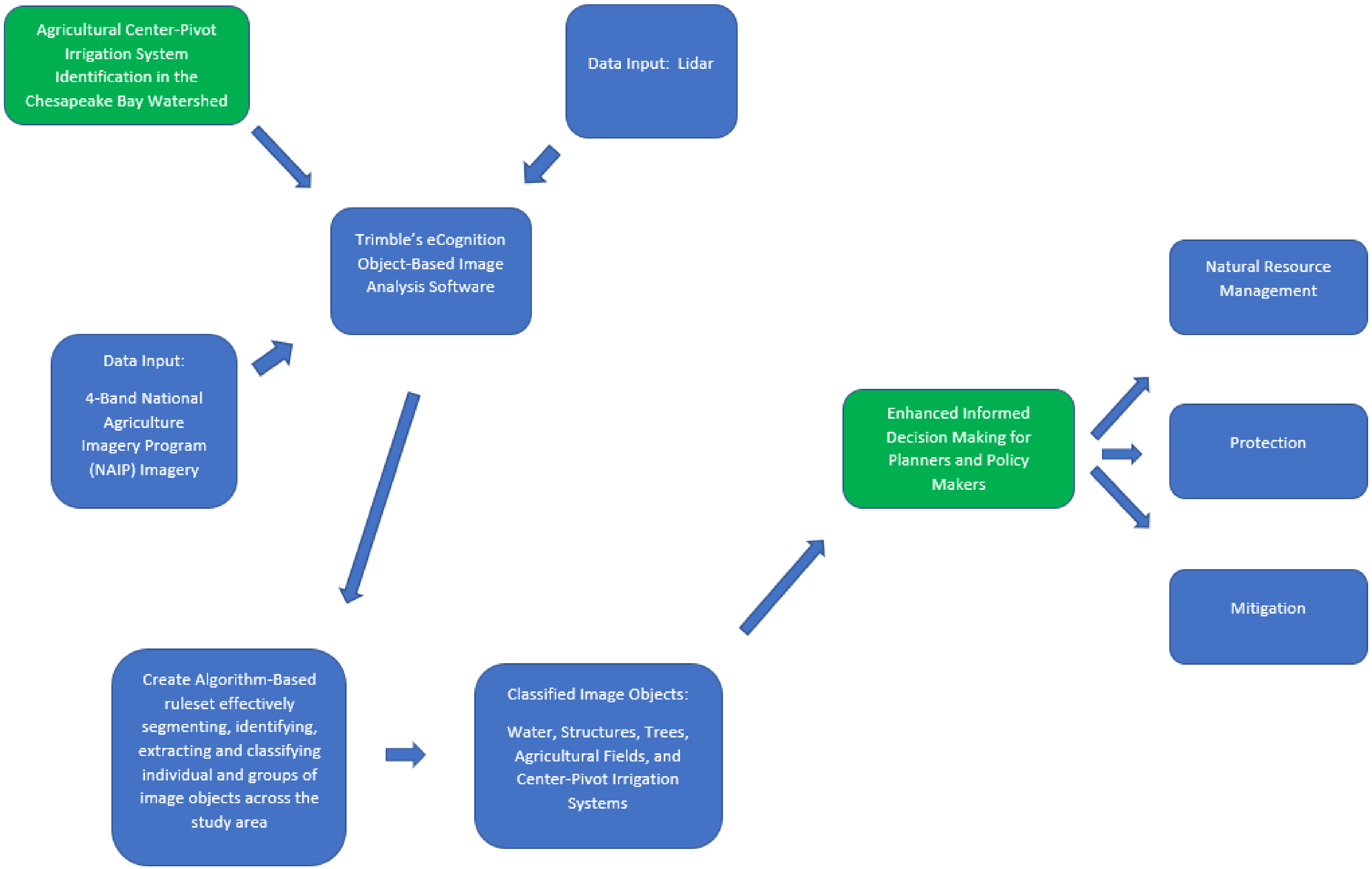
Class/Value	Class 1	Class 2	Class 3	Class 4	Class 5	Grand Total	User's Accuracy	Kappa
Class 1								
Class 2								
Class 3								
Class 4								
Class 5								
Grand Total								
Producer's Accuracy								
Kappa								

Congalton, R. G. (1991, July). A review of assessing the accuracy of classifications of remotely sensed data. *Remote Sensing of Environment, 37*(1), 35-46. Retrieved April 5, 2020, from https://doi.org/10.1016/0034-4257(91)90048-B

USDA NAIP



nDSM


Agricultural Center-Pivot Irrigation System Identification in the Chesapeake Bay Watershed
Data Input: Lidar
Trimble's eCognition Object-Based Image Analysis Software
Data Input:
4-Band National Agriculture Imagery Program (NAIP) Imagery
Create Algorithm-Based ruleset effectively segmenting, identifying, extracting and classifying individual and groups of image objects across the study area
Classified Image Objects:
Water, Structures, Trees, Agricultural Fields, and Center-Pivot Irrigation Systems
Enhanced Informed Decision Making for Planners and Policy Makers
Natural Resource Management
Protection
Mitigation

Task	Time	Date
Define Problem and Propose Project	3 Months	October 2020 - December 2020
Data Acquisition	1 Month	December 2020
Feature Extraction Development and Execution	3 Months	December 2020 - March 2021
Accuracy Assessment	1 Month	March 2021
Create Final Report	1 Month	April 2021
Submit Abstract to Conference	1 Month	April 2021
Present at Conference	1 Month	May 2021

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