IowaView 2019 - 2020 Activities

Developing a Remotely Sensed Cover Crop Identification Tool

The planting of cover crops has been identified as an important strategy to protect Iowa soils and waterways. According to the NRCS, "Cover crops have the potential to provide multiple benefits in a cropping system. They prevent erosion, improve soil's physical and biological properties, supply nutrients, suppress weeds, improve the availability of soil water, and break pest cycles along with various other benefits."

The goals of this project were to create a publicly shareable process to determine the presence of cover crops over a season using public imagery and to produce a dataset relatively quickly. This past year, IowaView staff completed creation of a tool that allows users to input a series of Sentinel 2 images (late fall, early spring, and late spring) and receive an output of potential cover crop locations based on the collective Normalized Difference Vegetation Index (NDVI; this index shows greenness of vegetation on the landscape) value (ranging from -1 to 1, with higher values indicating greater vitality and plant health). The tool was then used to create another deliverable: a statewide map showing potential cover crops. The project website can be found here:

https://www.iowaview.org/cover-crop-mapping-project/

The toolbox uses the NDVI values to compare pixels in a scene. The project chose NDVI to reveal areas of intentional growth by observing a pattern of greenness from fall through spring. During the months after harvest, it was assumed that fields would be bare in areas not specifically planted to cover crop or covered in permanent vegetation, such as forest or grass.

The tool was developed to operate as three consecutive steps. The first step produced an NDVI image for each of the three Sentinel 2 input images and created a geodatabase for each scene. This geodatabase contains four Sentinel 2 bands, a Normalized Difference Vegetation Index raster for the image, a field boundaries layer that has zonal statistics for each field, and a zonal statistics table.

The second step examined each pixel of the NDVI images and assigned values indicating low, moderate, and high growth/greenness. Known cover crop planted field data from partner organizations was used to determine the NDVI cutoff values. Then, the values from each of the images were combined to create a composite image with 15 possible values indicating likelihood of cover crop.

The final step of the tool reclassified the composite image to three categories based on the sequence of NDVI values: No Cover Crop, Potential Cover Crop, and Cover Crop. These raster values were then summarized by field boundary to give a generalized indication of cover crop potential in the field.

Cereal Rye Cover Crop Field
Photo by Jason Johnson

NDVI Fall Image
Osceola County, Iowa - 11/21/2017

NDVI Early Spring Image
Osceola County, Iowa - 4/25/2018

*NDVI Late Spring Image*
Osceola County, Iowa - 5/25/2018

AmericaView Website:
www.AmericaView.org
Christopher McGinty, Executive Director:
chris.mcginty@americaview.org
Lisa Wirth, Program Manager:
lisa.wirth@americaview.org
Brent Yantis, Board Chair:
rodney.yantis@louisiana.edu

BENEFITS TO IOWA

- The primary goal of this project was to create a data model that was easy to use and publicly accessible. A secondary goal was to create a statewide dataset showing potential cover crops across the state. Both of these will benefit conservation managers and natural resource professionals across the state. It also has potential to be applied in surrounding Midwest states with similar cropping patterns.

- The IowaView Cover Crop Detection Model was built in ArcMap and is available in for use in ArcMap and ArcGIS Pro. While the software usually comes with a cost, downloading and using the model is free, as is acquiring the input imagery.

- As new imagery becomes available , the NDVI can be calculated and analyses performed to generate an updated cover crop map. This model can provide a rapid roll out of cover crop analysis. It could aid in determining cover crop success across the state in the late spring of a particular year. Natural resource or conservation professionals can use this type of data in their watershed planning.

- Two student employees participated in portions of the project. They gained training in setting up and running a model in ArcGIS Desktop and evaluated the results in conjunction with known field-level data.

The upper image is an example of tool output and the lower image is a generalization of the output data using field boundaries in Osceola County, Iowa. Light blue dots denote fields from a sample cover crop data set. Gray areas indicate No Cover Crop; green areas are Potential Cover Crop and orange areas are Cover Crop.
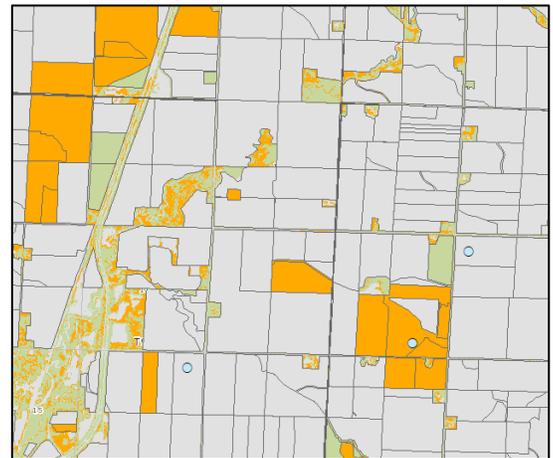
IOWAVIEW CONSORTIUM MEMBERSHIP

The mission of the IowaView consortium is to increase the knowledge and use of remote sensing and other geospatial technologies for the benefit of the citizens of Iowa, through education, research and service. IowaView supports the collection and management of publicly accessible remote sensing data archives (ortho.gis.iastate.edu) which includes current and historic imagery, LiDAR elevation and other datasets useful for research and education. Collaborators come from several departments at ISU as well as from public agencies and organizations.

IOWA STATE UNIVERSITY

GISF ISU GIS Facility

dnr gis

IOWA geographic information council

IowaView Principal Investigator:

Robin McNeely, GIS Facility Manager

Iowa State University

515-294-2087

mobes@iastate.edu

https://www.iowaview.org

State Coordinator: Amy Logan

amylogan@iastate.edu