IOWA STATE UNIVERSITY

IowaView – AmericaView Consortium

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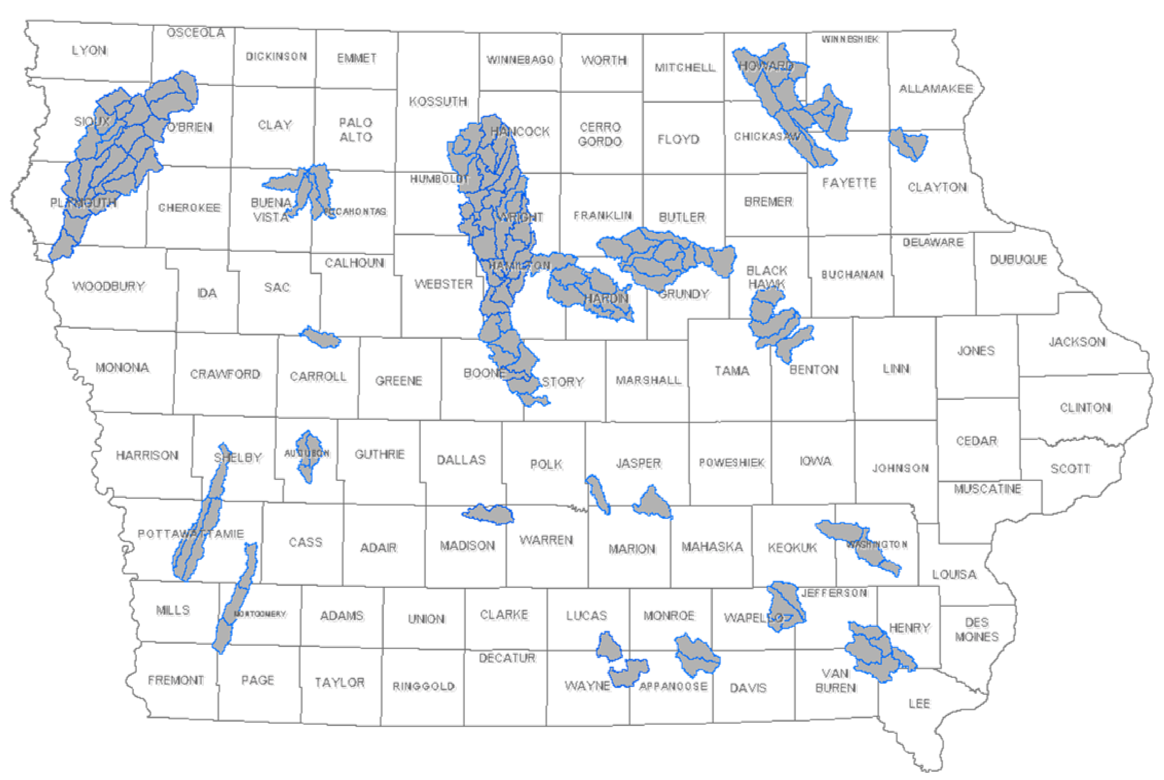
Institute for Design Research and Outreach – GIS Facility

Inventory of Conservation Practices Using Visual Interpretation and Remote Sensing Protocols

Introduction

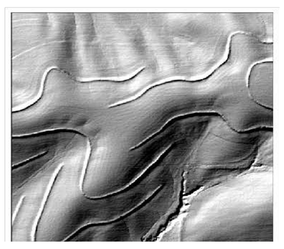
The Iowa Nutrient Reduction Strategy is a guiding document which uses science and technology to assess and reduce nutrients in Iowa waters and the Gulf of Mexico. One priority specifically identified in the strategy is the important combination of in-field and off-field conservation practices for reducing erosion and nutrient loss. This project provides an accurate inventory of best management practices which are essential to establish baseline conditions and document implementation resulting from the Iowa Nutrient Reduction Strategy. Our research is intended to enhance the ability to inventory current and future nutrient reduction management practices.

Inventoried HUC 12 Watersheds in Iowa



Best Management Practices (NRCS Practice Codes) being digitized:
Contour Buffer Strip - 332 Pond Dam - 378
Grassed Waterway - 412 Stripcropping - 585
Terrace - 600 Water and Sediment Control Basin - 638

Examples of Imagery used to identify practices:
Lidar-derived hillshade, Lidar-derived slope, and Color-infrared Imagery



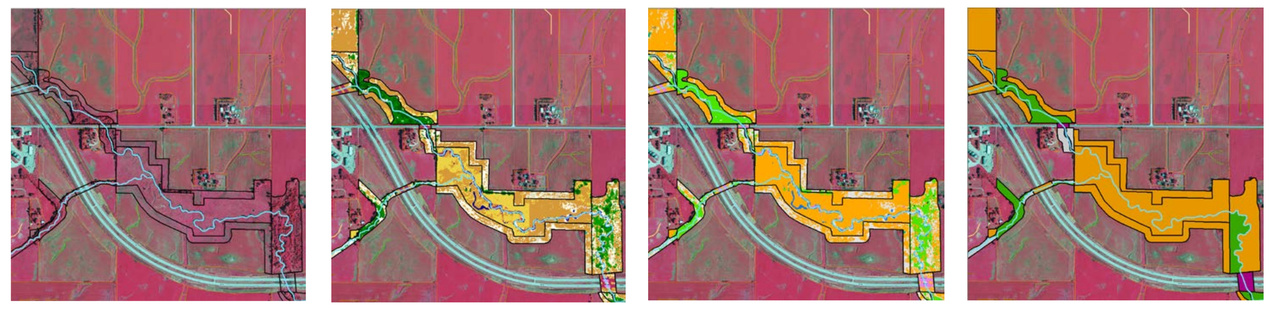
Hillshade showing narrow base terraces

Slope grid showing narrow base terraces

Narrow base terraces on color infrared photography

Riparian Zone Delineation and Classification

A semi-automated method was developed to identify and classify the non-crop riparian land bordering main stream corridors. This technique used stream centerlines to locate common land unit polygons within a 2 meter distance of the centerline. Technicians then evaluated and edited the polygons using high resolution land cover (HRLC) raster data as well as aerial photography and LiDAR with the intent that these polygons would capture a majority of the land cover in the riparian zone.



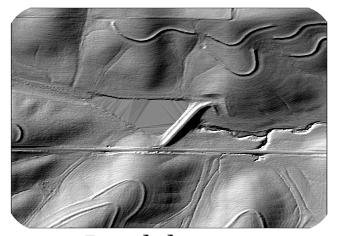
Left to Right: Edited Riparian Polygons; HRLC clipped to Riparian Polygons; Riparian Polygons reclassified; Riparian Polygons populated with majority land cover in polygon

Visual Interpretation

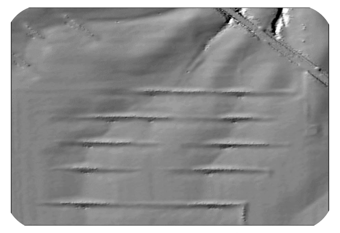
To identify best management practices on the landscape, aerial imagery and lidar-derived products such as hillshade and slope are used. Hillshade and slope are helpful for identifying practices such as terraces because the imagery provides a three dimensional view of the ground to supplement the natural color and infrared aerial photography (2-D).

Starting in the spring of 2015, four interns began digitizing best management practices in designated Iowa Water Quality Initiative (IWQI) watersheds. A second group of five student workers were hired to continue this work through the summer. 115 watersheds were completed. Additional watershed work has been funded through state initiatives. Our initial datasets for the best management practices are now fairly robust, a next step for this research will be to use the datasets as training material for automated detection.

Grassed waterway on NAIP imagery



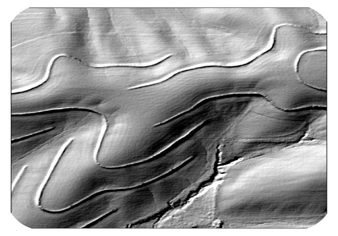
Pond dam on hillshade



A series of WASCOBs on hillshade

Contour buffer strips with grassed waterways on CIR imagery

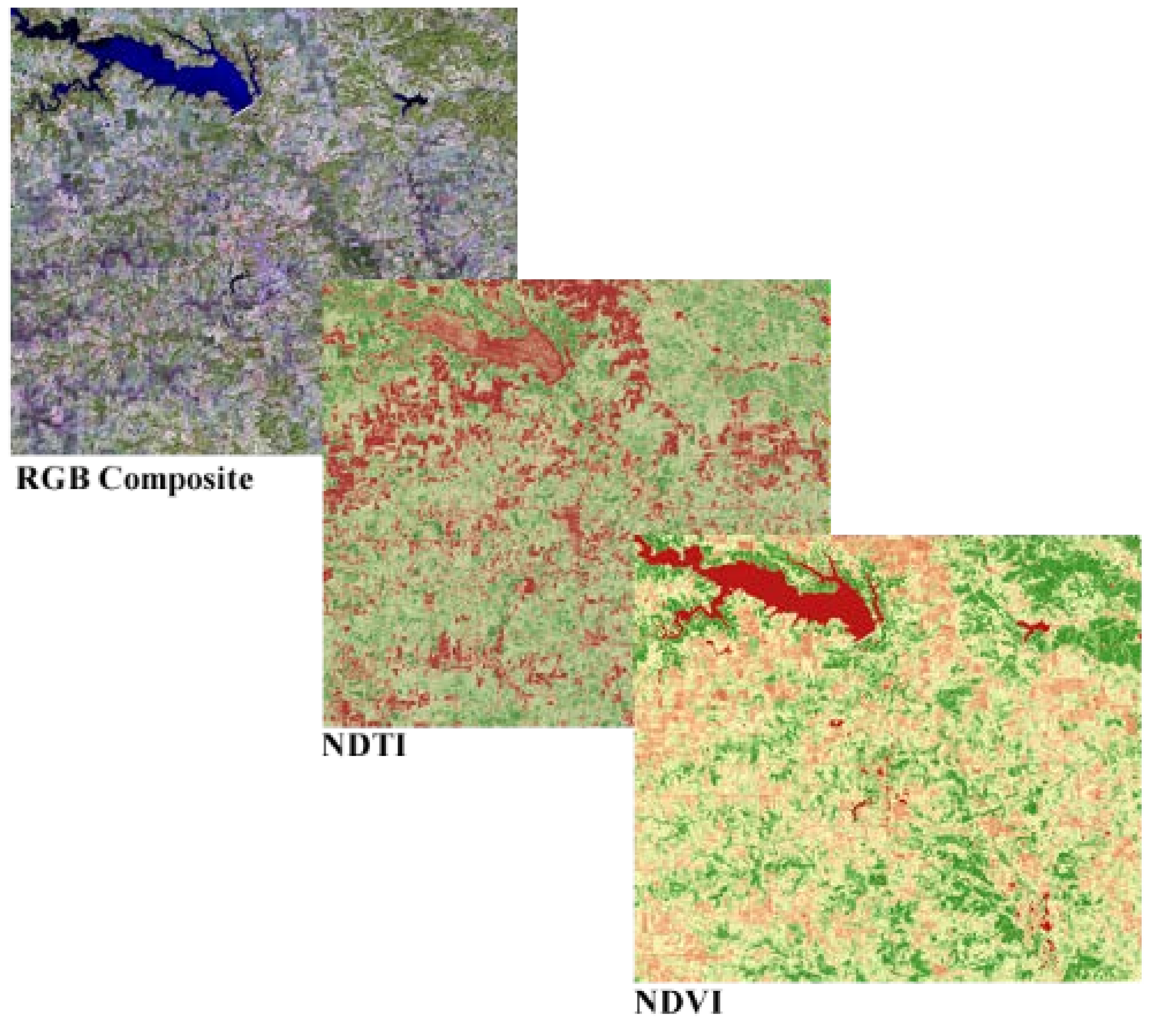
Contour strip cropping with grassed waterways on CIR imagery



Hillshade showing narrow base terraces

While some practices are very clear, others can be subtle or quite varied!

IowaView Consortium Member Projects



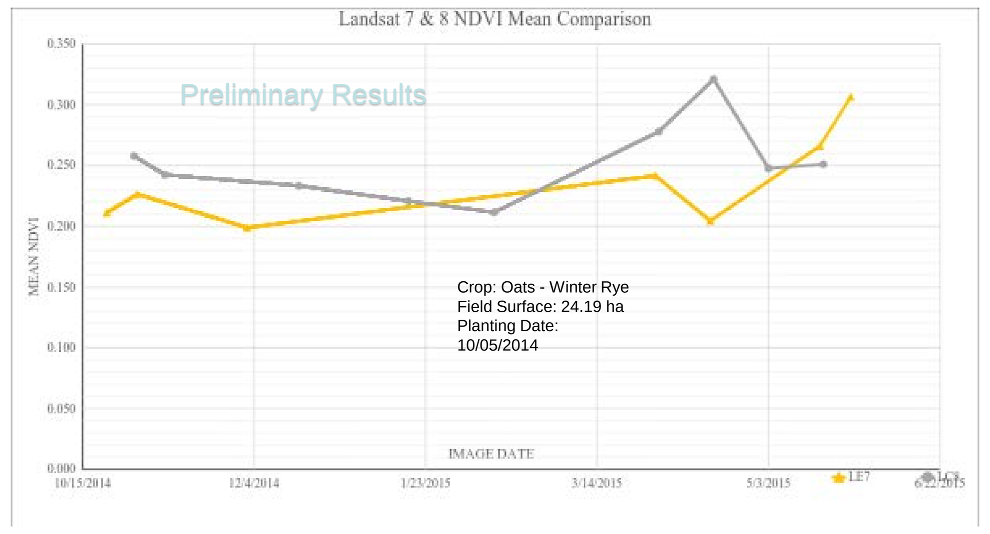
Python Tool to Unpack, Create and Categorize Landsat Imagery

Dr. Brian Gelder and Claudette Sandoval-Green created a Python and ArcGIS tool to quickly access, and easily process large amounts of inventoried Landsat data. This tool bulk processes Iowa View Landsat imagery inventory directories from 2000 to 2015 by unpacking Landsat .gz and .tar files, calculating a Normalized Difference Vegetation Index (NDVI), a Normalized Difference Tilth Index (NDTI), and creating an RGB composite raster for storage on a file server. The imagery is categorized by year, date, and pathway for each imagery product, and recorded in a summary feature class for future user query by location. Our ArcGIS toolbox and script is available at www.iowaview.org.

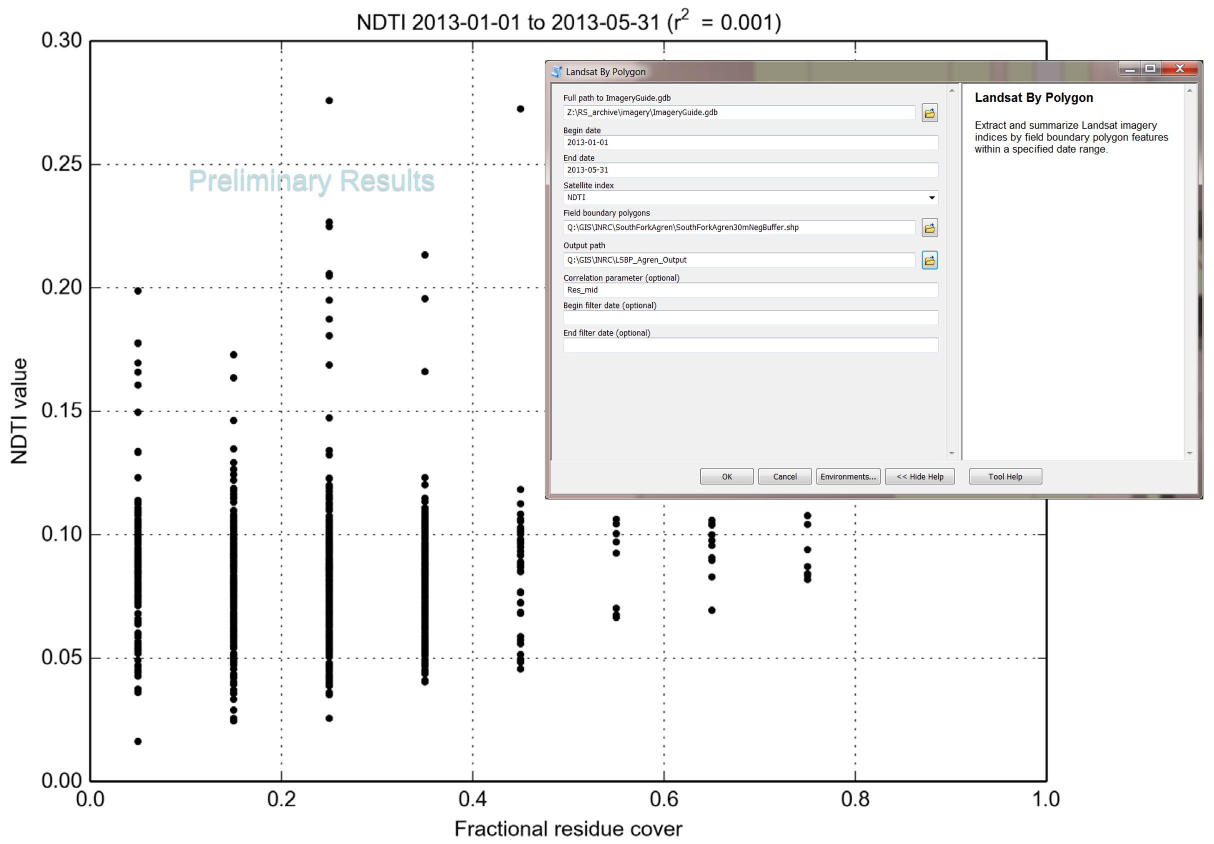
For more information about this project please contact:
Dr. Brian Gelder at bkgelder@iastate.edu

Comparison of Landsat 7 and 8 NDVI products for Cover Crops in Iowa

Reliable Normalized Difference Vegetation Index (NDVI) time series are fundamental and essential in long-term studies of crop and land properties. The purpose of this study is to analyze NDVI values based on spectral reflectance data from Landsat 7 and 8. The two NDVI products were compared using pairs of consecutive days to detect if both satellites performed similar when detecting cover crops.
For more information about this project, please contact:
Carolina Bermudez, M.S. Student at carob@iastate.edu



NDVI MIN	NDVI MAX	NDVI RANGE	NDVI MEAN	NDVI STD	SENSOR	IMAGE.DATE
0.14743	0.46287	0.31544	0.21118	0.03425	LE7	10/22/2014
0.22450	0.45814	0.23364	0.25766	0.03192	LC8	10/30/2014
0.17273	0.33989	0.16716	0.22645	0.02760	LE7	10/31/2014
0.21329	0.38357	0.17029	0.24229	0.02488	LC8	11/8/2014
0.12438	0.26412	0.13974	0.19887	0.02364	LE7	12/2/2014
0.19934	0.28699	0.08766	0.23338	0.01654	LC8	12/17/2014
0.10696	0.28350	0.17654	0.22074	0.03306	LC8	1/18/2015
0.04747	0.42136	0.37389	0.21151	0.10445	LC8	2/12/2015
0.19445	0.29547	0.10102	0.24167	0.02267	LE7	3/31/2015
0.22029	0.33140	0.11111	0.27779	0.01835	LC8	4/1/2015
0.16804	0.23693	0.06889	0.20454	0.01302	LE7	4/16/2015
0.22068	0.44213	0.22146	0.32093	0.05151	LC8	4/17/2015
0.21112	0.41328	0.20215	0.24763	0.02230	LC8	5/3/2015
0.22143	0.68822	0.46679	0.26598	0.07233	LE7	5/18/2015
0.22403	0.57304	0.34901	0.25086	0.03702	LC8	5/19/2015
0.24342	0.75666	0.51325	0.30650	0.05732	LE7	5/27/2015



Arcpy Script for Determining and Visualizing Zonal Mean of Landsat Imagery Across Time

Calculates temporal average of index (NDVI/NDTI) mean, standard deviation, and raster coverage percentage for each polygon. The script filters out raster cells containing water, shadow, snow, and clouds (it uses the Landsat cfmask raster). The results are shown as NDVI/NDTI average for the period selected (per polygon) and it is also possible to have the values for each day the index was calculated.
For more information about this project contact, please contact: Dr. Brian Gelder at bkgelder@iastate.edu

Amy Logan and Robin McNeely – ISU GIS Facility