

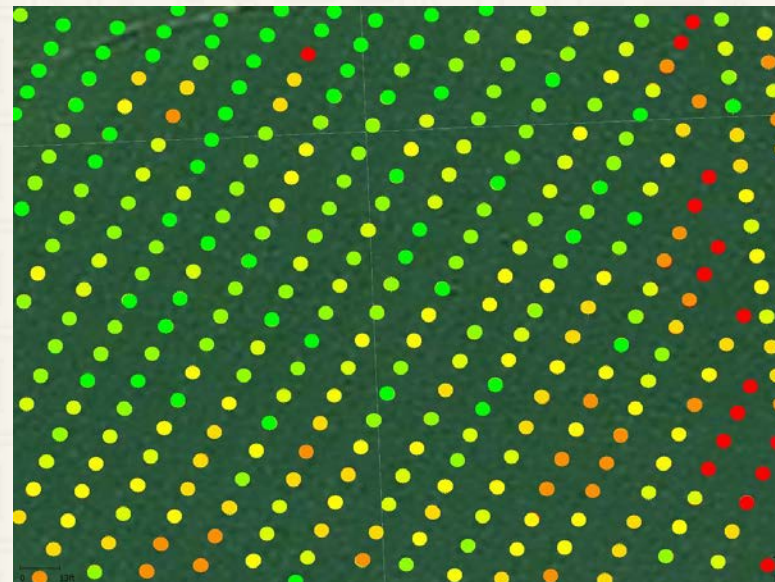


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# Connect the Dots: Improving Yield Data, Understanding My Map, and Making Decisions

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**Nathan Mueller**  
**PhD CCA**

**Cropping  
Systems  
Educator for  
Dodge &  
Washington  
Counties**

# Overview

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- Yield Data Quality – Remove Bad Dots
- Imagery – Explain Some Dots
- Soil Map Unit vs. Soil EC – Need More Dots
- Connect the Dots
  - Create management zones
  - Create prescriptions
  - Create profitability maps
- Verify You Connected the Dots Right
  - On-Farm Research Network
  - Precision Ag Data Management Workshops



Dodge County, NE

[croptechcafe.org/connectthedots](http://croptechcafe.org/connectthedots)

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Get this presentation



# Yield Data Quality: Remove Bad Dots

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Dot 1

# How Important is Yield Data Quality?

*Most valuable data gathered each year*

- Yield data is used to:
  - Develop fertilizer recommendations
  - Develop management zones
  - Assess hybrid/variety performance
  - Evaluating product performance
  - Assess profitability
- So.... Do you want to make these decision using bad yield data?

Normalized multi-year yield



# Impact of keeping the BAD dots

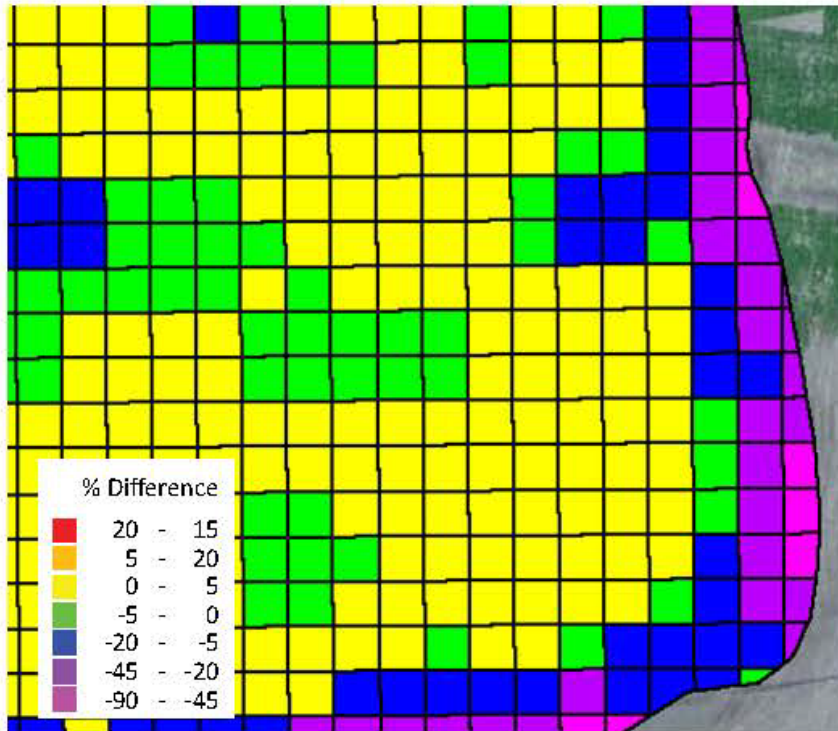


Figure 7: Differences (in %) between clean and raw gridded (50 ft square) yield data (raw grid data subtracted from clean grid data divided by clean grid data).

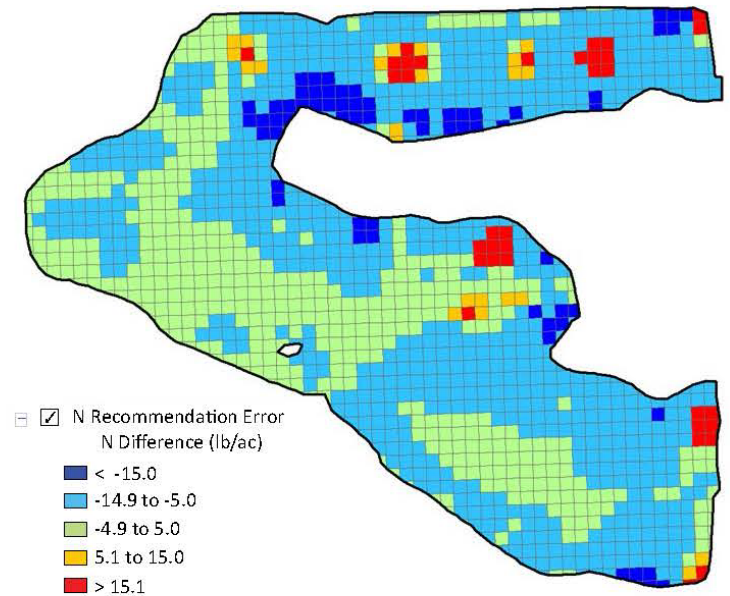
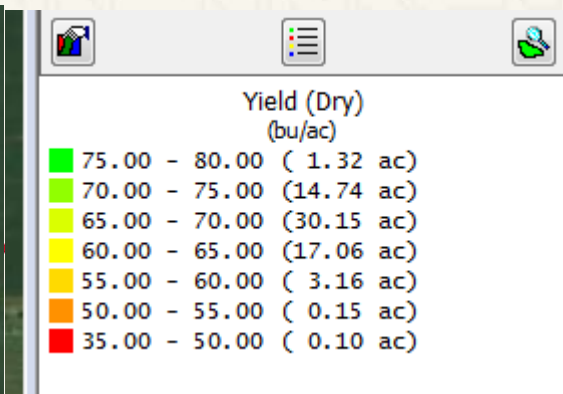
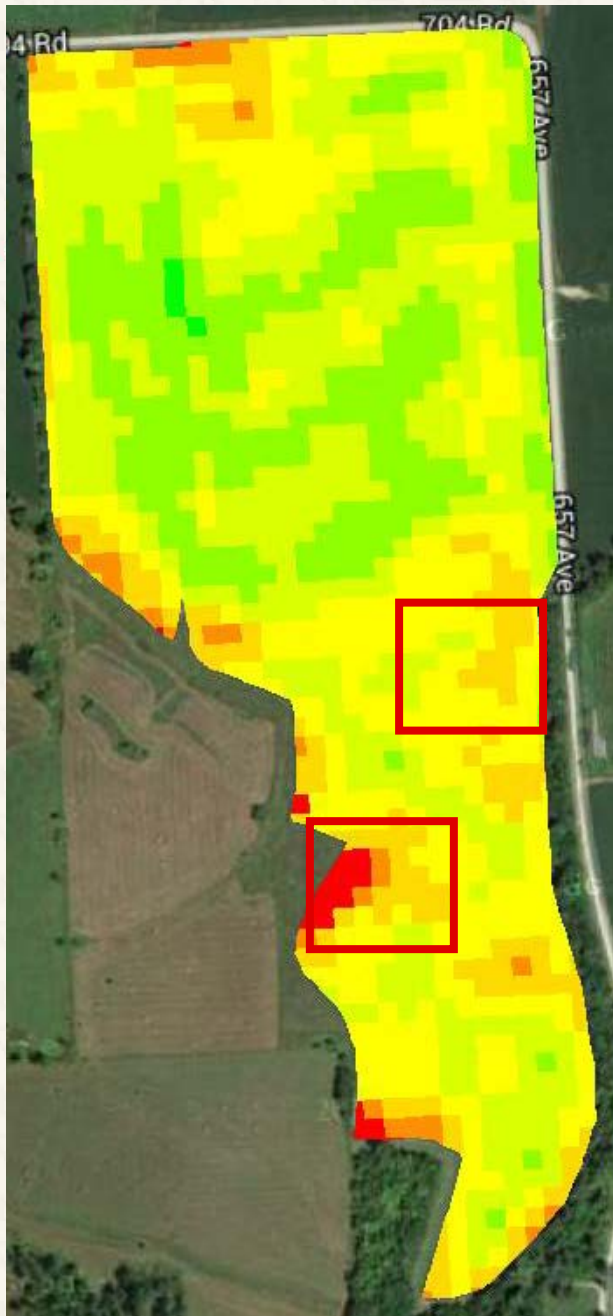


Figure 12: Map (50 ft grid) showing the potential differences in a N prescription map when using raw yield data versus cleaned yield data. In many instances, predictions of N can exceed 15 lb/ac.





- Yield at 13%
- On Same Yield Ranges (colors)
- Raw Data
- vs.
- Cleaned Data



# Improving Yield Map Quality by Reducing Errors through Yield Data File Post-Processing

Joe D. Luck, Extension Specialist, Precision Agriculture Engineer  
Nathan Mueller, Extension Educator  
John P. Fulton, Associate Professor, The Ohio State University

## Introduction

Yield monitor data is certainly one of the most valuable pieces of information that is gathered throughout the year. It can allow producers to estimate profitability, evaluate management decisions, and develop recommendations for the upcoming year. If this information is to be used to its fullest potential, ensuring that the yield data represents accurate estimates of crop performance is critical. However, yield monitor data typically contains some errors. While errors are generally a very small percentage of the data gathered, they can influence the final results.

### Common physically-measured errors include:

1. Header cut-width (or harvest width)
2. Header position
3. Lag time (or flow delay) settings
4. Travel distance measurements

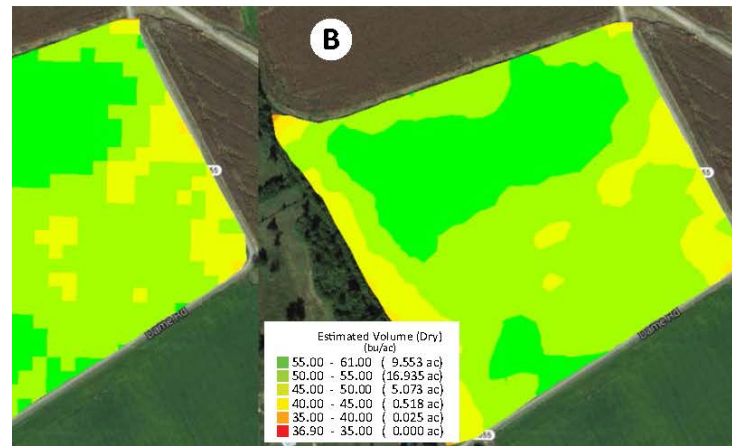
Soon after yield monitoring systems became commercially available, researchers quickly began to develop methods to improve the quality of those datasets. Different procedures (some real-time and others post-harvest) were developed as early as the late 1990s to solve many of these issues.

The goal of this publication is to help end users understand why post-processing or “cleaning” yield data may be important for their operations by showing examples of common errors and providing suggested best management practices (BMPs) for reducing them within their datasets.

A list of abbreviations used in this article are: Best management practices (BMPs), file format for files using comma-separated values (.csv), farm management information systems (FMIS), global position systems (GPS), inverse distance weighted (IDW), kriging (KRG), prescription (Rx), file format for files using text (.txt), Spatial Management Software (SMS), and United States Department of Agriculture (USDA).

## Why Post-Processing (or Cleaning) Yield Data is Important

At the time yield data collection became mainstream, many farm management information systems (FMIS), including software comparable to Ag Leader’s SMS or John Deere’s Apex, were difficult to use for most customers. Most users would generate yield maps for viewing; however further analysis using the data was not widespread. Many prescription (Rx) maps were generated by manually creating zones that didn’t require a high level of accuracy when viewing yield maps. General trends across a field were considered when generating these management zones on such maps.



ield map (A) and contour-based yield map (B) using clean data points from Figure 2.

### ing grid- and contour-based maps created from raw and clean yield data.

Yield (bu/ac)	Raw Yield Data Grid Map (bu/ac)	Clean Yield Data Grid Map (bu/ac)	Raw Yield Data Contour Map (bu/ac)	Clean Yield Data Contour Map (bu/ac)
0	31.2	36.9	32.2	38.0
10.0	60.3	61.0	56.4	60.3
20.0	51.7	53.0	51.6	52.8
Total (bu)	1,660 (bu)	1,701 (bu)	1,653 (bu)	1,693 (bu)

nto either grids or zones eas within the field. This tween raw and cleaned many of minimum, maxi- om the raw and clean yield d and contour). The field roximately 30 ac in size.

values may not be alarm- s between a gridded yield ow errors more clearly. Fig- ing a grid map of raw yield an data. In most locations, estimates, cleaning the es higher. Figure 5 also es were regularly off by eld estimates were high, ot over-estimated in the

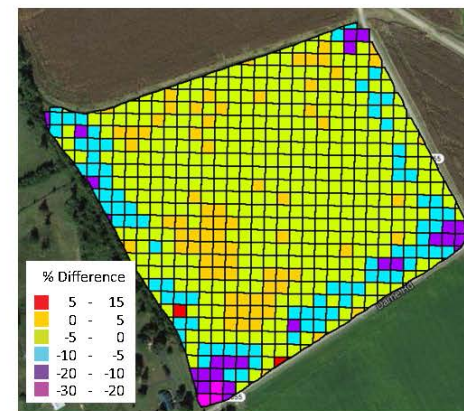


Figure 5: Differences (%) between clean and raw gridded yield data (raw grid data subtracted from clean grid data divided by clean grid data).



# Common Errors in Yield Data

---

- Examples in our data set
  - Header cut-width/overlap
  - Flow delay
  - Drastic velocity changes
- Others
  - Header up/down

Removed Yield Data Points



# USDA Yield Editor 2.0.7

---

- Import Ag Leader Advanced or Greenstar text file formats

Table 1. *Required* data fields in *bold* for emulating AgLeader advanced file format.

<b>1) Longitude</b>	<i>decimal degrees, negative in W hemisphere</i>
<b>2) Latitude</b>	<i>decimal degrees, negative in S hemisphere</i>
<b>3) Flow</b>	<i>pounds per second</i>
4) GPSTime	seconds
<b>5) Logged Interval</b>	<i>seconds</i>
<b>6) Distance</b>	<i>inches</i>
<b>7) Swath</b>	<i>inches</i>
8) Moisture	percent wet basis
9) Header Status	unitless, 1 = harvesting, 0 = not harvesting
<b>10) Pass Number</b>	<i>unitless, generally +1 each header up/down cycle</i>

# Filter Types in Yield Editor - Delays

---

- Delays
  - Flow
  - Moisture
  - Start Pass
  - End Pass
- A positive value – grain moved backwards in time
- A negative value – grain moved forward in time

# Filter Types in Yield Editor - Velocity

---

- Velocity
  - Max (mph)
  - Min (mph)
  - Smooth (mph)
- Example of smooth velocity (point-to-point in transect)
  - 4.0 mph down to 3.1 mph (>0.2 smooth vel)
  - 0.2 or 20% of 4 mph is 0.8 mph decrease or increase

# Filter Types in Yield Editor - STD

---

- Standard Deviation (STD) Filters
  - “Fieldwide” STD
  - Local STD (Auto) – # of header widths
- Local Standard Deviation Example (bu/ac)
  - 50, 55, 60, 65, 55, 60, 60, 65, 50, **200** = Average = 72
  - $(50-72)^2 + (55-72)^2 \dots$  Sum of Squares
  - Square root of the Sum of Squares/(n-1) = STD = 15
  - 3 STD = 45 bu/ac,
  - 27 to 117 bu/ac

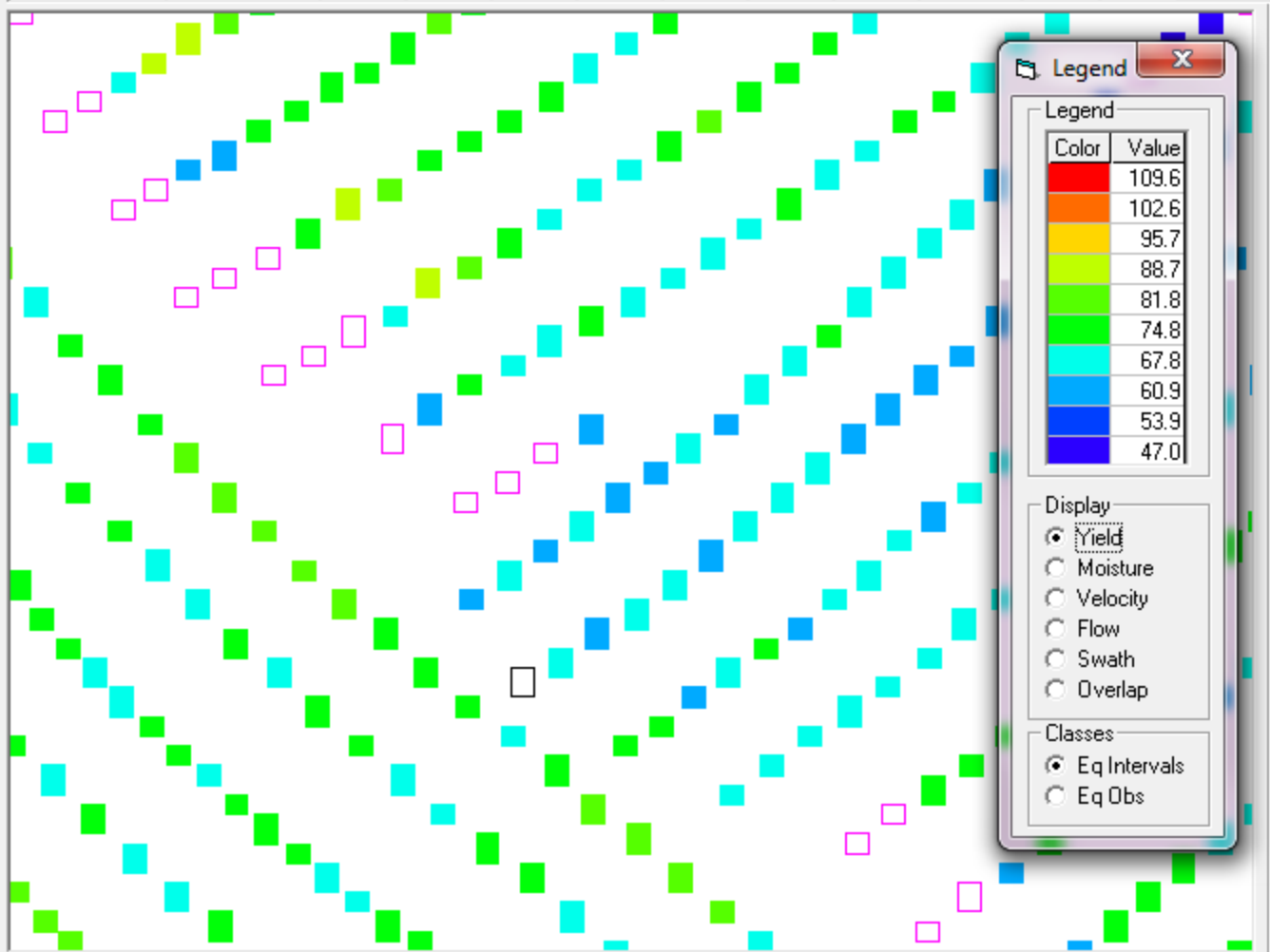


Filter Selection

Use?	Show?	Deleted
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="60"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="509"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="353"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="135"/>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="1154"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="0"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="text" value="773"/>
<input checked="" type="checkbox"/>	<input checked="" type="radio"/>	<input type="text" value="1455"/>
<input checked="" type="checkbox"/>	Position Filter	<input type="text" value="0"/>
	To	<input type="text" value="0"/>
Easting	<input type="text" value="286104"/>	<input type="text" value="286568"/>
Northing	<input type="text" value="4432973"/>	<input type="text" value="4434027"/>
		<input type="text" value="Manual Deletes"/>
<input checked="" type="checkbox"/>	Adjust for Moisture?	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Expand Dry?	
<input type="text" value="15.5"/>	Manual Moisture Setting	<input type="text" value=""/>
<input checked="" type="checkbox"/>	Sensor Based?	<input type="text" value=""/>

Map and Manual Editor

Easting (m)	Northing (m)	Yield	Flow	Speed	Moist	Swath	Up/Dn	Nsecs	RmCode	Pass	Point
286394	4433433	108.06	5.62	2.81	10.5	113	1	2.0	49152	164	45



Legend

Color	Value
Red	109.6
Orange	102.6
Yellow	95.7
Light Green	88.7
Green	81.8
Dark Green	74.8
Cyan	67.8
Blue	60.9
Dark Blue	53.9
Dark Blue	47.0

Display

- Yield
- Moisture
- Velocity
- Flow
- Swath
- Overlap

Classes

- Eq Intervals
- Eq Obs

Advanced

Select Points

- Clean
- Deleted
- All

Filter(s) to Mask

- Flow Delay
- Moisture Delay
- Start Delay
- End Delay

RmCode

Zoom Tools

Manual Editing Tools

Display Legend?

Symbol Size (m)

# Filter Types in Yield Editor

---

- Overlap (auto)
- Effective at removing overlapped data points on field harvested by one combine
- Assuming GPS data is good
- Multiple combines in the same field could be an extra issue to deal with

# Filter Types in Yield Editor - Overlap

- Overlap (auto)

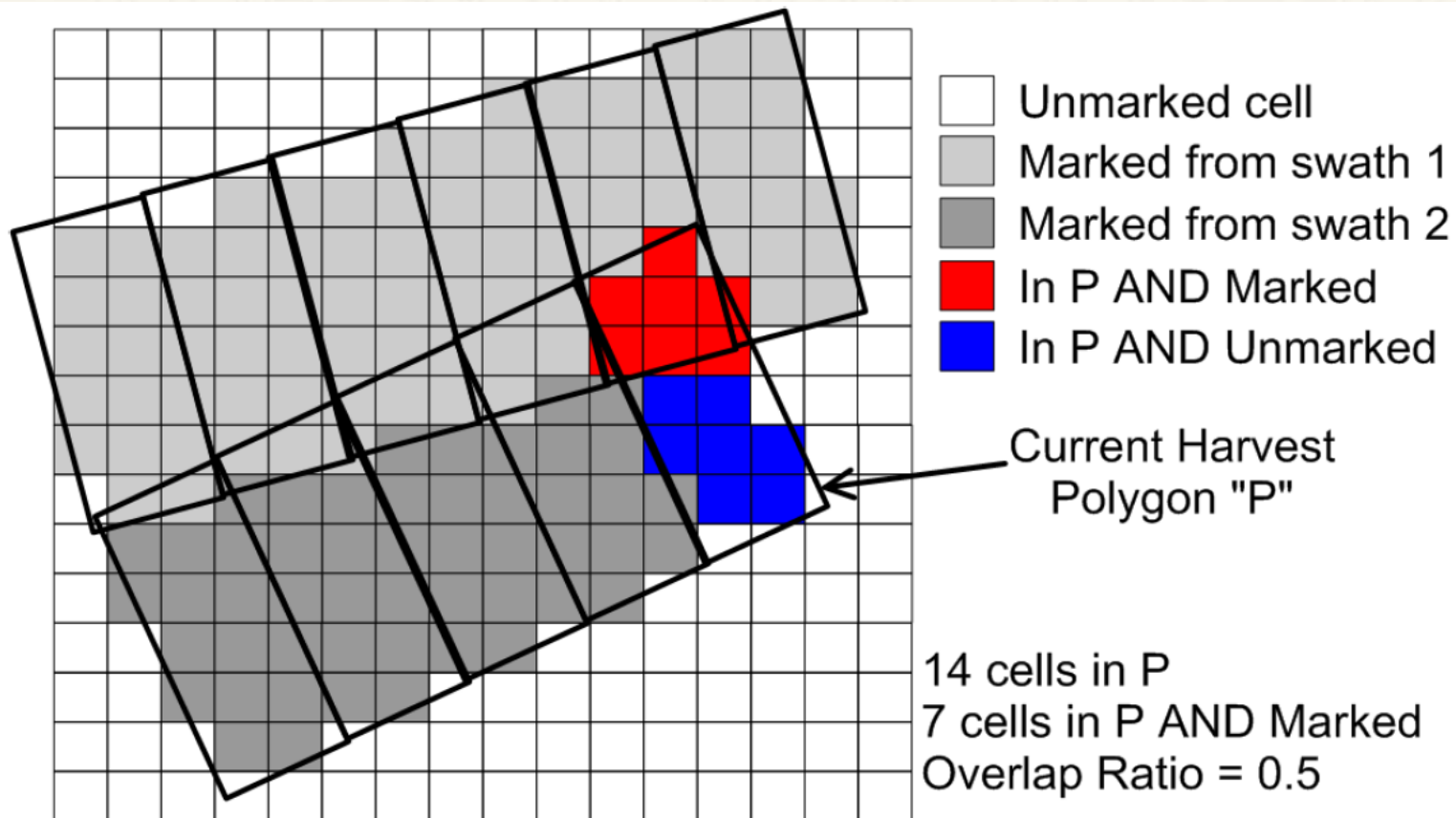


Figure 6. Illustration of the bitmap method by Han et al. (1997) for removal of overlapped areas.

Load/Import File

Filtering, Mapping and Editing

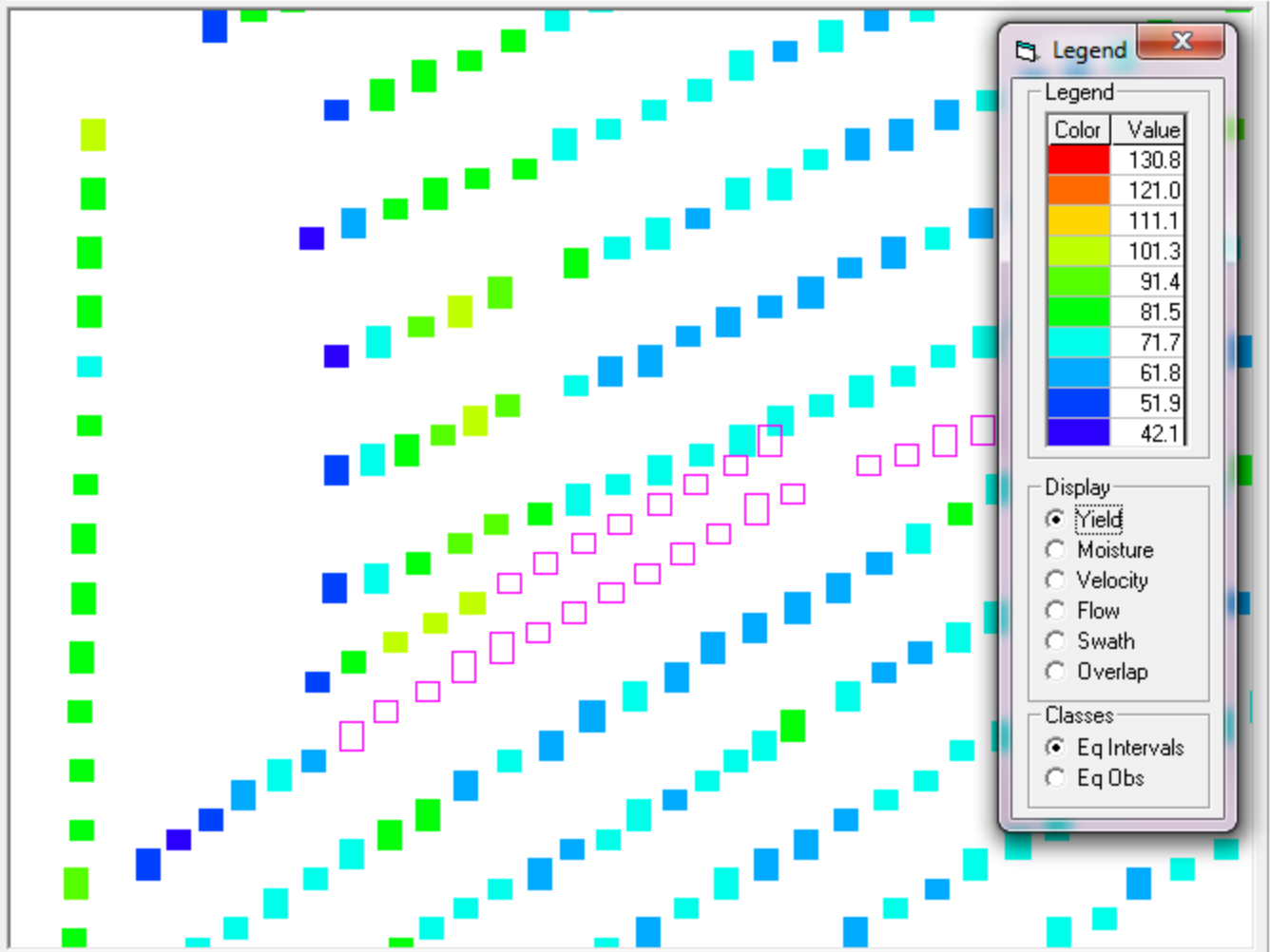
Save/Export File

**Filter Selection**

Use?	Show?	Deleted
<input checked="" type="checkbox"/> -1	<input type="radio"/> Flow Delay	244
<input checked="" type="checkbox"/> 0	<input type="radio"/> Moisture Delay	0
<input type="checkbox"/> 0	<input type="radio"/> Start Pass Delay	0
<input type="checkbox"/> 0	<input type="radio"/> End Pass Delay	0
<input checked="" type="checkbox"/> 4.1	<input type="radio"/> Max Velocity (mph)	60
<input checked="" type="checkbox"/> 1.8	<input type="radio"/> Min Velocity (mph)	509
<input checked="" type="checkbox"/> 0.2	<input type="radio"/> "Smooth" Velocity	353
<input type="checkbox"/> 120	<input type="radio"/> Minimum Swath (in)	0
<input checked="" type="checkbox"/> 134	<input type="radio"/> Maximum Yield	158
<input checked="" type="checkbox"/> 32	<input type="radio"/> Minimum Yield	1174
<input type="checkbox"/> 4	<input type="radio"/> STD Filter	0
<input type="checkbox"/>	<input type="radio"/> Header Down Req	0
	<input checked="" type="radio"/> Overlap (Auto)	773
	<input type="radio"/> Local STD (Auto)	1624
<input checked="" type="checkbox"/> Position Filter	To	0
Easting	286104	286568 <b>Manual Deletes</b>
Northing	4432973	4434027
<input checked="" type="checkbox"/> Adjust for Moisture?	<input checked="" type="checkbox"/> Expand Dry?	
15.5 Manual Moisture Setting	<F10> Apply Filters	
<input checked="" type="checkbox"/> Sensor Based?		

Map and Manual Editor

Easting (m)	Northing (m)	Yield	Flow	Speed	Moist	Swath	Up/Dn	Nsecs	RmCode	Pass	Point
286322	4433828	73.23	7.66	2.81	10.6	227	1	2.0	0	136	14



**Legend** X

Color	Value
Red	130.8
Orange	121.0
Yellow	111.1
Light Green	101.3
Green	91.4
Dark Green	81.5
Cyan	71.7
Blue	61.8
Dark Blue	51.9
Dark Blue	42.1

**Display**

- Yield
- Moisture
- Velocity
- Flow
- Swath
- Overlap

**Classes**

- Eq Intervals
- Eq Obs

**Yield Statistics**

	Mean	STD	CV	N	Range
Clean	67.02	8.71	13.0	18294	32-131
Raw	63.09	21.42	33.9	20736	5-200

**Zoom Tools** **Manual Editing Tools**

Display Legend?

Symbol Size (m)

<< Advanced

# Filter Types in Yield Editor - Others

---

- Others
  - Header Down Req
  - Position
- Moisture (not a filter, just an adjustment option)



# Aerial Imagery – Explain Some Dots

---

Dot 2

# Sources of Aerial Imagery

- USDA Geospatial Gateway
  - Free, available online
  - Georeferenced
  - More than aerial imagery
- USGS Earth Explorer
  - Free, available online
- Many other sources
  - Google Earth
  - Sat Shot
  - Terra Server
  - Many more service providers

The screenshot shows the USDA Geospatial Data Gateway website. The header includes the USDA logo and the text 'Geospatial Data Gateway'. Below the header is a navigation menu with links for Home, Login, Check Order, Status Maps, News, Data Policy, FAQ, Help, Admin, and Contact Us. The main content area is divided into several sections: a sidebar on the left with a tree view of navigation options (Natural Resources Conservation Service, Farm Services Agency, Rural Development, National Geospatial Center of Excellence (NGCE), Aerial Photography Field Office (APFO), Web Soil Survey, eFOTG, Geo.Data.Gov, USGS Maps, Imagery and Publications, National Atlas, National Map Viewer 2.0, US Census Bureau Geography, Download TIGER/Line Shapefiles, Download Public Land Survey System Data, United States Elevation Inventory), a central 'Welcome to GDG' section with a 'System Status' notice and a 'GEOSPATIAL DATA GATEWAY' banner, and a 'Place a Data Order' button on the right. The footer contains links for NRCS, USDA, FOIA, Accessibility Statement, Privacy Policy, Non-Discrimination Statement, Info Quality, FirstGov, and White House.

# USDA Geospatial Gateway

**USDA** National Resources Conservation Service  
United States Department of Agriculture

## Geospatial Data Gateway

Home | Login | Check Order | Status Maps | News | Data Policy | FAQ | Help | Admin | Contact Us

You are here: Home / GDGHome.aspx

**Welcome to GDG**

System Status:  
\*\*\*This new 6.0.3.2 release of GDG on 30-Nov-16 causes IE users to NOT be able to enter email address. Browser cache must be cleared\*\*\* If using IE, exit Gateway application, go to Tools/Internet options, click Browsing History Settings button, click view files button, cntrl-A to select all files, press Delete button on keyboard to delete all. Exit IE. This will allow you to enter your email address and access the "Continue" button.  
Chrome and FireFox browsers work fine without doing anything.

**GET DATA**

**Place a Data Order** **GDG**

**I Want To...**

- Order by County/Countries
- Order by State
- Order by Place
- Order by entering Latitude/Longitude Bounding Rectangle
- Order by Interactive Map
- using custom Area Of Interest

The Geospatial Data Gateway (GDG) provides access to a map library of over 100 high resolution vector and raster layers in the Geospatial Data Warehouse. It is the One Stop Source for environmental and natural resources data, at anytime, from anywhere, to anyone. It allows you to choose your area of interest, browse and select data, customize the format, then download or have it shipped on media.

This service is made available through a close partnership between the three Service Center Agencies (SCA): Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA) and Rural Development (RD).

NRCS | USDA | FOIA | Accessibility Statement | Privacy Policy | Non-Discrimination Statement | Info Quality | FirstGov | White House

- Contains National Agriculture Imagery Program imagery
- Order content by county or specified area
- Example:
  - Nebraska 2016
  - Resolution: 0.6 meter

<https://gdg.sc.egov.usda.gov/>

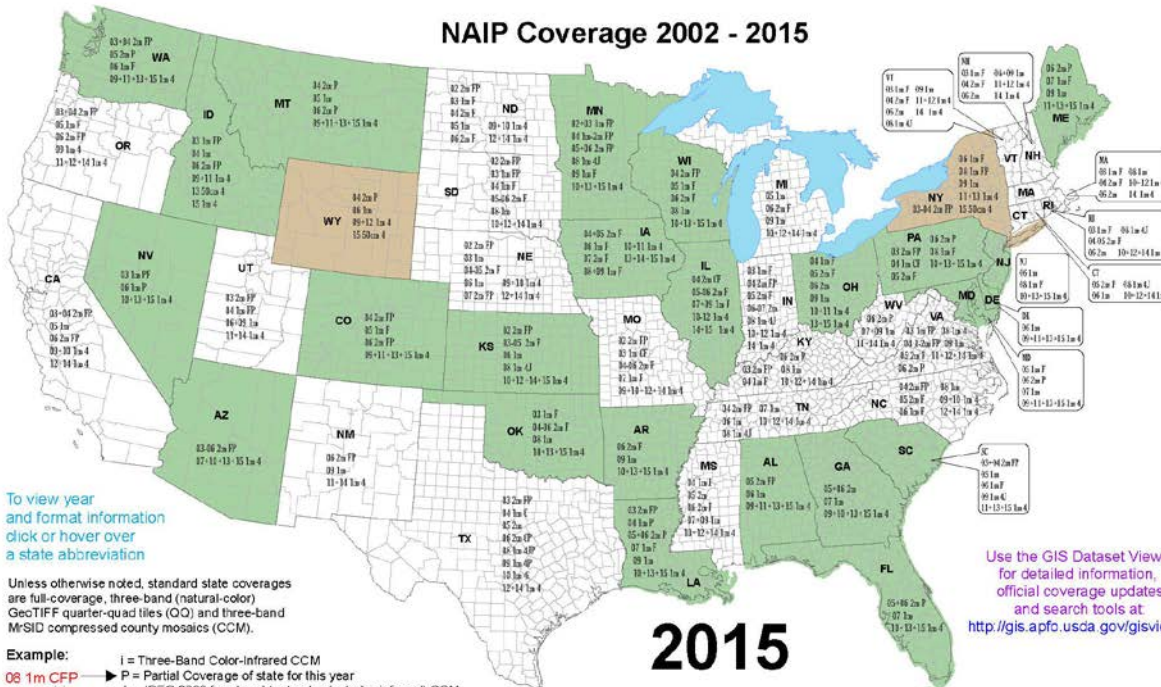


# NAIP Coverage



United States Department of Agriculture

## NAIP Coverage 2002 - 2015



To view year and format information click or hover over a state abbreviation

Unless otherwise noted, standard state coverages are full-coverage, three-band (natural-color) GeoTIFF quarter-quad tiles (QQ) and three-band MrSID compressed county mosaics (CCM).

Example:  
 08 1m CFP → i = Three-Band Color-Infrared CCM  
 → P = Partial Coverage of state for this year  
 → J = JPEG 2000 four-band (natural-color/color-infrared) CCM  
 → F = Film available  
 → C = Three-band Color-infrared GeoTIFF QQ & CCM  
 → 4 = Four-Band (Natural Color/Color Infrared) GeoTIFF QQ.

Check "All NAIP Format & Years" layer to view all years available

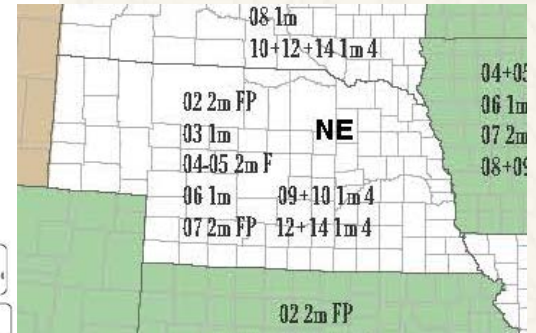
To view layers individually click on the Layers icon in the left margin of the document. Uncheck (turn off eyeball symbol) each NAIP Coverage year except for the one that you want to view. This will ensure the accurate coverage is portrayed.

Use the GIS Dataset Viewer for detailed information, official coverage updates and search tools at <http://gis.apfo.usda.gov/gisviewer>

ArcGIS 9.3+ Server Connection: <http://gis.apfo.usda.gov/arcgis/services>

US Department of Agriculture  
 Farm Service Agency, Aerial Photography Field Office  
 Customer Service Section  
 2222 West 2300 South Salt Lake City, UT 84119-2020  
 Tel: 801-644-2922 Fax: 855-415-2014  
 Email: [apfo.sales@slc.usda.gov](mailto:apfo.sales@slc.usda.gov)  
 Website: [www.apfo.usda.gov](http://www.apfo.usda.gov)

Updated May 6, 2015



# Orth NAIP Mosaics for Dodge County



## 1-WHERE

### 2-WHAT

The list in the middle pane indicates the available map layers for your area of interest. The number of maps and total size of the map layers are listed next to the description. Clicking on the **i** icon will provide a pop-up window with that map layer's description. Use the **+** icon to get a list of individual maps for that map layer. Within the list of maps, use the **m** icon to get metadata for the specific map and the **g** icon for an individual map preview. You may collapse this map list with the **-** icon. Your selections will be added to the YOUR ORDER Panel on the far right.

You may change your map layers after this step but all of the subsequent choices made for your order will be removed.

Maps in layers that are "...by State" cover an entire state.

## 3-HOW

## 4-WHO

## 5-REVIEW

## WHAT

Here are the available map layers for your selected area of interest.

- Quadrangle Index 1:250,000 by State, 1 map 0.012 MB **i** **+**

### Ortho Imagery

- Digital Ortho County Mosaic of 7.5' quads by APFO, 1 map 106.196 MB **i** **+**

### Ortho NAIP

- NAIP NCGC Derivative Mosaic, 1 map 444.619 MB **i** **+**
- 2003 National Ag. Imagery Program Mosaic, 1 map 125.88 MB **i** **+**
- 2004 National Ag. Imagery Program Mosaic, 1 map 35.958 MB **i** **+**
- 2005 National Ag. Imagery Program Mosaic, 1 map 142.868 MB **i** **+**
- 2006 National Ag. Imagery Program Mosaic, 1 map 444.652 MB **i** **+**
- 2007 National Ag. Imagery Program Mosaic, 1 map 110.533 MB **i** **+**
- 2009 National Ag. Imagery Program Mosaic, 1 map 441.873 MB **i** **+**
- 2010 National Ag. Imagery Program Mosaic, 1 map 441.801 MB **i** **+**
- 2012 National Ag. Imagery Program Mosaic, 1 map 442.352 MB **i** **+**
- 2014 National Ag. Imagery Program Mosaic, 1 map 442.452 MB **i** **+**
- 2016 National Ag. Imagery Program Mosaic, 1 map 306.676 MB **i** **+**

### Ortho NAIP Seamline

- 2012 NAIP Seam Lines by State, 1 map 12.35 MB **i** **+**
- 2014 NAIP Seam Lines by State, 1 map 39.532 MB **i** **+**

### Soils

- Soil Survey Spatial and Tabular Data (SSURGO 2.2), 1 map 16.245 MB **i** **+**
- Gridded Soil Survey Geographic (gSSURGO) by State or Conterminous U.S., 1 map 1179.713 MB **i** **+**
- U.S. General Soil Map (STATSGO2) by State, 1 map 6.223 MB **i** **+**

CONTINUE

## YOUR ORDER

Order Area (Where): Dodge County, Nebraska

Order Map Layers (What):

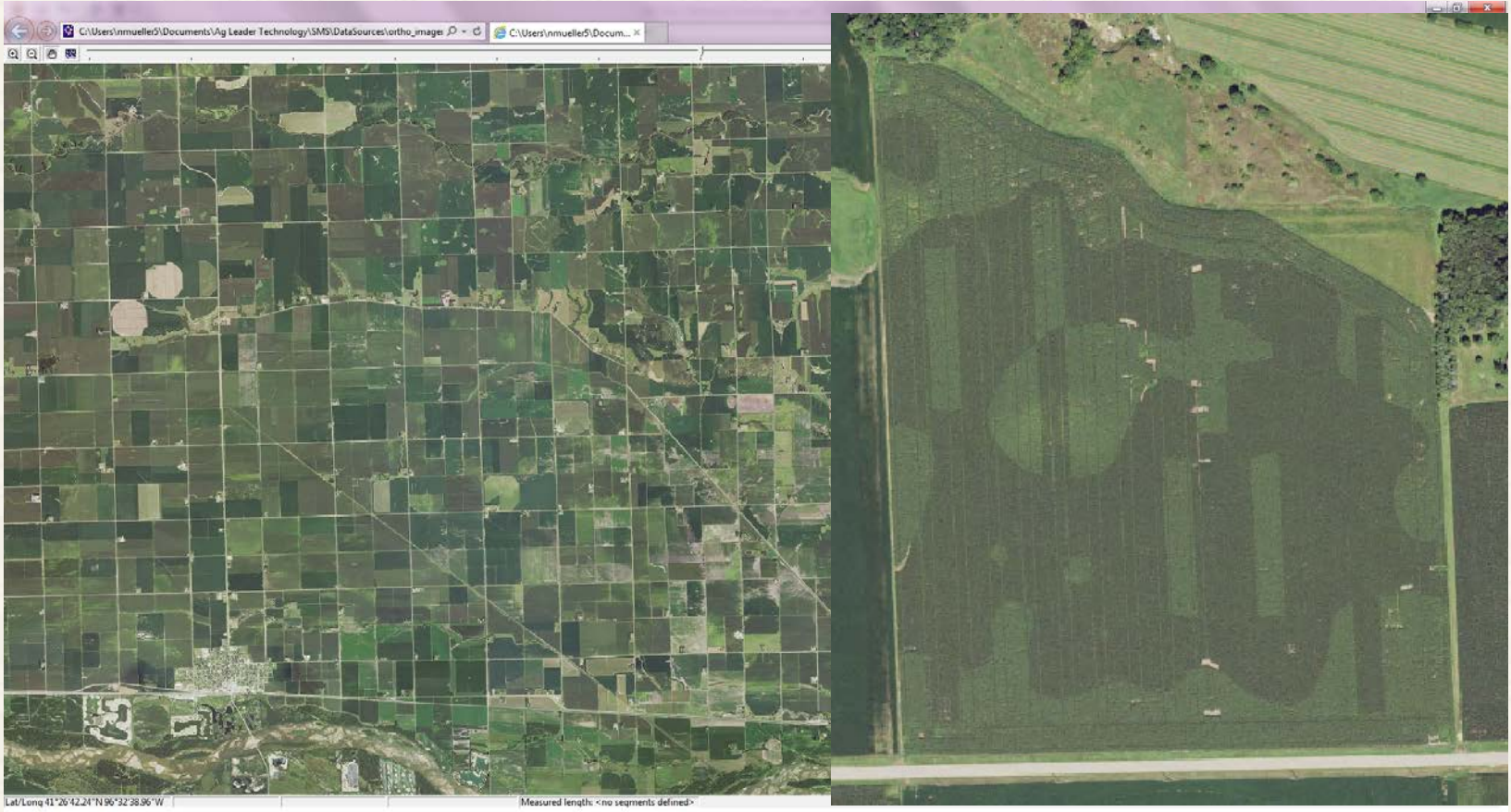
Order Format (How): None  
Order Projection (How): None  
Order Inclusion (How): None  
Order Delivery Method (How): None

Order Recipient (Who):



# 2016 NAIP Mosaic – Dodge County

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**LizardTech ExpressView Browser Plug-in**

# USGS EarthExplorer

<https://earthexplorer.usgs.gov/>

The screenshot displays the USGS EarthExplorer web application. At the top left is the USGS logo with the tagline "science for a changing world". The main header includes "EarthExplorer" and navigation links like "Home", "Save Criteria", "Load Favorite", and "Manage Criteria". On the right, there's a "USGS Home" link, a user profile for "nathan.mueller@unLedu", and a "Page Expires In 1:12:27" timer.

The interface is divided into several sections:

- Search Criteria Summary (Show):** A yellow bar at the top of the main content area.
- Search Criteria:** A sidebar on the left with tabs for "Search Criteria", "Data Sets", "Additional Criteria", and "Results". It contains instructions: "2. Select Your Data Set(s). Check the boxes for the data set(s) you want to search. When done selecting data set(s), click the Additional Criteria or Results buttons below. Click the plus sign next to the category name to show a list of data sets." Below this are checkboxes for "Use Data Set Prefilter" and a "Data Set Search:" input field.
- Data Set Search:** A list of data sets categorized under "Aerial Imagery", "AVHRR", "CEOS Legacy", "Commercial Satellites", "Declassified Data", and "Digital Elevation". The "Aerial Imagery" list includes items like "ASAS", "Aerial Photo Mosaics", "Aerial Photo Single Frames", "Toggle Coverage Map", "Antarctic Single Frames", "DOQ", "High Resolution Orthoimagery", "NAIP GEOTIFF", "NAIP JPG2000", "NAPP", "NHAP", "PAO Image Gallery", "SD NRCSS Section Photos", "SLAR", and "Space Acquired Photography".
- Map:** A large satellite map showing a rural landscape with a winding river (Elkhorn River), fields, and a road. A red pin is placed on the map. The map includes a "Map/Satellite" toggle, a coordinate display (41° 38' 20" N, 096° 38' 36" W), and zoom controls.
- Clear Criteria:** A button in the top right corner of the map area.

At the bottom of the map, there is a Google logo and a copyright notice: "Map data ©2017, Google Imagery ©2017, DigitalGlobe, Landsat / Copernicus, U.S. Geological Survey, USDA Farm Service Agency, 500 m". A disclaimer at the very bottom states: "The up-to-date Google map is not for purchase or for download; it is to be used as a guide for reference and search purposes only."



# Some Historical Imagery Available

The screenshot displays the USGS EarthExplorer web interface. The browser address bar shows the URL <https://earthexplorer.usgs.gov>. The page features a navigation bar with the USGS logo and the tagline "science for a changing world". Below the navigation bar, there are tabs for "Search Criteria", "Data Sets", "Additional Criteria", and "Results". The main content area is titled "4. Search Results" and includes instructions for using the dropdown menu to view search results for each specific data set. A "Data Set" section lists four search results, each with a thumbnail, entity ID, coordinates, acquisition date, and scale. The first result is Entity ID: AR4001200050024, Coordinates: 41.629909, -96.535604, Acquisition Date: 23-JUL-63, Scale: 66500. The second result is Entity ID: AR4001200050026, Coordinates: 41.629653, -96.609914, Acquisition Date: 23-JUL-53, Scale: 66500. The third result is Entity ID: AR1TN0000030074, Coordinates: 41.611019, -96.58212, Acquisition Date: 14-APR-52, Scale: 17000. The fourth result is Entity ID: AR1TN0000030073, Coordinates: 41.611229, -96.601802, Acquisition Date: 14-APR-52, Scale: 17000. A "Search Criteria Summary" section is visible, showing a map of the area with a highlighted search area. The map shows the Scribner State Airport and the Arkansas River. The search area is labeled with the entity ID AR1TN0000030073. The map also shows the coordinates 41° 36' 35" N, 096° 36' 18" W. The page footer includes the USGS logo and the text "The up-to-date Google map is not for purchase or for download; it is to be used as a guide for reference and search purposes only." The system tray at the bottom shows the date and time as 11:54 AM on 1/1/2017.

USGS Home  
Contact USGS  
Search USGS

Page Expires In 1:57:49

Home Save Criteria Load Favorite Manage Criteria Item Basket (0) nathan.mueller@unl.edu Feedback Help

Search Criteria Data Sets Additional Criteria Results

### 4. Search Results

If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.

Show Result Controls

Data Set [Click here to export your results »](#)

Aerial Photo Single Frames

6		Entity ID: AR4001200050024 Coordinates: 41.629909, -96.535604 Acquisition Date: 23-JUL-63 Scale: 66500
7		Entity ID: AR4001200050026 Coordinates: 41.629653, -96.609914 Acquisition Date: 23-JUL-53 Scale: 66500
8		Entity ID: AR1TN0000030074 Coordinates: 41.611019, -96.58212 Acquisition Date: 14-APR-52 Scale: 17000
9		Entity ID: AR1TN0000030073 Coordinates: 41.611229, -96.601802 Acquisition Date: 14-APR-52 Scale: 17000

« First » Previous 1 Next » Last »

[View Item Basket »](#) [Submit Standing Request »](#)

Search Criteria Summary (Show) Clear Criteria

Map Satellite

(41° 36' 35" N, 096° 36' 18" W) Options Overlays

AR1TN0000030073

USGS

Google

Map data ©2017 Google Imagery ©2017 DigitalGlobe, Landsat / Caprimus, U.S. Geological Survey, USDA Farm Service Agency, 500 m. Terms of Use Report a map error.

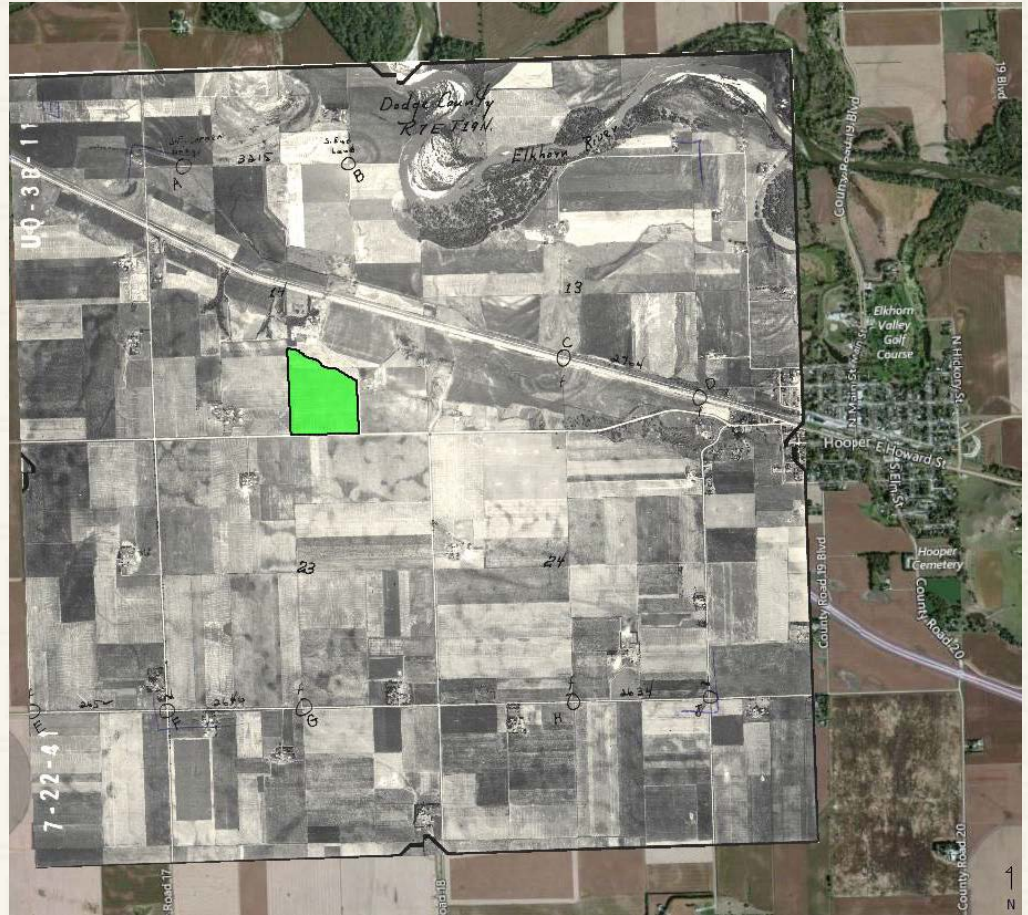
The up-to-date Google map is not for purchase or for download; it is to be used as a guide for reference and search purposes only.

11:54 AM  
1/1/2017

# Nebraska Maps and More Store

<http://nebraskamaps.unl.edu/productcart/pc/home.asp>

- UNL East Campus
- 101 Hardin Hall,  
3310 Holdrege  
Street, Lincoln, NE  
68583-0961
- 402-472-3471
- [snrsales@unl.edu](mailto:snrsales@unl.edu)



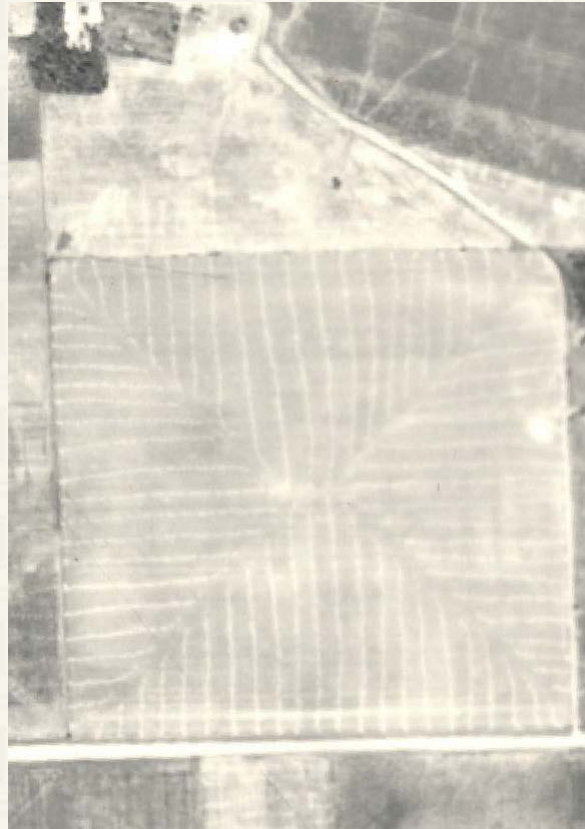


# Utilizing Imagery in SMS

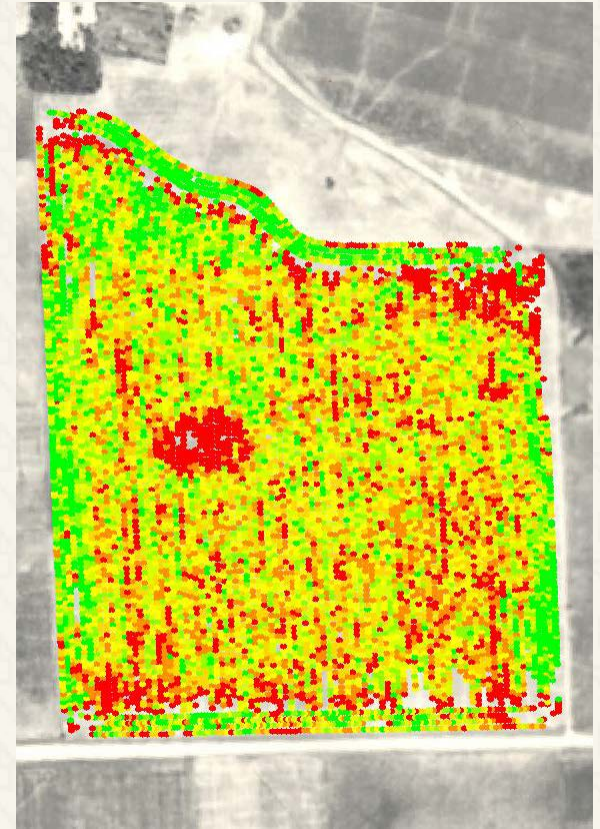
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2016 Imagery/Boundary



1941 Historical Imagery

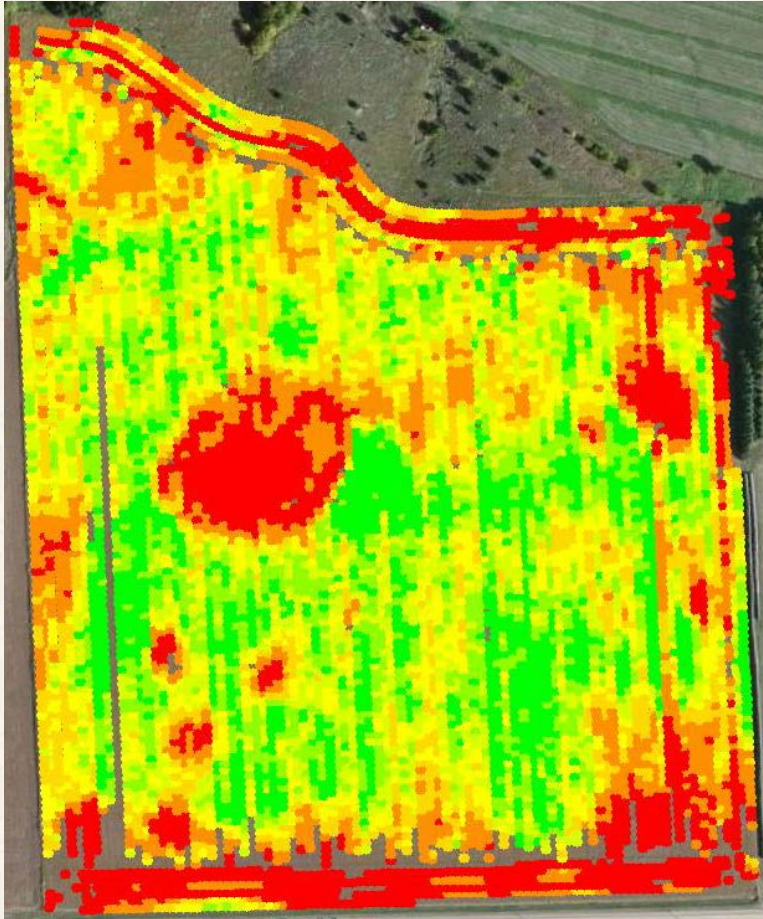


2014 Yield Data

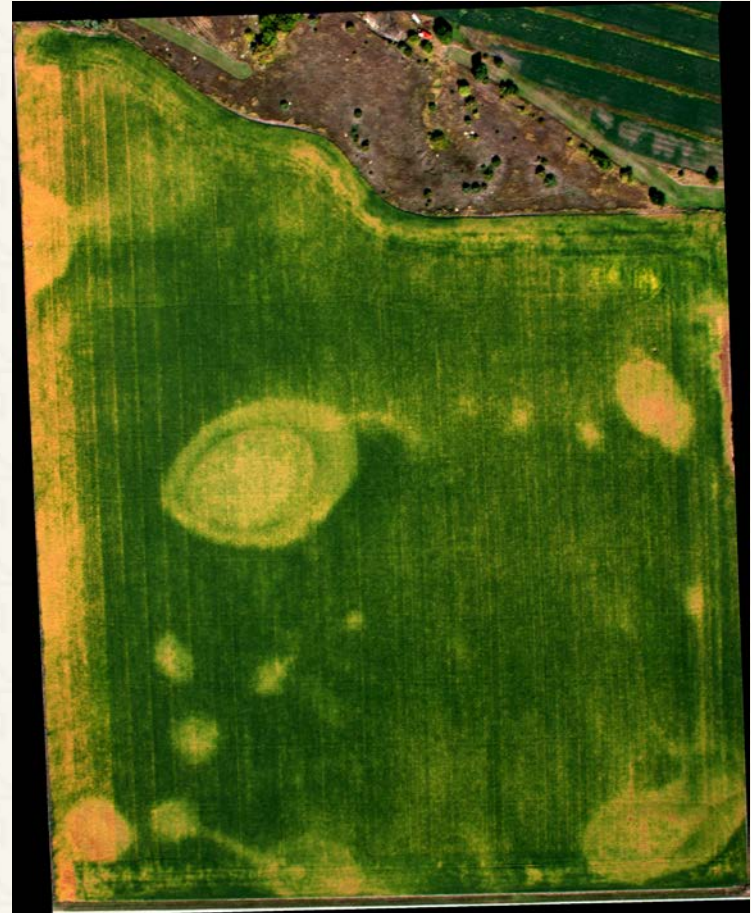


# Capture Differentiation - Timeliness

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2012 Corn Yield Map - Drought



2013 Aerial Image –  
Soybeans, Flash Drought



# Resolution

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USDA NAIP Mosaic – 0.6 m

UAV Imagery

# Soil Map Unit vs. Soil EC – More Dots

---

Dot 3



# Soil Map Unit

Soil Survey Manual - Chapter T... Web Soil Survey

websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx

Most Visited Getting Started Suggested Sites Web Slice Gallery Crop Tech Cafe - Fre... Home | University of N... UNL Extension On-Far...

USDA United States Department of Agriculture Natural Resources Conservation Service

Contact Us Subscribe Archived Soil Surveys Soil Survey Status Glossary Preferences Link Logout Help

Area of Interest (AOI) **Soil Map** Soil Data Explorer Download Soils Data Shopping Cart (Free)

**Map Unit Description** Printable Version

**Search**

**Map Unit Legend**

Moody	Area	Percentage
6526 Janude loam, rarely flooded	59.2	2.8%
6528 Janude loam, clayey substratum, rarely flooded	1.8	0.1%
6545 Moody silty clay loam, terrace, 0 to 2 percent slopes	836.6	39.9%
6603 Alcester silty clay loam, 2 to 6 percent slopes	39.9	1.9%
6681 Crofton silt loam, 17 to 30 percent slopes, eroded	37.2	1.8%
6686 Crofton silt loam, 30 to 60 percent slopes	14.6	0.7%
6750 Nora silt loam, 11 to 17 percent slopes, eroded	52.3	2.5%
6767 Nora silty clay loam, 6 to 11 percent slopes	9.8	0.5%
6768 Nora silty clay loam, 6 to 11 percent slopes, eroded	57.9	2.8%
6811 Moody silty clay loam, 2 to 6 percent slopes	325.8	15.0%
6812 Moody silty clay loam, 2 to 6 percent slopes, eroded	4.5	0.2%
6813 Moody silty clay loam, 6 to 11 percent slopes	25.4	1.2%
6814 Moody silty clay loam, 6 to 11 percent slopes, eroded	28.9	1.4%
7787 Luton silty clay	27.0	1.3%

**Report - Map Unit Description**

**Dodge County, Nebraska**  
**6545 - Moody silty clay loam, terrace, 0 to 2 percent slopes**  
**Map Unit Setting**  
*National map unit symbol:* 2ts6n  
*Elevation:* 1,020 to 2,230 feet  
*Mean annual precipitation:* 24 to 31 inches  
*Mean annual air temperature:* 43 to 52 degrees F  
*Frost-free period:* 140 to 180 days  
*Farmland classification:* All areas are prime farmland

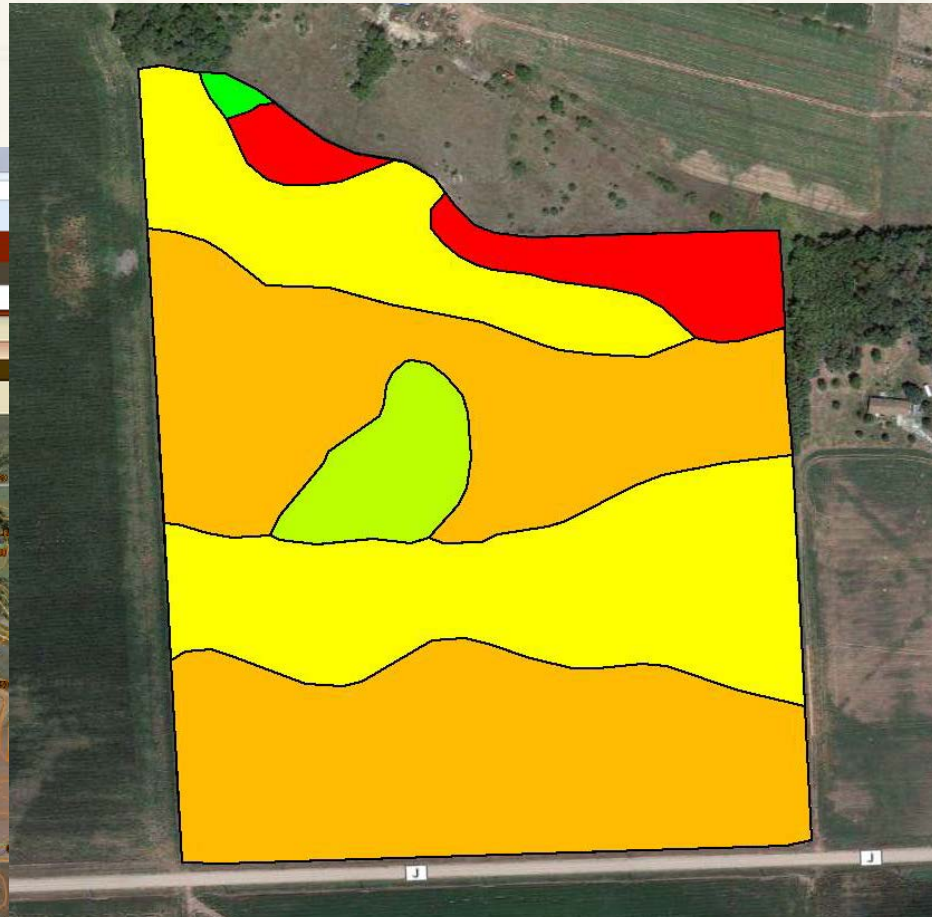
**Map Unit Composition**  
**Moody, terrace, and similar soils: 95 percent**  
**Minor components: 5 percent**

*Estimates are based on observations, descriptions, and transects of the mapunit.*

**Description of Moody, Terrace Setting**  
*Landform:* Stream terraces  
*Landform position (three-dimensional):* Tread, riser  
*Down-slope shape:* Linear, convex, concave  
*Across-slope shape:* Linear  
*Parent material:* Calcareous loess

**Typical profile**  
*Ap - 0 to 7 inches:* silty clay loam  
*A - 7 to 12 inches:* silty clay loam  
*Bw - 12 to 37 inches:* silty clay loam  
*BCK - 37 to 46 inches:* silty clay loam  
*C - 46 to 79 inches:* silt loam

**Properties and qualities**  
*Slope:* 0 to 2 percent  
*Depth to restrictive feature:* More than 80 inches  
*Natural drainage class:* Well drained  
*Runoff class:* Medium  
*Capacity of the most limiting layer to transmit water (Ksat):*  
 Moderately high (0.20 to 0.60 in/hr)  
*Depth to water table:* More than 80 inches  
*Frequency of flooding:* None  
*Frequency of ponding:* None  
*Calcium carbonate, maximum in profile:* 14 percent  
*Salinity, maximum in profile:* Nonsaline (0.0 to 2.0 mmhos/cm)  
*Available water storage in profile:* High (about 10.8 inches)



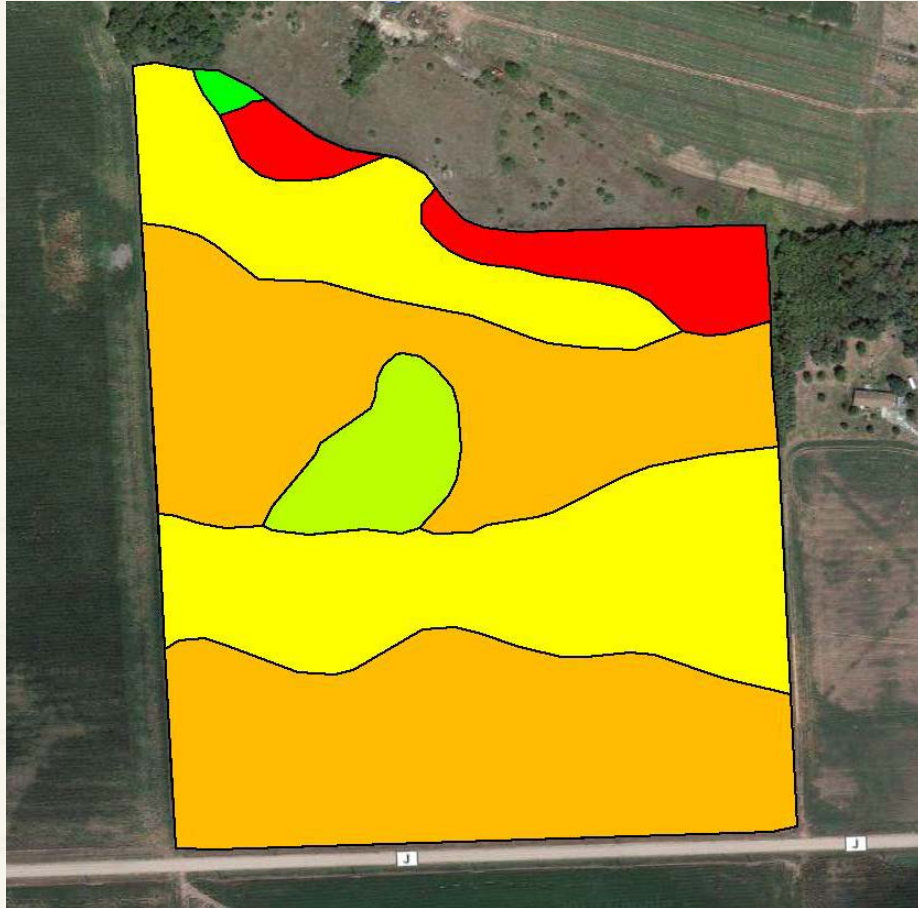


# Soil Electrical Conductivity Mapping

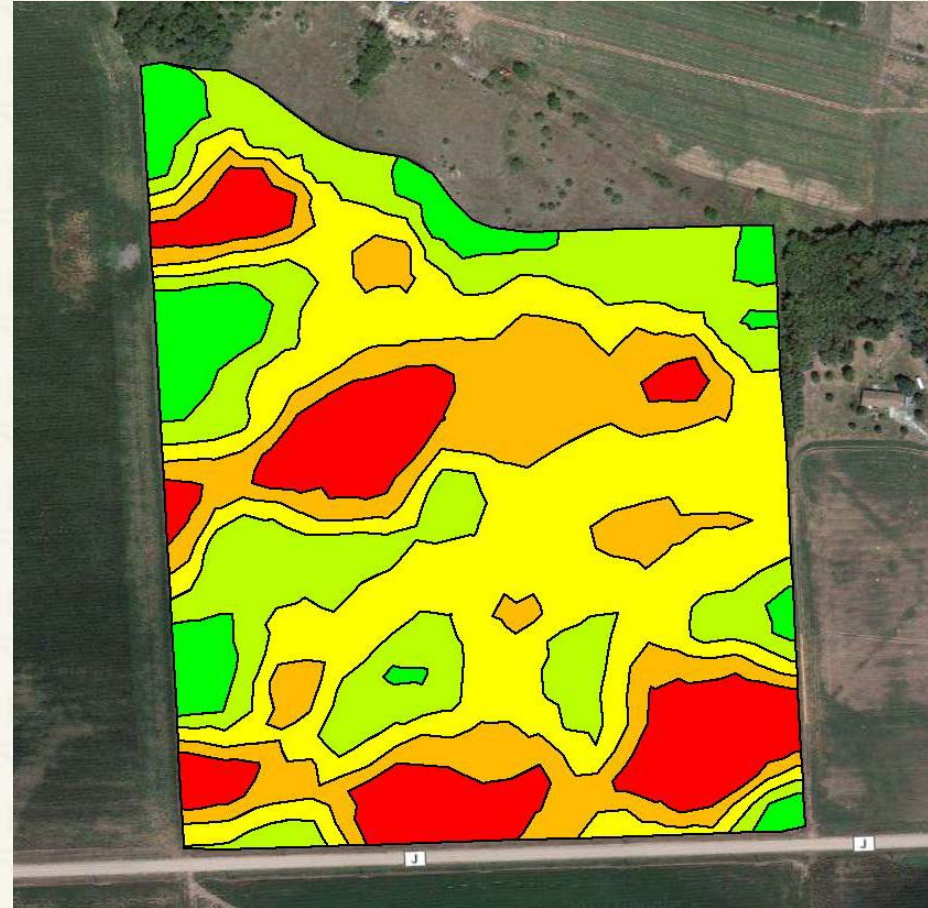
- **Electrical conductivity is the ability of a material to transmit an electrical current (Often express as mS/m).**
  - **Sand (low)**
  - **Silt**
  - **Clay**
  - **Saline soils (high)**
- **Methods for measuring soil conductivity**
  - **Veris platform uses coulter (contact)**
  - **Electromagnetic sleds (non-contact)**
- **Delineate ¼ acre inclusions versus 2.5 to 4 acre inclusions**

# Comparing Data Layers

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1979 Soil Map



IDW Deep EC Map **N** EXTENSION

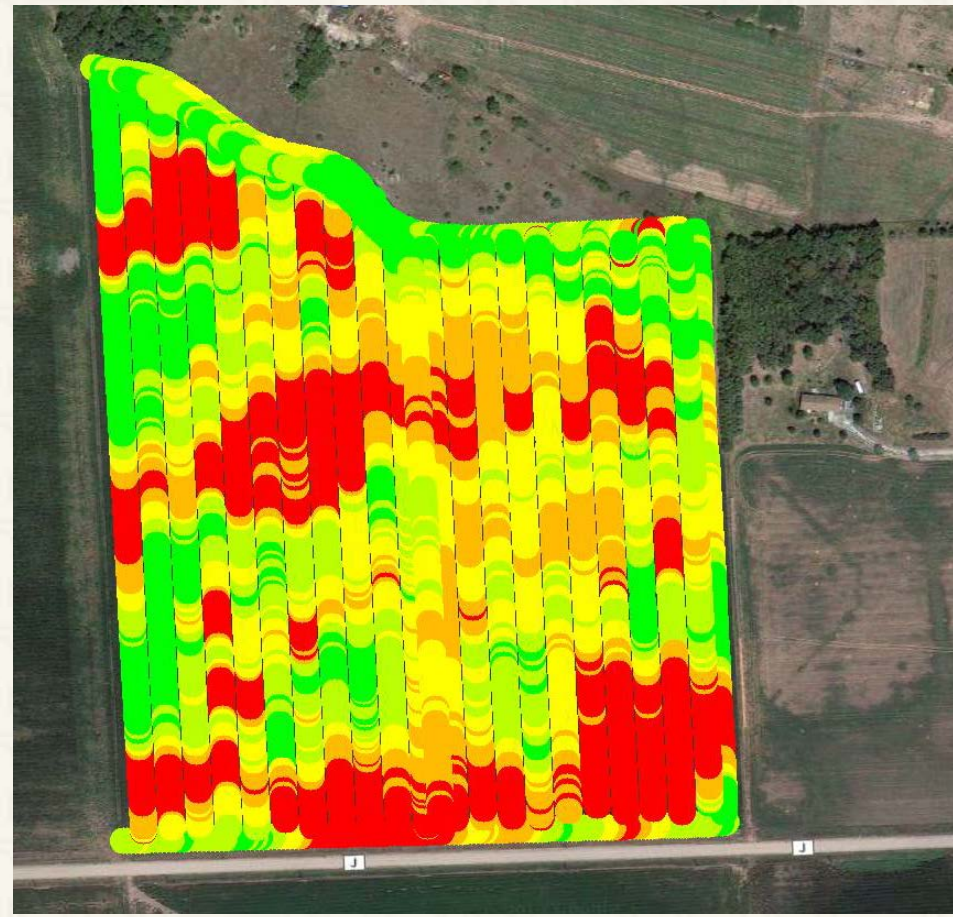


# Comparing Data Layers

---



2012 Yield Map



2014 EC Map **N** EXTENSION

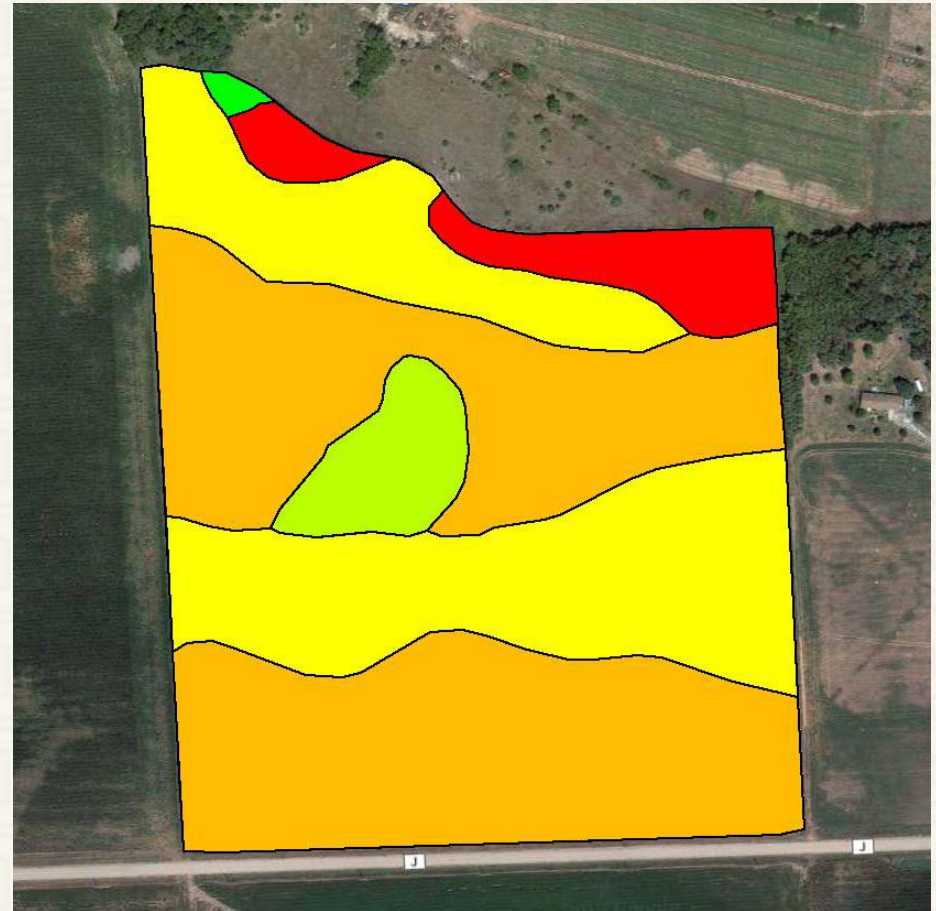


# Comparing Data Layers

---



2012 Yield Map



1979 Soil Map



# So what?

- Improving the resolution of soil maps allows for:
  - Helping guide soil sampling for VR lime and fertilizer applications
  - Developing variable-rate seeding
  - Multi-hybrid planting
  - Multi-seed treatment or VR seed treatment
  - VR soil applied herbicide applications

## Application Rates

SOIL TEXTURAL GROUP	BROADCAST RATE PER ACRE*					
	WARRANT (quarts) Less than 3% Organic Matter			WARRANT (quarts) 3% or More Organic Matter		
Coarse	1.5	to	2.0	2.0		
Medium	1.5	to	2.75	2.0	to	2.75
Fine	1.5	to	2.75	2.75	to	3.0

\*Use the higher rate in the range for areas of heavy weed infestation.

# Connect the Dots: Management zones, prescriptions, & profitability maps

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Dot 4

# Creating an equation for profitability

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- Factors
  - Yield
  - Price
  - Production cost
  - Spatially variability
- Things to consider
  - Raw or cleaned yield
  - Conditional statements

# Creating an equation in SMS

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If ( [Yield (Dry)(bu/ac)] > 0.00 ) Then

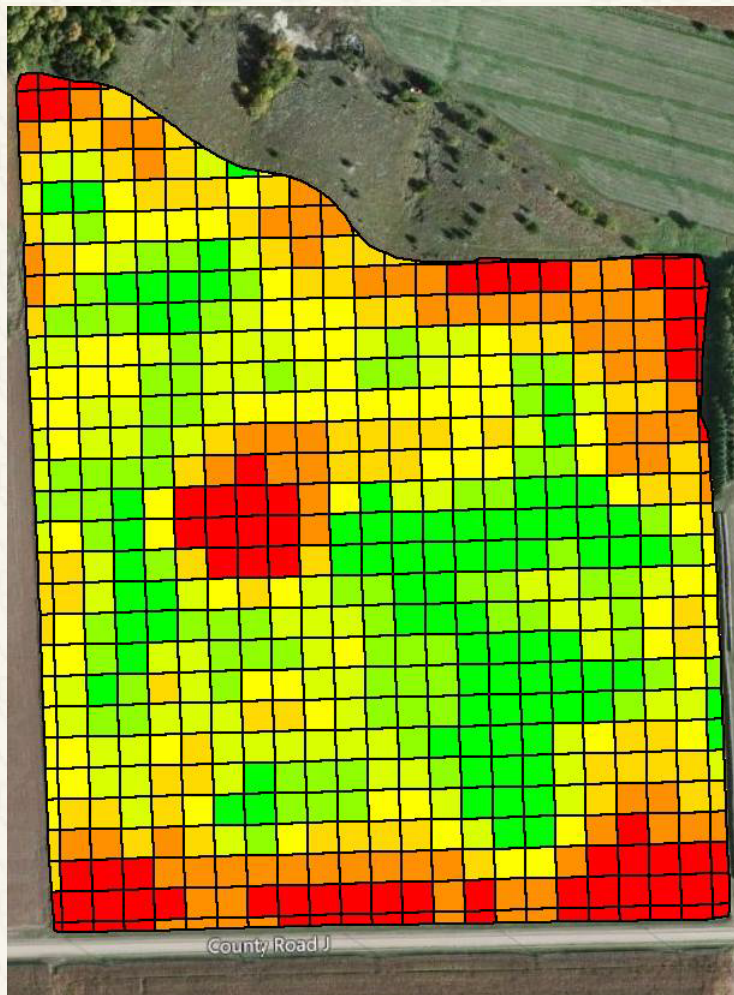
Begin

RESULT= ( [Yield (Dry)(bu/ac)] \* [Corn Price] ) -  
[Production Cost]

End



# Yield and profitability map



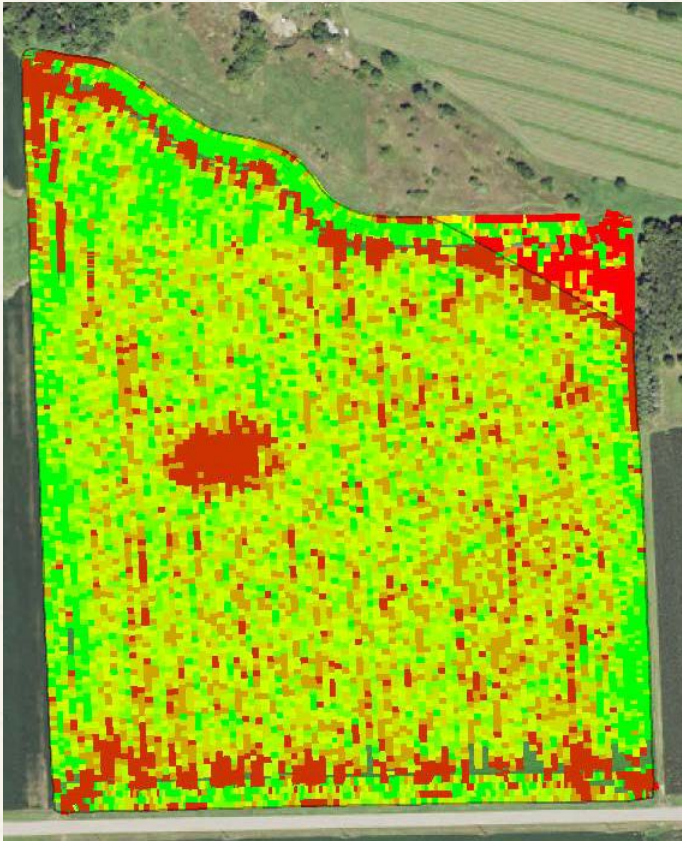
10/12/14 Corn Yield Maps



Profitability: \$700/ac & \$4.00/bu

# Produce or Not Produce...

---



2014 Yield Data



2016 Imagery/Boundary

# Let's discuss these...

---

- Know your cost of production – accrual budget
- Run various scenarios
- Utilize precision ag software
- What action steps can be taken?



# Verify You Connected the Dots Right: On-Farm Research Network & Precision Ag Data Management Workshops

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Dot 5

# Multi-Hybrid Planting

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# Multi-Hybrid Planting

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Treatment	211: Yield (bu/acre)†	209: Yield (bu/acre)†	P Value
Zone 1	231 A*	233 A	0.326
Zone 2	240 A	244 A	0.062

†Bushels per acre corrected to 15.5% moisture.

\*Values with the same letter are not significantly different at a 95% confidence interval.



# Nebraska On-Farm Research Network

## 2017 Annual Results Update

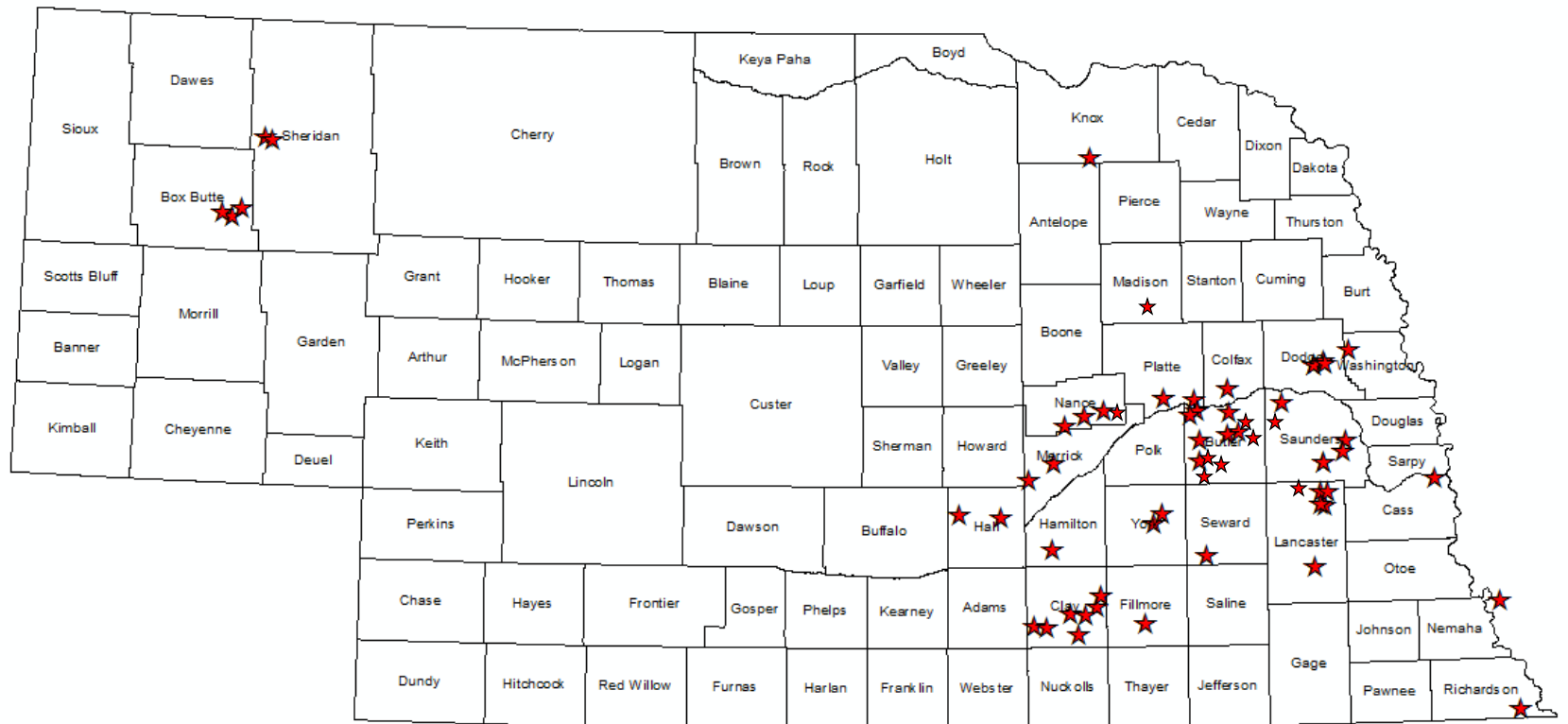
- Feb. 20 | Agricultural Research and Development Center, near Mead | 9 a.m.- 4:30 p.m.
- Feb. 21 | Lifelong Learning Center, Northeast Community College, Norfolk | 9 a.m.- 4:30 p.m.
- Feb. 23 | West Central Research and Extension Center, North Platte | 12 noon - 4:30 p.m.
- Feb. 24 | Knight Museum & Sandhills Center, Alliance | 9 a.m.- 2 p.m.
- Feb. 27 | Hall County Extension Office, College Park Campus, Grand Island | 9 a.m.- 4:30 p.m.

*Registration begins ½ hour prior to the start times listed above.*

**N**  
**EXTENSION**  
*On-Farm Research*

# 2016 Studies – 70+ studies

CROPS: Soybean, Corn, Dry Edible Beans, Field Pea, Forage Kochia, Alfalfa, Smooth Brome, Big Bluestem

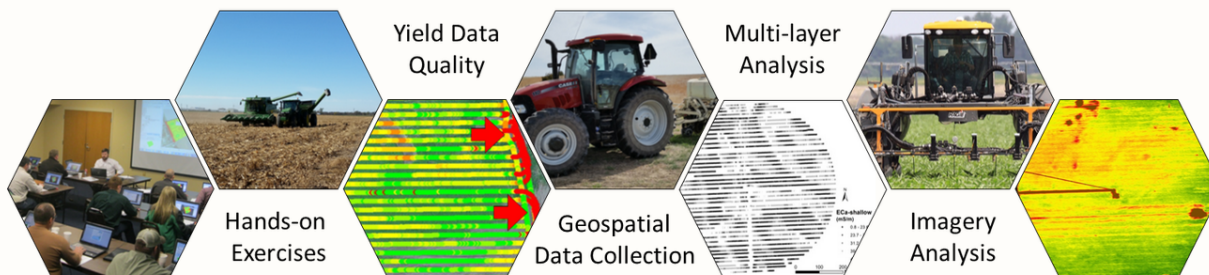


# agronomy.unl.edu/precisionag

Nebraska IANR CASNR Department of Agronomy and Horticulture Department of Agronomy and Horticulture Community Outreach precisionag

DEPARTMENT HOME FUTURE STUDENTS CURRENT STUDENTS FACULTY/STAFF RESEARCH COMMUNITY OUTREACH

## 2017 Nebraska Extension Precision Ag Data Management Workshop



A hands-on workshop experience to demonstrate methods for extracting more information from your Precision Ag data

Hands-on Exercises | Yield Data Quality | Geospatial Data Collection | Multi-layer Analysis | Imagery Analysis

### Who should attend?

Producers, consultants, government personnel, retailers, and other ag professionals may attend (6 hours of CCA CEUs are expected for each day). We are limited to 20 attendees per session, so please register early! Lunch and snacks are included.

### Registration Options

Online Pre-registration Required

**Location:** Nebraska Innovation Campus Conference Center, Lincoln, NE - **REGISTER**

Email Us



# Conclusions

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- Yield Data Quality – Remove Bad Dots
- Imagery – Explain Some Dots
- Soil Map Unit vs. Soil EC – Need More Dots
- Connect the Dots
  - Create management zones
  - Create prescriptions
  - Create profitability maps
- Verify You Connected the Dots Right
  - On-Farm Research Network



Dodge County, NE

 [croptechcafe.org/connectthedots](http://croptechcafe.org/connectthedots)  
 [@croptechcafe](https://twitter.com/croptechcafe)  
 [nathan.mueller@unl.edu](mailto:nathan.mueller@unl.edu)

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Thank You!