

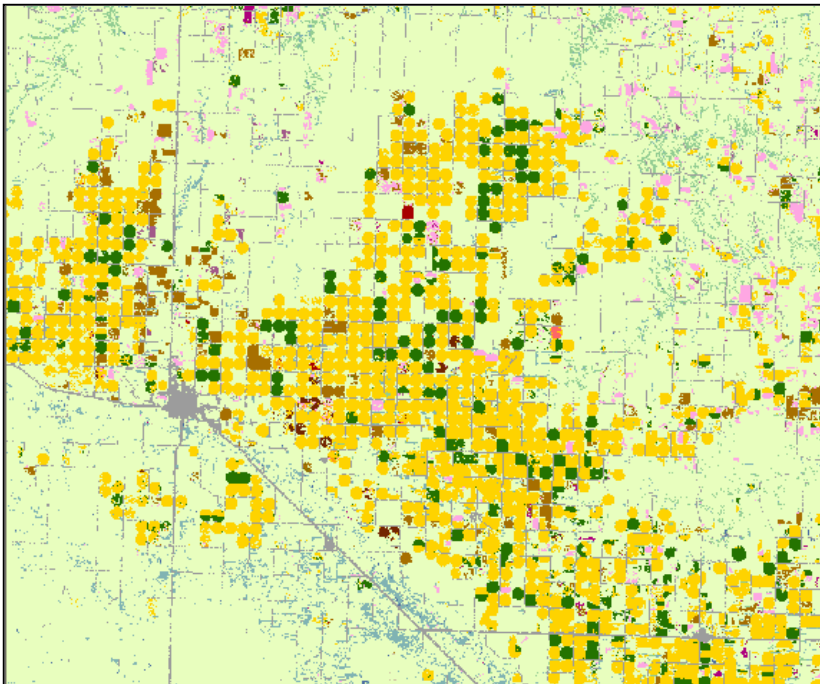
*An Evaluation of Single Crop Planting Intensity  
and Crop Rotation Patterns  
in  
Nebraska, Iowa and Illinois*



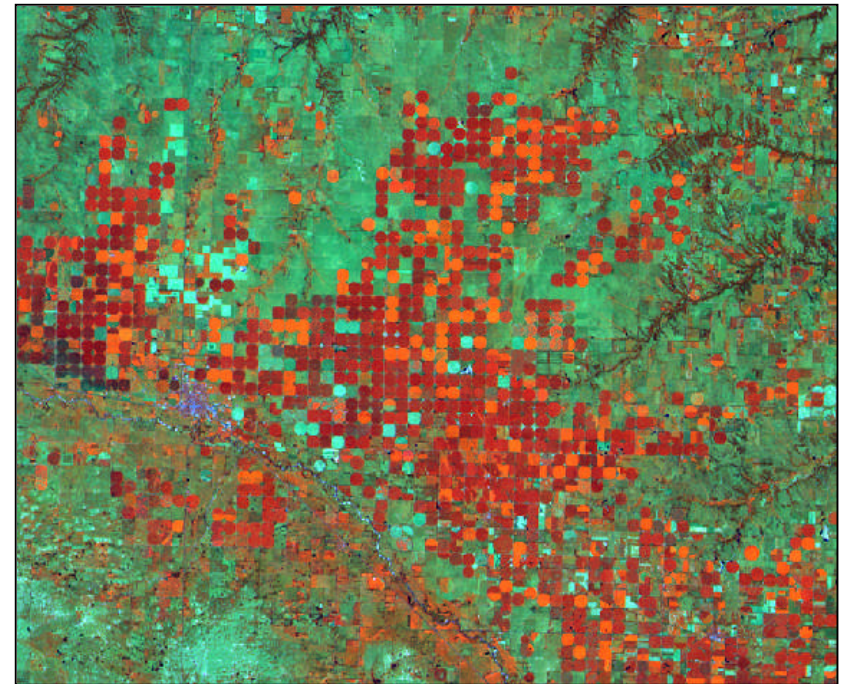
**Claire Boryan, Mike Craig,  
Patrick Willis  
USDA/NASS**

# Cropland Data Layer (CDL)

- Derive state/district/county acreage estimates
- Estimates delivered to meet NASS survey deadlines
- Image product available to the public



**CDL Classification**



**Resourcesat-1 AWiFS, 27 August 2007**

# Goals of Single Crop Planting Intensity and Crop Rotation Assessment

To determine the specific counties and/or watersheds with high percentages of single crop planting intensity and derive the predominant crop rotation patterns in Nebraska, Iowa and Illinois



**Corn**



**Soybeans**

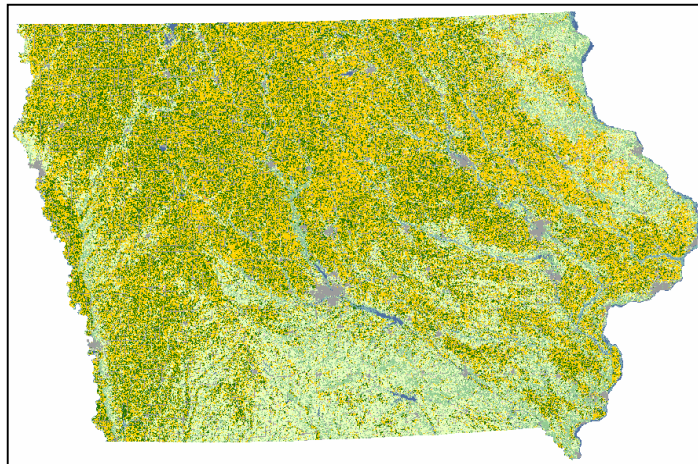
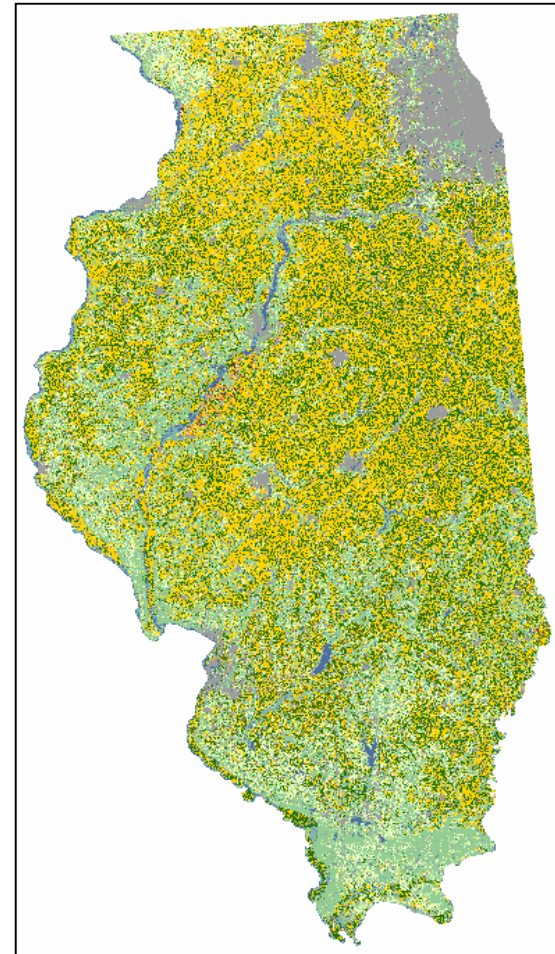
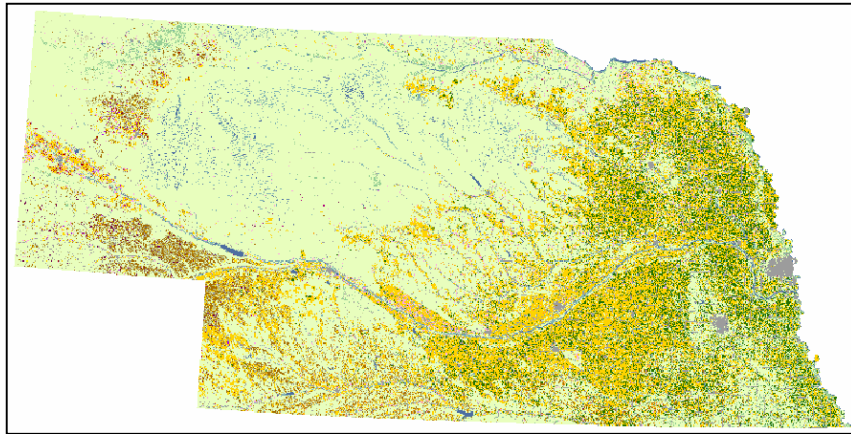
# Single Crop Planting Intensity Methodology



1. Inputs include: Cropland Data Layers (CDLs) for 2003-2007
2. CDLs are recoded such that crop under evaluation = 1
3. The recoded CDL's are added together using the ERDAS Imagine Modeler
4. The output is the Crop Intensity Image which is ready for evaluation

# Single Crop Planting Intensity, 2003-2007

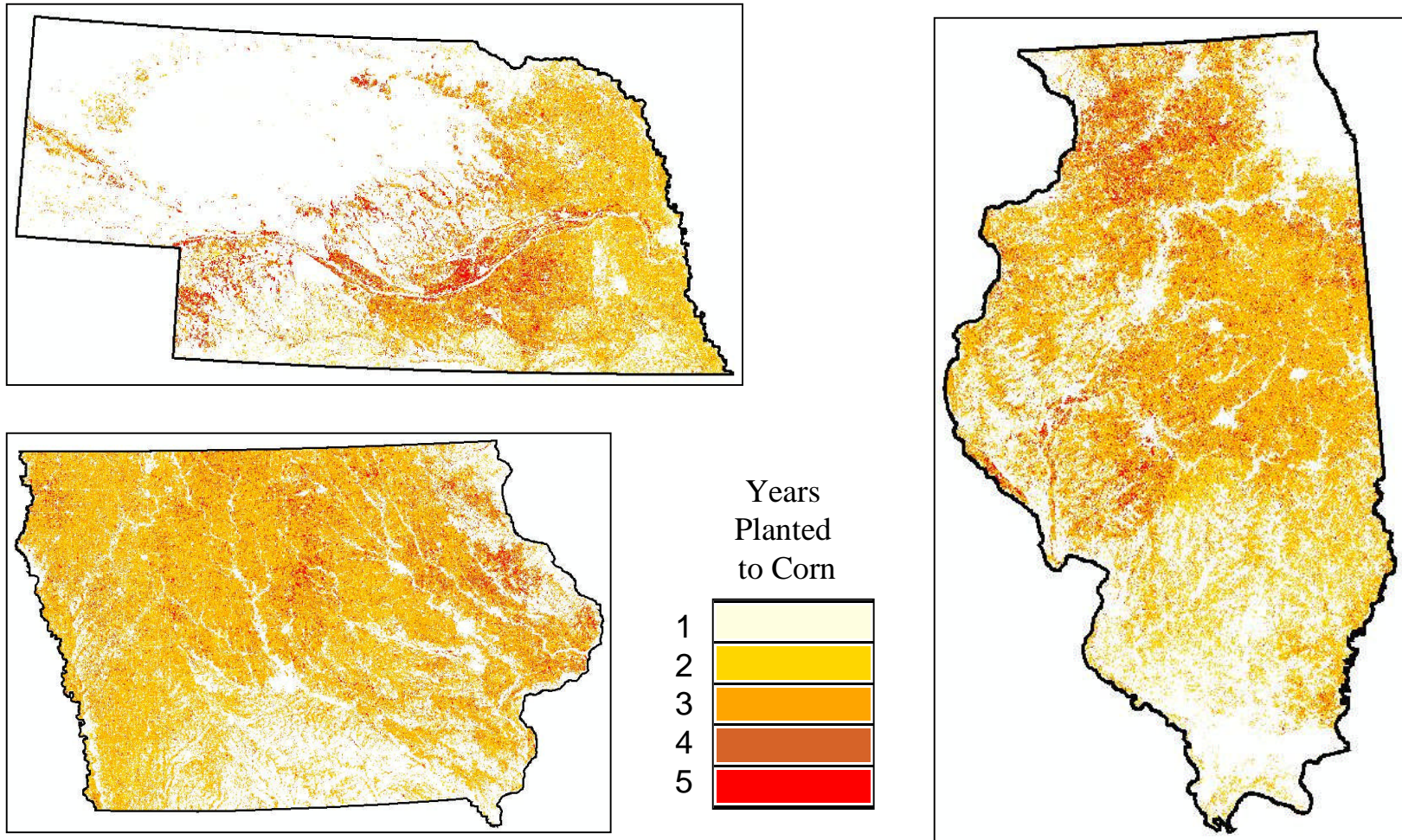
## Nebraska, Iowa and Illinois



Cropland Data Layers (CDLs) utilized in assessment: 2003 - 2007

# Single Crop Planting Intensity, 2003-2007

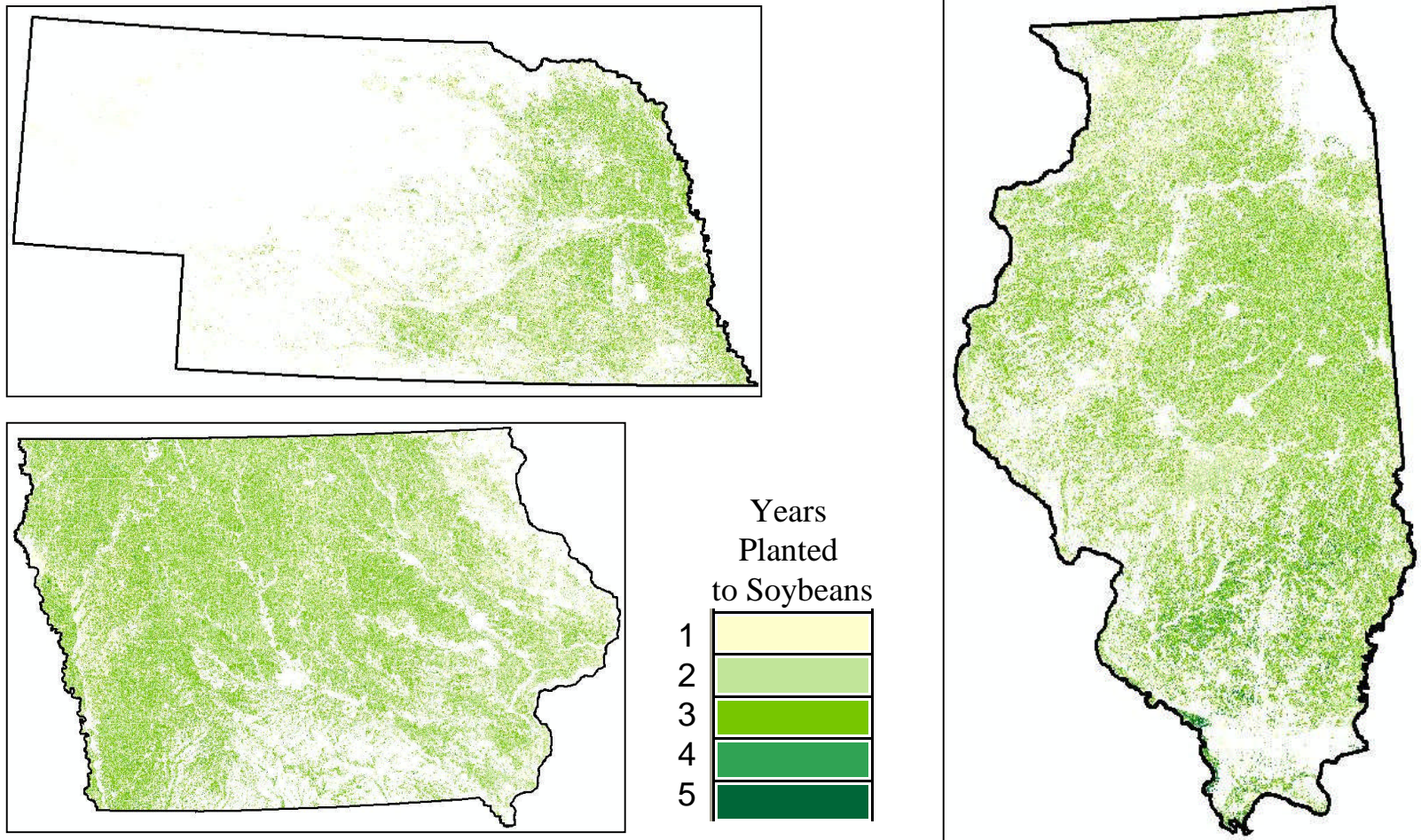
## Nebraska, Iowa and Illinois



Cropland Data Layers (CDLs) utilized in assessment: 2003 - 2007

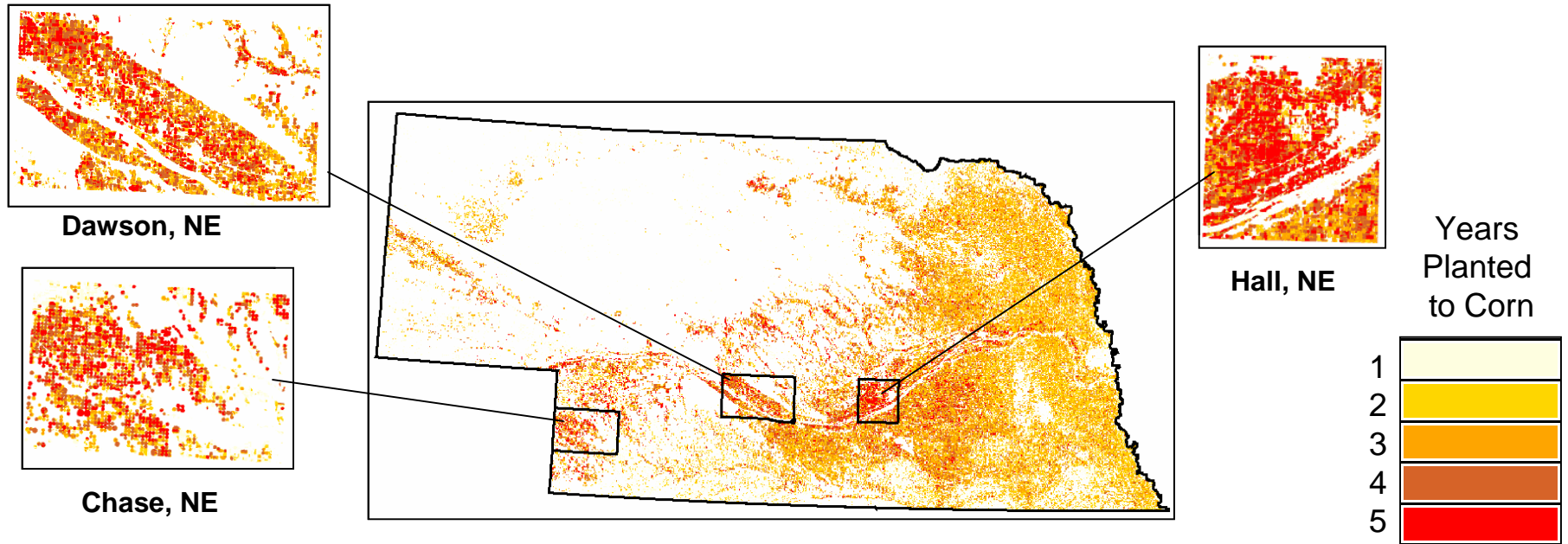
# Single Crop Planting Intensity, 2003-2007

## Nebraska, Iowa and Illinois



Cropland Data Layers (CDLs) utilized in assessment: 2003 - 2007

# Corn Planting Intensity in Nebraska 2003-2007



Hall County	Chase County	Dawson County	State Total
5 years in a row planted to corn: <b>38%</b>	5 years in a row planted to corn: <b>26%</b>	5 years in a row planted to corn: <b>20%</b>	5 years in a row planted to corn: <b>6%</b>
4 out of 5 years planted to corn: <b>24%</b>	4 out of 5 years planted to corn: <b>22%</b>	4 out of 5 years planted to corn: <b>28%</b>	4 out of 5 years planted to corn: <b>12%</b>

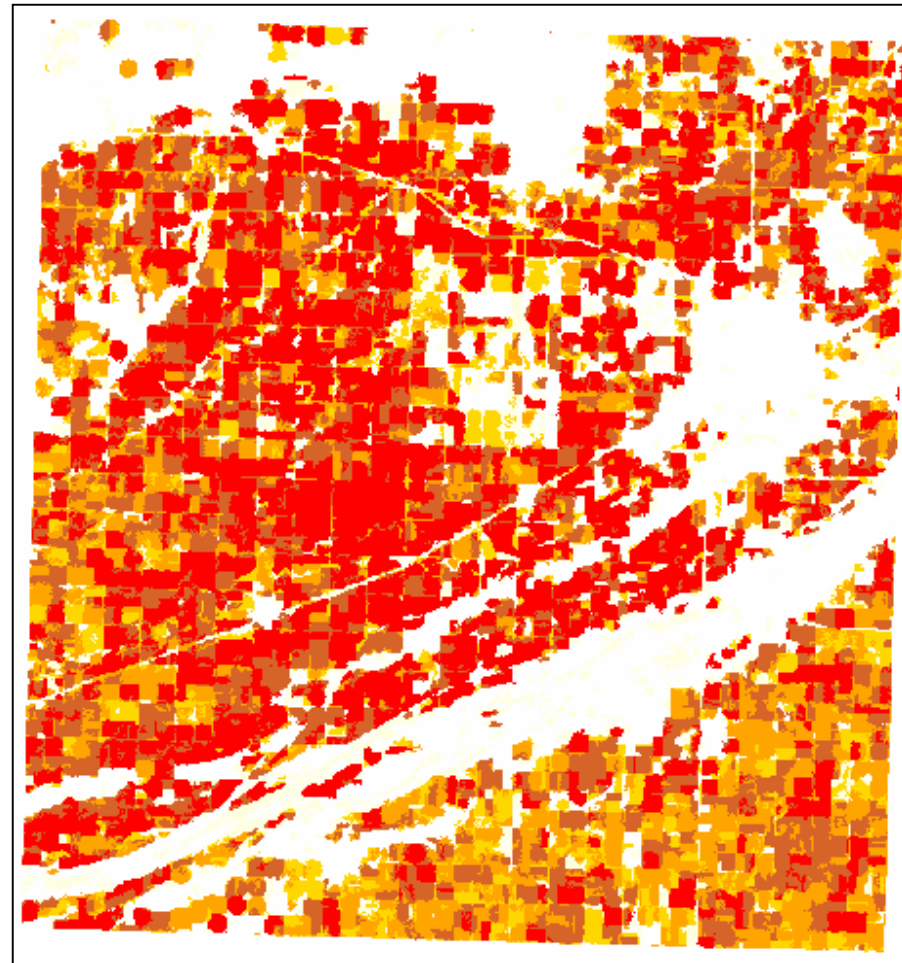


# Corn Planting Intensity, 2003-2007

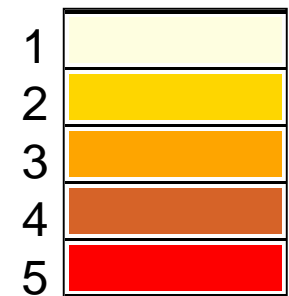
## Hall County, Nebraska

<b>Hall County</b>
5 years in a row planted to corn: <b>38%</b>
4 out of 5 years planted to corn: <b>24%</b>

AWiFS 8/13/2007  
Bands 3/4/2  
Red/Green/Blue



Years  
Planted to Corn

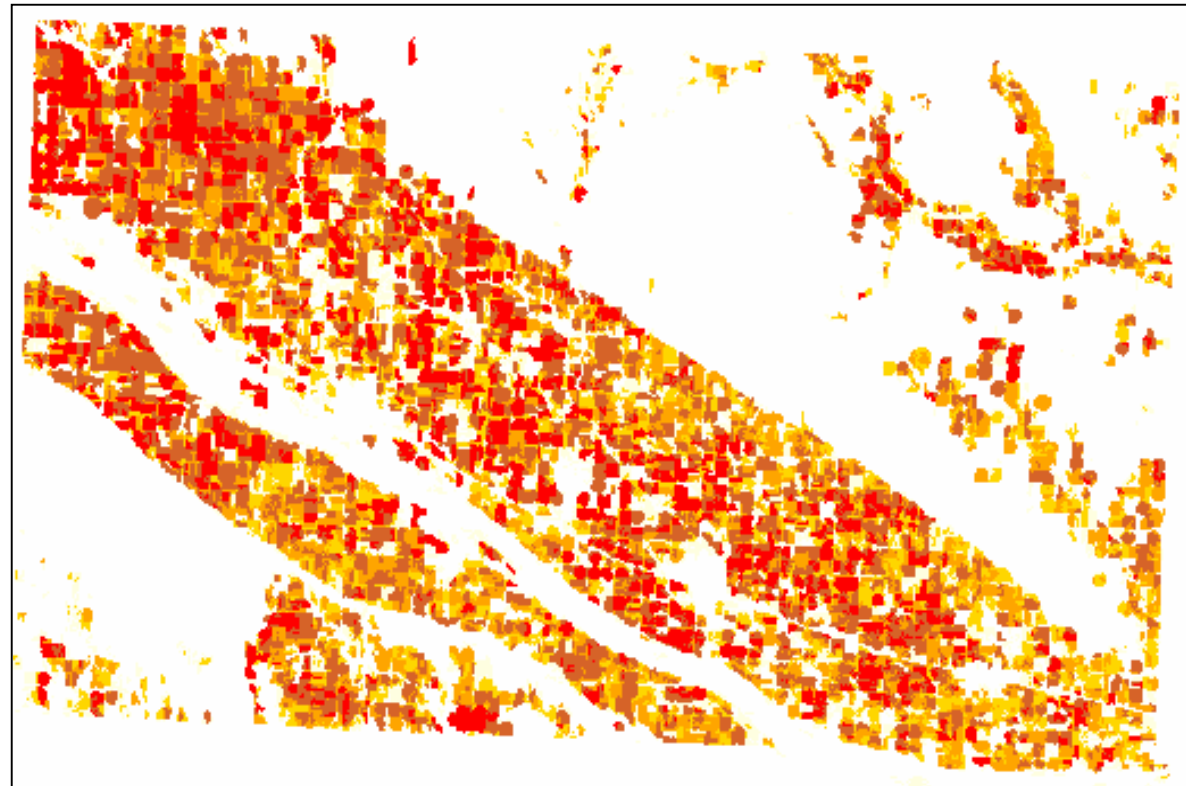


Percentages derived from total acreage in corn production

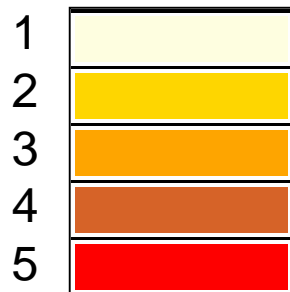
# Corn Planting Intensity, 2003-2007

## Dawson County, Nebraska

<b>Dawson County</b>
5 years in a row planted to corn: <b>20%</b>
4 out of 5 years planted to corn: <b>28%</b>



Years Planted  
to Corn

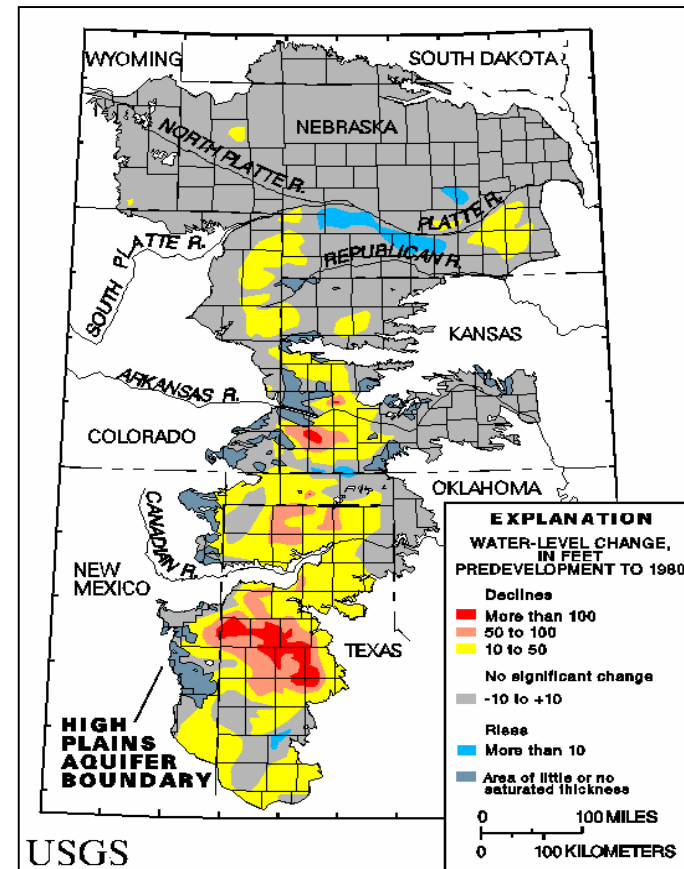
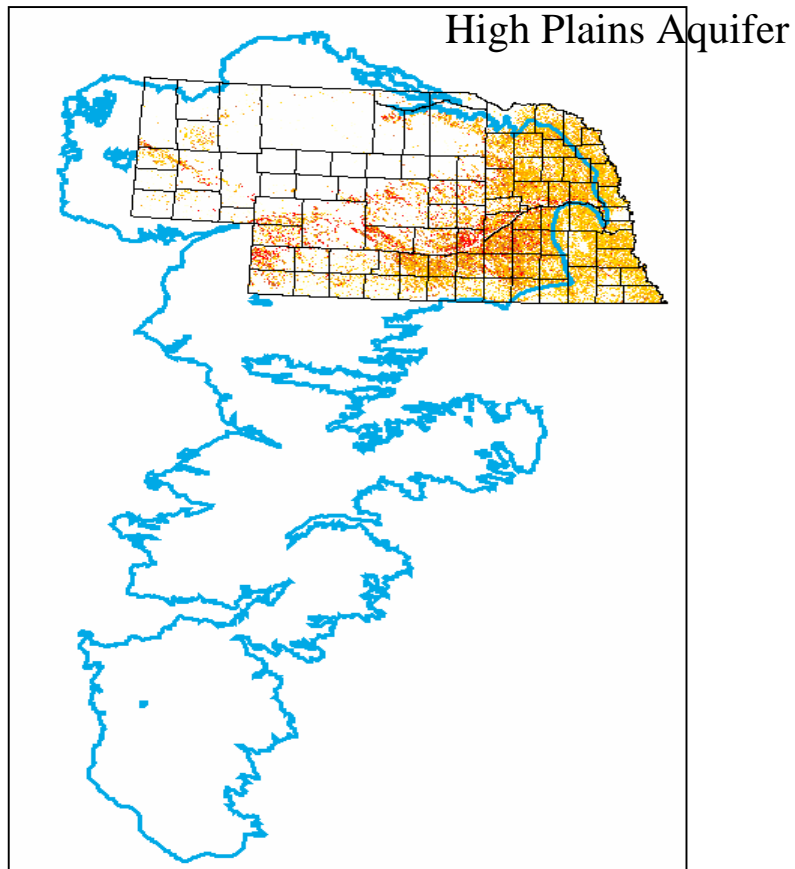


Percentages derived from total acreage in corn production

AWiFS 8/13/2007  
Bands 3/4/2  
Red/Green/Blue

# Why is the continuous cropping of corn sustainable in Nebraska?

## Irrigation from the High Plains Aquifer



# Corn Planting Intensity in Iowa 2003-2007

## Delaware County

5 years in a row planted to corn: **15%**

4 out of 5 years planted to corn: **27%**

## Hamilton County

5 years in a row planted to corn: **6%**

4 out of 5 years planted to corn: **13%**

## Dubuque County

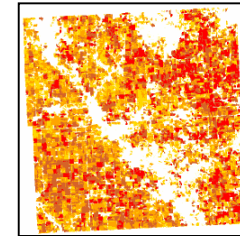
5 years in a row planted to corn: **13%**

4 out of 5 years planted to corn: **17%**

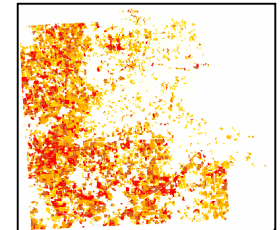
## Iowa State Totals

5 years in a row planted to corn: **2%**

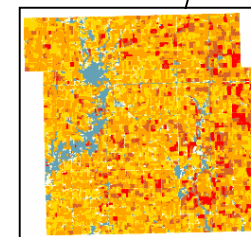
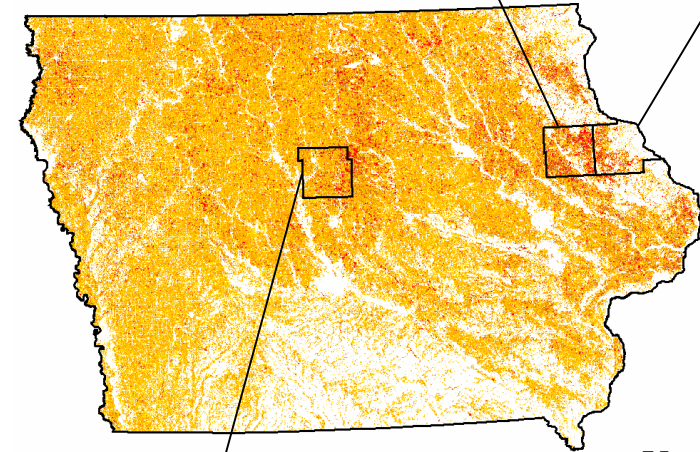
4 out of 5 years planted to corn: **8%**



Delaware, IA

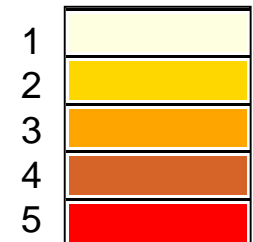


Dubuque, IA



Hamilton, IA

Years  
Planted  
to Corn



Percentages derived from total acreage in corn production

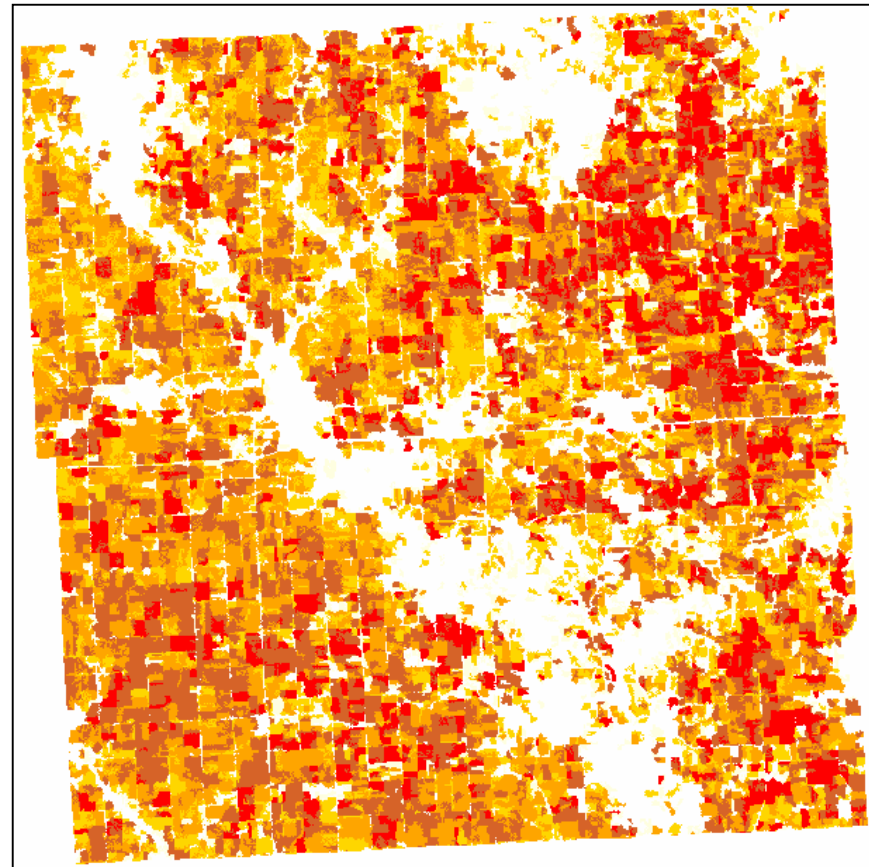
# Corn Planting Intensity, 2003-2007

## Delaware County, Iowa

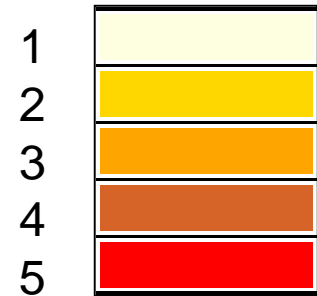
### Delaware County, IA

5 years in a row planted to corn: **15%**

4 out of 5 years planted to corn: **27%**



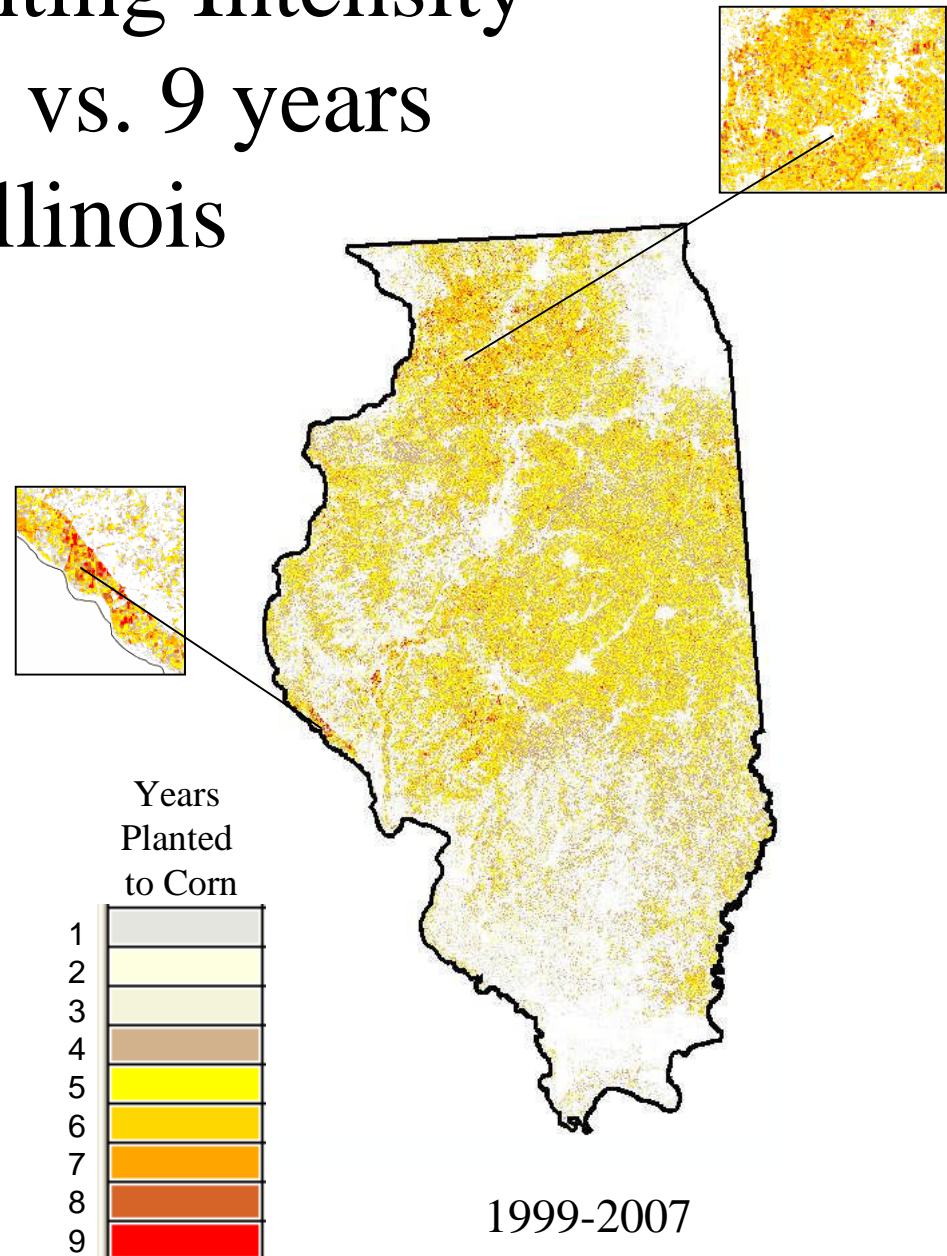
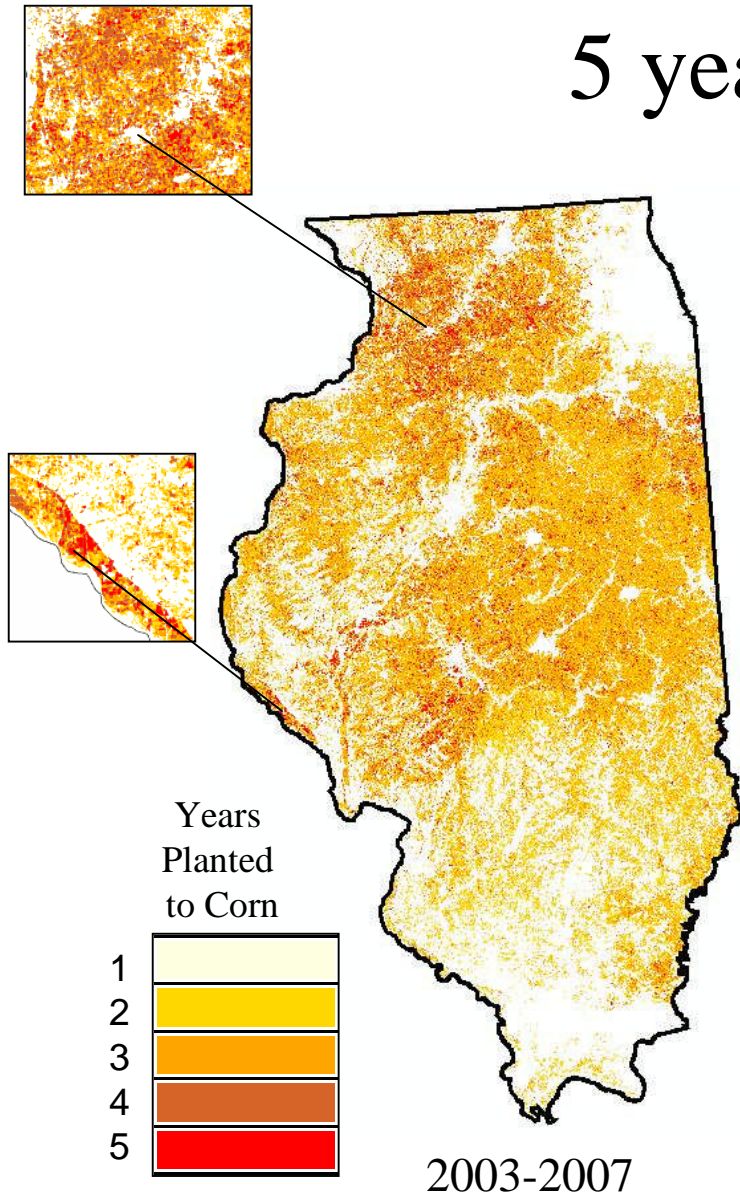
Years  
Planted to Corn



AWiFS 8/10/2007  
Bands 3/4/2  
Red/Green/Blue

Percentages derived from total acreage in corn production

# Corn Planting Intensity 5 years vs. 9 years Illinois



# Corn Planting Intensity in Illinois 2003-2007

## Bureau County

5 years in a row planted to corn: **11%**  
4 out of 5 years planted to corn: **20%**

## Illinois County

5 years in a row planted to corn: **12%**  
4 out of 5 years planted to corn: **26%**

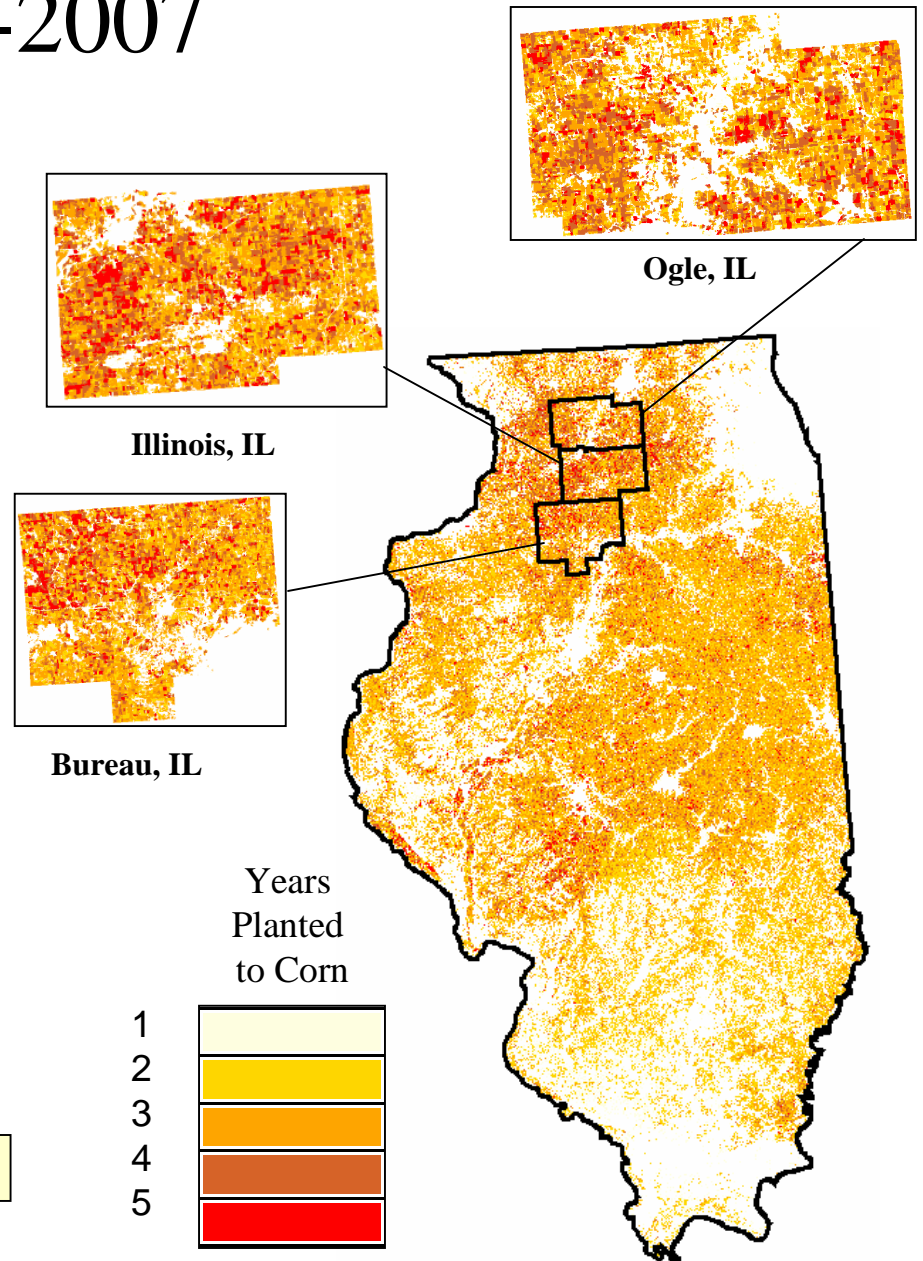
## Ogle County

5 years in a row planted to corn: **10%**  
4 out of 5 years planted to corn: **24%**

## Illinois State Totals

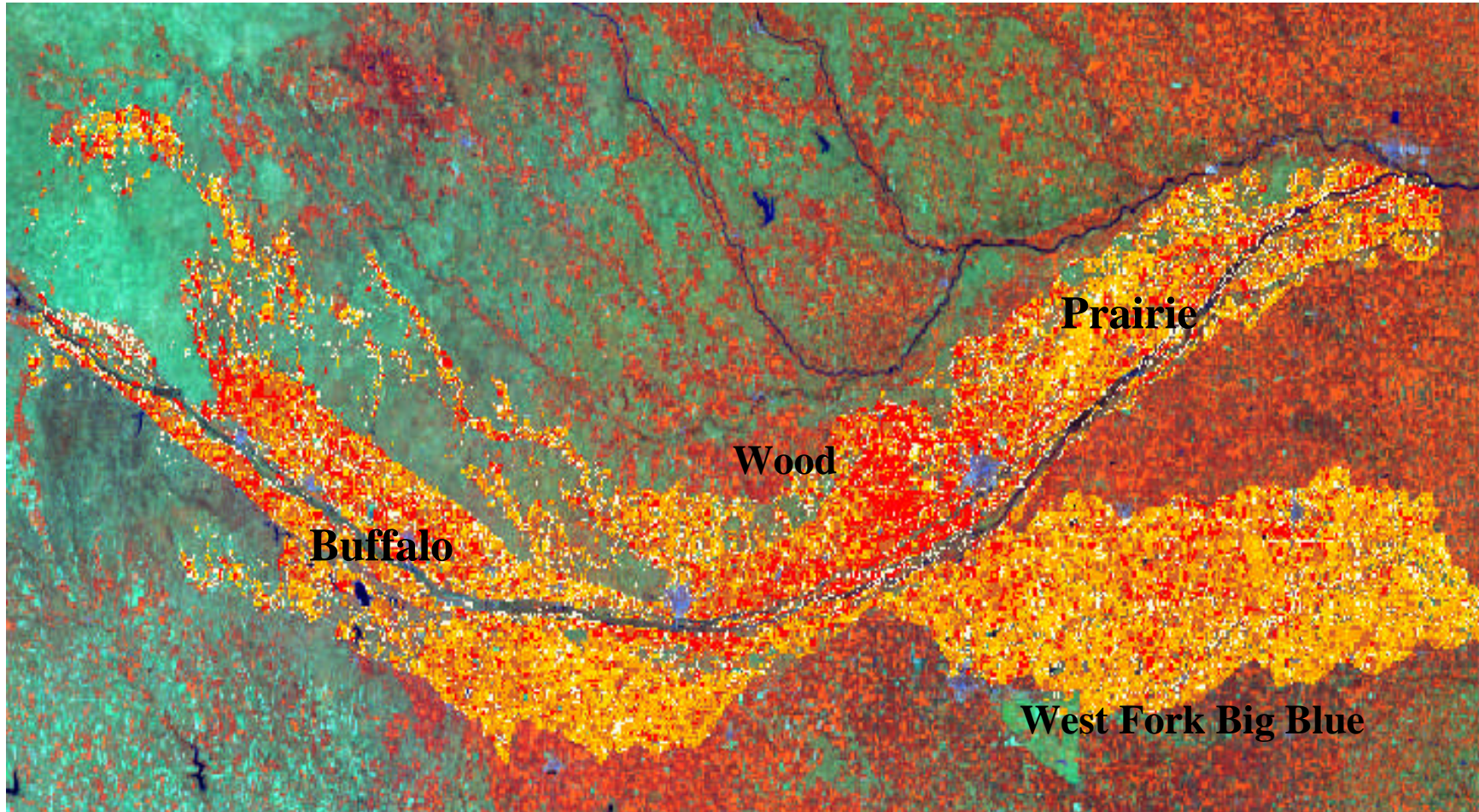
5 years in a row planted to corn: **3%**  
4 out of 5 years planted to corn: **10%**

Percentages derived from total acreage in corn production



# Middle Platte Watersheds, Nebraska

Prairie, Wood, Buffalo and West Fork Big Blue





# Watershed Statistics

## Corn Planting Intensity, 2003-2007

### **Middle Platte, Prairie**

5 years in a row planted to corn: **23%**

4 out of 5 years planted to corn: **22%**

### **Middle Platte, Wood**

5 years in a row planted to corn: **22%**

4 out of 5 years planted to corn: **29%**

### **Middle Platte, Buffalo**

5 years in a row planted to corn: **16%**

4 out of 5 years planted to corn: **24%**

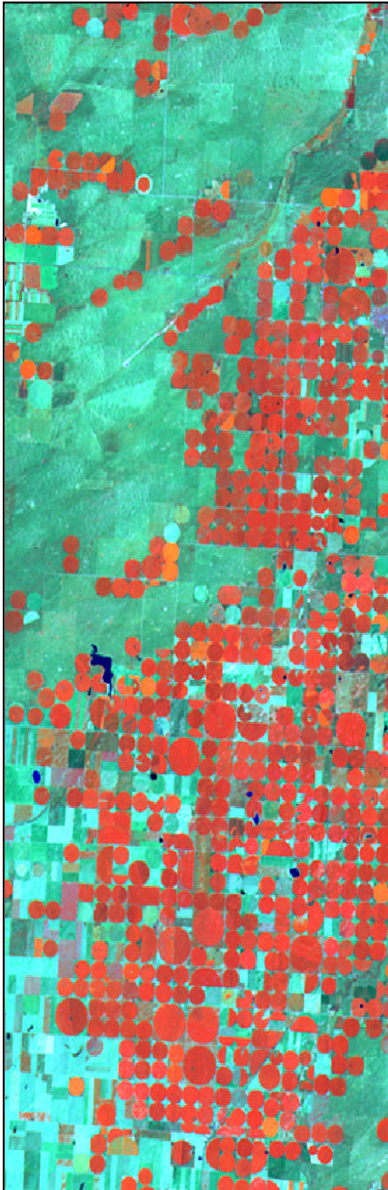
### **West Fork Big Blue**

5 years in a row planted to corn: **9%**

4 out of 5 years planted to corn: **21%**



Percentages derived from total acreage in corn production

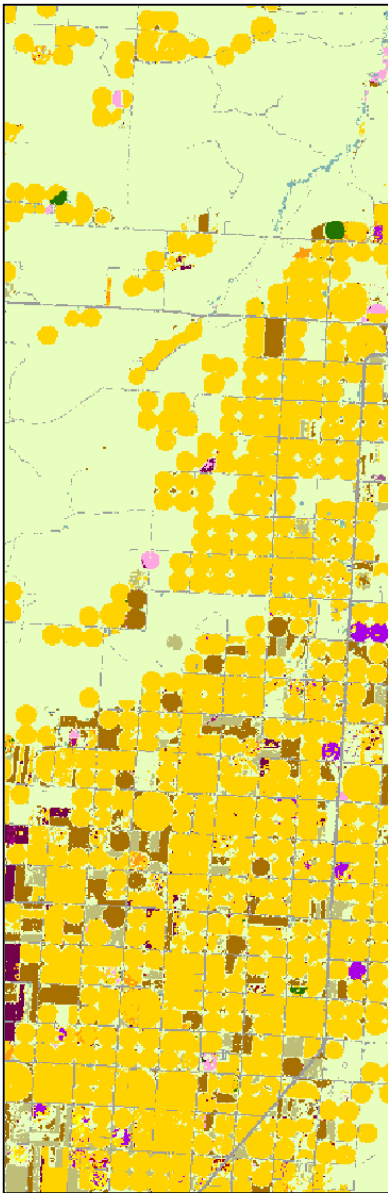


# Crop Rotation Methodology

1. Inputs include: Cropland Data Layers (CDLs) for 2003-2007
2. CDLs are recoded to  
**2007:** Corn: 1, Soy: 2, Other: 3  
**2006:** Corn: 10, Soy: 20, Other: 30  
**2005:** Corn: 100, Soy: 200, Other: 300  
**2004:** Corn: 1,000, Soy: 2,000, Other: 3,000  
**2003:** Corn: 10,000, Soybeans: 20,000, Other: 30,000
3. The recoded CDLs are added together using the ERDAS Imagine Modeler
4. The output is the Crop Rotation Image which is ready for evaluation

# Crop Rotation Results Nebraska

**Crop Rotation Patterns (Corn and Soybean) 03- 07  
As Percentage of  
Total Cultivated Cropland**



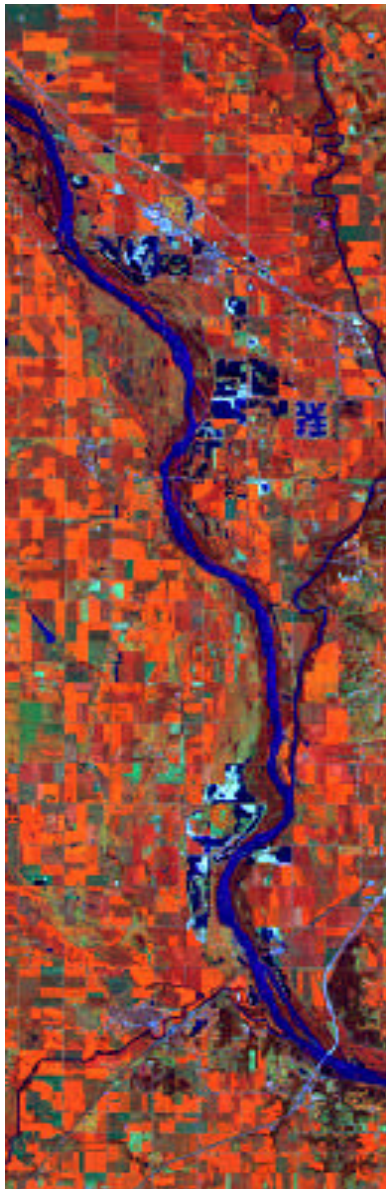
<b>Corn (03), Soy (04), Corn (05), Soy (06), Corn (07)</b>	<b>11.6%</b>
<b>Soy (03), Corn (04), Soy (05), Corn (06), Soy (07)</b>	<b>10.0%</b>
<b>Corn (03), Corn (04), Corn (05), Corn (06), Corn (07)</b>	<b>7.8%</b>
<b>Four Years: Corn, 1 Year: Other (03-07)</b>	<b>14.0%</b>
<b>Additional acreage into corn production (07):</b>	<b>309,688 acres (2.2%)</b>

**Total Cultivated Cropland derived from NASS' Nebraska 2007 CDL**

# Crop Rotation Results

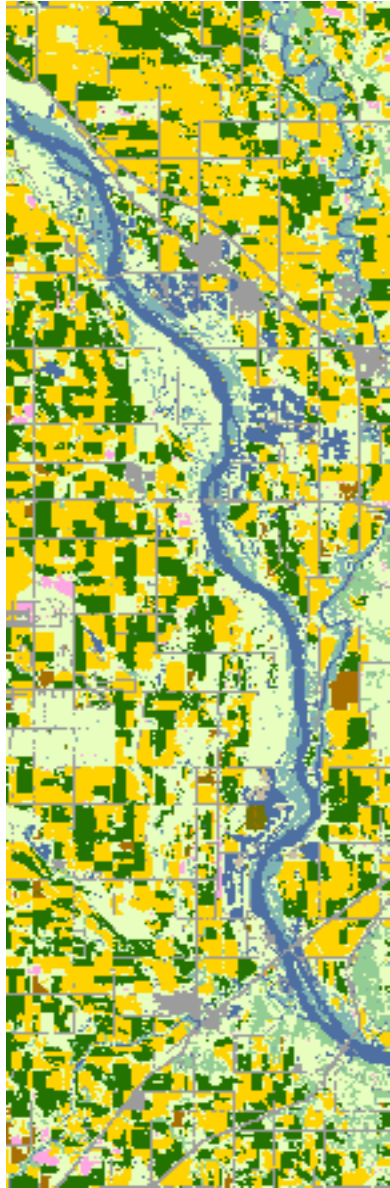
## Iowa

**Crop Rotation Patterns (Corn and Soybean) 03- 07**  
**As Percentage of**  
**Total Cultivated Cropland**



<b>Corn (03), Soy (04), Corn (05), Soy (06), Corn (07)</b>	<b>25.8 %</b>
<b>Soy (03), Corn (04), Soy (05), Corn (06), Soy (07)</b>	<b>21.3 %</b>
<b>Corn (03), Corn (04), Corn (05), Corn (06), Corn (07)</b>	<b>3.0 %</b>
<b>Four Years: Corn, 1 Year: Other (03-07)</b>	<b>8.9 %</b>
<b>Additional acreage into corn production (07):</b>	<b>124,261 acres (.6 %)</b>

**Total Cultivated Cropland derived from NASS' Iowa 2007 CDL**



# Crop Rotation Results Illinois

**Crop Rotation Patterns (Corn and Soybean) 03- 07  
As Percentage of  
Total Cultivated Cropland**

<b>Corn (03), Soy (04), Corn (05), Soy (06), Corn (07)</b>	<b>19.6 %</b>
<b>Soy (03), Corn (04), Soy (05), Corn (06), Soy (07)</b>	<b>16.2 %</b>
<b>Corn (03), Corn (04), Corn (05), Corn (06), Corn (07)</b>	<b>3.4 %</b>
<b>Four Years: Corn, 1 Year: Other (03-07)</b>	<b>10.3 %</b>
<b>Additional acreage into corn production (07):</b>	<b>148,234 acres (.8 %)</b>

**Total Cultivated Cropland derived from NASS' Illinois 2007 CDL**

# Conclusions

- The primary goal of NASS' Cropland Data Layer (CDL) program is to generate state and county acreage estimates for the NASS Agricultural Statistics Board and NASS Field Offices.
- AWiFS data have proven highly effective for crop acreage estimation over large crop areas such as the Midwest, the Delta and the Northern Great Plains.
- A high degree of classification accuracy has been achieved due to the spectral characteristics, the temporal frequency and generous swath width of the Advanced Wide Field Sensor which provides the ability to acquire an abundance of data throughout the growing season while utilizing both training and ancillary data over large areas.



# Conclusions

- Single crop planting intensity in Nebraska, Iowa and Illinois was evaluated focusing primarily on continuous corn cropping systems. Counties and watersheds with high rates of continuous corn cropping were identified.
- Nebraska had the highest rates of corn cropping intensity fed by irrigation from the High Plains Aquifer.
- Analysis of crop rotation patterns indicate a predominant corn/soybean rotation in all three states with Nebraska experiencing the highest rate of continuous cropping to corn and adding the largest percentage of new acreage (over 300,000 acres) into corn production in 2007.



# Thank You

**Claire Boryan, Mike Craig and Patrick Willis**

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[datagateway.nrcs.usda.gov](http://datagateway.nrcs.usda.gov)

