

Change in California Farmland Using Cropland Data Layer

2007 vs. 2009

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Fairfax, VA



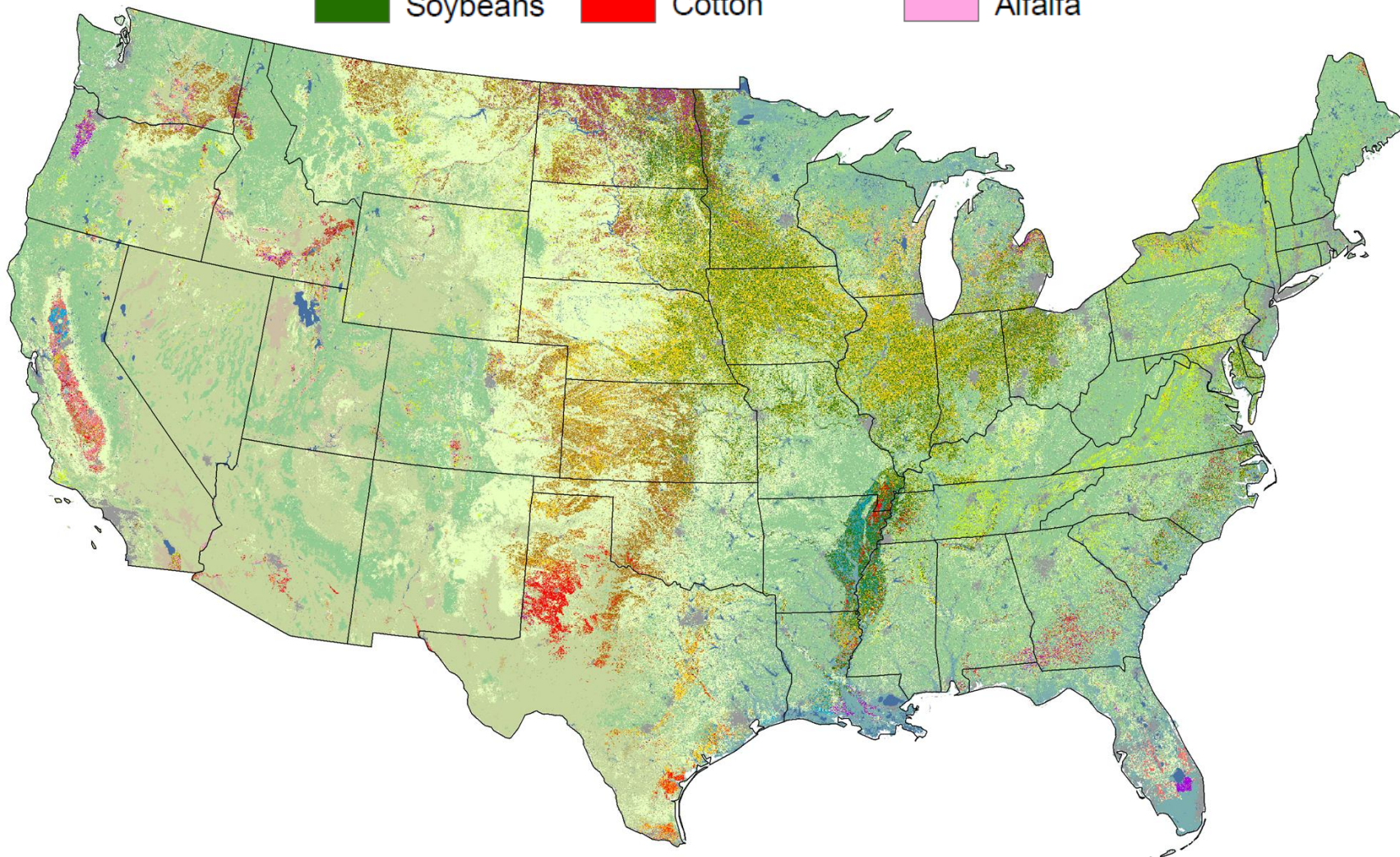
What is a Crop Land Data Layer (CDL)?

A tool to identify agriculture type and location

Each pixel represents a type of crop or land cover

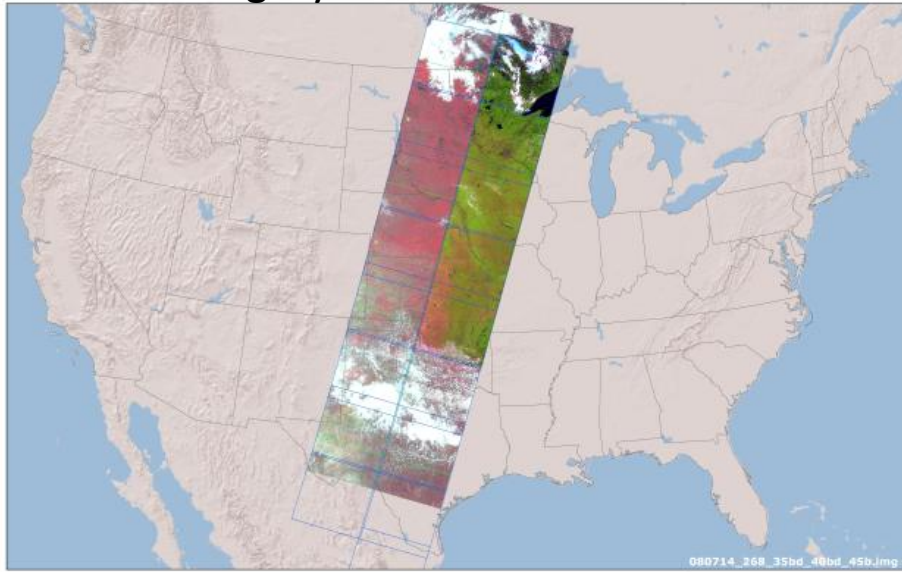
A sample:

	Corn		Winter Wheat		Rice
	Soybeans		Cotton		Alfalfa

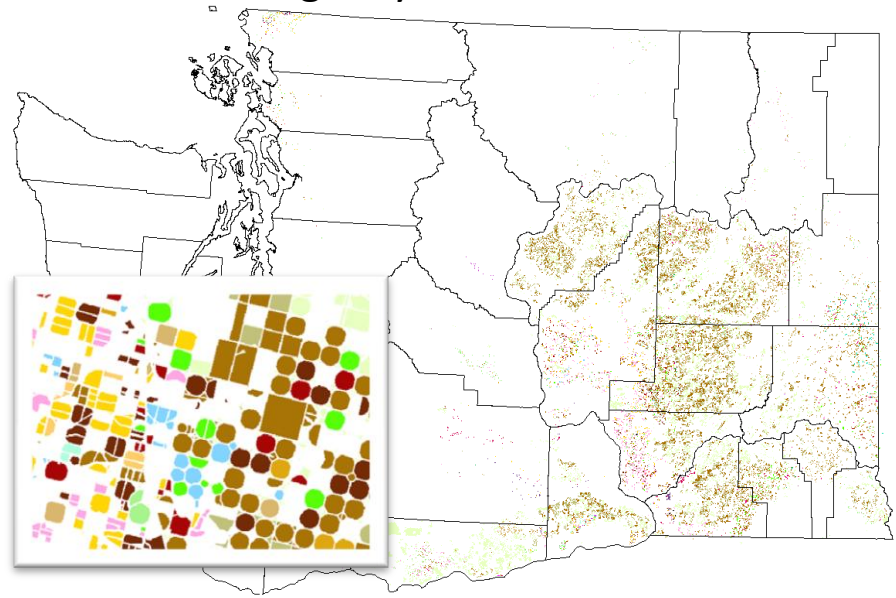


Inputs

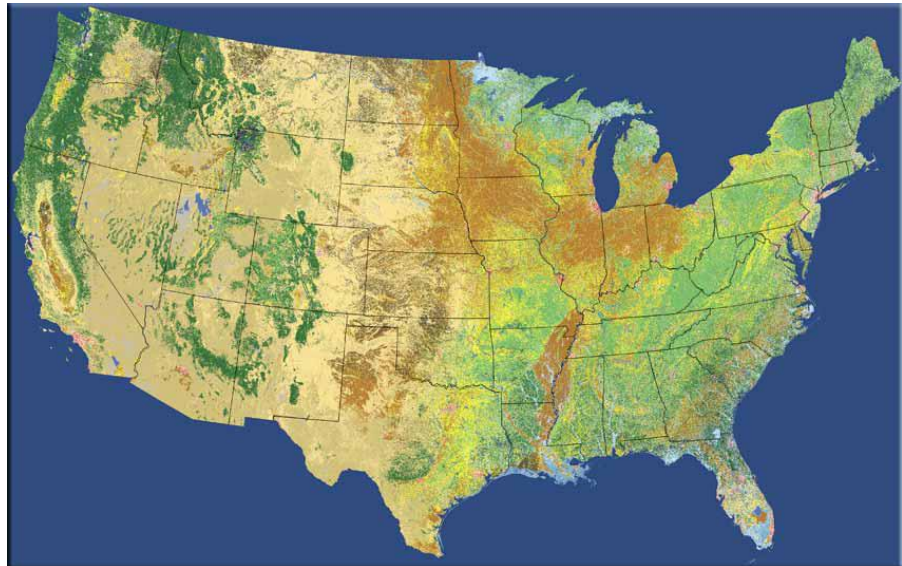
Satellite Imagery - AWiFS & Landsat TM



Farm Service Agency – Common Land Unit

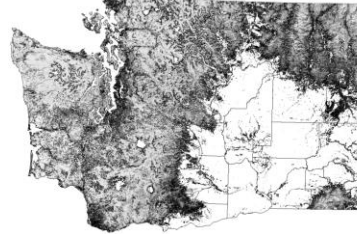


NLCD

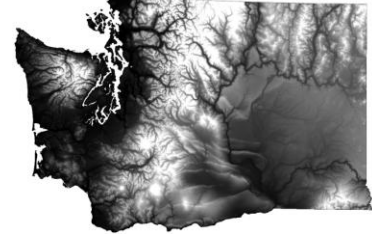


NLCD Derivative Products

Forest Canopy



Elevation



Impervious



Software Suite

Ground Truth Preparation

- ESRI ArcMap

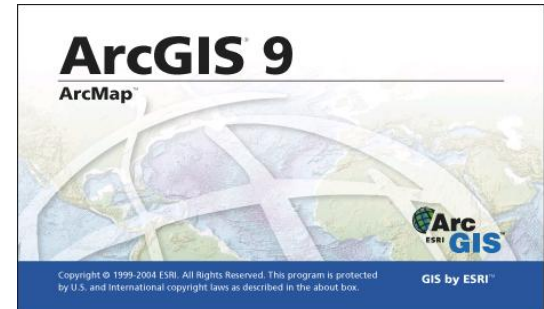


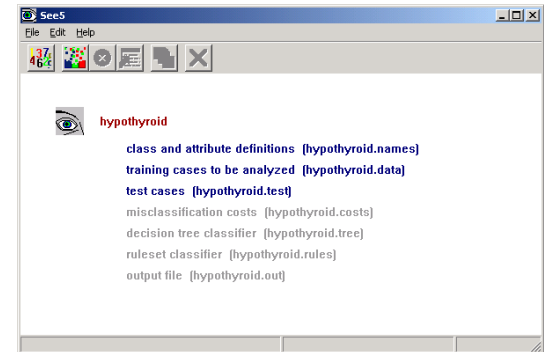
Image Preparation

- Leica Geosystems ERDAS Imagine 9.1



Image Classification

- See 5



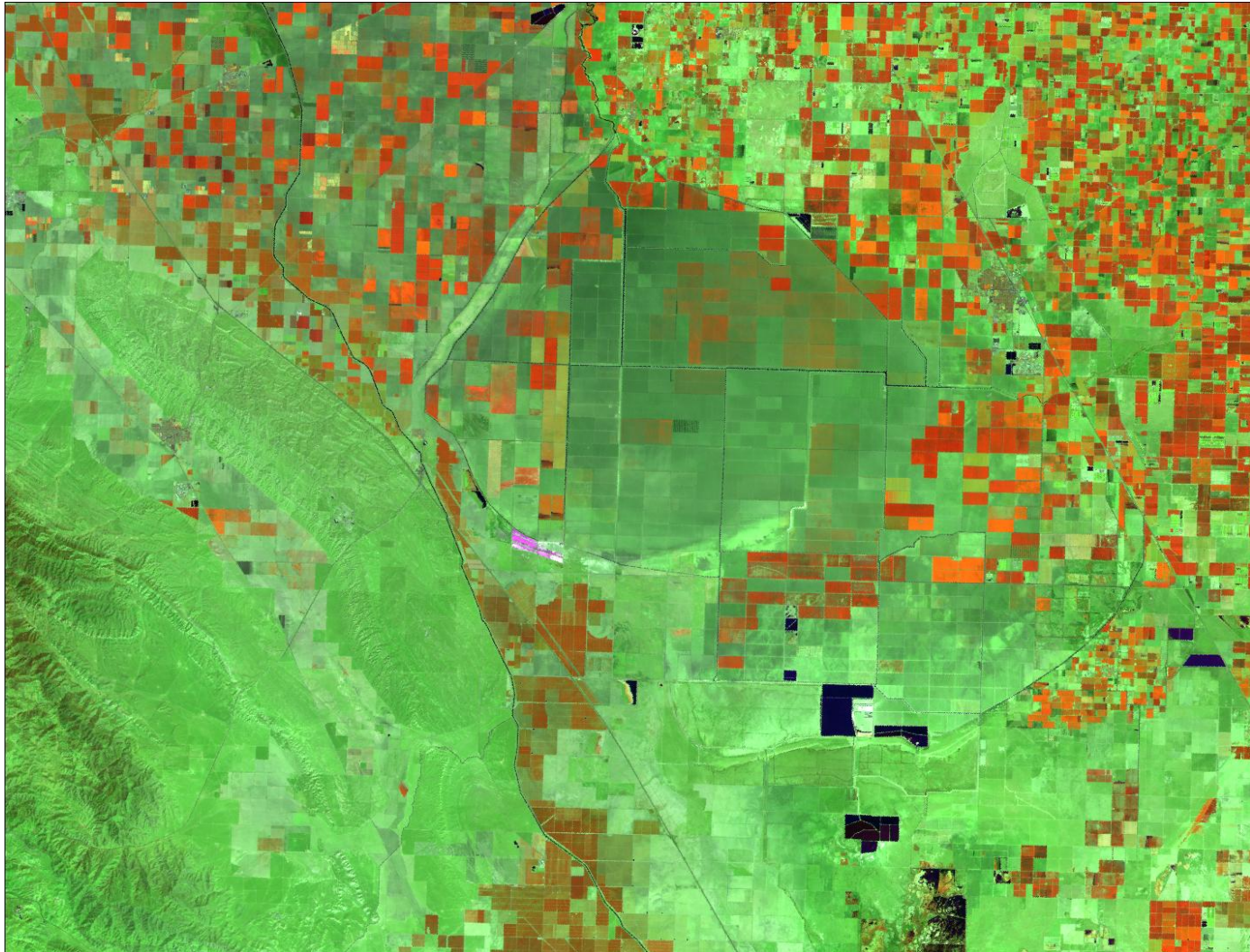
Acreage Estimates

- SAS/IML Workshop



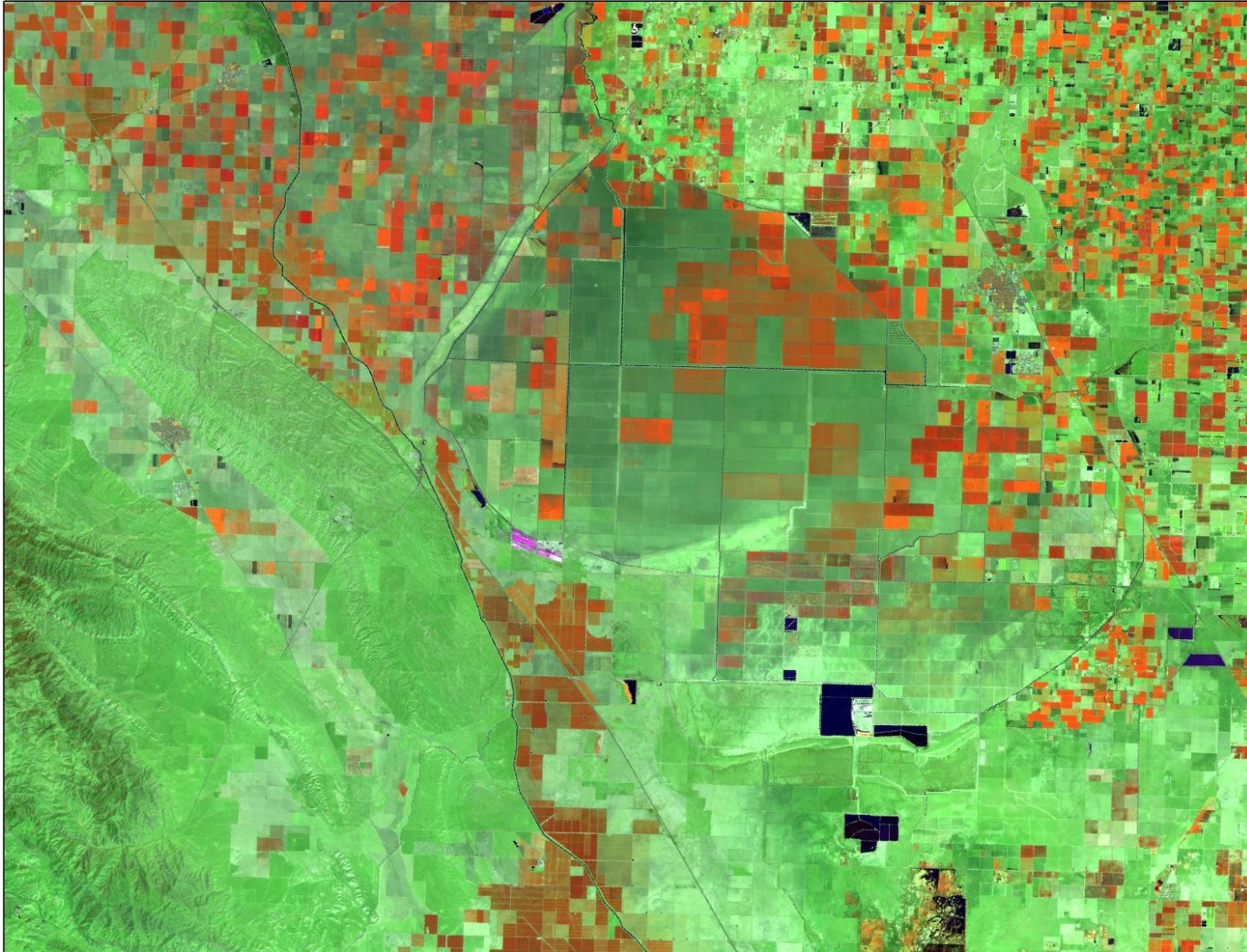
Landsat TM

April 23, 2009



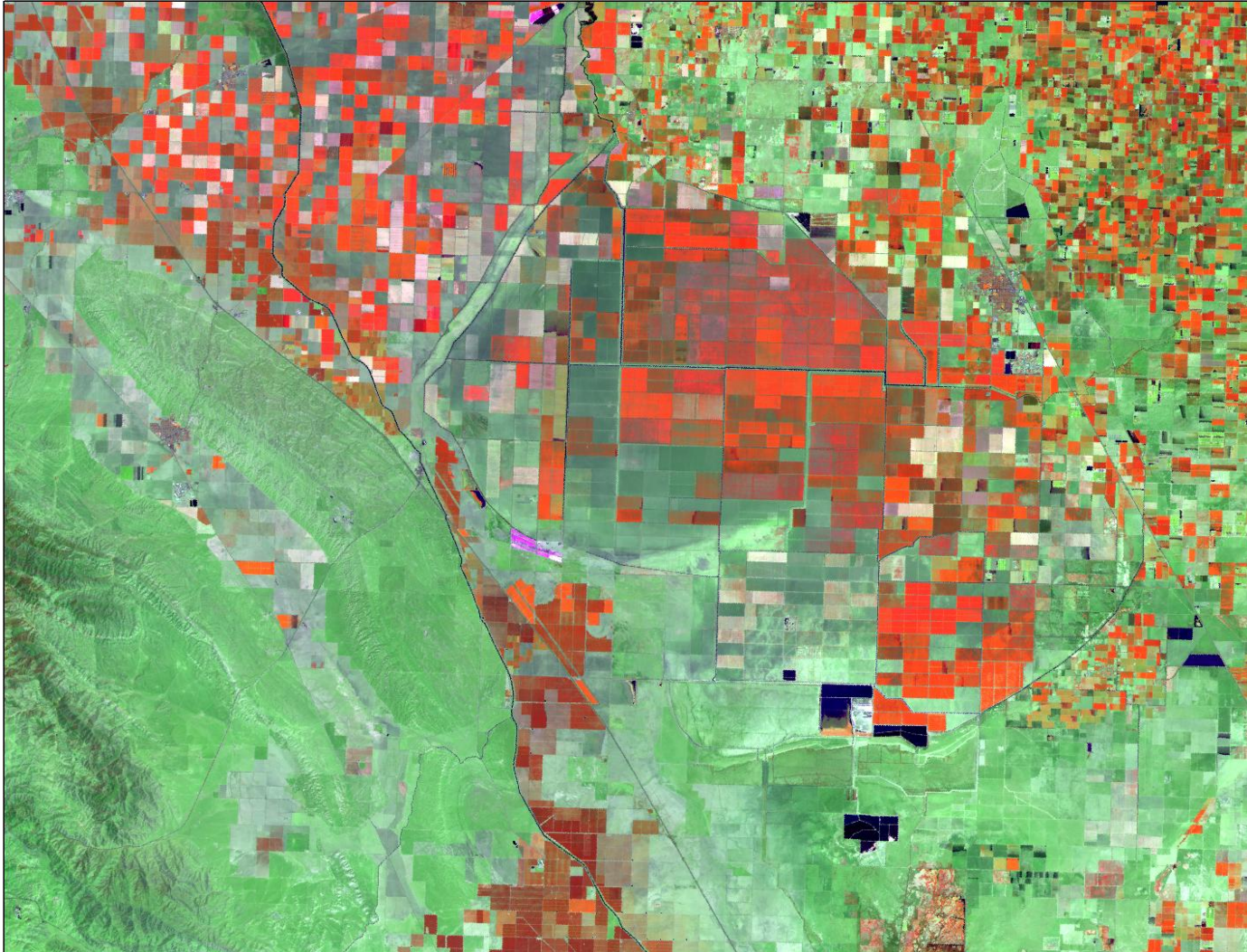
Landsat TM

May 9, 2009



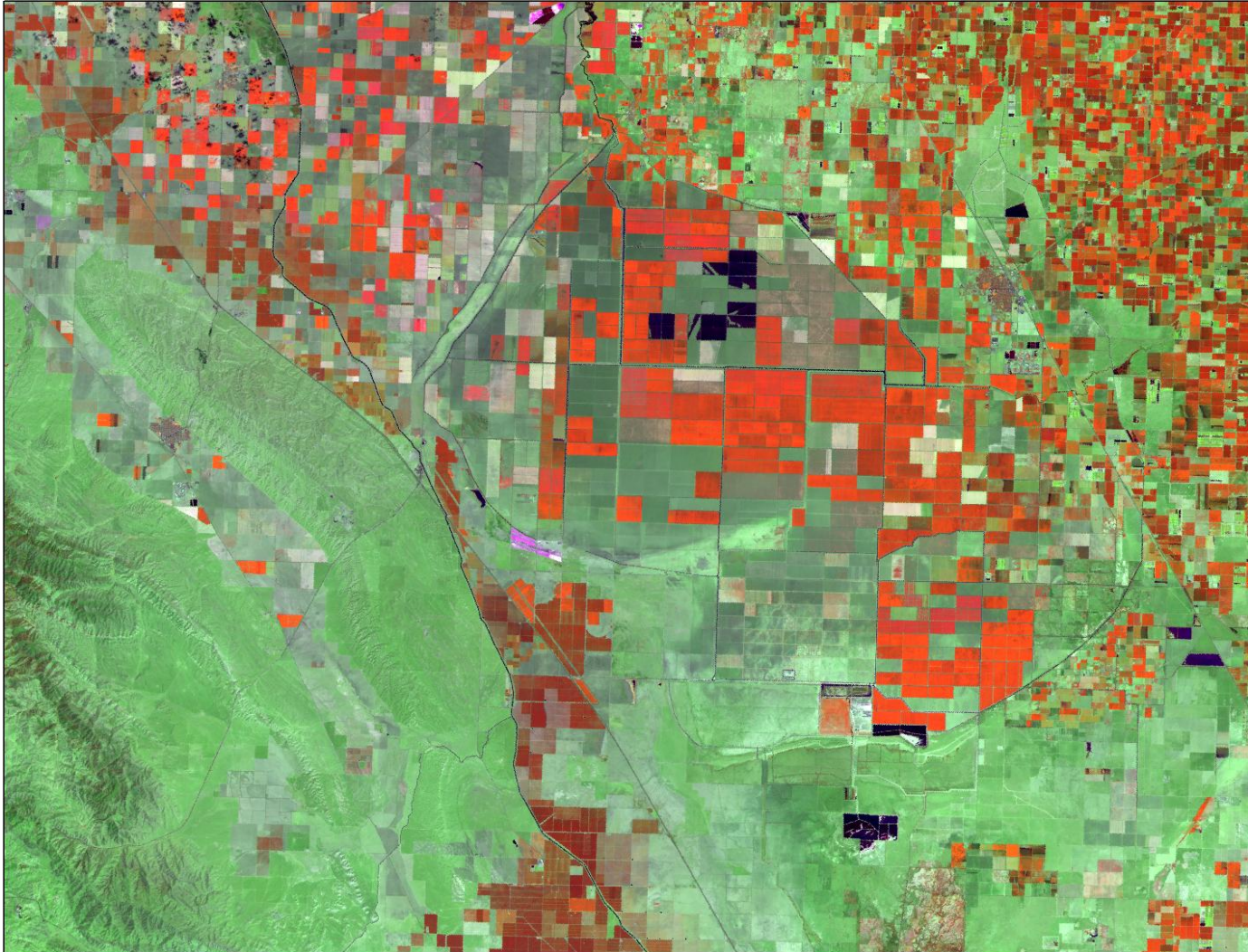
Landsat TM

June 26, 2009



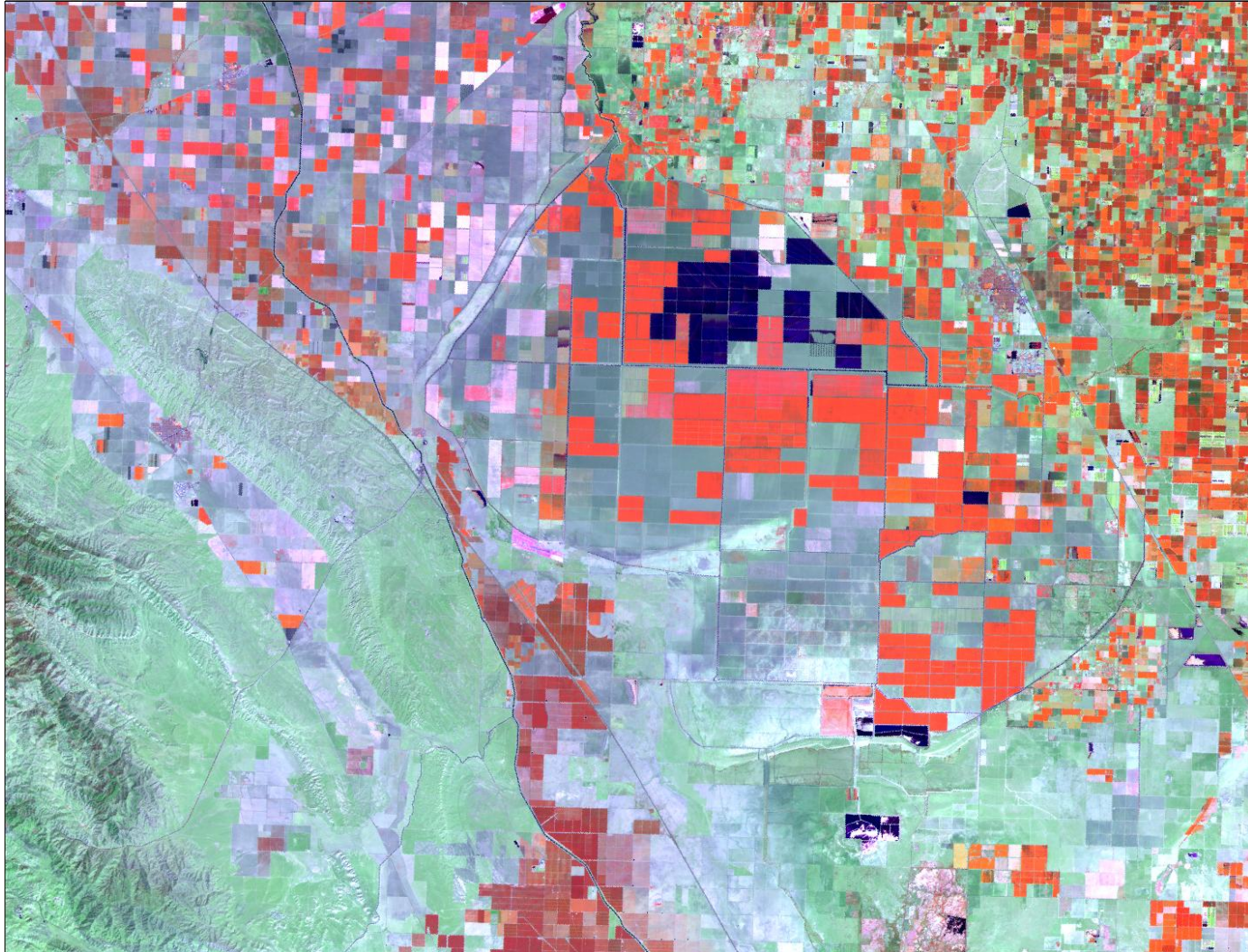
Landsat TM

July 28, 2009

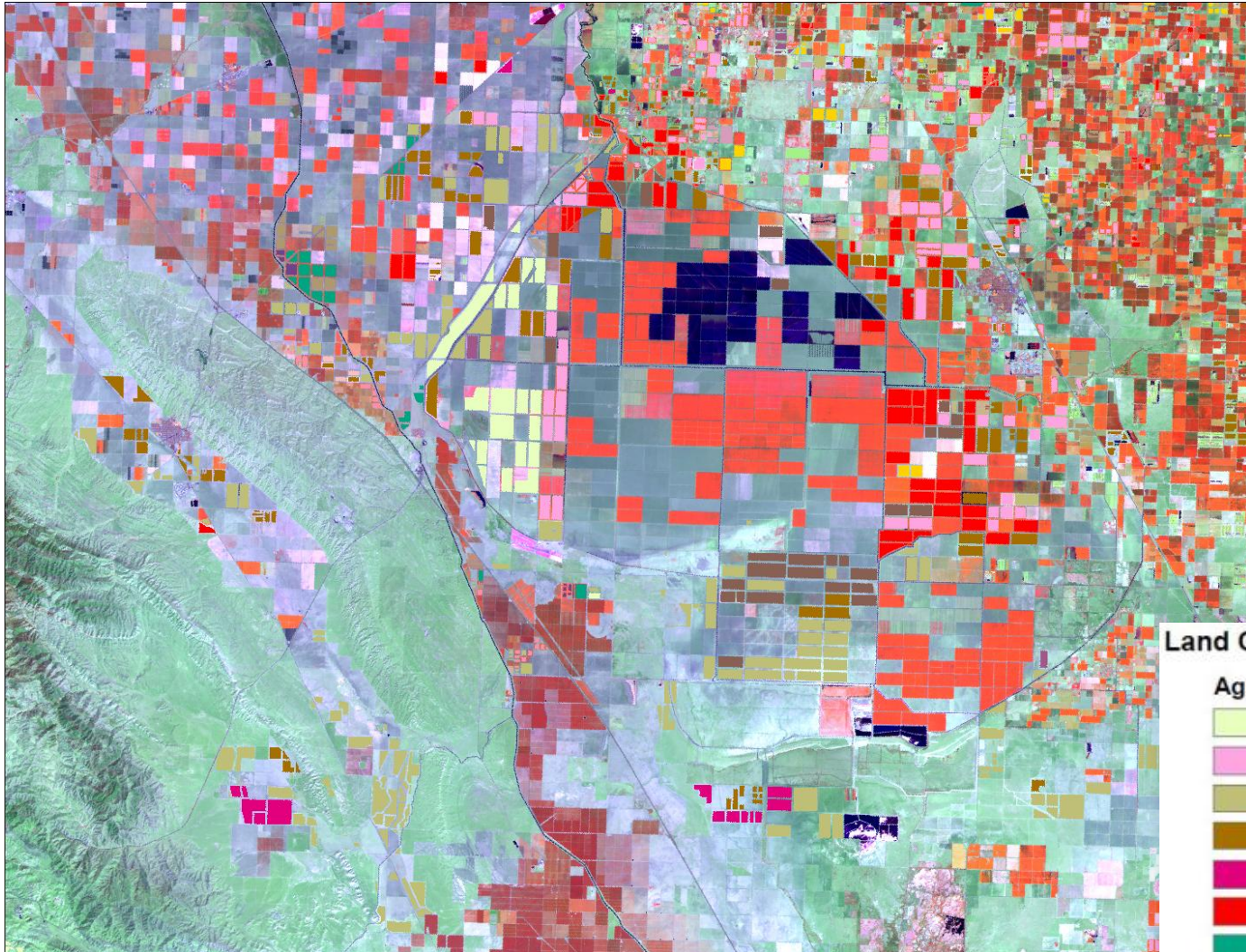


Landsat TM

August 29, 2009



FSA Groundtruth Known Fields

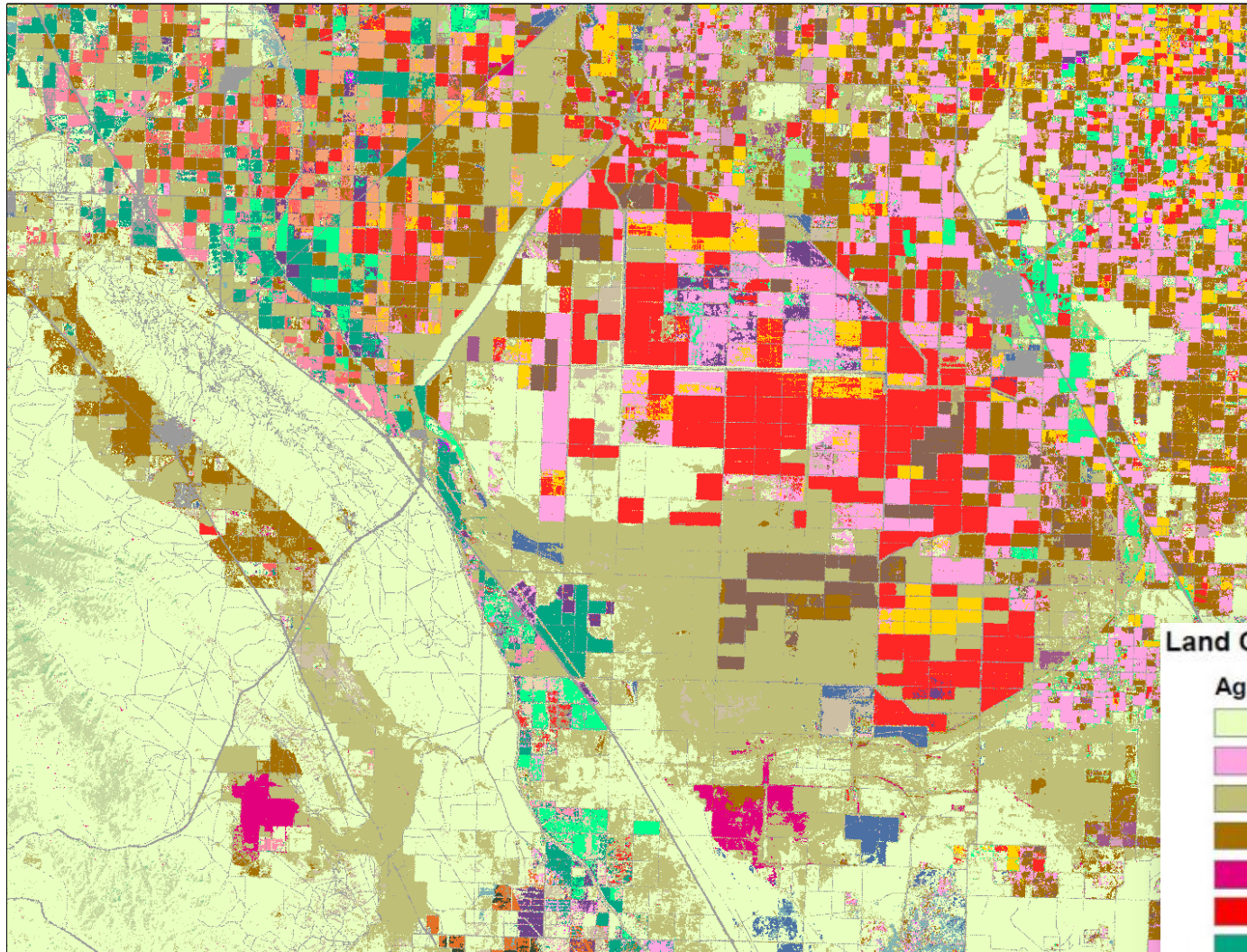


Land Cover Categories

Agriculture

- Pasture/Grass
- Alfalfa
- Fallow/Idle Cropland
- Winter Wheat
- Barley
- Cotton
- Almonds
- Corn
- Durum Wheat

Crop Land Data Layer 2009

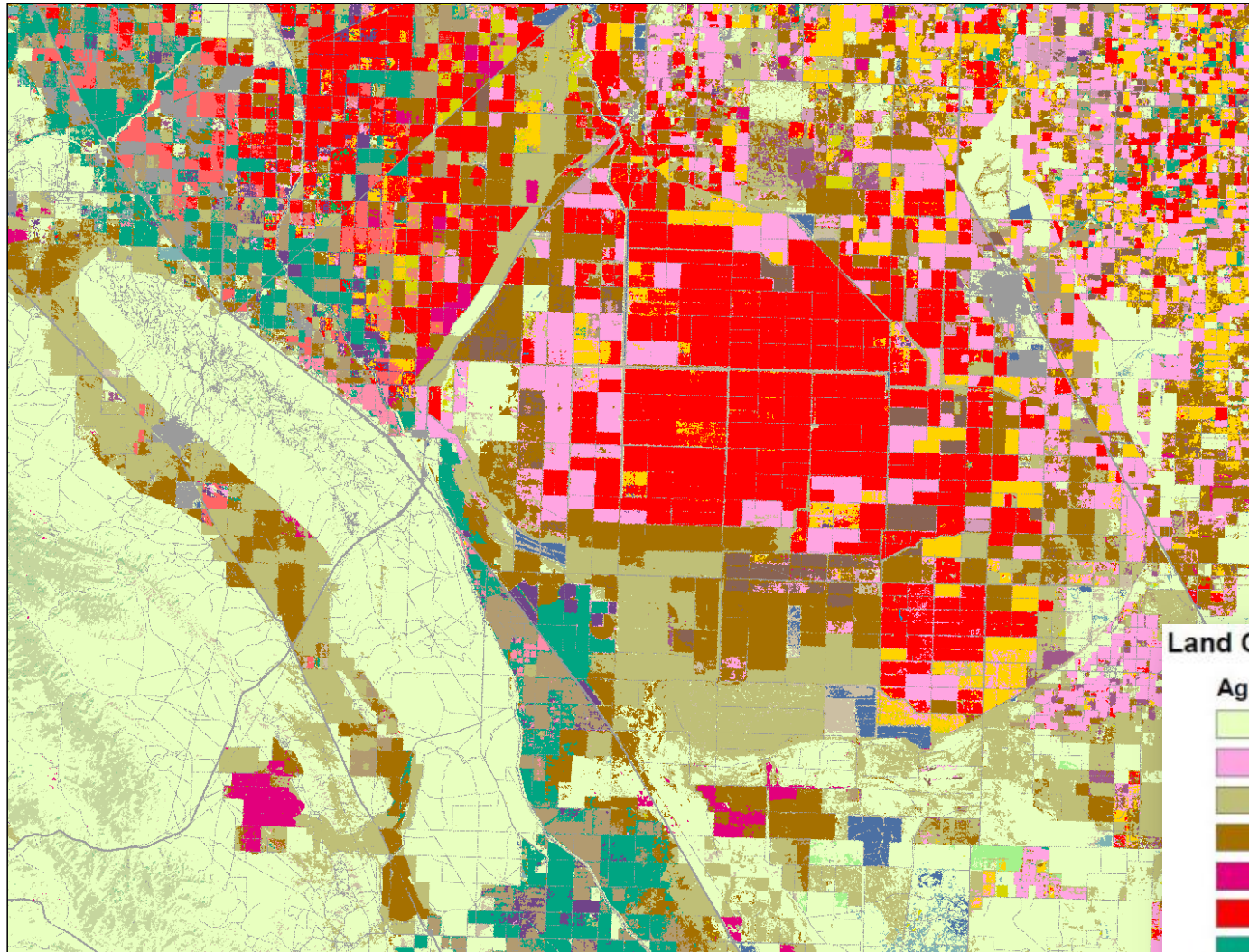


Land Cover Categories

Agriculture

- Pasture/Grass
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- Winter Wheat
- Barley
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- Corn
- Durum Wheat

Crop Land Data Layer 2007



Land Cover Categories

Agriculture

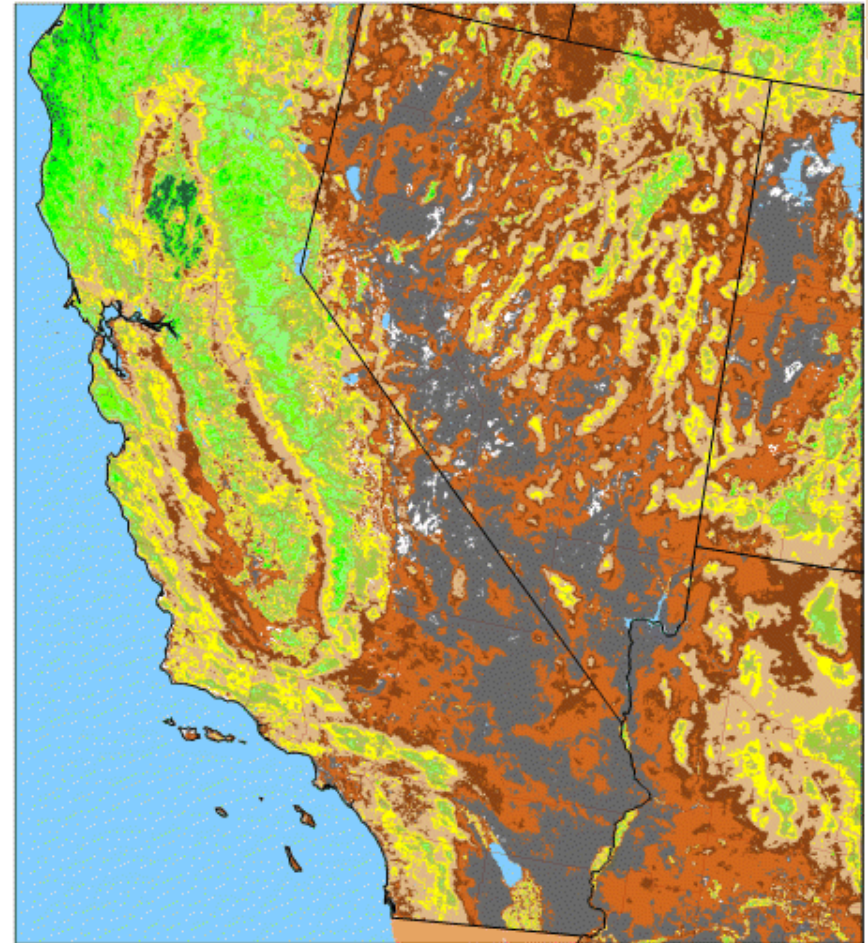
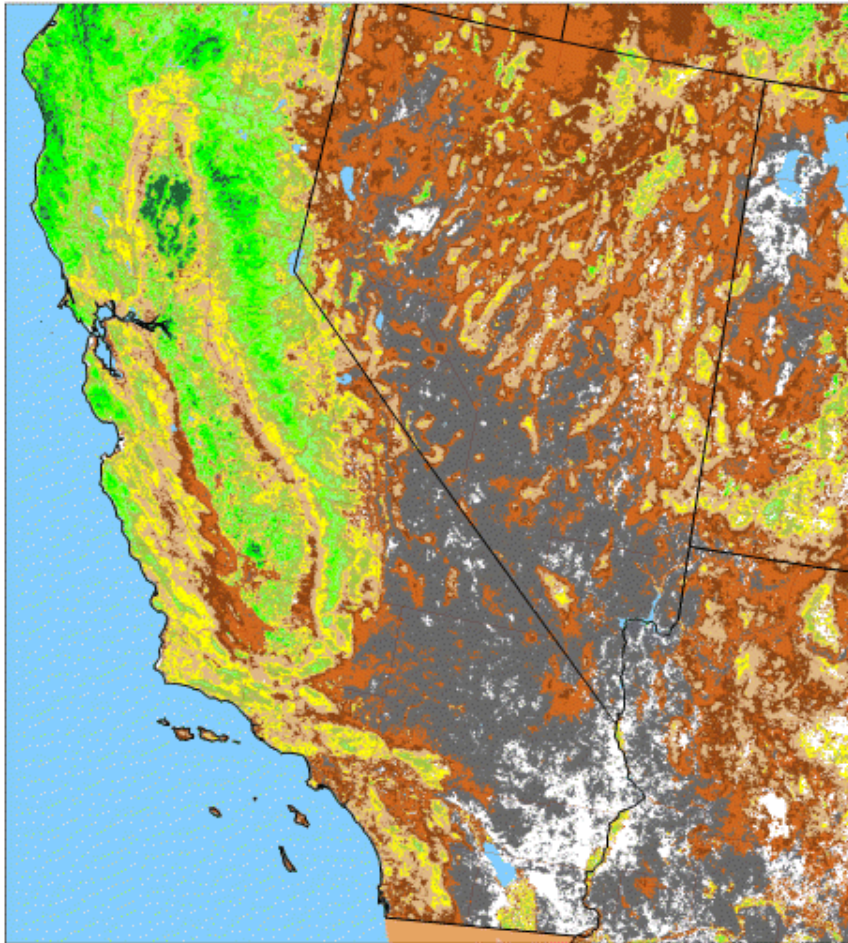
- Pasture/Grass
- Alfalfa
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- Winter Wheat
- Barley
- Cotton
- Almonds
- Corn
- Durum Wheat

California Drought Monitoring

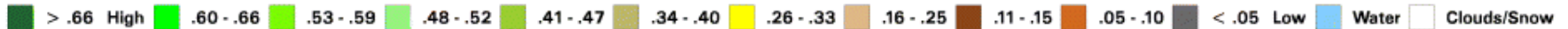
Vegetation Condition

Period 32 (7/24 - 8/6) 2007

Period 32 (7/28 - 8/10) 2009



Vegetation Index



No Water Vapor
Correction Applied

Compiled BY: USDA/NASS & USDA/ARS, NOAA AVHRR 18. 1 KM Resolution
Composite Imagery: USGS EROS Data Center. Image at <http://www.nass.usda.gov/research>

Additional Water Restraints on Farmers

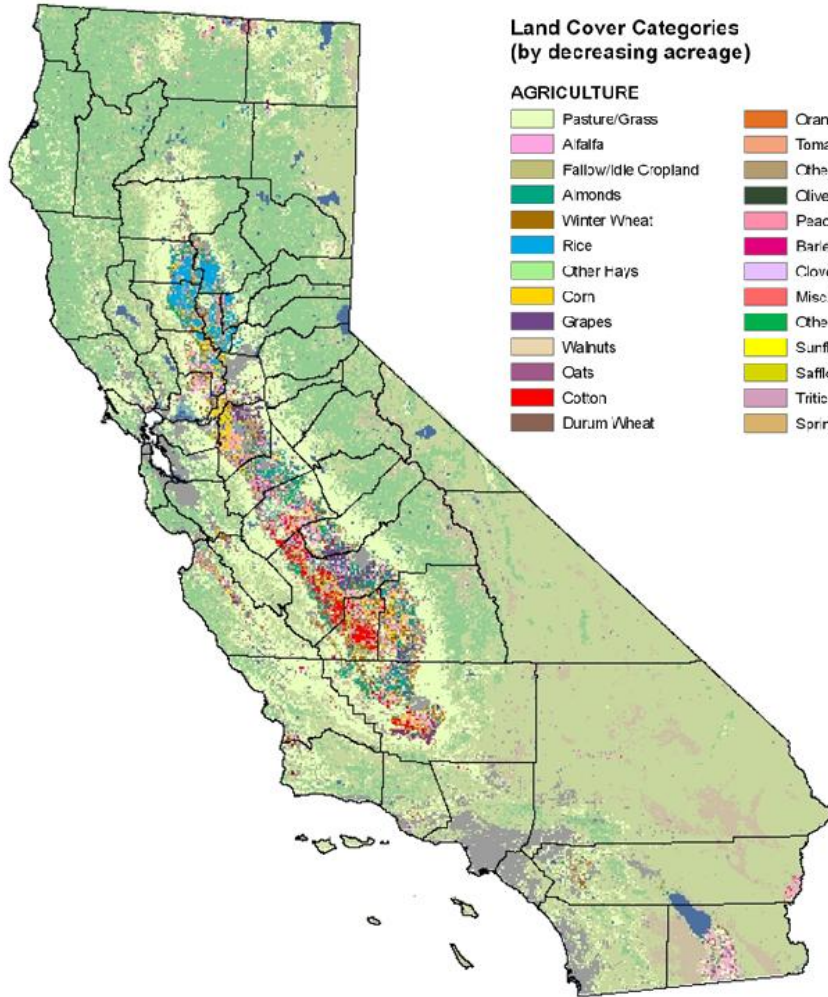
July 2009

Federal Bureau of Reclamation shut off water supply to farmers in central California to protect Delta Smelt population



Assess change by comparing CDLs

2007
Cropland Data Layer



Land Cover Categories (by decreasing acreage)

AGRICULTURE

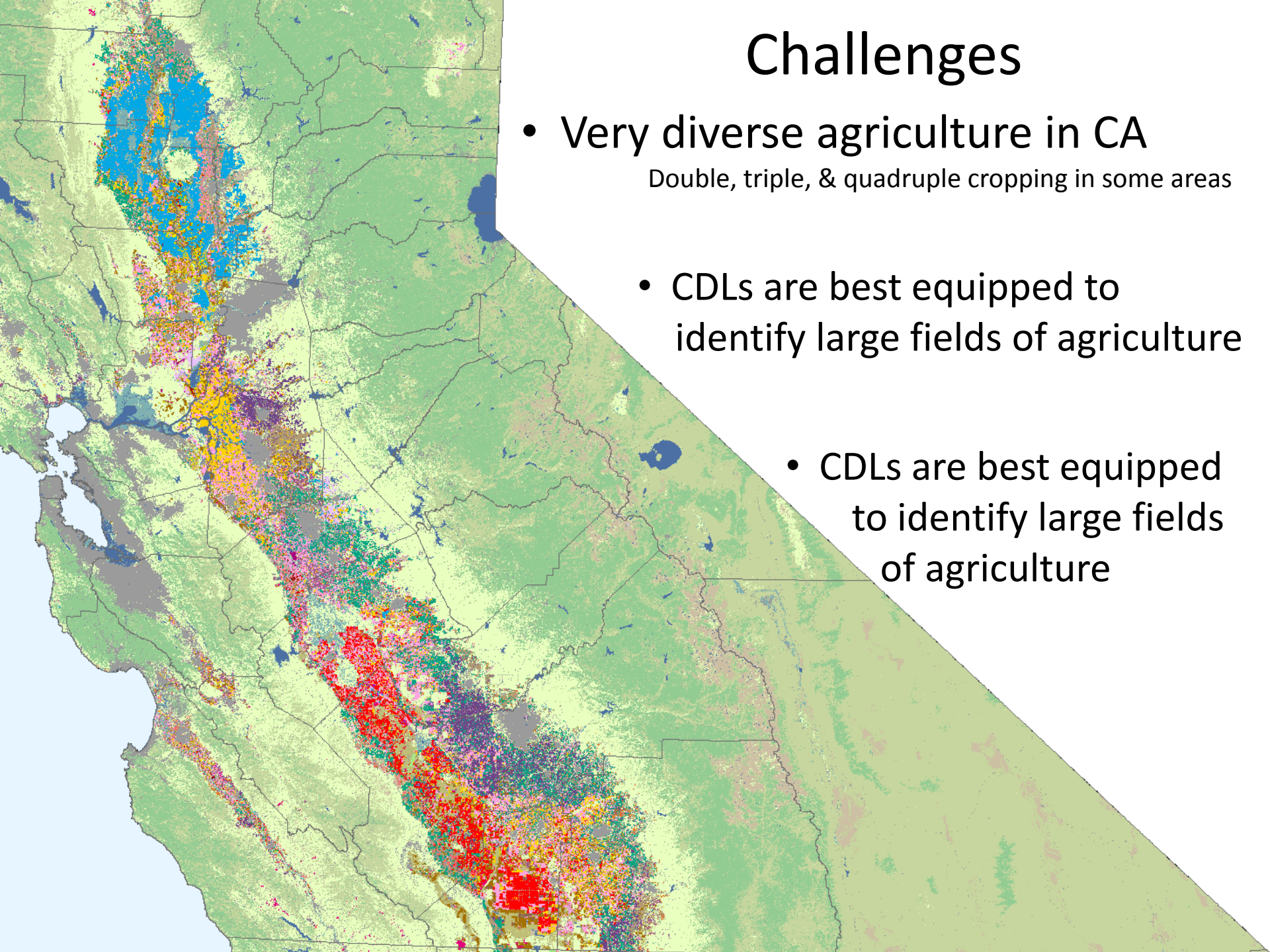
- | | |
|----------------------|----------------------------|
| Pasture/Grass | Oranges |
| Alfalfa | Tomatoes |
| Fallow/Idle Cropland | Other Tree Nuts & Fruits |
| Almonds | Olives |
| Winter Wheat | Peaches/Plums/Apricots |
| Rice | Barley |
| Other Hays | Clover/Wildflowers |
| Corn | Misc. Veggies. & Fruits |
| Grapes | Other Crops/Seed/Sod Grass |
| Walnuts | Sunflowers |
| Cats | Safflower |
| Cotton | Triticale |
| Durum Wheat | Spring Wheat |

2009
Cropland Data Layer



Challenges

- Very diverse agriculture in CA
Double, triple, & quadruple cropping in some areas
- CDLs are best equipped to identify large fields of agriculture
- CDLs are best equipped to identify large fields of agriculture



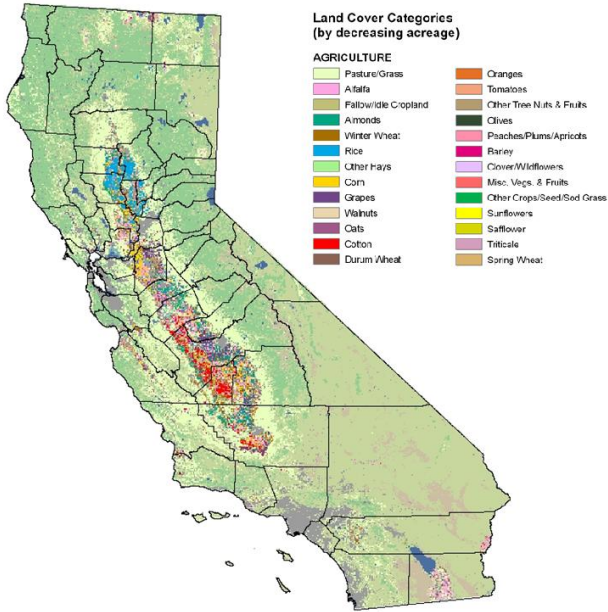
Accuracy Assessments

- Producers Accuracy – a measurement of omission
 - The percent of pixels in category that are over classified
- User Accuracy – a measurement of commission
 - The percent of pixels in a category that are under classified

2009	FSA CROPS		IDLE/GRASS	
	Producer	User	Producer	User
District 51	77.50%	81.74%	54.97%	85.72%
San Joaquin	84.06%	85.78%	53.37%	75.94%
Stanislaus	74.19%	99.33%	60.99%	65.32%
Merced	73.92%	77.92%	37.95%	75.92%
Madera	72.13%	81.11%	48.49%	95.37%
Fresno	75.52%	74.74%	20.36%	56.02%
Kings	79.11%	83.85%	84.41%	79.13%
Tulare	64.00%	87.64%	45.40%	50.61%
Kern	81.76%	91.89%	77.11%	93.41%

Method

2007
Cropland Data Layer



2009
Cropland Data Layer



2007		2009	
Value	Category	Value	Category
1	Agriculture	4	Agriculture
2	Grass	8	Grass
3	Idle	12	Idle

2007 + 2009	
Value	Category
1	Ag 07
2	Grass 07
3	Idle 07
4	Ag 09
5	Ag 07 + Ag 09
6	Grass 07 + Ag 09
7	Idle 07 + Ag 09
8	Grass 09
9	Ag 07 + Grass 09
10	Grass 07 + Grass 09
11	Idle 07 + Grass 09
12	Idle 09
13	Ag 07 + Idle 09
14	Grass 07 + Idle 09
15	Idle 07 + Idle 09

Recode 2007 and 2009 CDLs

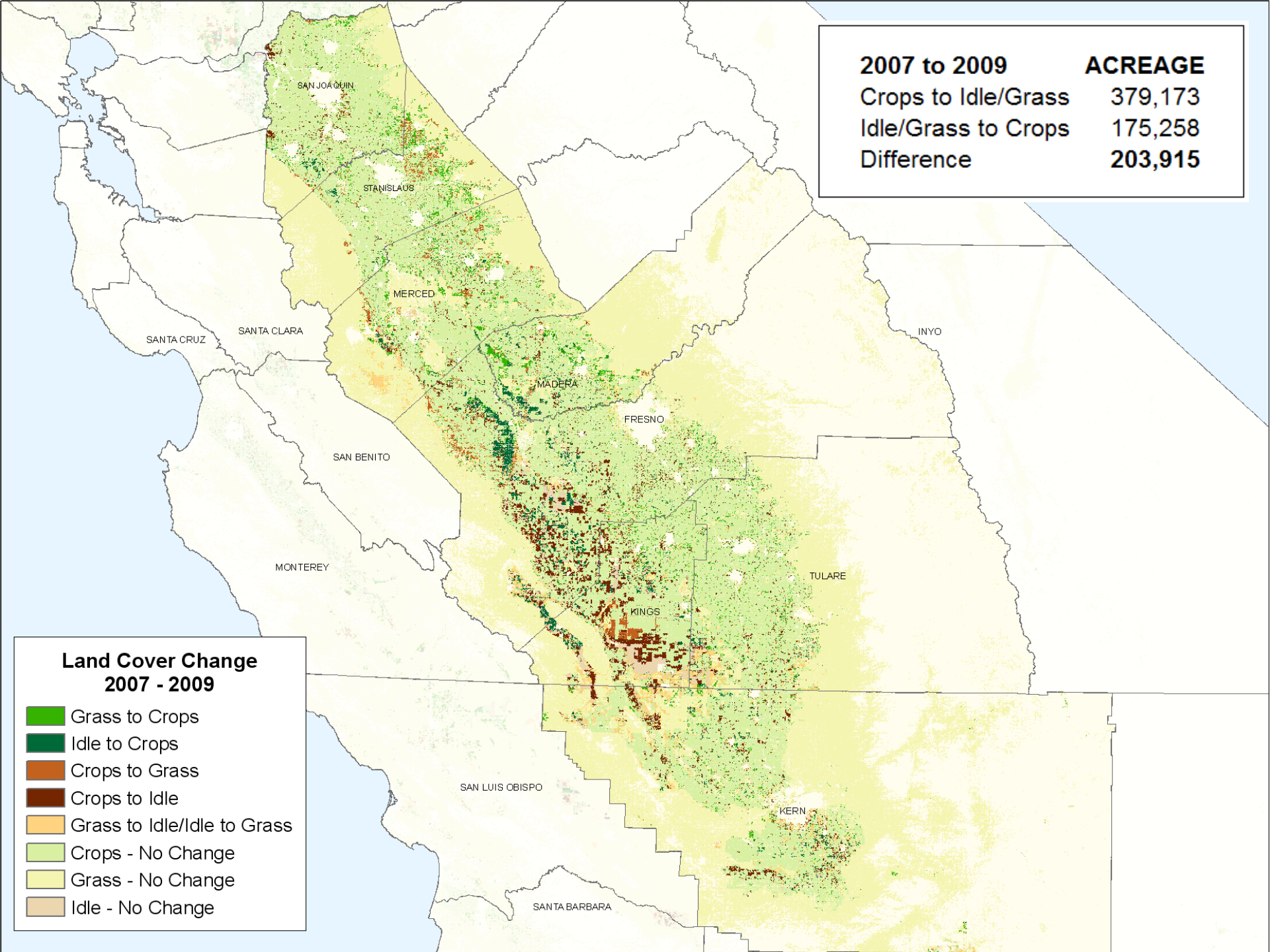
Add recoded CDLs together

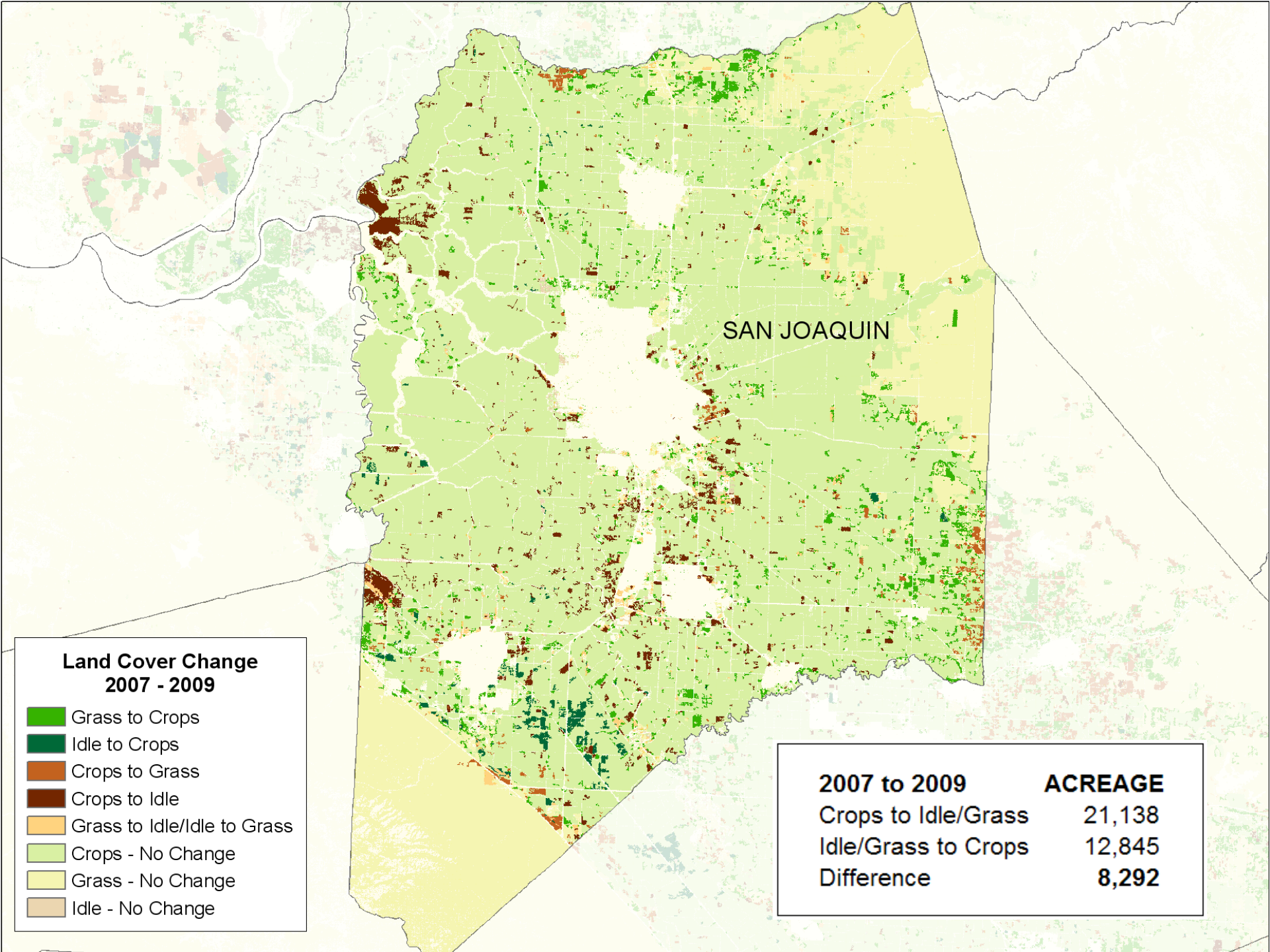
Analyze Results

2007 to 2009	ACREAGE
Crops to Idle/Grass	379,173
Idle/Grass to Crops	175,258
Difference	203,915

**Land Cover Change
2007 - 2009**

- Grass to Crops
- Idle to Crops
- Crops to Grass
- Crops to Idle
- Grass to Idle/Idle to Grass
- Crops - No Change
- Grass - No Change
- Idle - No Change



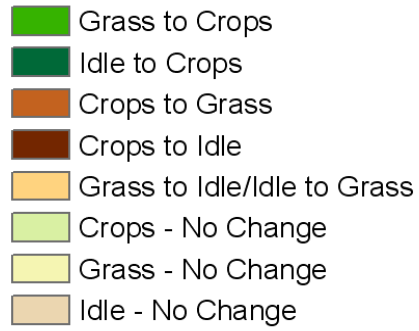


**Land Cover Change
2007 - 2009**

- Grass to Crops
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- Crops to Grass
- Crops to Idle
- Grass to Idle/Idle to Grass
- Crops - No Change
- Grass - No Change
- Idle - No Change

2007 to 2009	ACREAGE
Crops to Idle/Grass	21,138
Idle/Grass to Crops	12,845
Difference	8,292

**Land Cover Change
2007 - 2009**



STANISLAUS

2007 to 2009	ACREAGE
Crops to Idle/Grass	23,555
Idle/Grass to Crops	8,614
Difference	14,941

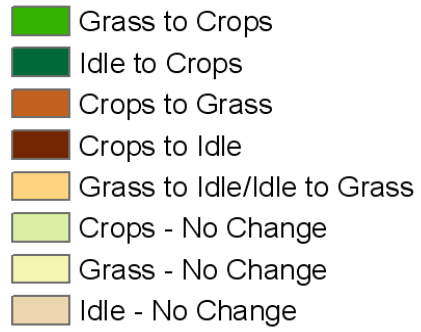
**Land Cover Change
2007 - 2009**

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MERCED

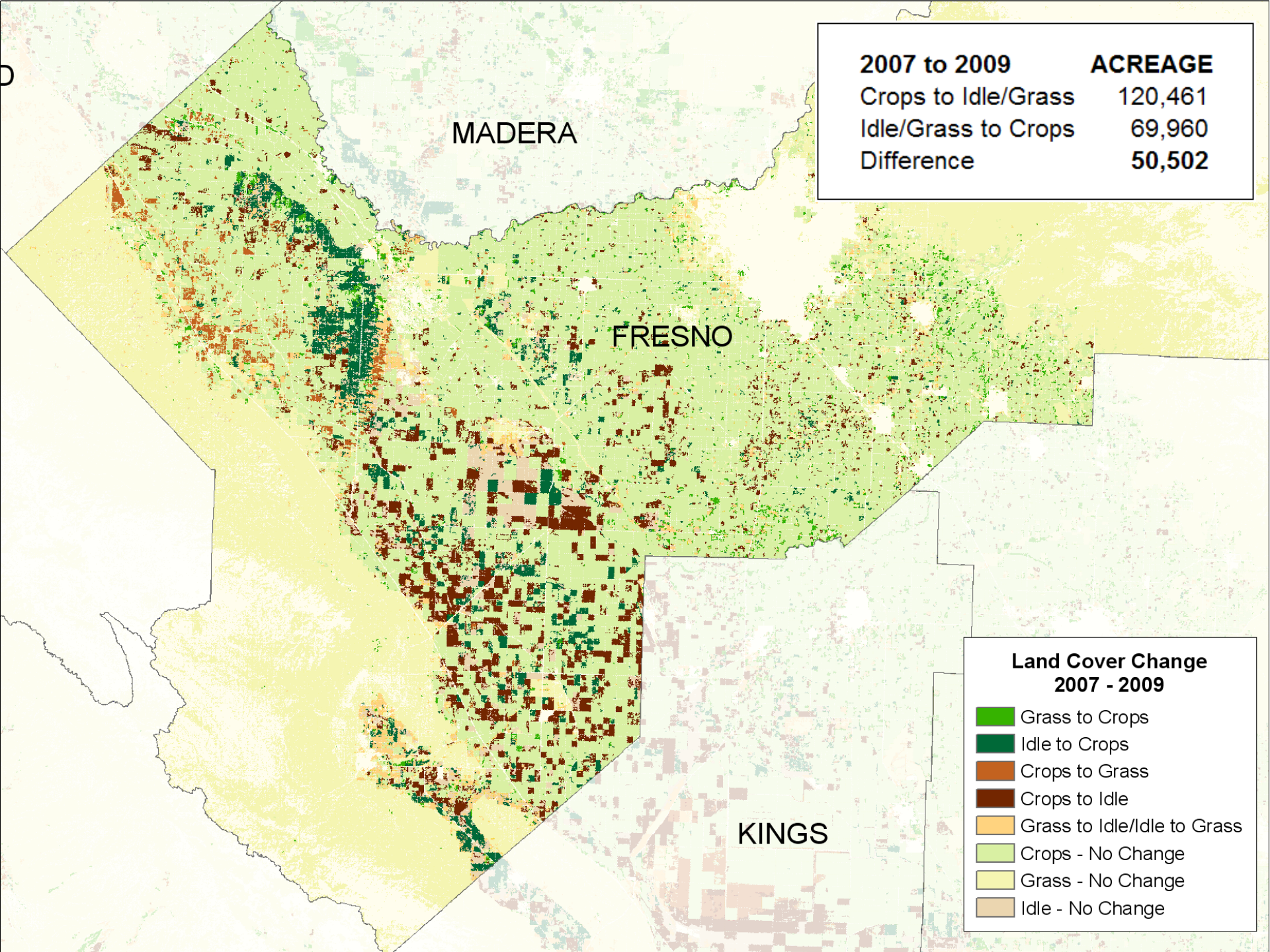
2007 to 2009	ACREAGE
Crops to Idle/Grass	32,081
Idle/Grass to Crops	20,468
Difference	11,613

**Land Cover Change
2007 - 2009**



MADERA

2007 to 2009	ACREAGE
Crops to Idle/Grass	13,016
Idle/Grass to Crops	20,735
Difference	(7,719)



MADERA

FRESNO

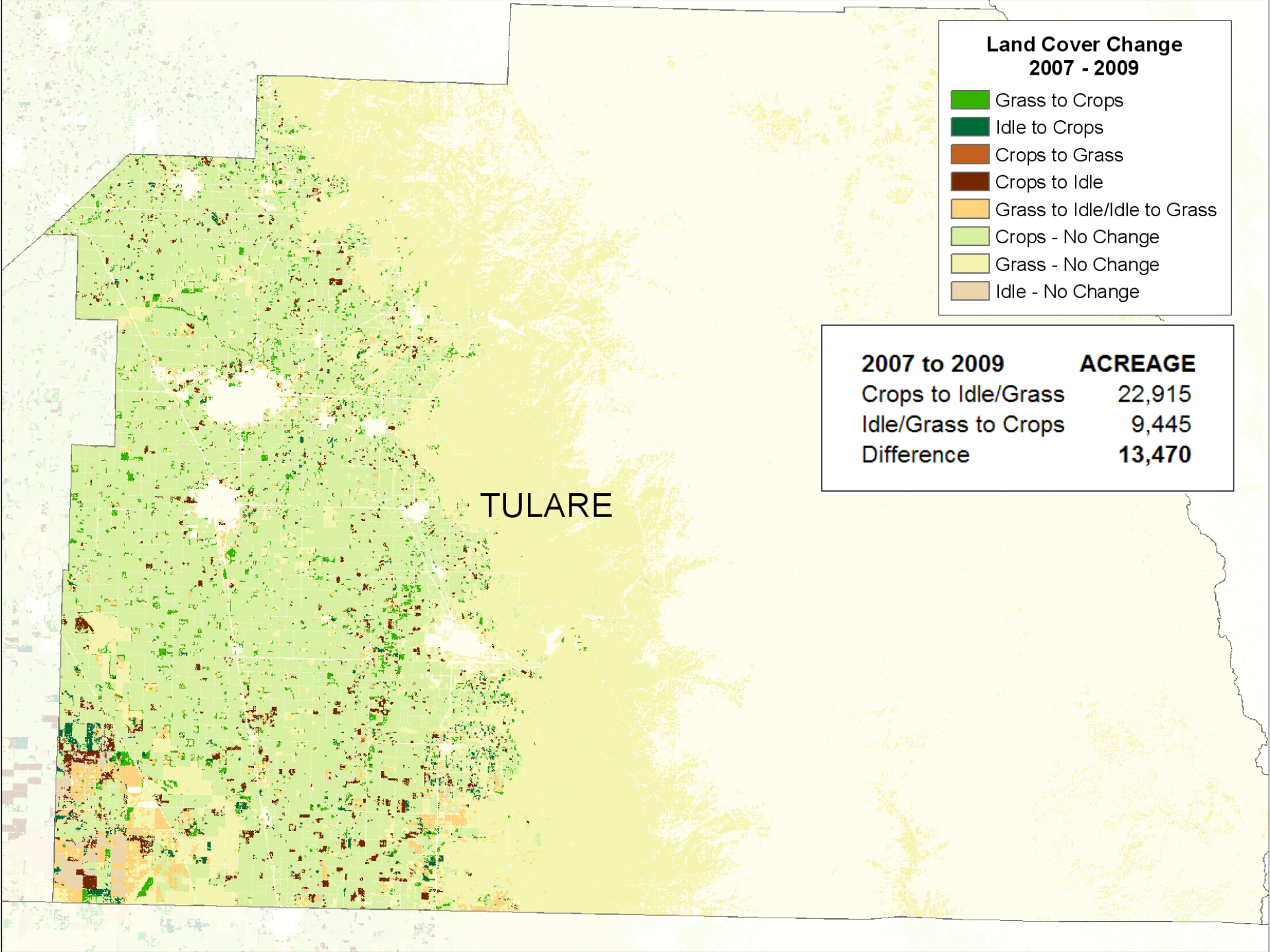
KINGS

**Land Cover Change
2007 - 2009**

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- Crops to Grass
- Crops to Idle
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- Crops - No Change
- Grass - No Change
- Idle - No Change

2007 to 2009	ACREAGE
Crops to Idle/Grass	99,289
Idle/Grass to Crops	16,243
Difference	83,046

KINGS

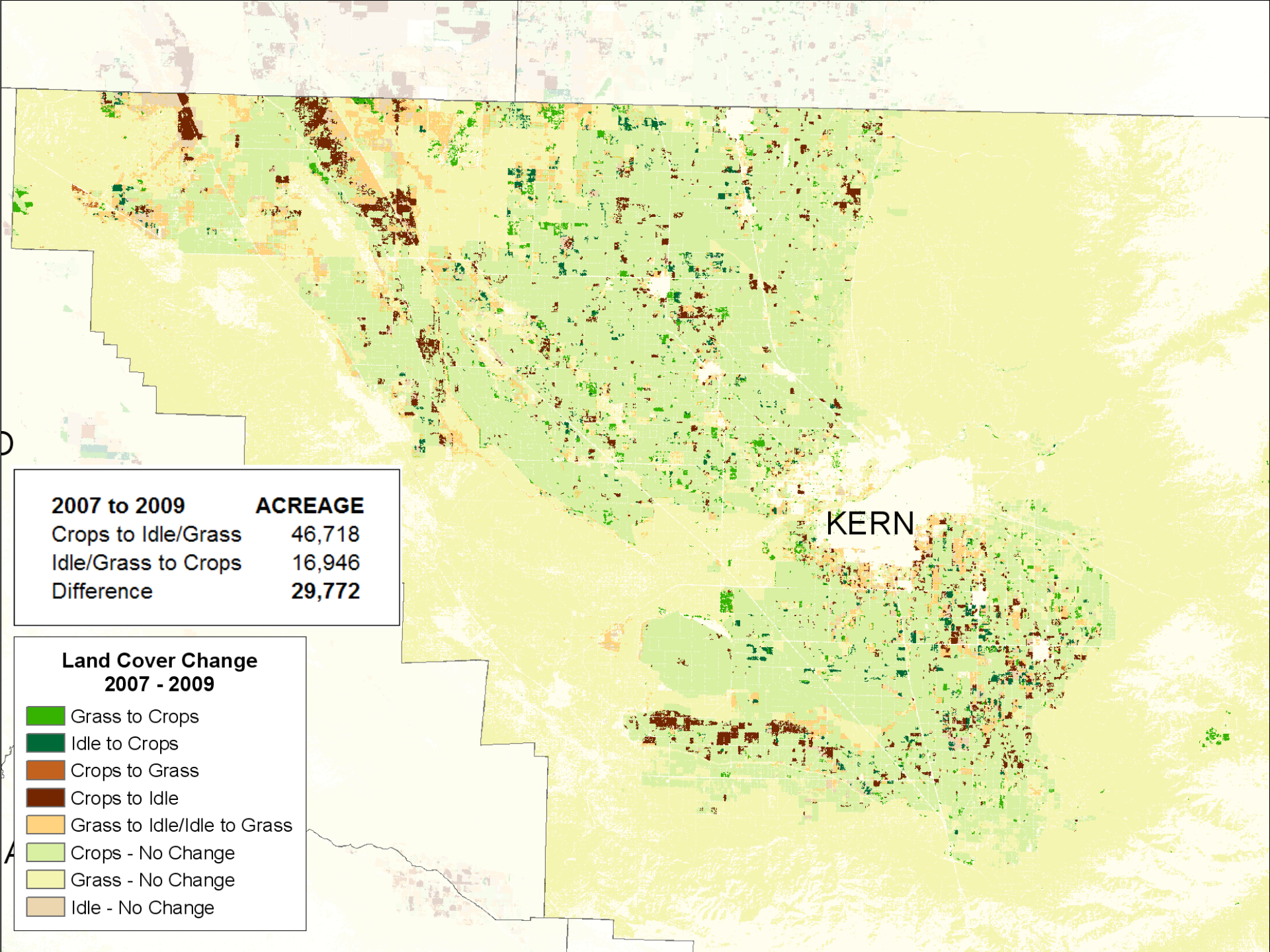


**Land Cover Change
2007 - 2009**

- Grass to Crops
- Idle to Crops
- Crops to Grass
- Crops to Idle
- Grass to Idle/Idle to Grass
- Crops - No Change
- Grass - No Change
- Idle - No Change

2007 to 2009	ACREAGE
Crops to Idle/Grass	22,915
Idle/Grass to Crops	9,445
Difference	13,470

TULARE



2007 to 2009	ACREAGE
Crops to Idle/Grass	46,718
Idle/Grass to Crops	16,946
Difference	29,772

**Land Cover Change
2007 - 2009**

- Grass to Crops
- Idle to Crops
- Crops to Grass
- Crops to Idle
- Grass to Idle/Idle to Grass
- Crops - No Change
- Grass - No Change
- Idle - No Change

Summary

2007 - 2009

	Crops to Idle/Grass	Idle/Grass to Crops	Difference
District 51	379,173	174,076	205,097
San Joaquin	21,138	12,759	8,379
Stanislaus	23,555	8,556	14,999
Merced	32,081	20,330	11,751
Madera	13,016	20,595	-7,579
Fresno	120,461	69,488	50,973
Kings	99,289	16,134	83,155
Tulare	22,915	9,381	13,534
Kern	46,718	16,831	29,887

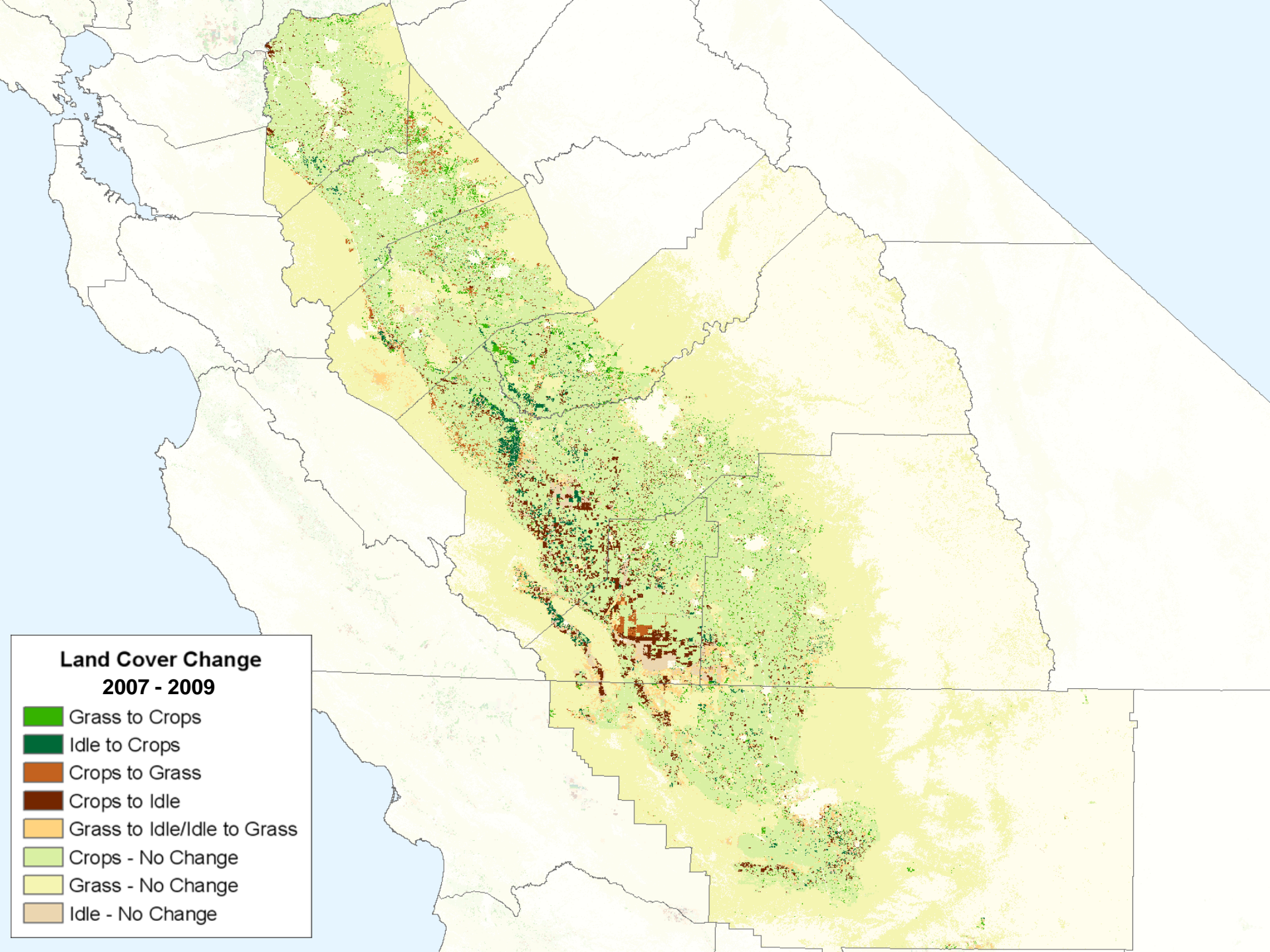
- Remote sensing confirms agricultural land in District 51 affected by water resource issues.

- Three counties most affected in District 51 are

Kings

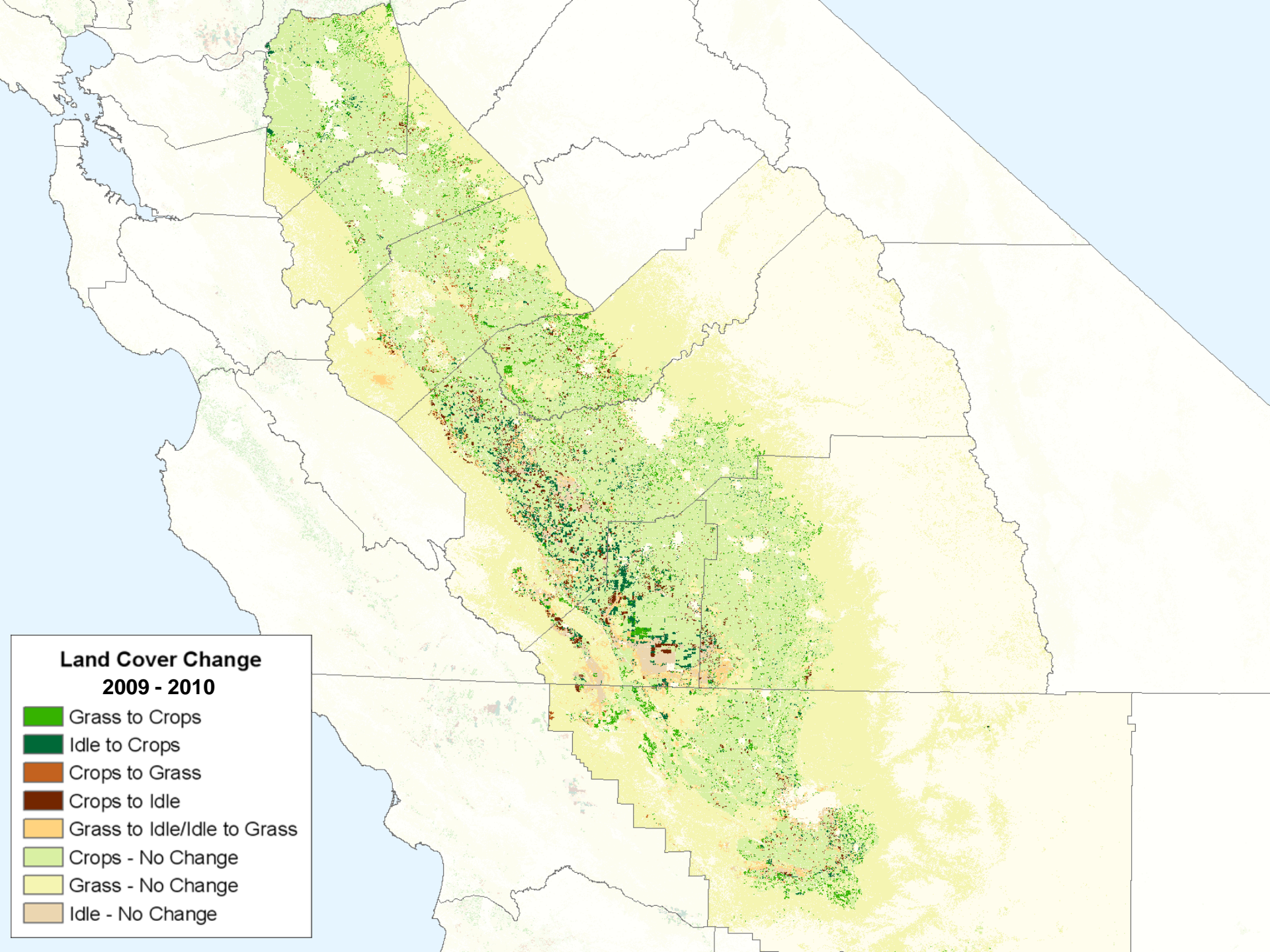
Fresno

Kern



**Land Cover Change
2007 - 2009**

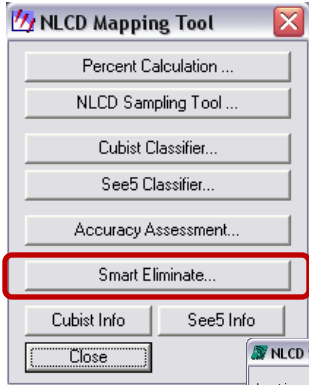
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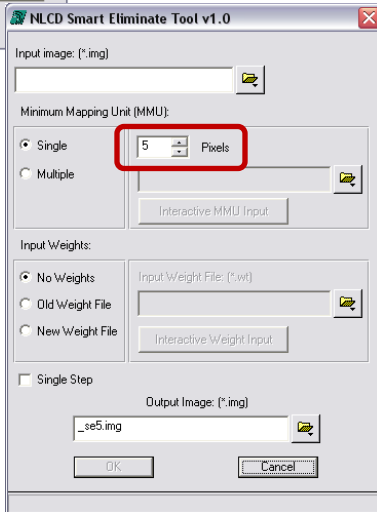
**Land Cover Change
2009 - 2010**

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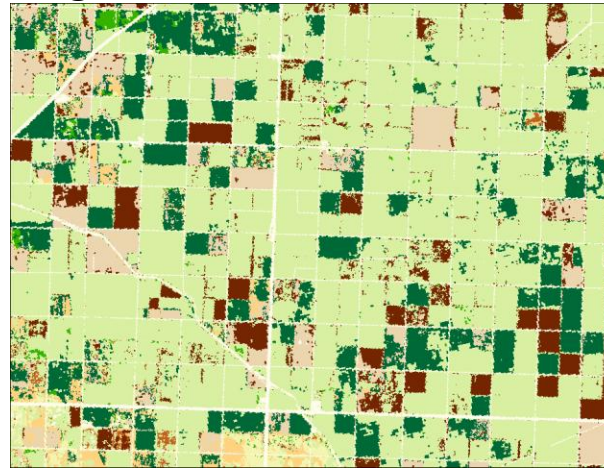
Smart Eliminate



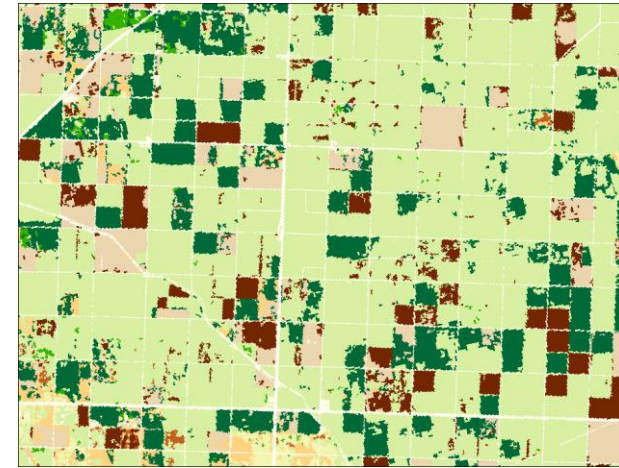
MMU =
Minimum
Mapping
Unit



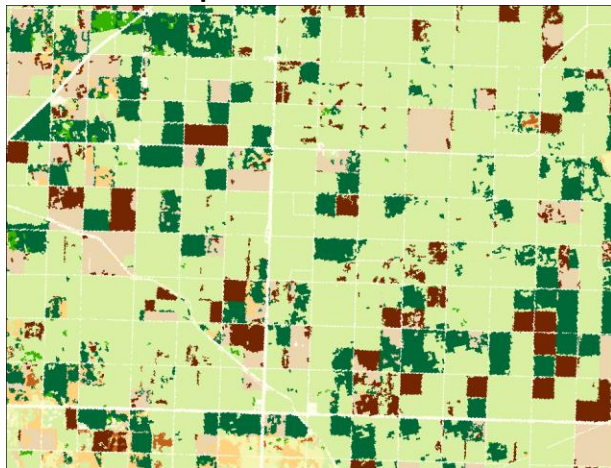
Original File



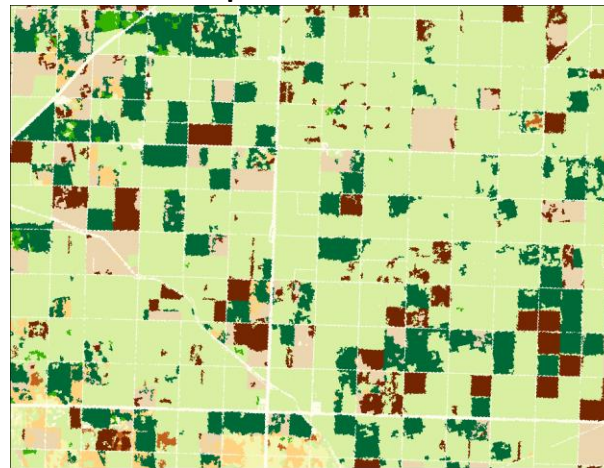
MMU = 5 pixels



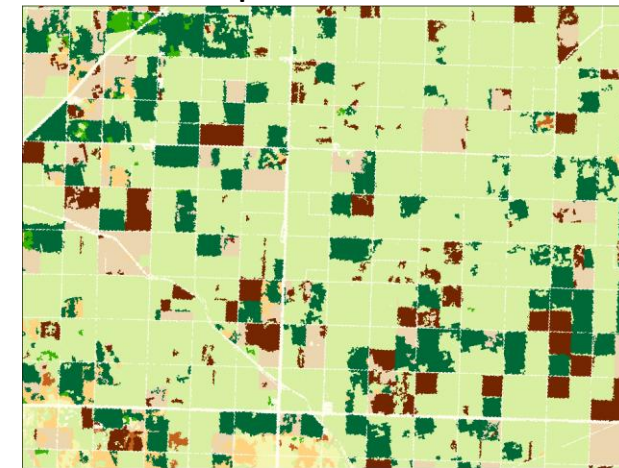
MMU = 8 pixels



MMU = 13 pixels

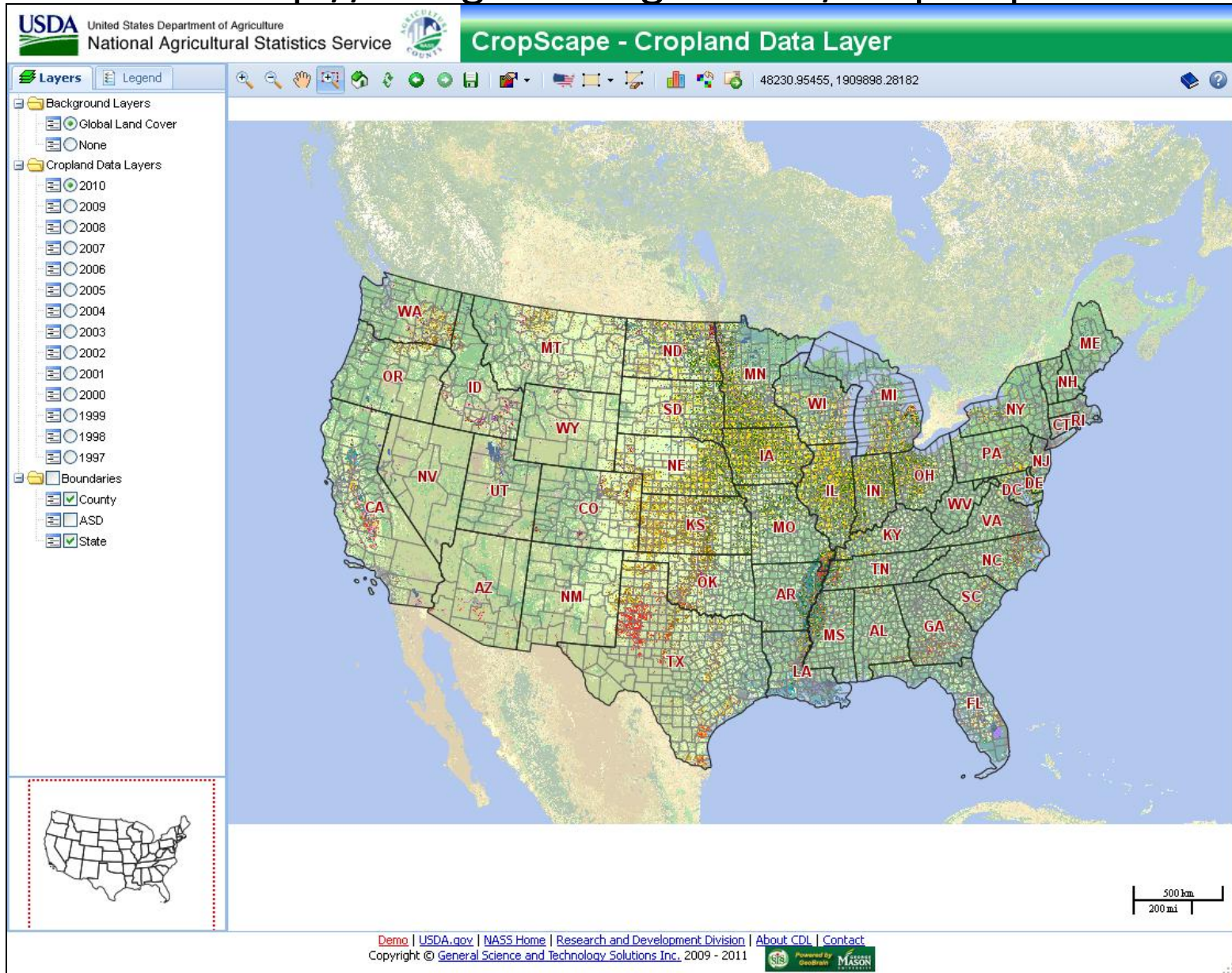



MMU = 18 pixels



CropScape

<http://nassgeodata.gmu.edu/CropScape>





Thank you!
Questions?

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