

# Cropland Mapping with Satellite Data

Rick Mueller

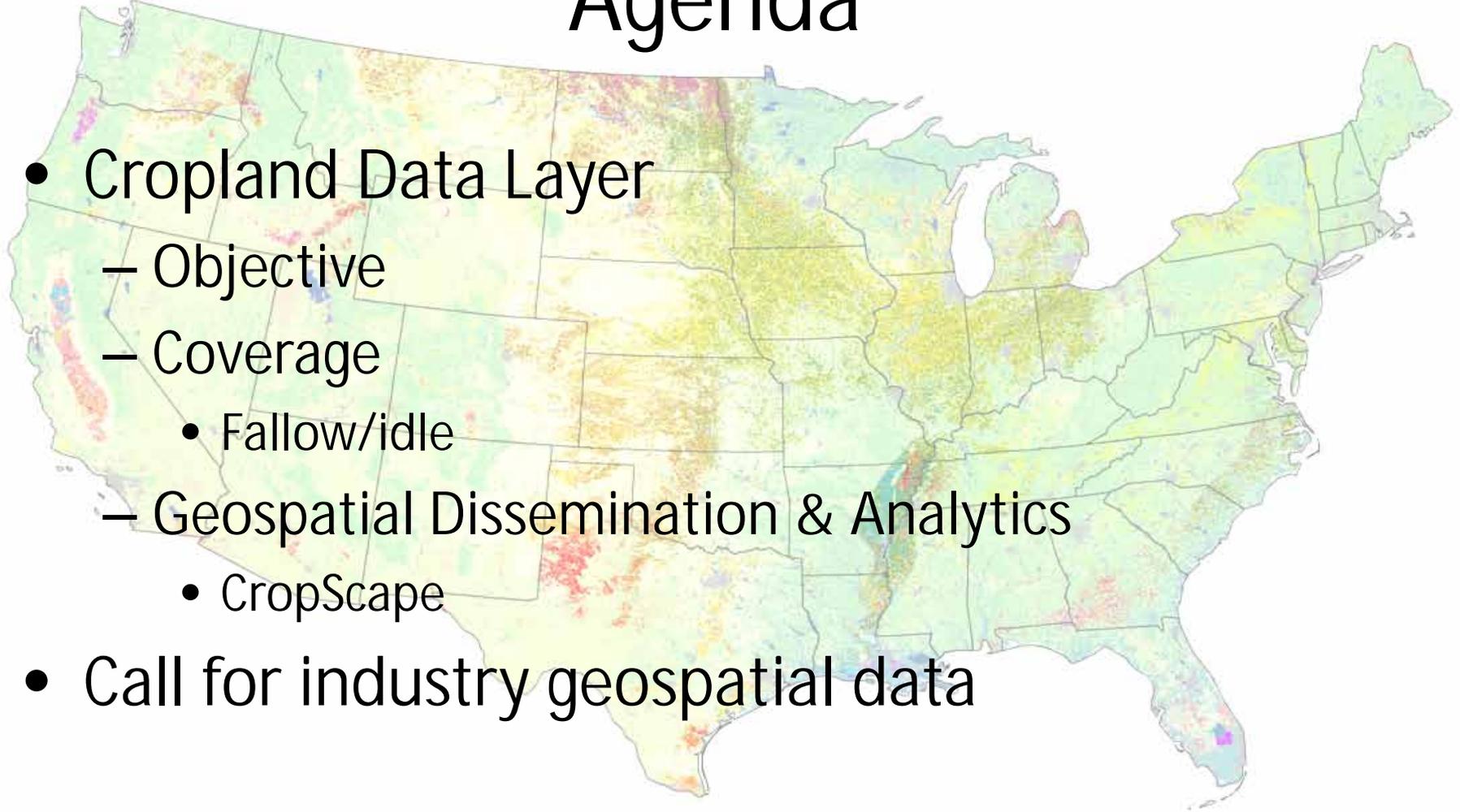
Head/Spatial Analysis Research  
USDA/National Agricultural Statistics Service

*Border-Area Water Management Remote Sensing Workshop*



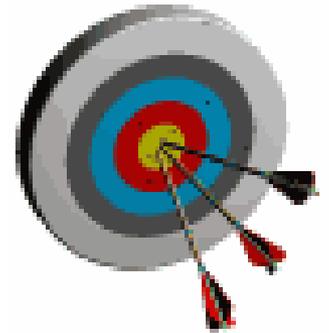
# Agenda

- Cropland Data Layer
  - Objective
  - Coverage
    - Fallow/idle
  - Geospatial Dissemination & Analytics
    - CropScape
- Call for industry geospatial data

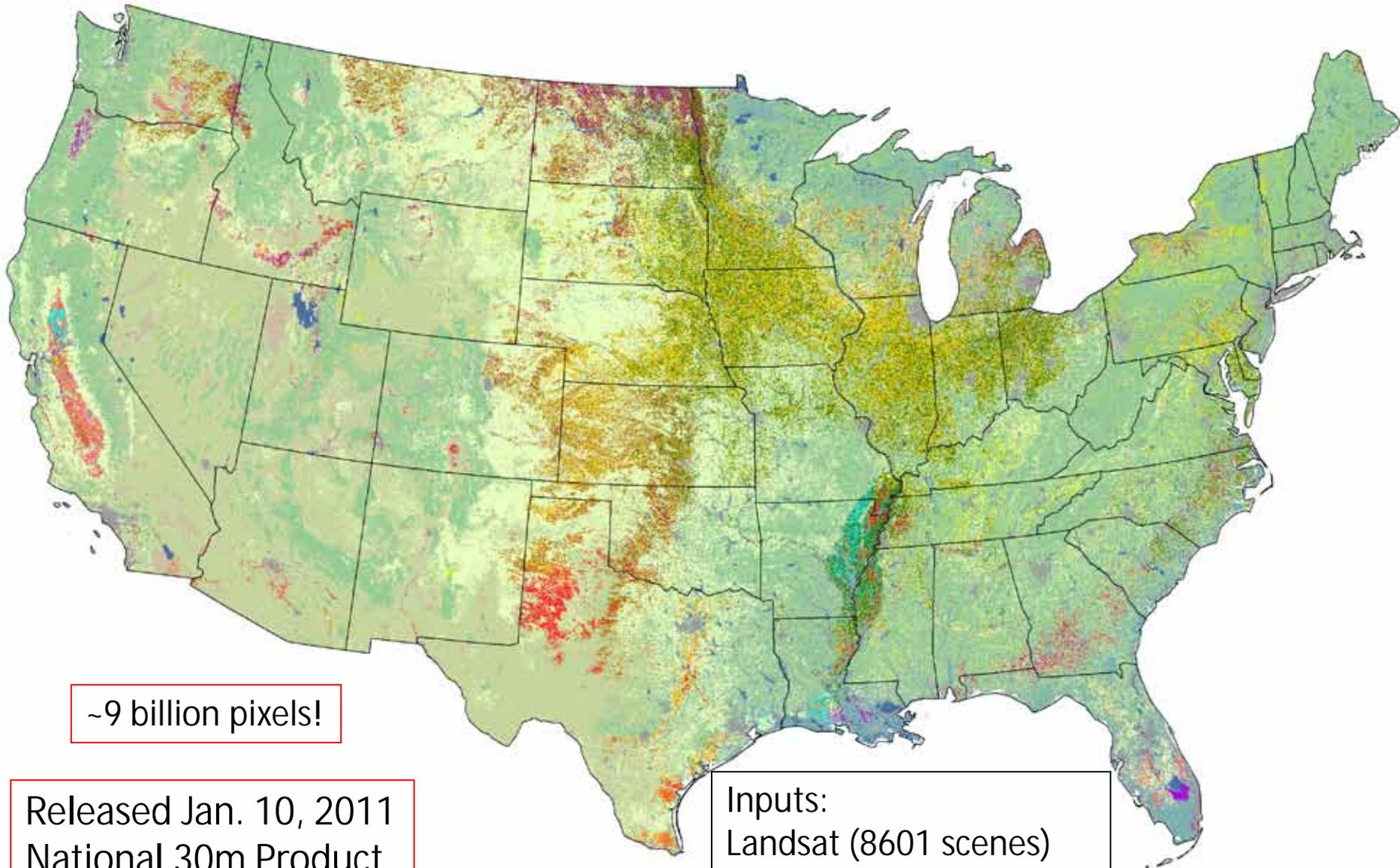


# Cropland Data Layer (CDL) Objectives

- § “Census by Satellite”
  - § *Annually* cover major program crops and regions
  - § Operational Program
  
- § Deliver in-season remote sensing acreage estimates
  - § For June, August, September, and October Official Reports
  - § Update planted area
  - § Reduce respondent burden
  
- § Provide timely, accurate, useful estimates
  - § Measurable error
  - § Unbiased/independent estimator
  - § State, District, County
  
- § Public domain crop specific crop classification
  - § <http://nassgeodata.gmu.edu/CropScape>
  - § [NRCS Geospatial Data Gateway](http://www.nrcs.usda.gov/geospatial/data_gateway/)
  - § <http://www.nass.usda.gov/research/Cropland/SARS1a.htm>
  - § Google “CropScape”



# 2010 Cropland Data Layers



~9 billion pixels!

Released Jan. 10, 2011  
National 30m Product

Inputs:  
Landsat (8601 scenes)  
AWiFS (1194 scenes)

# 2011 Production Plans

January						
Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

February						
Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28					

March						
Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

April						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

Acreage Report – Winter Wheat

Crop Production Report – Corn & Soybeans

May						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

June						
Su	Mo	Tu	We	Th	Fr	Sa
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

July						
Su	Mo	Tu	We	Th	Fr	Sa
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

August						
Su	Mo	Tu	We	Th	Fr	Sa
1	2	3	4	5	6	
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

Crop Production Report – CDL Cotton, Rice, & Peanuts

September						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

October						
Su	Mo	Tu	We	Th	Fr	Sa
					1	
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

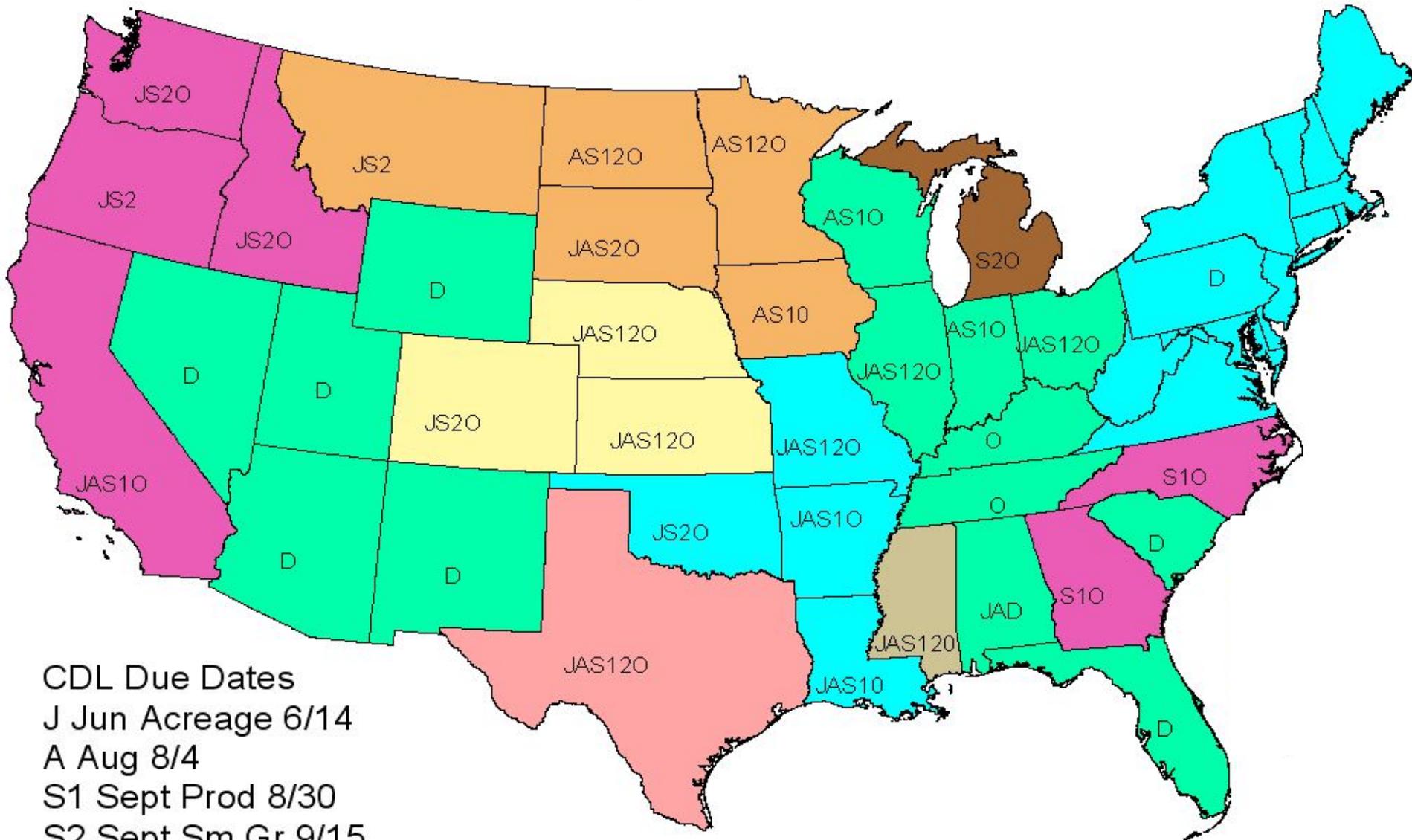
November						
Su	Mo	Tu	We	Th	Fr	Sa
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

December						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

Small Grains Summary

Crop Production Report – All Crops

# 2011 CDL Assignments & Due Dates



## CDL Due Dates

J Jun Acreage 6/14

A Aug 8/4

S1 Sept Prod 8/30

S2 Sept Sm Gr 9/15

O Oct Prod 9/29

D Dec 15

# Cropland Data Layer Analyst Coverage



Jun winter wheat



Aug assessment



Sep cotton/peanuts



Sep all small grains



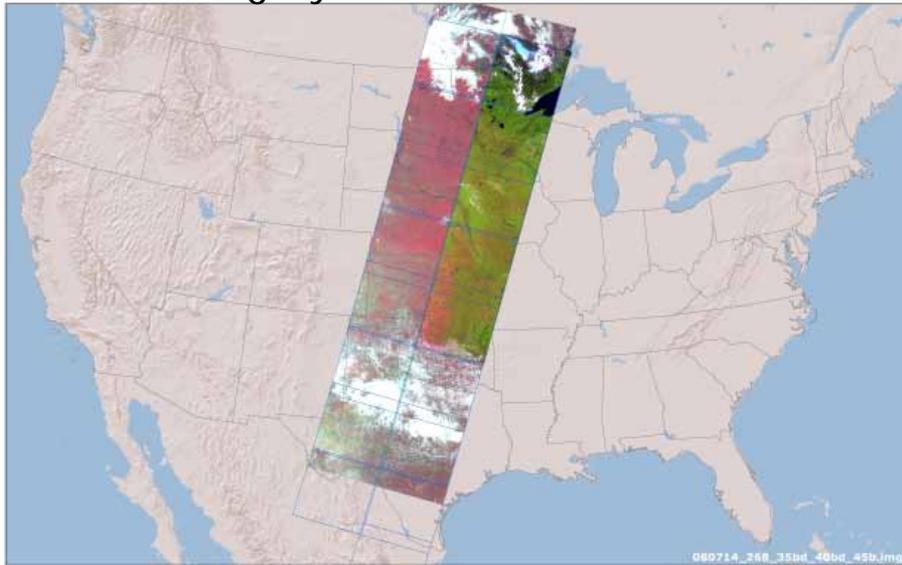
Oct all crops



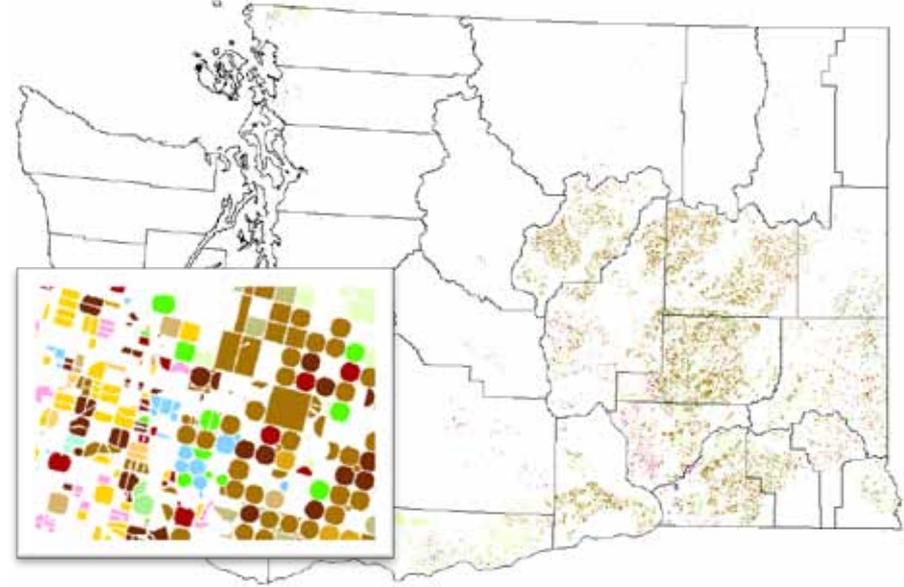
Total season analyst coverage

# 2011 Cropland Data Layer Inputs

Satellite Imagery – DMC & Landsat



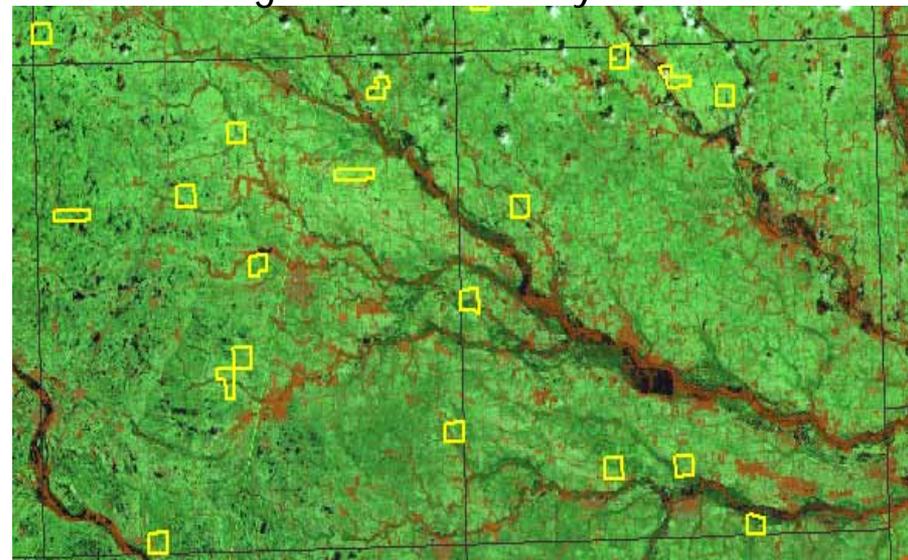
Farm Service Agency: Common Land Unit Unit



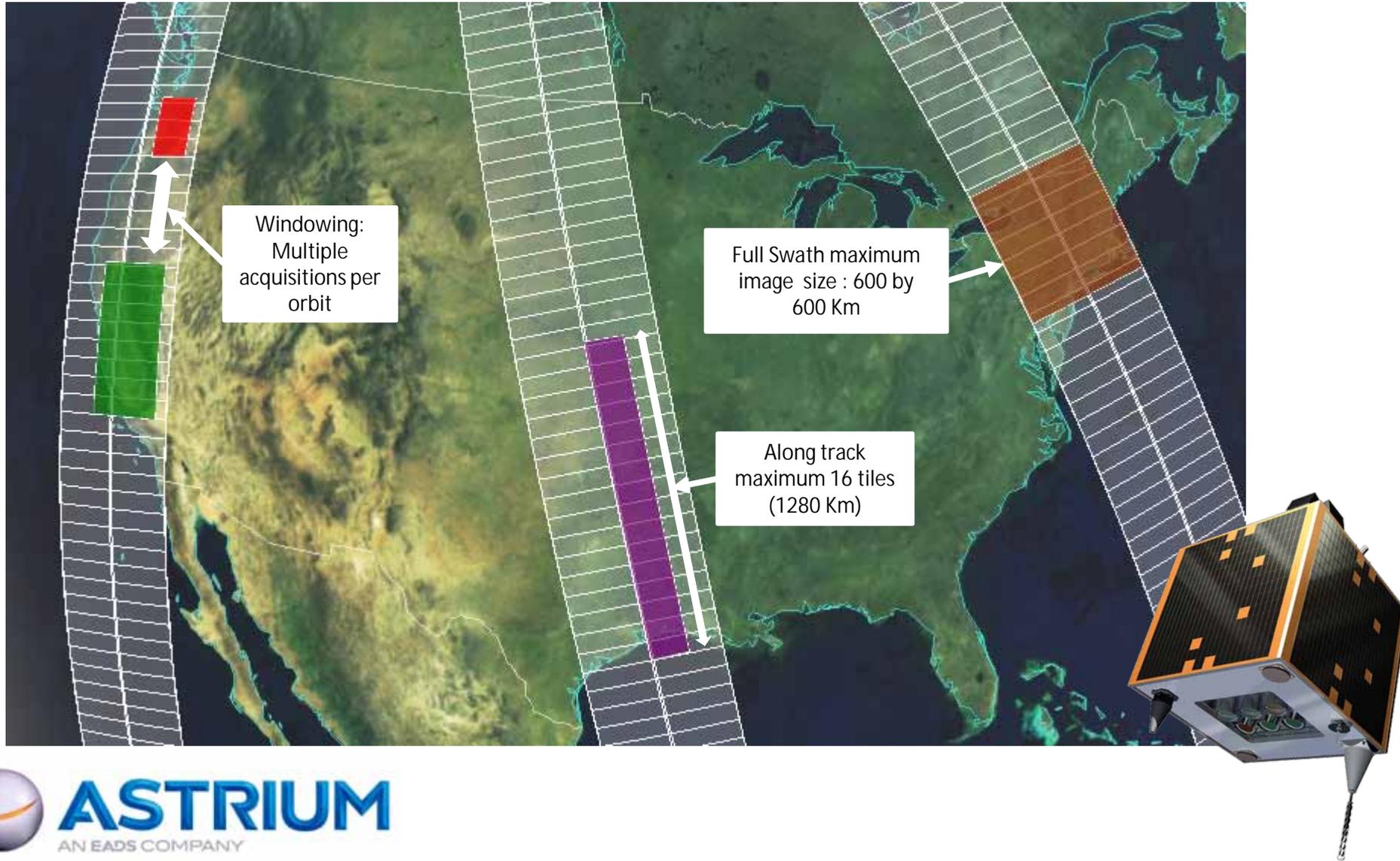
2006 NLCD & Derivative products



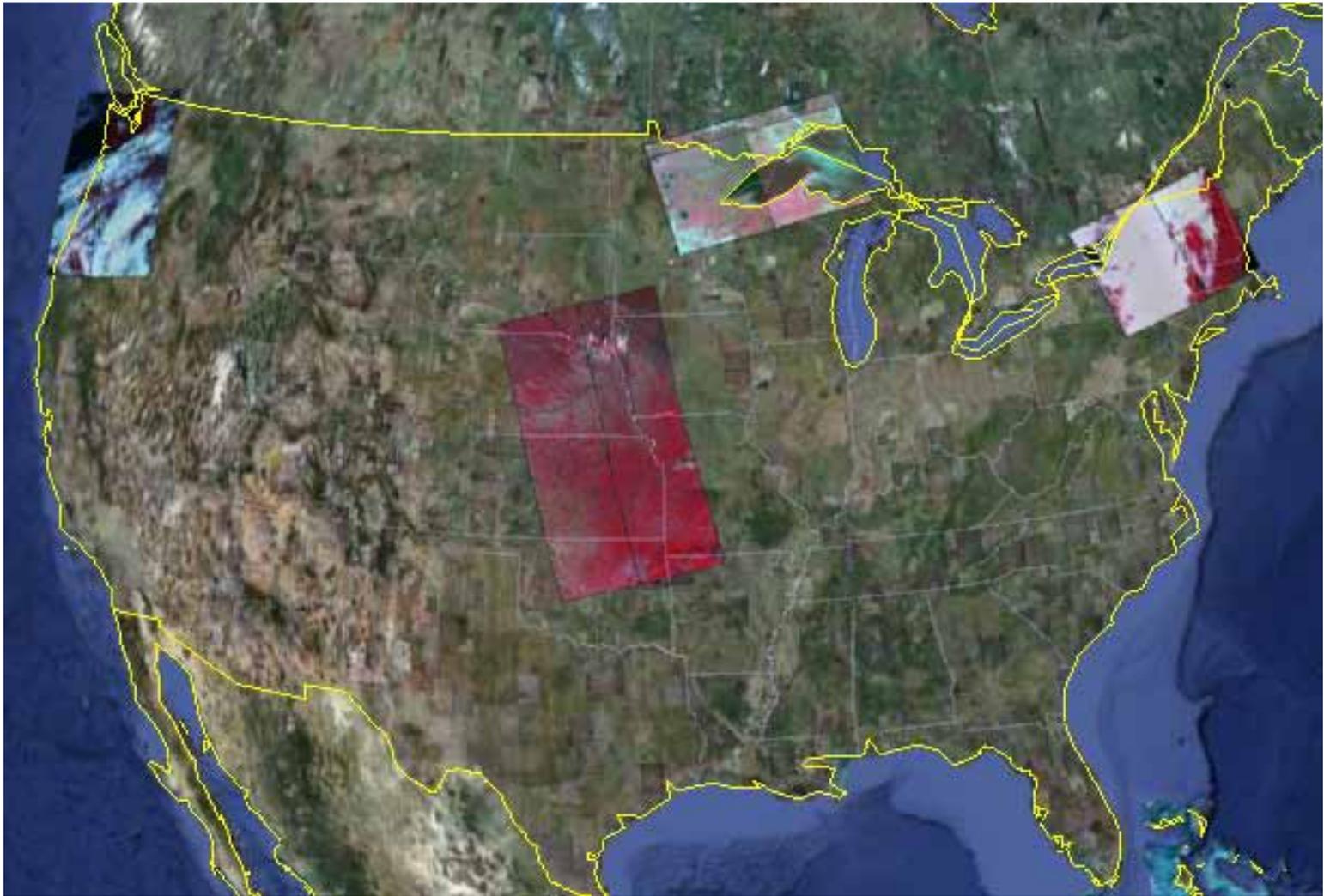
NASS June Agricultural Survey



# 2011 Deimos-1/UK2 Satellite Tasking



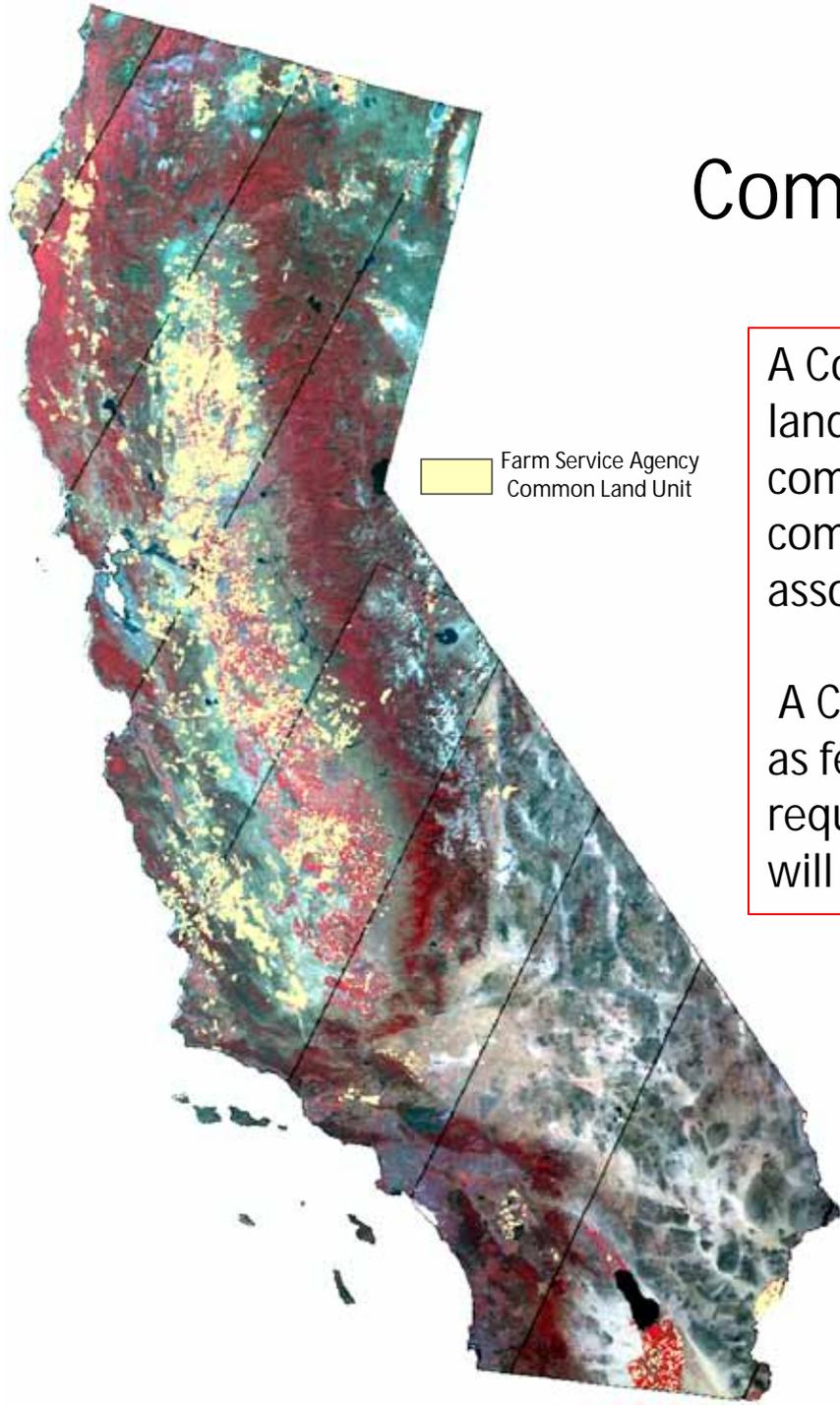
# Deimos-1 & UK2 June 5, 2011 Collects



# Comparative Satellite Information

	Deimos-1/UK2	AWiFS	Landsat	
Launch Date	Jul 2009	Oct. 2003	1984 & 1999	
Resolution	22m	56m	30m	
Spectral Bands	B2: 0.52 – 0.60 B3: 0.63 – 0.69 B4: 0.77 – 0.90	B2: 0.52 - 0.59 B3: 0.62 - 0.68 B4: 0.77 - 0.86 B5: 1.55 - 1.70	B2: 0.52 - 0.60 B3: 0.63 - 0.69 B4: 0.75 – 0.90 B5: 1.55 – 1.75	
Swath	600km	740km	185km	
Revisit Rate	4 Days	5 Days	16 Days	
Radiometric Resolution	8 or 10 bit	10 bit	8 bit	

# Farm Service Agency Common Land Unit Coverage

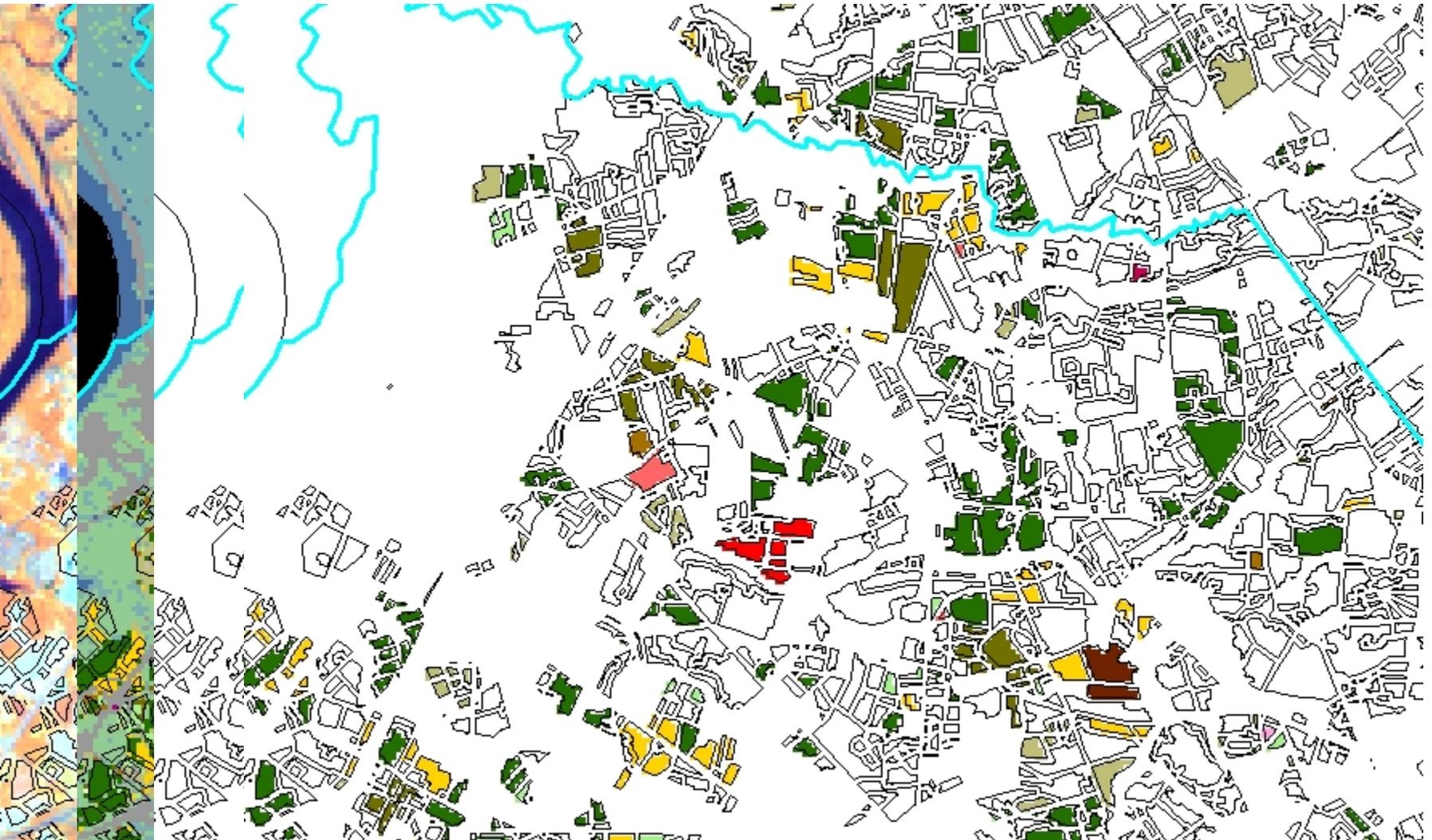


A Common Land Unit (CLU) is the smallest unit of land that has a permanent, contiguous boundary, a common land cover and land management, a common owner and a common producer association.

A CLU is delineated from permanent features such as fence lines, roads, and or waterways. This requirement minimizes the number of changes that will be required in the CLU boundary.

# Common Land Unit (CLU) Overlay

CLU overlay onto raw AWiFS    CLU overlay onto CDL    CLU only    Filtered CLU for processing



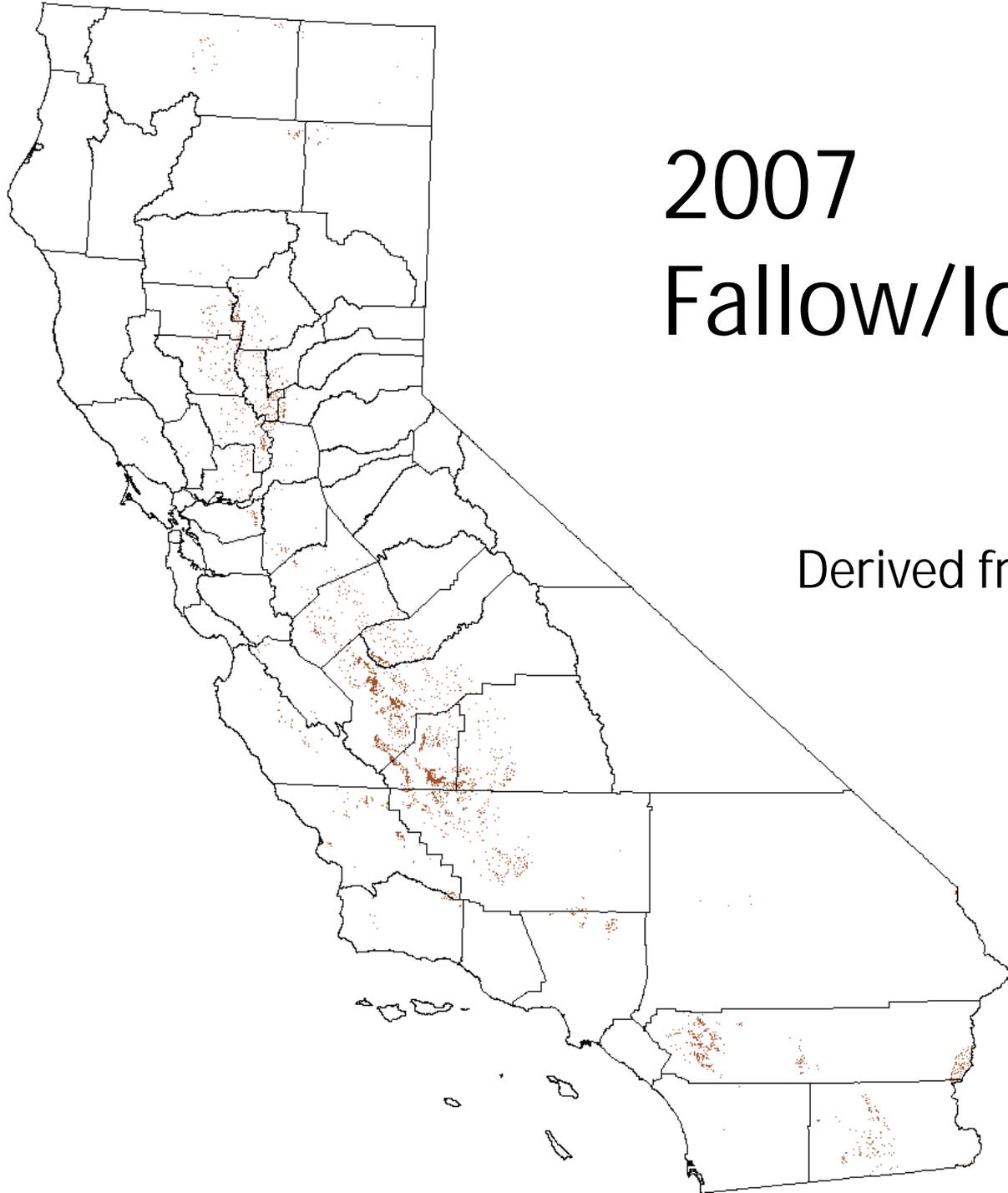
# California Crop Identification



2007

# Fallow/Idle Crop Mask

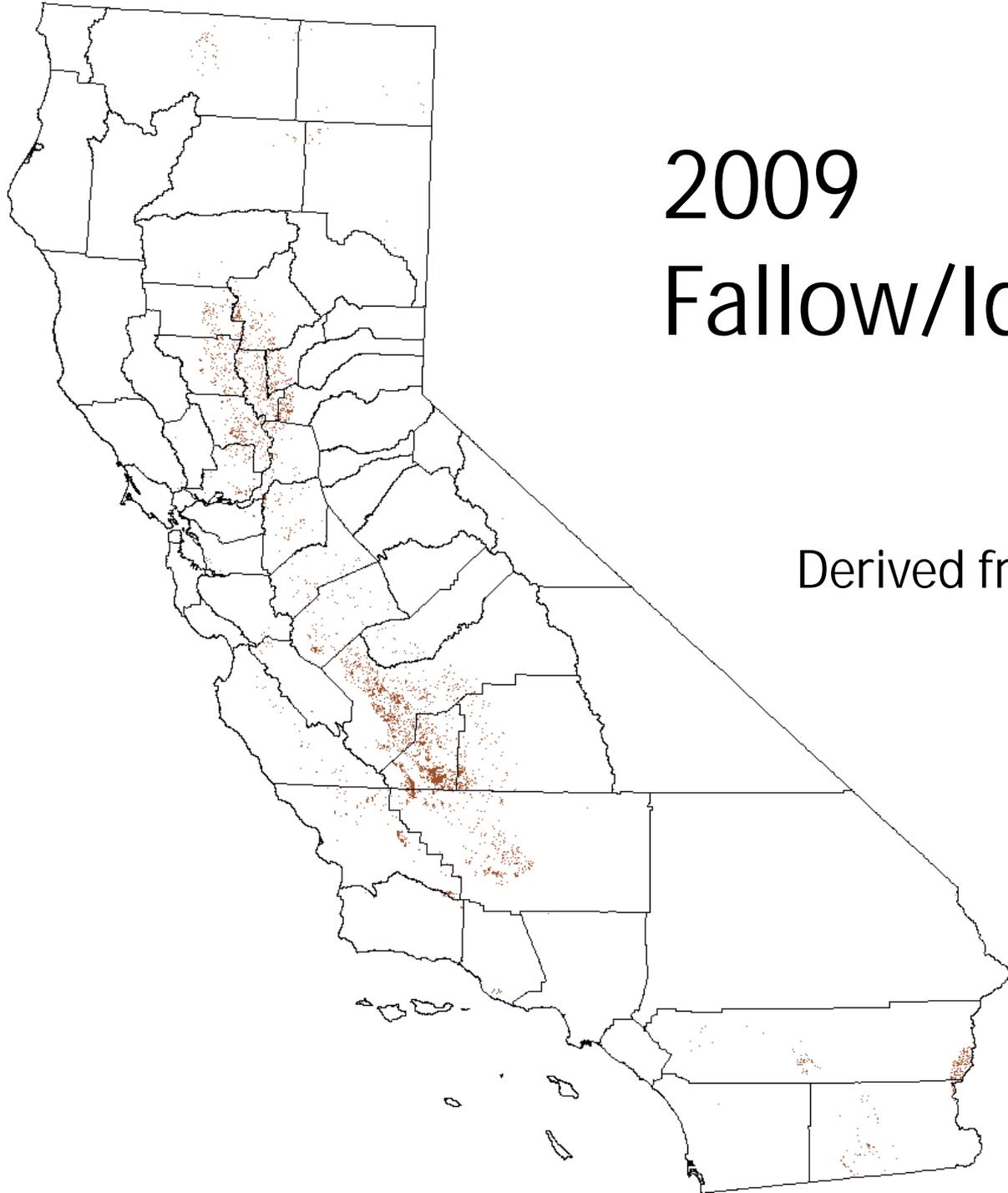
Derived from the CDL



2009

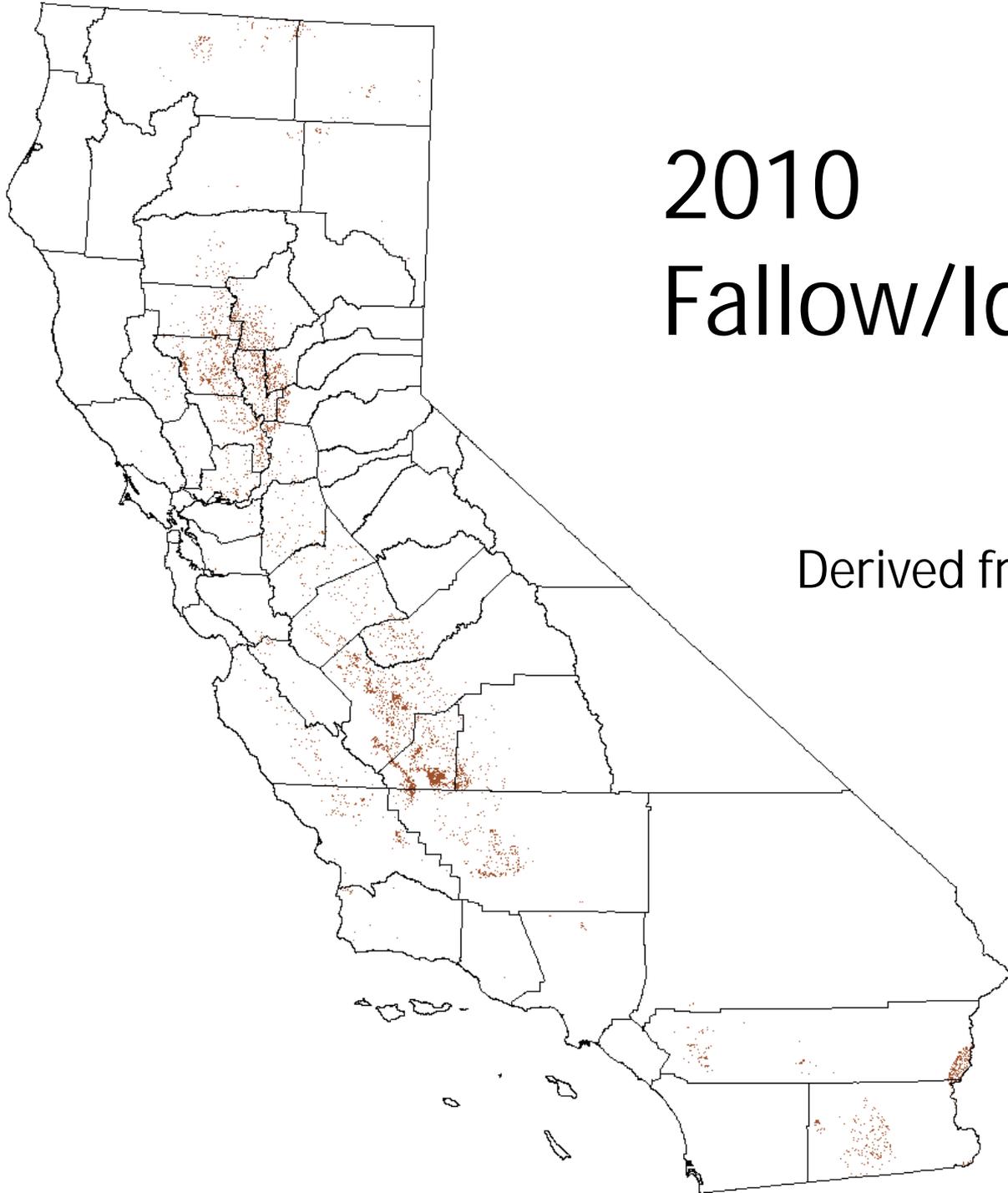
# Fallow/Idle Crop Mask

Derived from the CDL



# 2010 Fallow/Idle Crop Mask

Derived from the CDL



# 2007, 2009, and 2010 Fallow/Idle Crop Mask

Fields classified fallow/idle in all three years

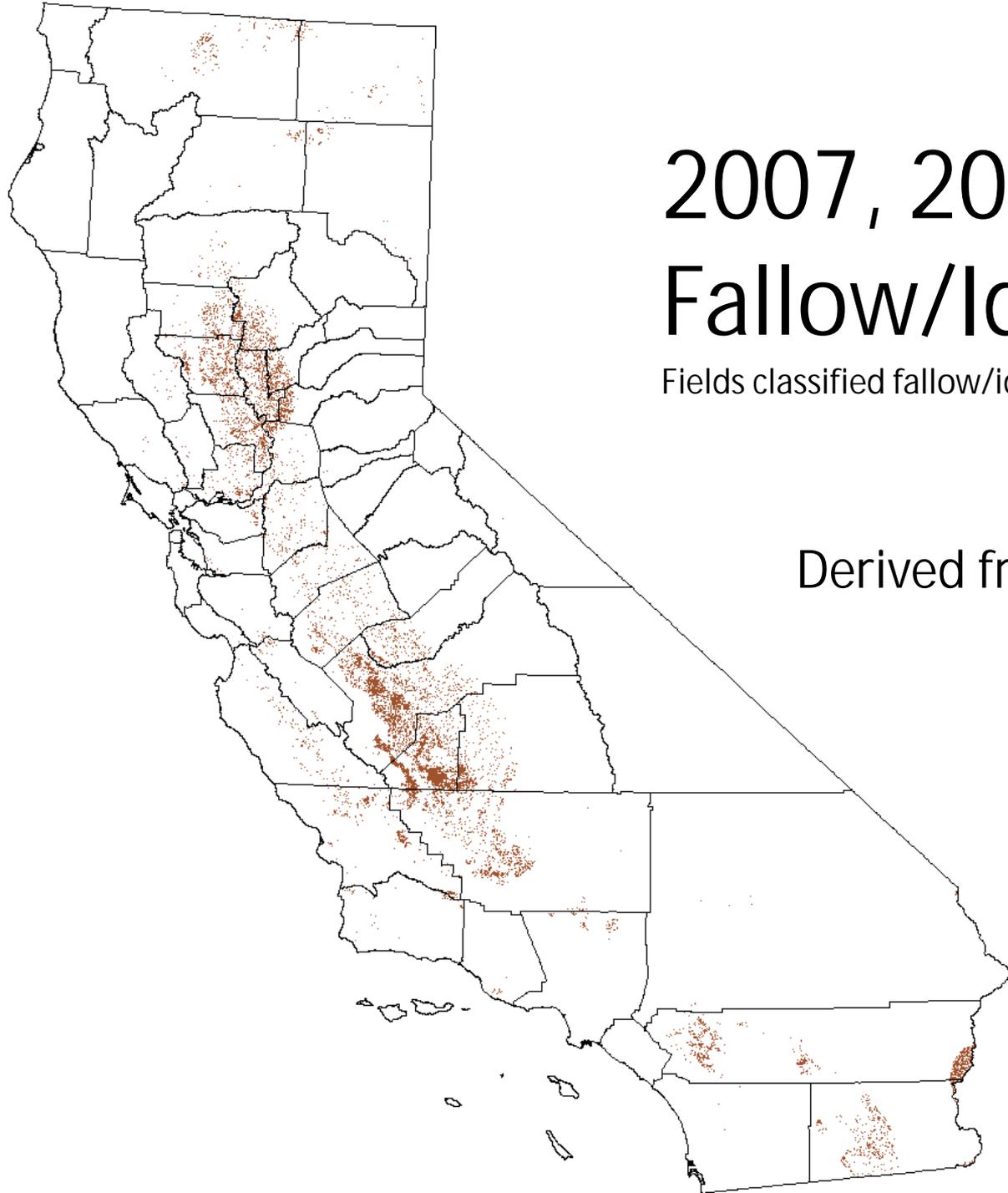
Derived from the CDL



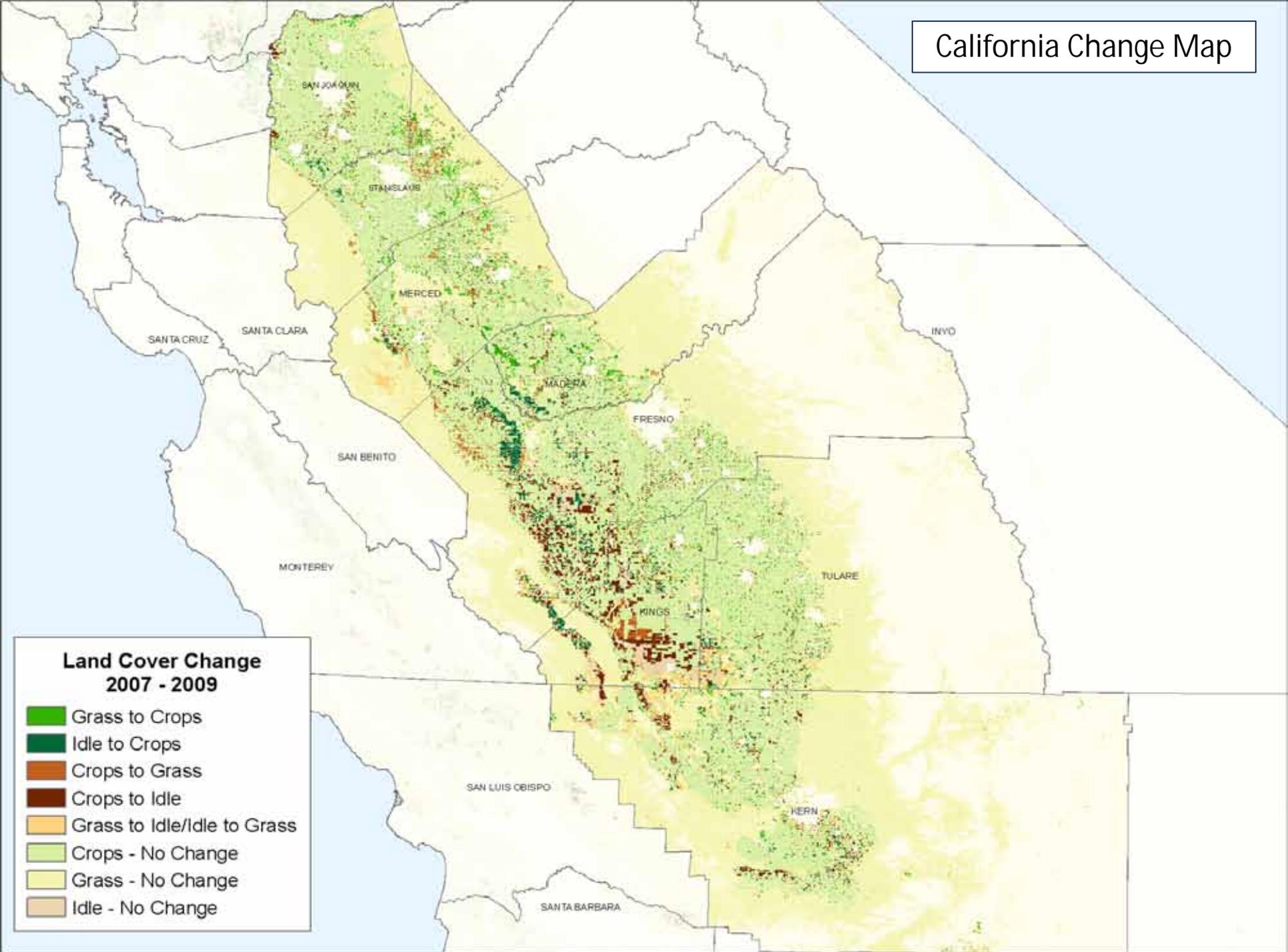
# 2007, 2009, or 2010 Fallow/Idle Crop Mask

Fields classified fallow/idle in at least one of the three years

Derived from the CDL



# California Change Map



## 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



# Geospatial Dissemination & Analytics

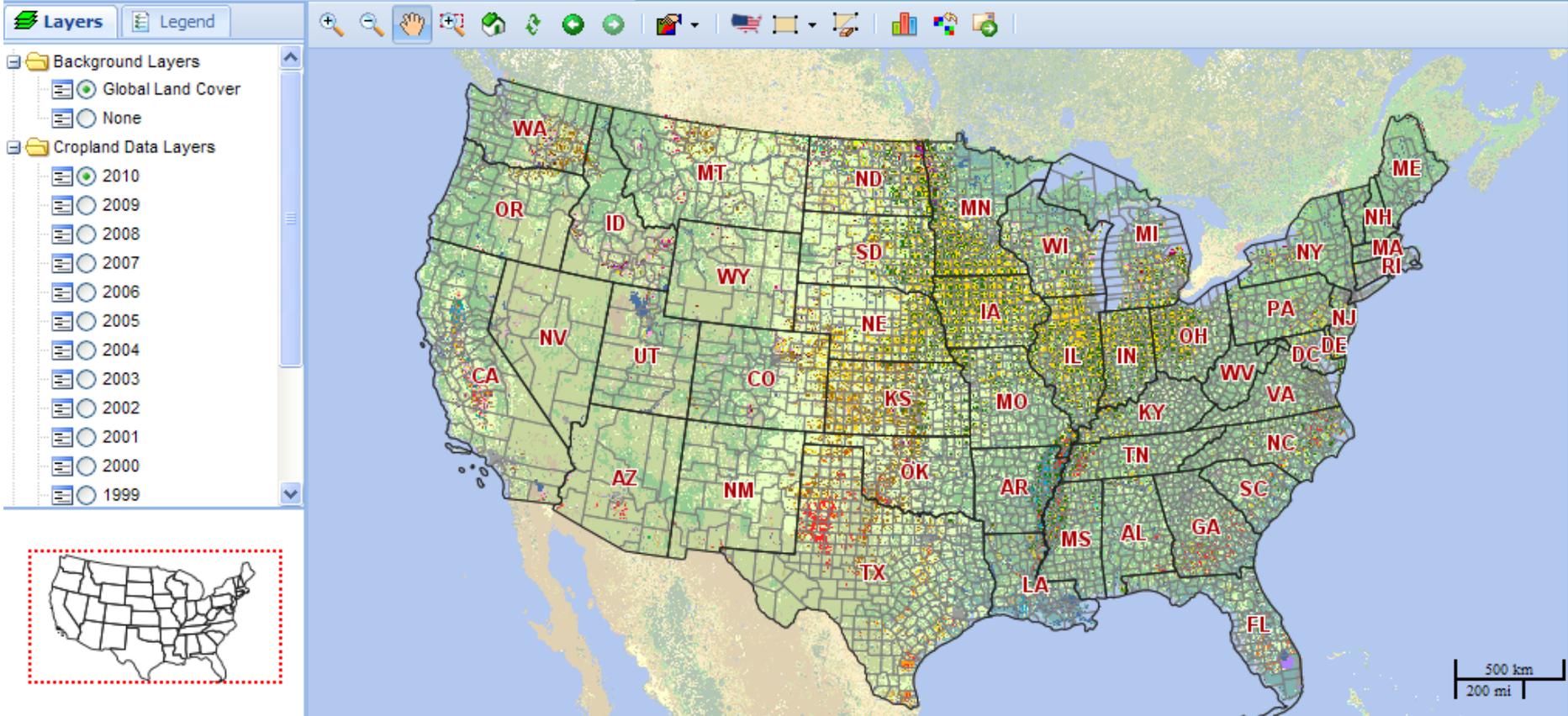
CropScape Web Service Portal

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

USDA United States Department of Agriculture  
National Agricultural Statistics Service



## CropScape - Cropland Data Layer



A web service based interactive map visualization, dissemination and querying system for U.S. cropland



# CropScape Mashups



BIOENERGY  
KNOWLEDGE DISCOVERY FRAMEWORK  
U.S. DEPARTMENT OF ENERGY

Login

Request Account

Like 48

Search

Home

Map

Data Library

About

Contact

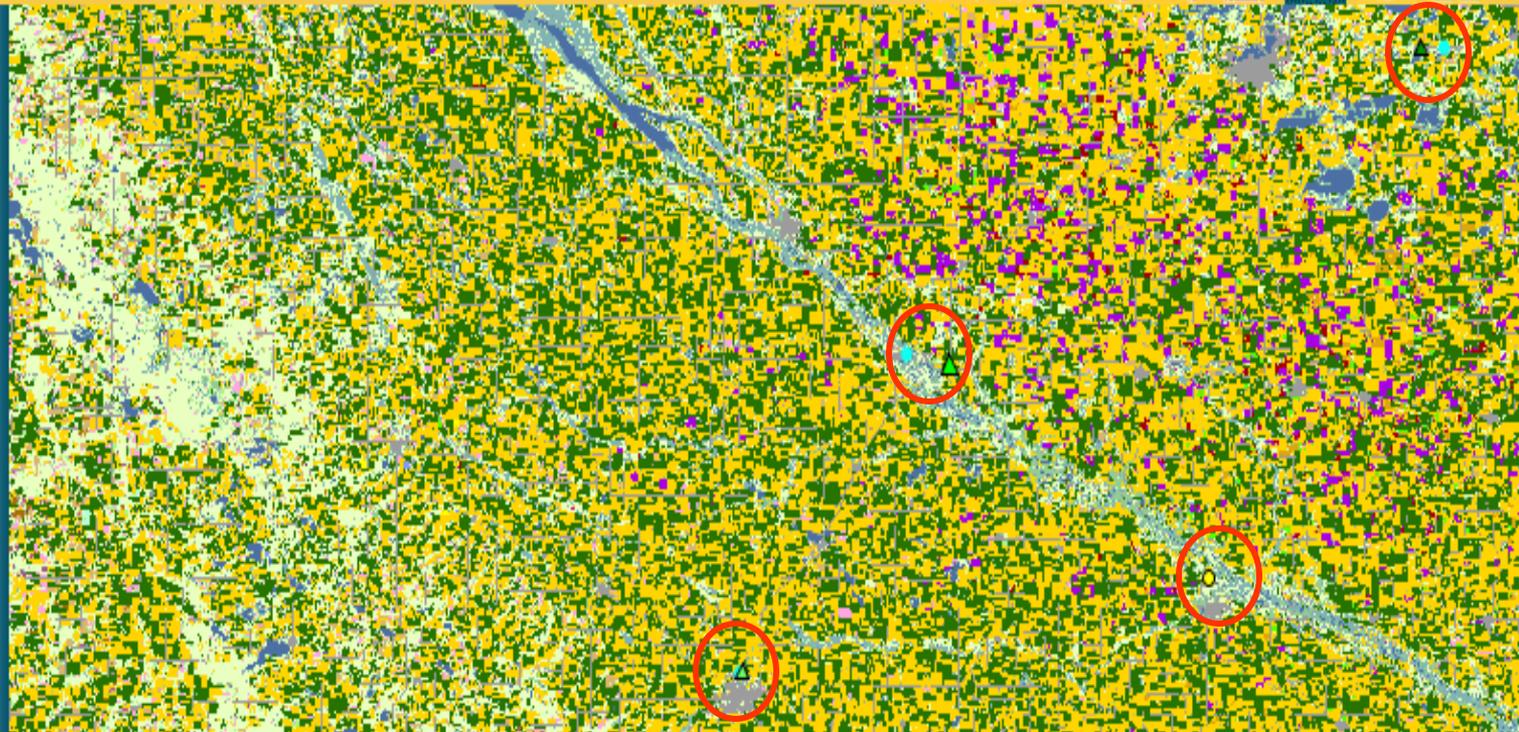
My Layers

Add Data

Attribute Query



- Base Map
- Ethanol Refinery Capacity
- Transload
- Unit Train
- Biodiesel Refinery Capacity
- RFA Biorefineries
- 2010 Cropland Data Layer



From: <https://www.bioenergykdf.net/>

# Need for Timely Industry Geospatial Data

- Improve fruit/nut tree classification accuracy
- Improve small area/specialty crop identification
  - Current focus on summer crops (i.e., April – October)

# 2007 Pixel Count Acreage vs. 2007 Census of Agriculture

ORANGE ACREAGE				
County	Pixel Acreage	Census of Ag	Difference	%
Tulare	14,089	89,671	-75,582	16%
Kern	29,356	52,049	-22,693	56%
Fresno	1,470	35,503	-34,033	4%
Riverside	328	9,272	-8,944	4%

WALNUT ACREAGE				
County	Pixel Acreage	Census of Ag	Difference	%
San Joaquin	68,921	39,859	29,062	173%
Butte	34,660	30,798	3,862	113%
Sutter	31,615	28,149	3,466	112%
Tulare	24,991	26,418	-1,427	95%
Stanislaus	20,551	24,414	-3,863	84%
Tehama	12,155	15,119	-2,964	80%
Glenn	16,890	14,664	2,226	115%
Kings	12,354	12,161	193	102%
Yolo	17,102	10,999	6,103	155%
Fresno	12,200	7,842	4,358	156%
Yuba	16,057	7,193	8,864	223%
Merced	4,774	5,164	-390	92%

ALMONDS ACREAGE				
County	Pixel Acreage	Census of Ag	Difference	%
Kern	202,473	143,473	59,000	141%
Stanislaus	97,968	123,528	-25,560	79%
Fresno	189,267	123,117	66,150	154%
Merced	109,159	103,736	5,423	105%
Madera	73,351	70,299	3,052	104%

Useable remote sensing training data (acres) after filtering

Oranges: 3100

Walnuts: 46300

Almonds: 79300

# Summary

- § CDL program improves agricultural statistics and paramount to other NASS geospatial activities
- § Partnerships with cooperating agencies critical for success
- § Timely delivery of geospatial data and statistical information are critical

# http://cal-adapt.org/

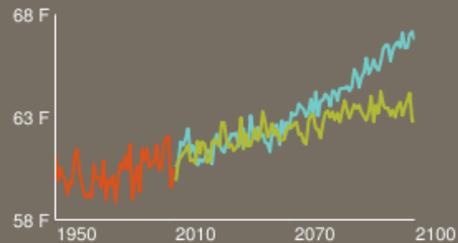
## cal-adapt

EXPLORING CALIFORNIA'S  
CLIMATE CHANGE RESEARCH



### View Local Profiles

QUICKLY EXPLORE CLIMATE PROJECTIONS FOR YOUR LOCAL AREA



### Explore Climate Tools

INTERACTIVE MAPS & CHARTS



### About Cal-Adapt

- WHAT'S NEW?
- WHAT'S TO COME?
- FAQs

### Access Data

ACCESS THE RAW DATA USED IN CAL-ADAPT



Select and download data in a variety of tabular and GIS formats

### Resources

INFORMATION, ARTICLES & LINKS



Find out more about how climate change in California is relevant to your community

### Community

PARTICIPATE IN COMMUNITY BASED TOOLS AND ACTIVITIES



Find out how you can share your thoughts and findings, communicate with experts, and help to collect new data



13



# Thank you!



Spatial Analysis Research Section  
USDA/NASS R&D Division

[nassgeodata.gmu/CropScape](http://nassgeodata.gmu/CropScape)