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:
- Yellow: Corn
- Brown: Winter Wheat
- Blue: Rice
- Green: Soybeans
- Pink: Alfalfa
Inputs

Satellite Imagery - AWiFS & Landsat TM

Farm Service Agency – Common Land Unit

NLCD Derivative Products
- Forest Canopy
- Elevation
- Impervious

NLCD
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
August 29, 2009
FSA Groundtruth
Known Fields
Crop Land Data Layer 2009

Land Cover Categories
- Agriculture
  - Pasture/Grass
  - Alfalfa
  - Fallow/Idle Cropland
  - 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

- > .66 High
- .60 - .66
- .53 - .59
- .48 - .52
- .41 - .47
- .34 - .40
- .26 - .33
- .16 - .25
- .11 - .15
- .05 - .10
- < .05 Low

Water, Clouds/Snow
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

2009 Cropland Data Layer

Land Cover Categories (by decreasing acreage)

AGRICULTURE
- Pasture/Grass
- Alfalfa
- Fallow/idle Cropland
- Amonds
- Winter Wheat
- Rice
- Other Hays
- Corn
- Grapes
- Walnuts
- Oats
- Cotton
- Durum Wheat
- Oranges
- Tomatoes
- Other Tree Nuts & Fruits
- Olives
- Peaches/Plums/Apricots
- Raines
- Clover/Wildflowers
- Med. Vg's & Fruits
- Other Crops/Seed/Seed Grass
- Sunflowers
- Safflower
- Triticale
- Spring Wheat
Challenges

- Very diverse agriculture in CA
  Double, triple, & quadruple cropping in some areas

- CDLs are best equipped to identify large fields of agriculture

- Grass can be difficult to identify accurately
# 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

<table>
<thead>
<tr>
<th>2009</th>
<th>FSA CROPS</th>
<th>IDLE/GRASS</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Producer</td>
<td>User</td>
</tr>
<tr>
<td>District 51</td>
<td>77.50%</td>
<td>81.74%</td>
</tr>
<tr>
<td>San Joaquin</td>
<td>84.06%</td>
<td>85.78%</td>
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<tr>
<td>Stanislaus</td>
<td>74.19%</td>
<td>99.33%</td>
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<td>Merced</td>
<td>73.92%</td>
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<tr>
<td>Madera</td>
<td>72.13%</td>
<td>81.11%</td>
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<td>Fresno</td>
<td>75.52%</td>
<td>74.74%</td>
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<tr>
<td>Kings</td>
<td>79.11%</td>
<td>83.85%</td>
</tr>
<tr>
<td>Tulare</td>
<td>64.00%</td>
<td>87.64%</td>
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<tr>
<td>Kern</td>
<td>81.76%</td>
<td>91.89%</td>
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Method

Recode 2007 and 2009 CDLs

Add recoded CDLs together

Analyze Results

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<td>Grass</td>
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<tr>
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<td>3</td>
<td>Idle</td>
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<td>Idle</td>
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<tr>
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<td>4</td>
<td>Ag 07</td>
<td>5</td>
<td>Ag 07 + Ag 09</td>
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<td>Grass 07</td>
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<td>Idle 07 + Ag 09</td>
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<td>Grass 09</td>
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<td>Grass 09</td>
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<td>Ag 07 + Ag 09</td>
<td>9</td>
<td>Ag 07 + Grass 09</td>
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</table>

Recode 2007 and 2009 CDLs

Add recoded CDLs together

Analyze Results
2007 to 2009

<table>
<thead>
<tr>
<th>Land Use Change</th>
<th>Acreage</th>
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<tbody>
<tr>
<td>Crops to Idle/Grass</td>
<td>379,173</td>
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<tr>
<td>Idle/Grass to Crops</td>
<td>175,258</td>
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<tr>
<td>Difference</td>
<td>203,915</td>
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## Summary

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

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

- Three counties most affected in District 51 are
  - Kings
  - Fresno
  - Kern
Smart Eliminate

MMU = Minimum Mapping Unit

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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