Change in California Farmland Using Cropland Data Layer
2007 vs. 2009

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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
- Red: Cotton
- Pink: Alfalfa
Inputs

Satellite Imagery - AWiFS & Landsat TM

Farm Service Agency – Common Land Unit

NLCD Derivative Products

- Forest Canopy
- Impervious
- Elevation
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
June 26, 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
Crop Land Data Layer 2007
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

No Water (for)

Compiled by: USGS/NAICS & USDA/NAIS, NOAA/AVHRR Bl. ERI Resolution
Composite Imagery: USGS/EROS Data Center, Image at http://www.nlds.ags.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

2009 Cropland Data Layer

Land Cover Categories (by decreasing acreage)

AGRICULTURE
- Posture/Grass
- Alfalfa
- Fallow/Idle Cropland
- Almonds
- Winter Wheat
- Rice
- Other Hays
- Corn
- Grapes
- Walnuts
- Oats
- Cotton
- Durum Wheat
- Oranges
- Tomatoes
- Other_tree Nuts & Fruits
- Olives
- Peaches/Plums-Apricots
- Raspberries
- Clover/Wildflowers
- Misc. Fruits & Nuts
- Other Corps/Seed/Sod Grass
- Sunflowers
- Safflower
- Sesame
- Triticale
- Spring Wheat

[Map showing different areas and land cover categories for 2007 and 2009 with various colors representing different crops and vegetation types]
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

<table>
<thead>
<tr>
<th>2009</th>
<th>FSA CROPS</th>
<th>IDLE/GRASS</th>
</tr>
</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>
</tr>
<tr>
<td>Stanislaus</td>
<td>74.19%</td>
<td>99.33%</td>
</tr>
<tr>
<td>Merced</td>
<td>73.92%</td>
<td>77.92%</td>
</tr>
<tr>
<td>Madera</td>
<td>72.13%</td>
<td>81.11%</td>
</tr>
<tr>
<td>Fresno</td>
<td>75.52%</td>
<td>74.74%</td>
</tr>
<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>
</tr>
<tr>
<td>Kern</td>
<td>81.76%</td>
<td>91.89%</td>
</tr>
</tbody>
</table>
**Method**

**Recode 2007 and 2009 CDLs**

**Add recoded CDLs together**

**Analyze Results**

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**2007**

<table>
<thead>
<tr>
<th>Value</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Agriculture</td>
</tr>
<tr>
<td>2</td>
<td>Grass</td>
</tr>
<tr>
<td>3</td>
<td>Idle</td>
</tr>
</tbody>
</table>

**2009**

<table>
<thead>
<tr>
<th>Value</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>Agriculture</td>
</tr>
<tr>
<td>8</td>
<td>Grass</td>
</tr>
<tr>
<td>12</td>
<td>Idle</td>
</tr>
</tbody>
</table>

**2007 + 2009**

<table>
<thead>
<tr>
<th>Value</th>
<th>Category</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Ag 07</td>
</tr>
<tr>
<td>2</td>
<td>Grass 07</td>
</tr>
<tr>
<td>3</td>
<td>Idle 07</td>
</tr>
<tr>
<td>4</td>
<td>Ag 09</td>
</tr>
<tr>
<td>5</td>
<td>Ag 07 + Ag 09</td>
</tr>
<tr>
<td>6</td>
<td>Grass 07 + Ag 09</td>
</tr>
<tr>
<td>7</td>
<td>Idle 07 + Ag 09</td>
</tr>
<tr>
<td>8</td>
<td>Grass 09</td>
</tr>
<tr>
<td>9</td>
<td>Ag 07 + Grass 09</td>
</tr>
<tr>
<td>10</td>
<td>Grass 07 + Grass 09</td>
</tr>
<tr>
<td>11</td>
<td>Idle 07 + Grass 09</td>
</tr>
<tr>
<td>12</td>
<td>Idle 09</td>
</tr>
<tr>
<td>13</td>
<td>Ag 07 + Idle 09</td>
</tr>
<tr>
<td>14</td>
<td>Grass 07 + Idle 09</td>
</tr>
<tr>
<td>15</td>
<td>Idle 07 + Idle 09</td>
</tr>
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</table>
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

<table>
<thead>
<tr>
<th>Conversion</th>
<th>Acreage</th>
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</thead>
<tbody>
<tr>
<td>Crops to Idle/Grass</td>
<td>379,173</td>
</tr>
<tr>
<td>Idle/Grass to Crops</td>
<td>175,258</td>
</tr>
<tr>
<td>Difference</td>
<td>203,915</td>
</tr>
</tbody>
</table>
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

MADERA

<table>
<thead>
<tr>
<th>Change Type</th>
<th>Acreage</th>
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</thead>
<tbody>
<tr>
<td>Crops to Idle/Grass</td>
<td>13,016</td>
</tr>
<tr>
<td>Idle/Grass to Crops</td>
<td>20,735</td>
</tr>
<tr>
<td>Difference</td>
<td>(7,719)</td>
</tr>
</tbody>
</table>
Summary

- 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

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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