



# **Geospatial Data for Mapping Pesticide Use Patterns**

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April 15, 2015



# Goal

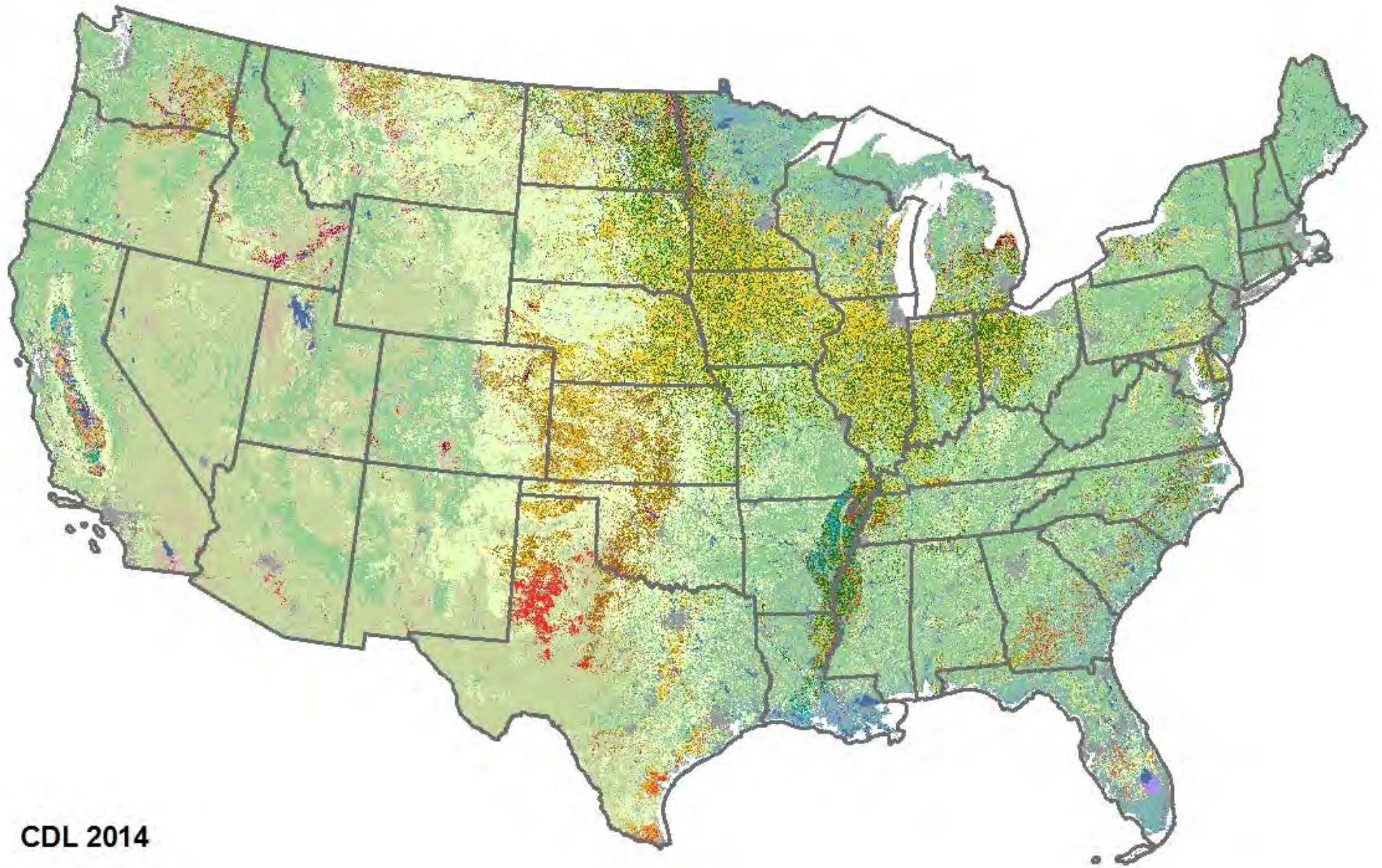
- Develop necessary spatial layers to move through Step 1 of the process
  - Step 1 of the three-step risk assessment and consultation process requires that EPA determine the extent to which areas proposed for pesticide application and listed species ranges coexist.

# Overview

- Pesticide Use Sites
  - Data layers to be as inclusive as possible so the output is not likely to underestimate distribution based on labeling.
  - Cropland Data Layer (CDL)
    - Cross walked into general categories
    - Aggregated across multiple years
    - Footprint of crop categories adjusted to National Agricultural Statistic Service (NASS) census levels
    - Leverages National Land Cover Dataset (NLCD) non-ag classes

# USDA Cropland Data Layer (CDL)

- Agricultural land cover data
- Annually produced on a state basis from satellite imagery and ancillary data
  - Landsat, MODIS, Disaster Monitoring Constellation (DMC) DEIMOS-1 and UK2, NED, NLCD
- The Farm Service Agency (FSA) Common Land Unit (CLU) program provides training and validation data



CDL 2014

# Reducing Uncertainty

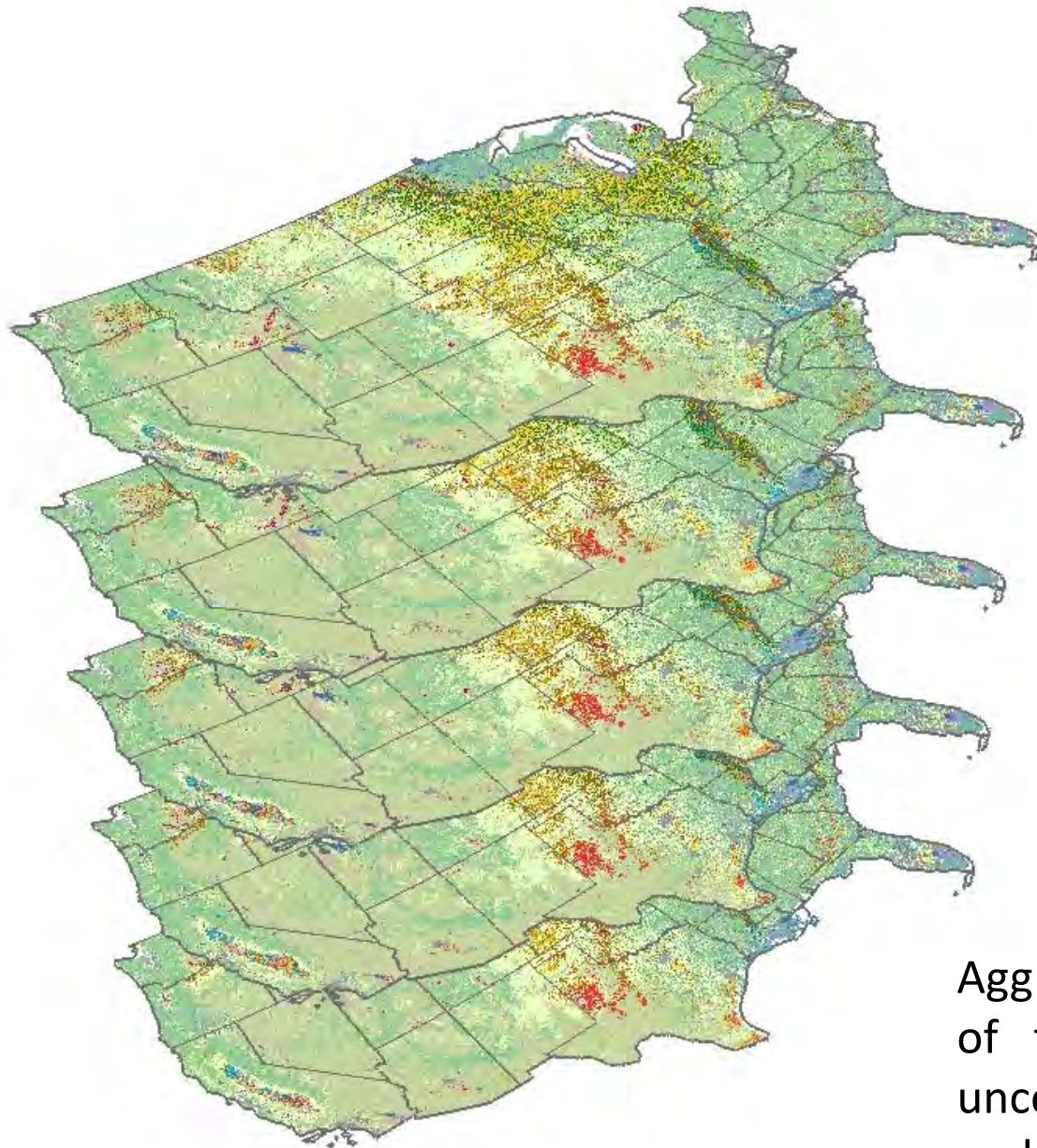
- Crop classes are lumped to help account for classification uncertainty
  - High-confidence crops represented individually
  - Lower-confidence crops represented by groups
  - Classification is hierarchical
    - Crops can always be further lumped/split
- Temporal (multi-year) aggregation performed to help account for temporal and spatial uncertainty
  - Five years
  - Number of years can be easily changed
  - Use of years with 30 meter resolution for aggregation

# Thematic Classes

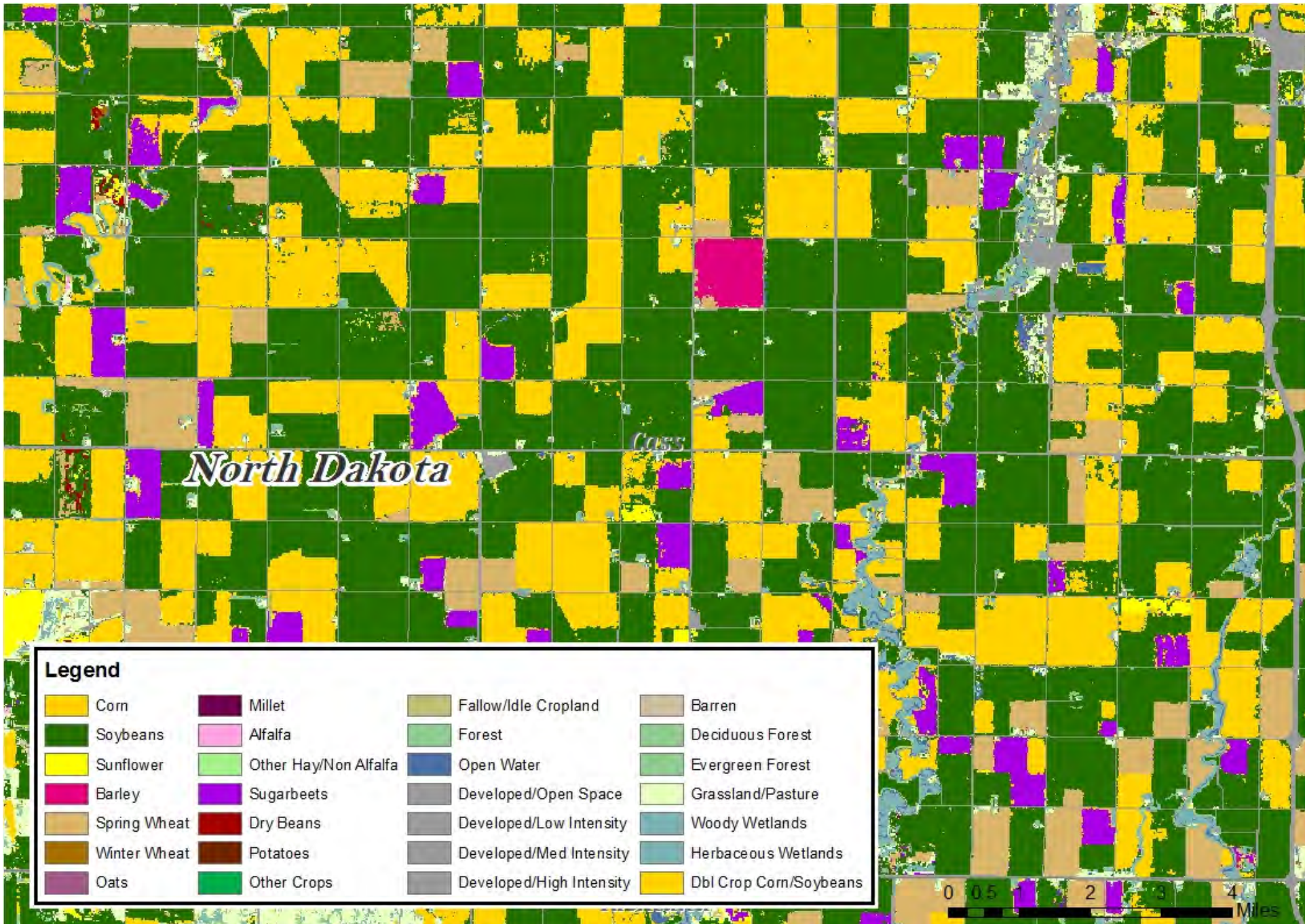
- 111 crop classes + general land cover classes
- Crosswalk original CDL ag classes into 11 generalized crop groups
  - Corn
  - Soybeans
  - Cotton
  - Wheat
  - Rice
  - Other Grains
  - Vegetables/Ground Fruit
  - Other Row Crops
  - Orchards/Vineyards
  - Pasture/Hay
  - Other Crops

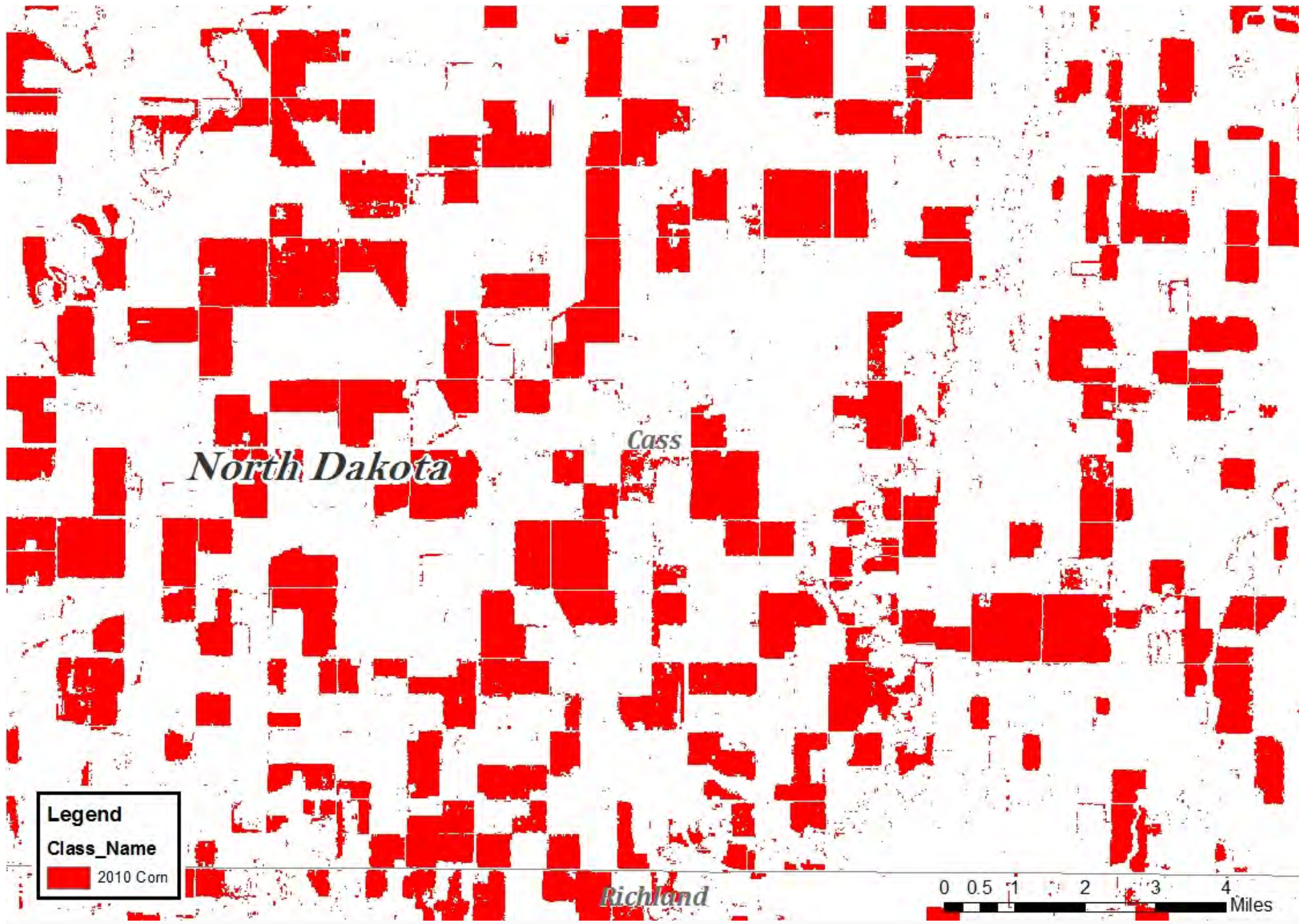


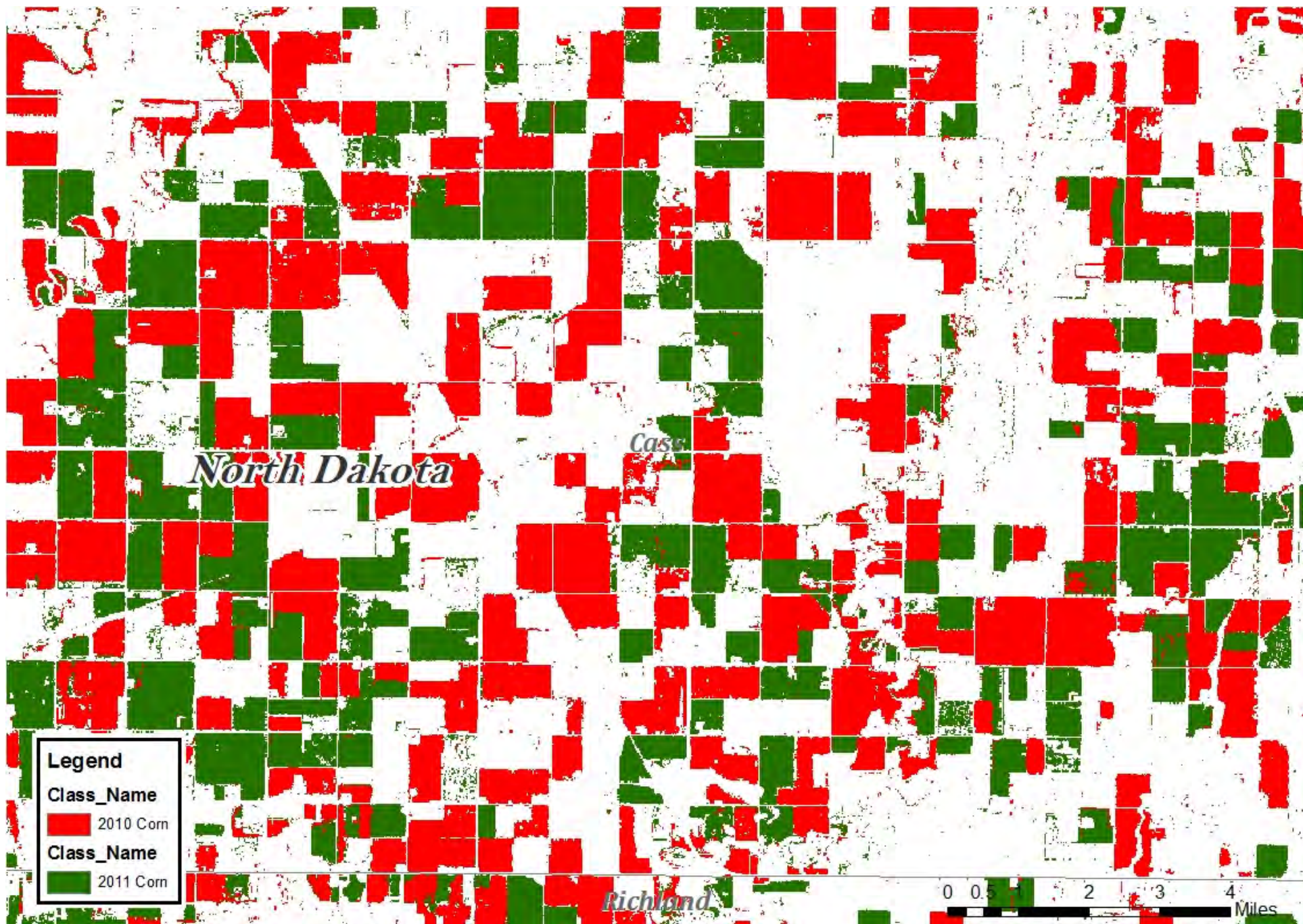


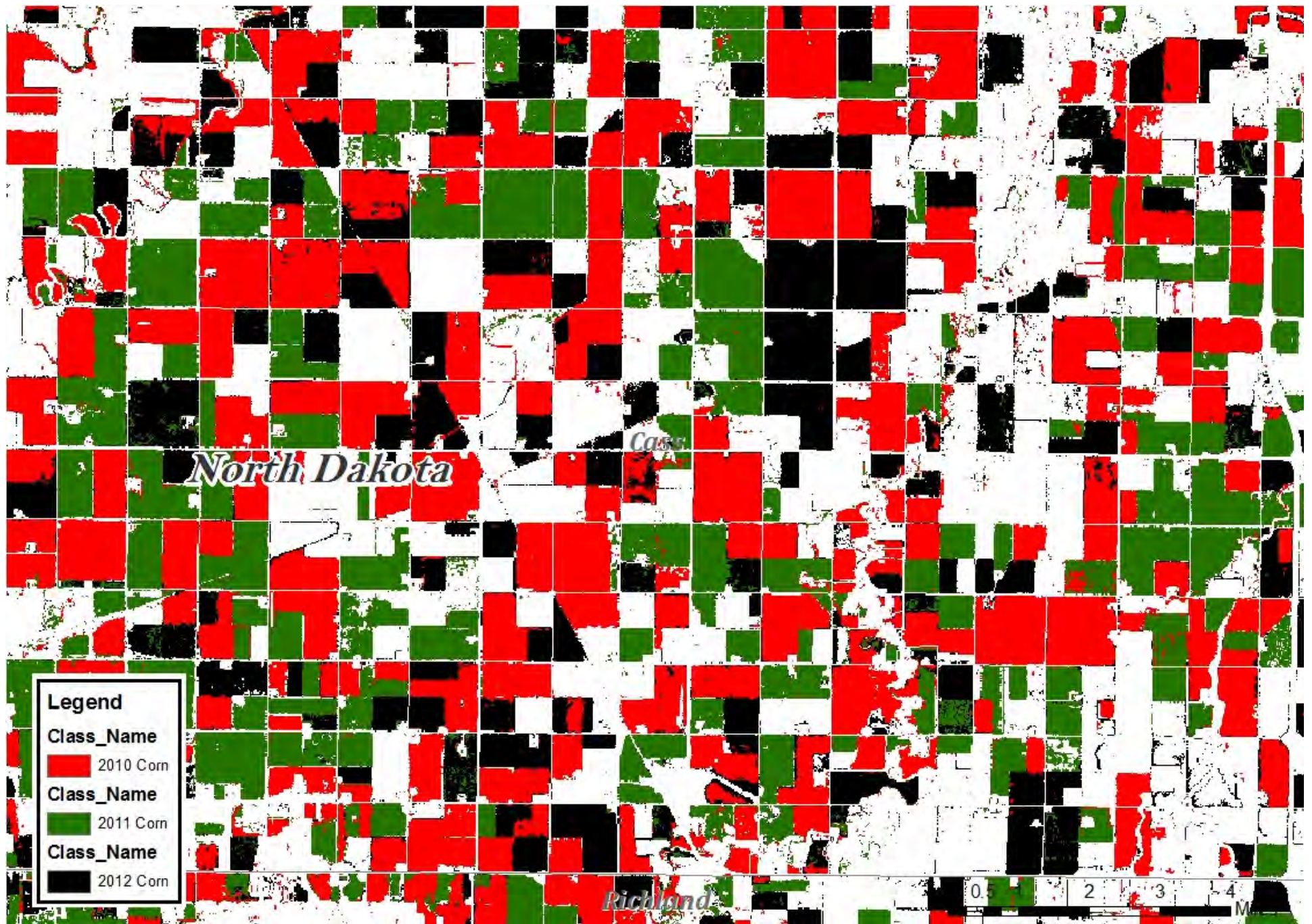


Aggregating multiple years of the CDL data reduces uncertainty in the product and helps account for crop rotation

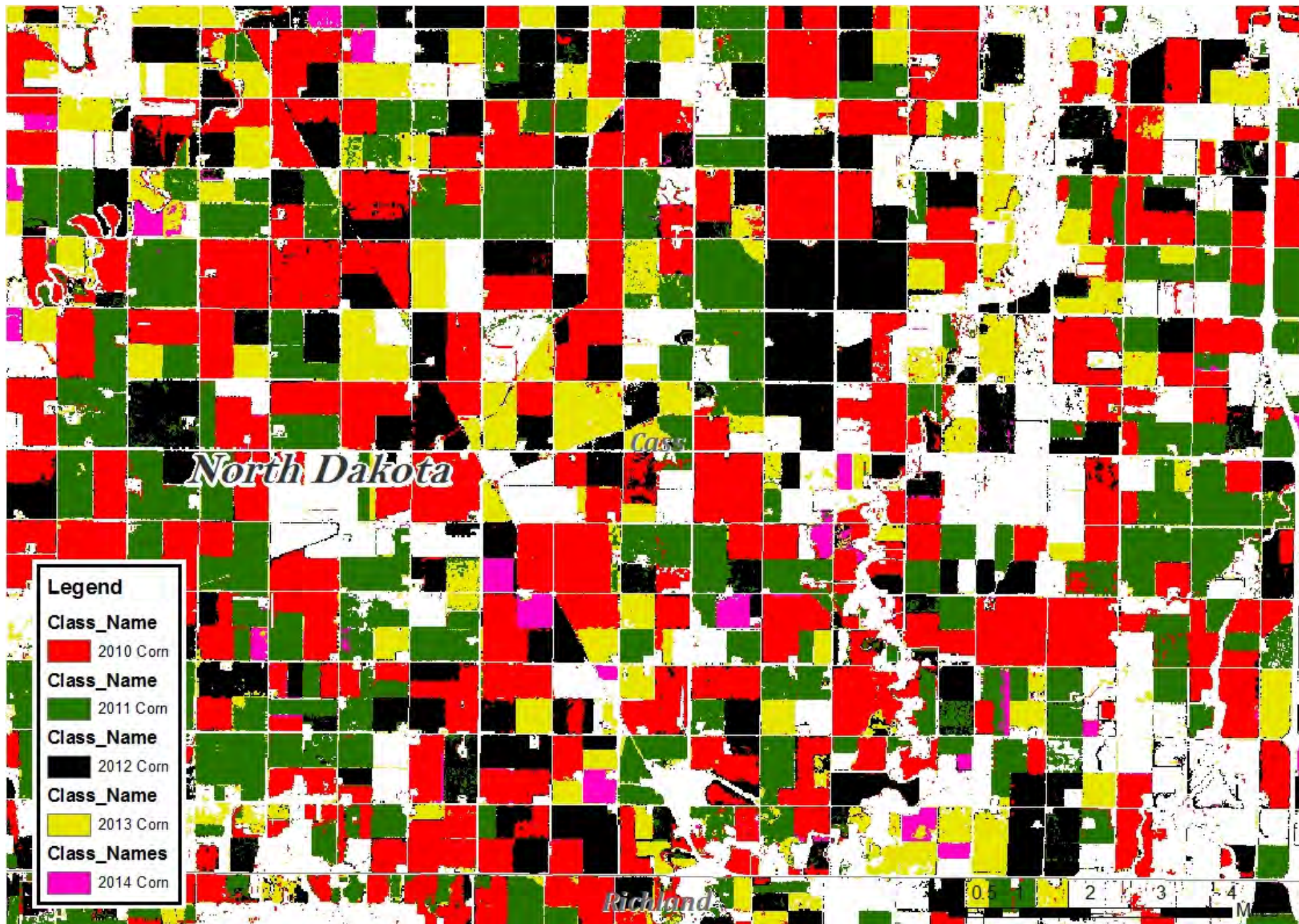


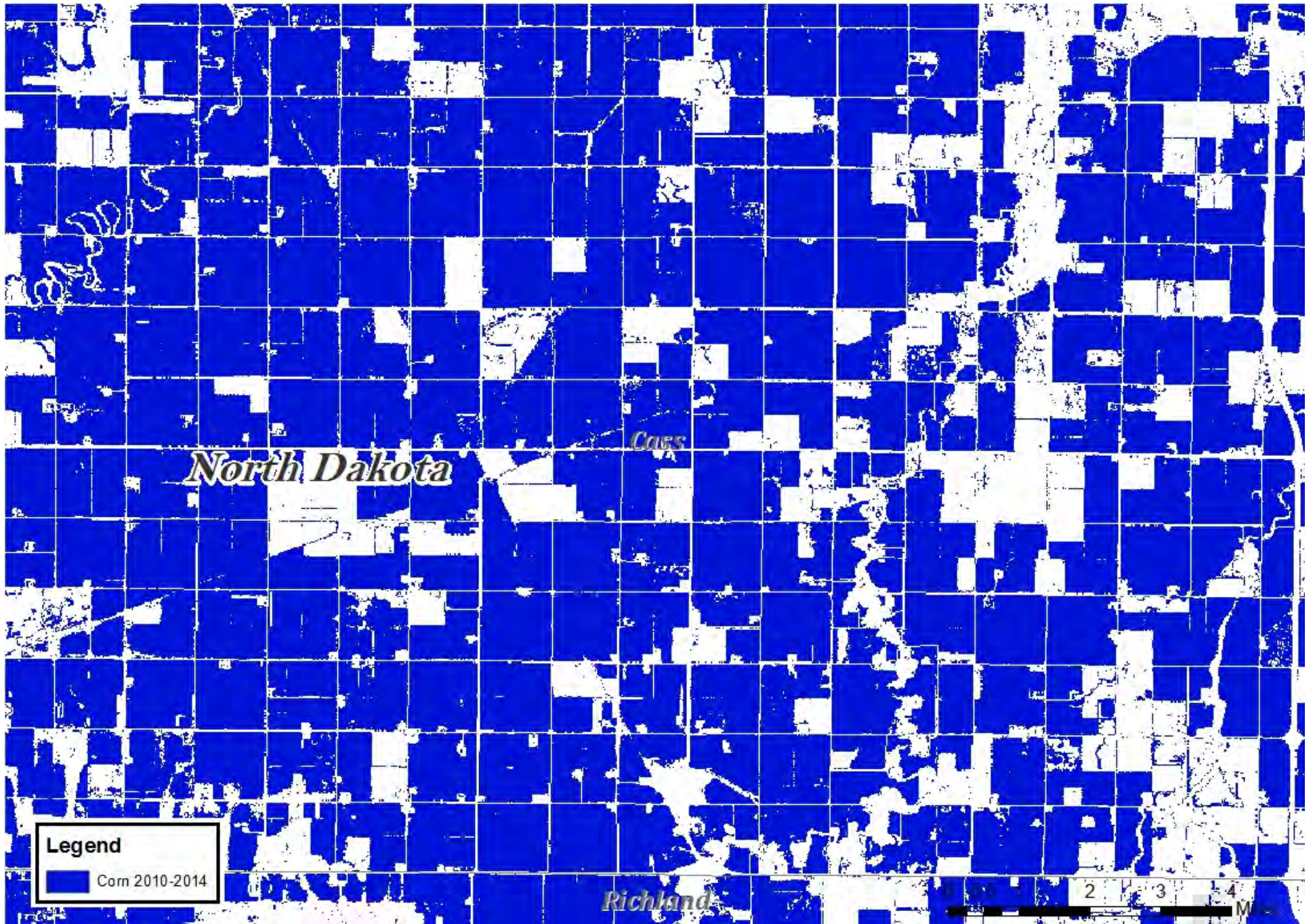













*North Dakota*

*Cass*

*Richland*

**Legend**

 Corn 2010-2014

0 1 2 3 4 Miles

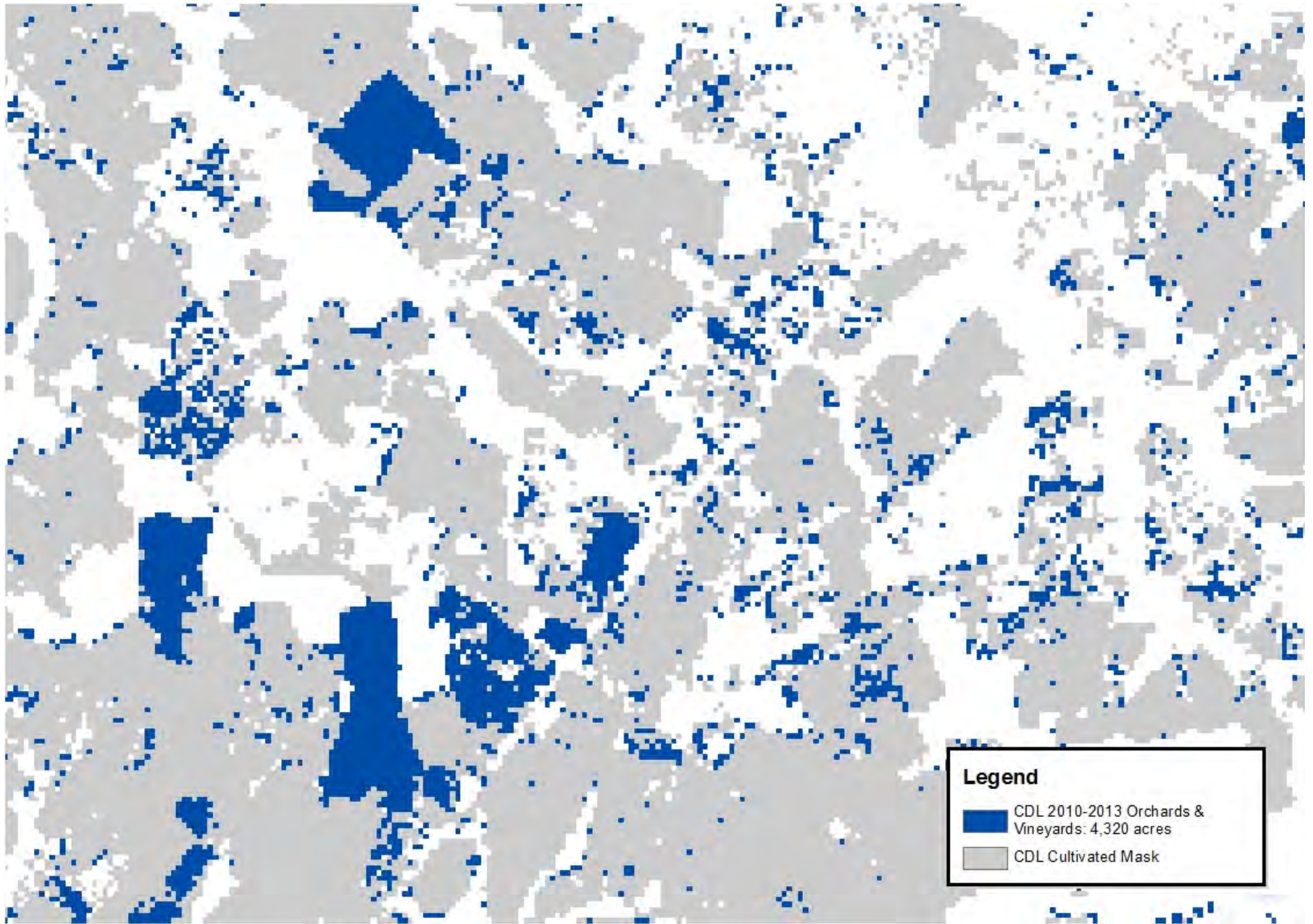


# What are the differences between CDL acreage and NASS Census of Agriculture reports?

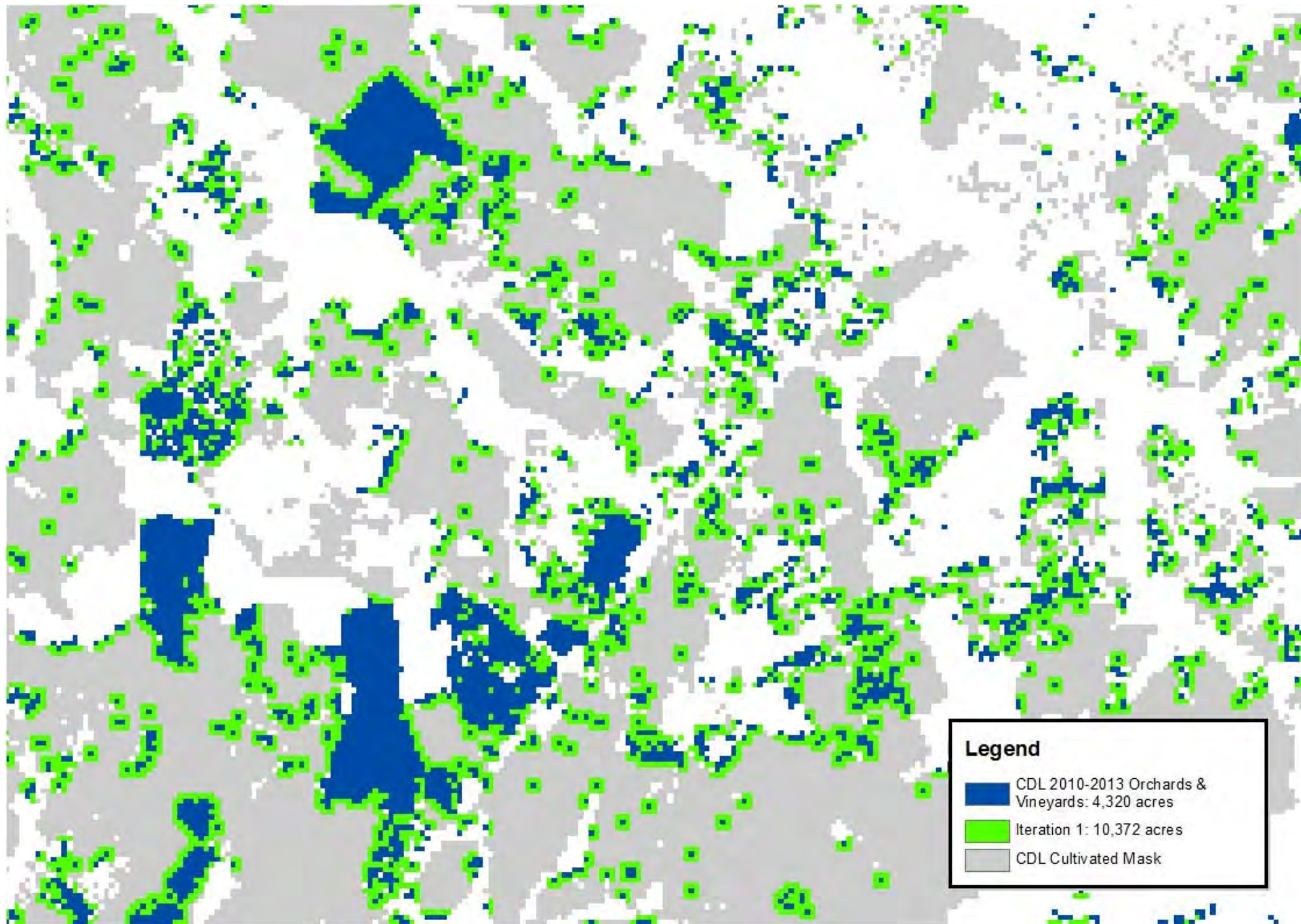
- The National Agricultural Statistics Service (NASS) maintains county level agricultural reports considered the “gold standard” for actual on-the-ground acreage
- There are differences between CDL and NASS estimates when comparing acreage
- Statistics generated by CDL are dependent upon pixel counting.
- Pixel counting is usually downward biased when compared to the official estimates. Counting pixels and multiplying by the area of each pixel results in biased area estimates and should be considered raw numbers needing bias correction.

# CDL and NASS

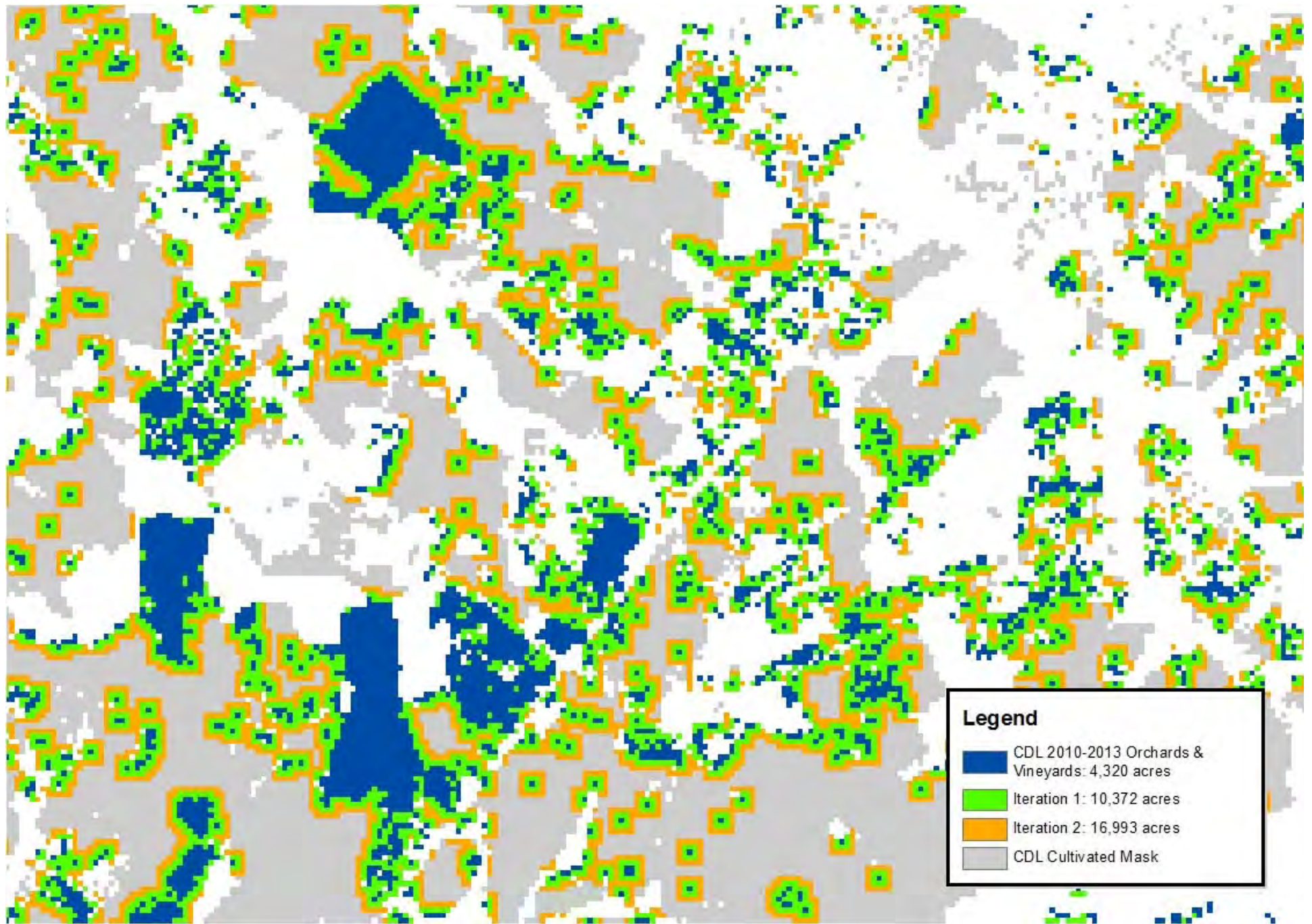
- The CDL will have bias correction applied by “region growing”
- NASS Census of Agriculture acreage reports are aggregated according to the 11 general crop categories
- Region growing will be applied to each crop on a county basis to more closely resemble the NASS acreage report
- Crop groups will be buffered by 1 pixel iterations until the NASS acreage value has been met or exceeded
- Region growing will be restricted using the CDL cultivated layer as a mask, to avoid buffering into any non-agricultural land cover types



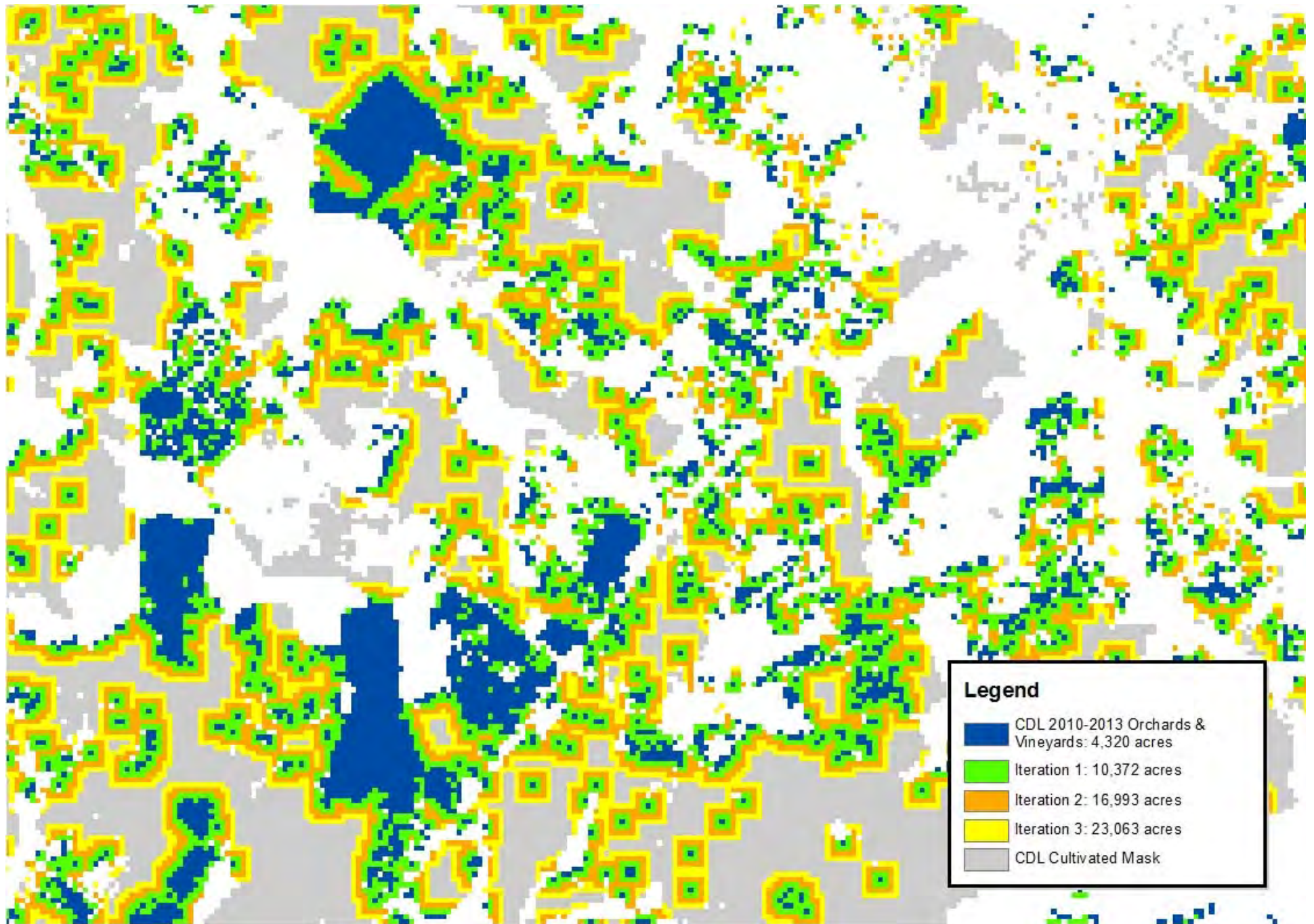
*“Region Growing” – Method Visualization*



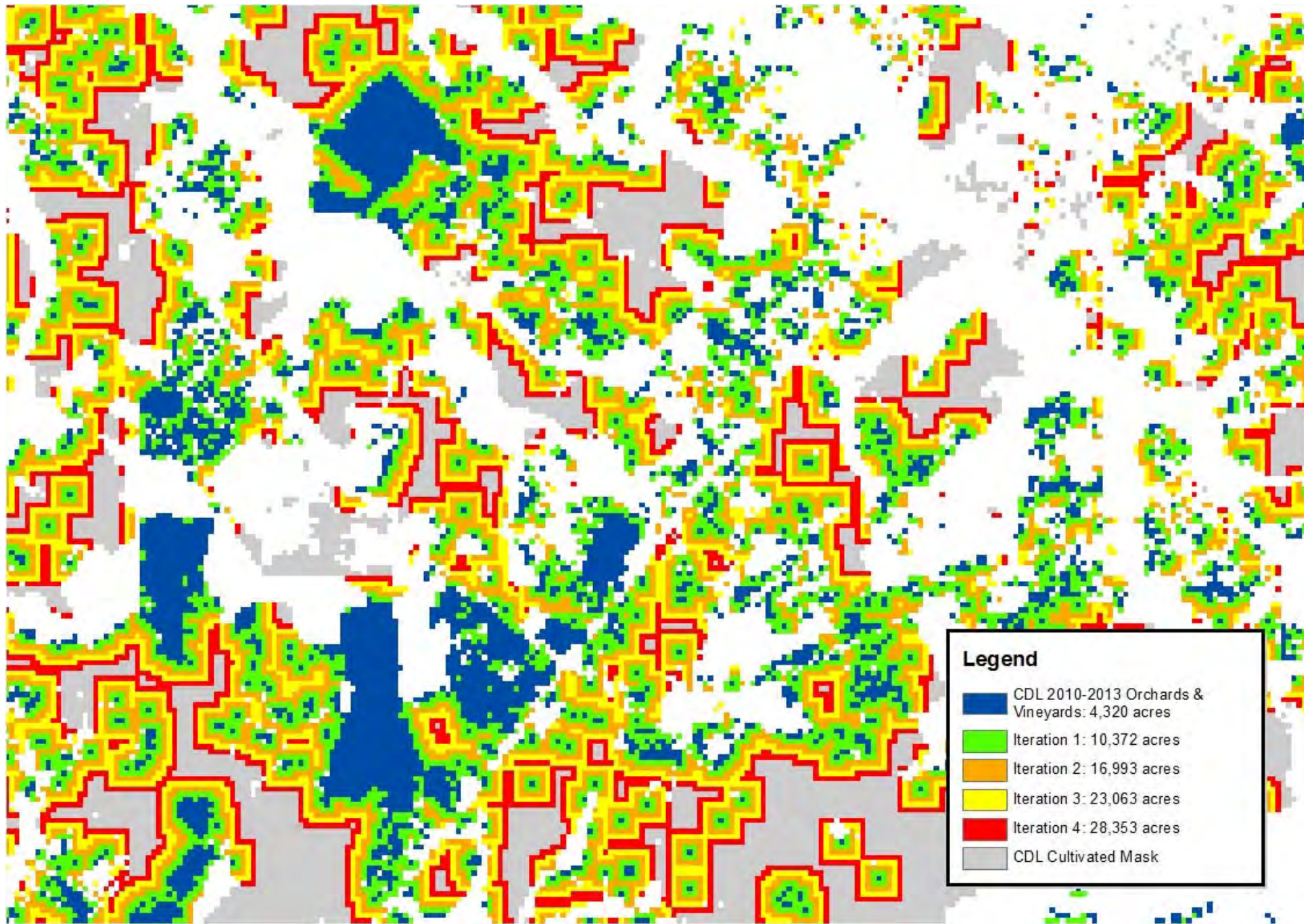
*“Region Growing” – Method Visualization*



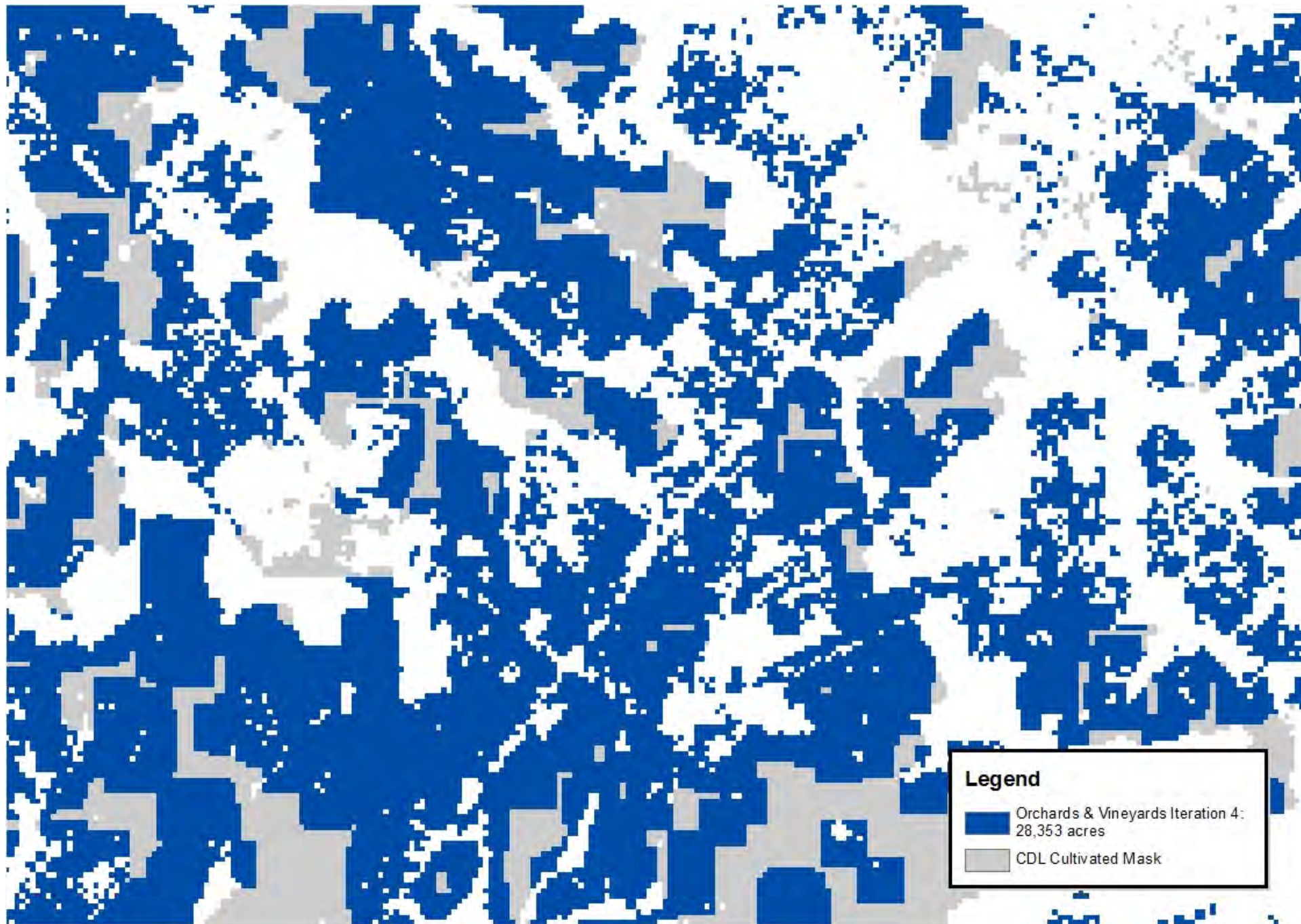
*“Region Growing” – Method Visualization*



*“Region Growing” – Method Visualization*



*“Region Growing” – Method Visualization*



*“Region Growing” – Method Visualization*



## NLCD vs CDL

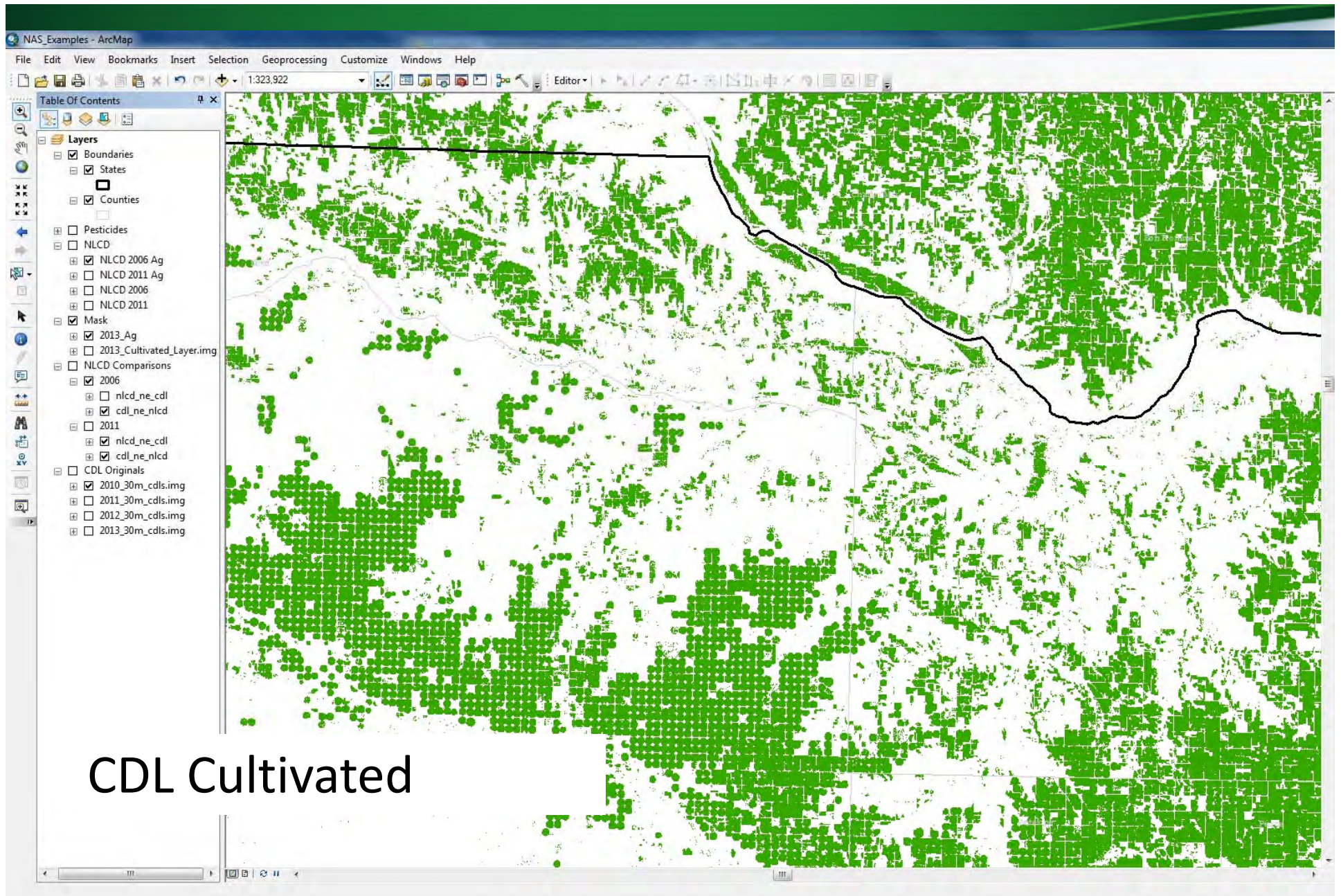
- All agricultural land cover categories in the Cropland Data Layer (CDL) are modeled using training and validation data collected by the Farm Service Agency (FSA) in their Common Land Unit Program
- All non-agricultural land cover categories in the Cropland Data Layer (CDL) are derived from the sampling of the most current USGS National Land Cover Database (NLCD).

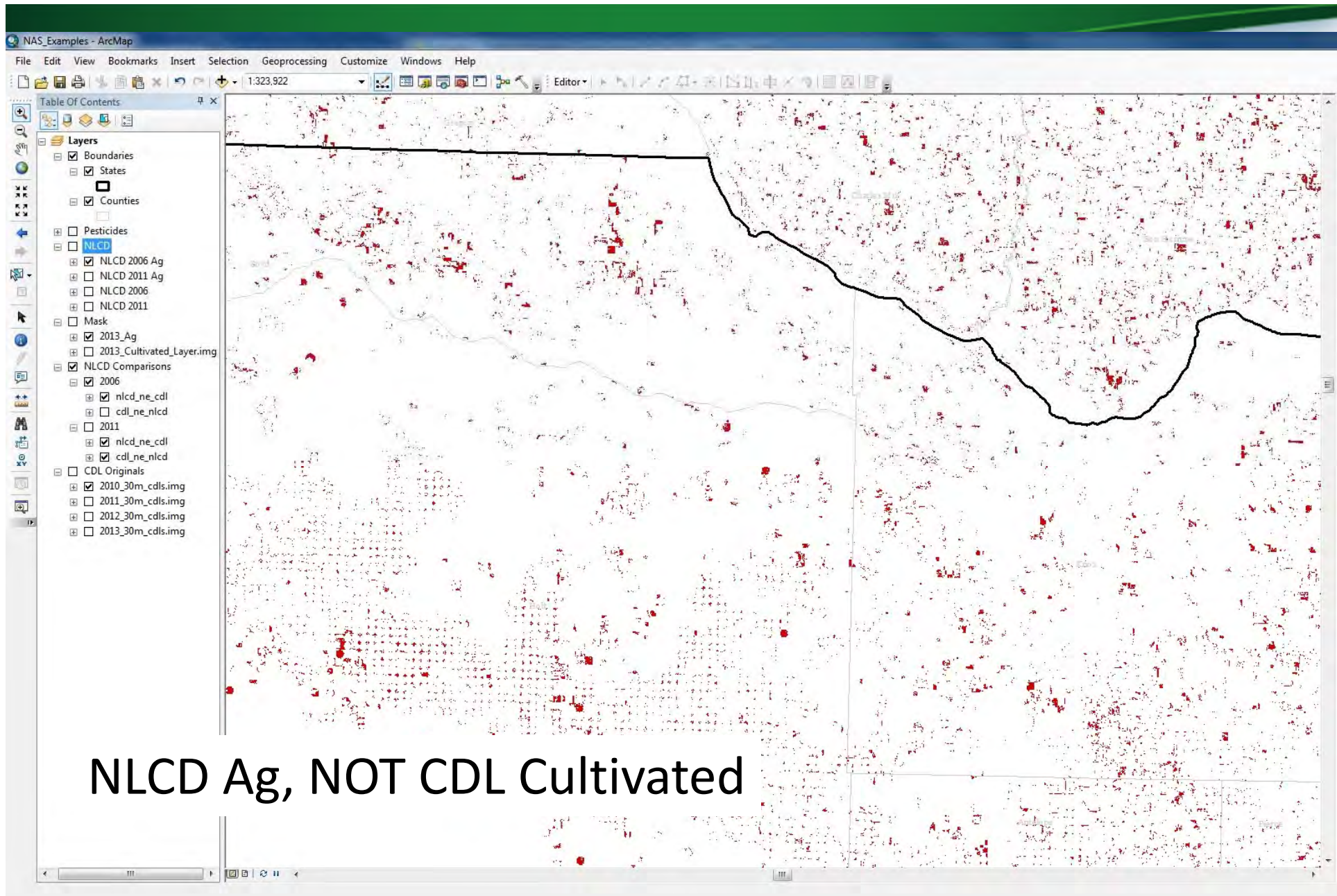
## NLCD vs CDL

- Cultivated Pixels

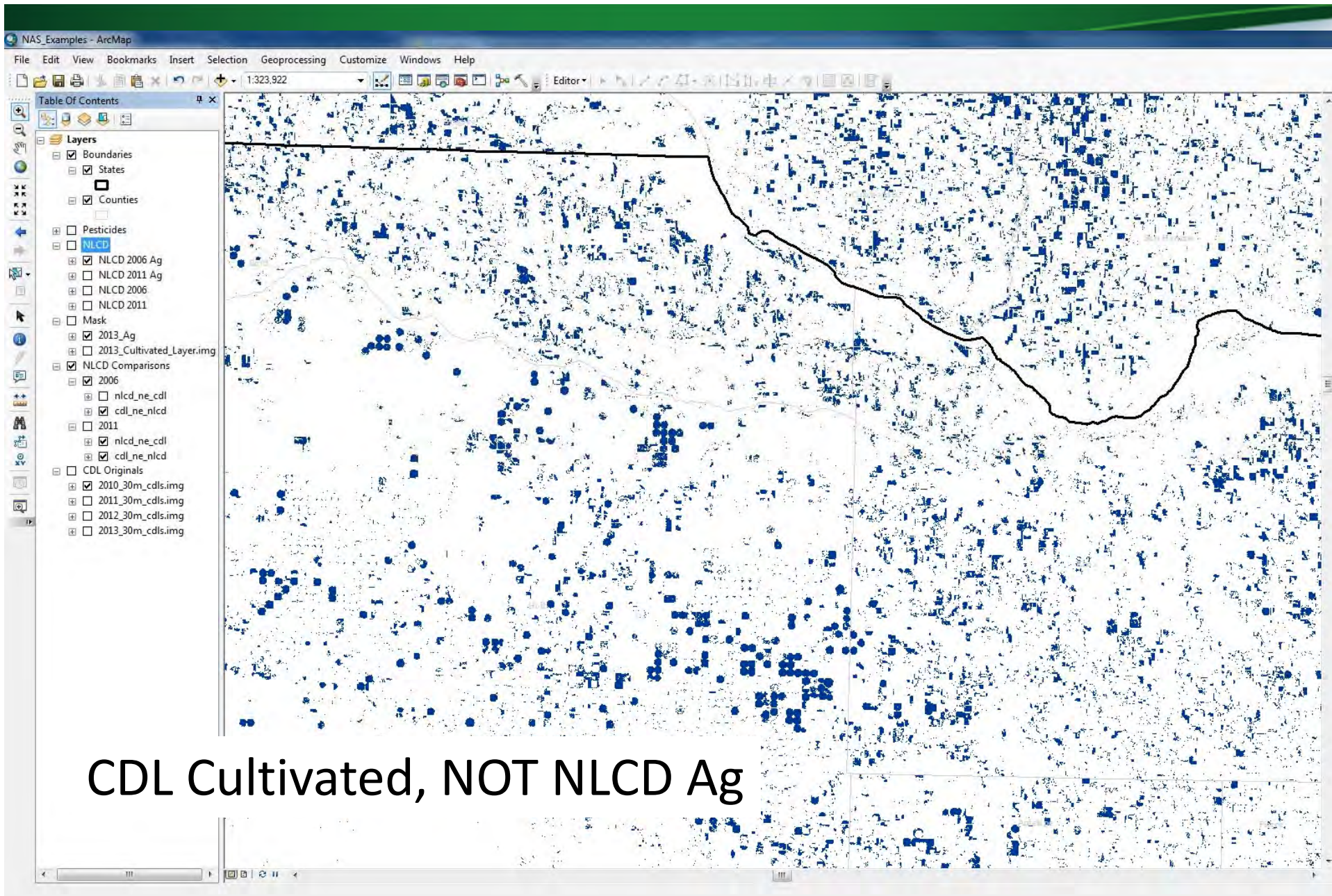
– NLCD 2006:	309,724,663 acres
– NLCD 2011:	309,622,184 acres
– CDL Cultivated 2013:	330,875,987 acres
– NASS 2012 Census:	333,681,818 acres

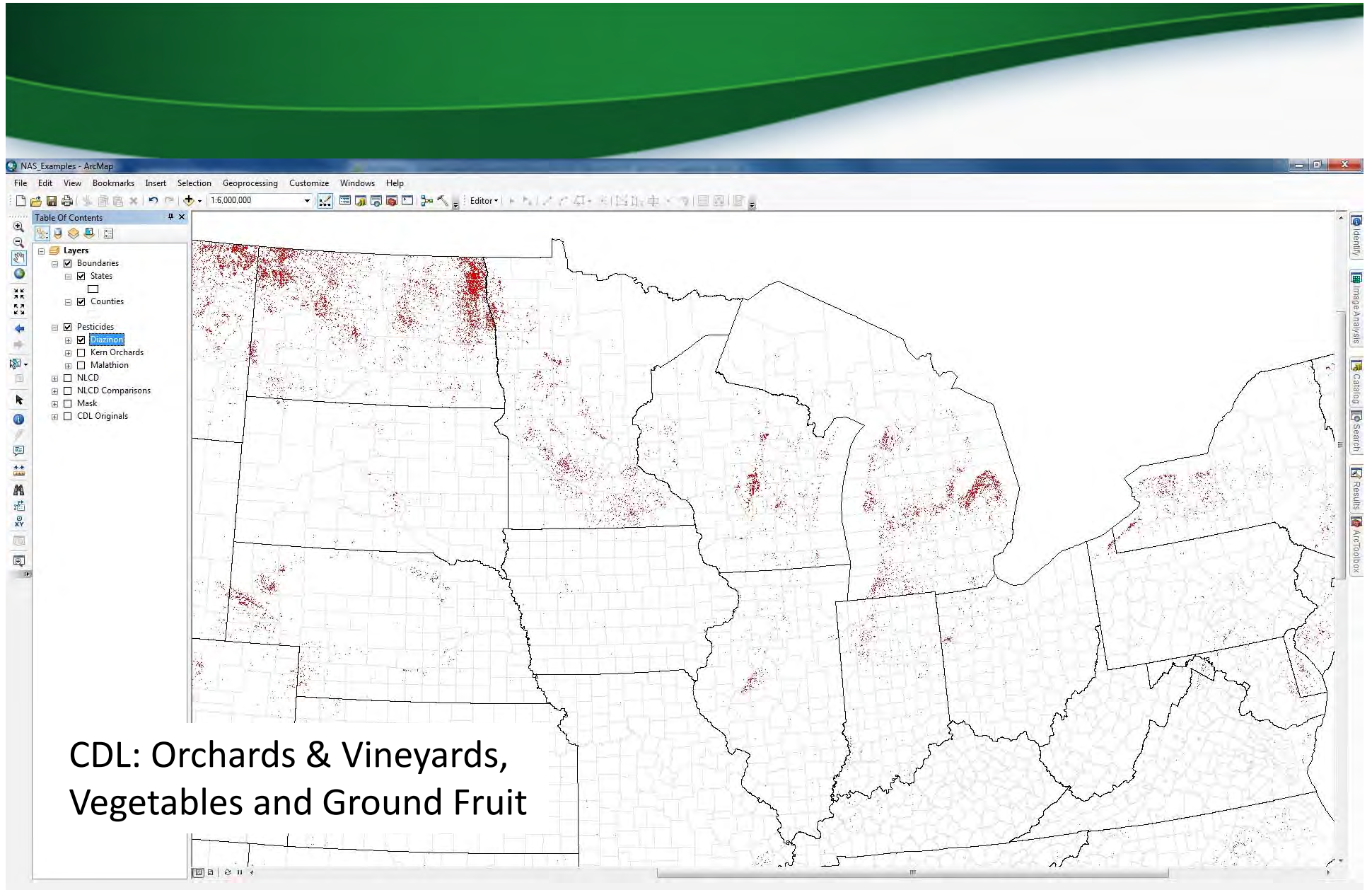
- There are spatial differences between CDL and NLCD





NLCD Ag, NOT CDL Cultivated

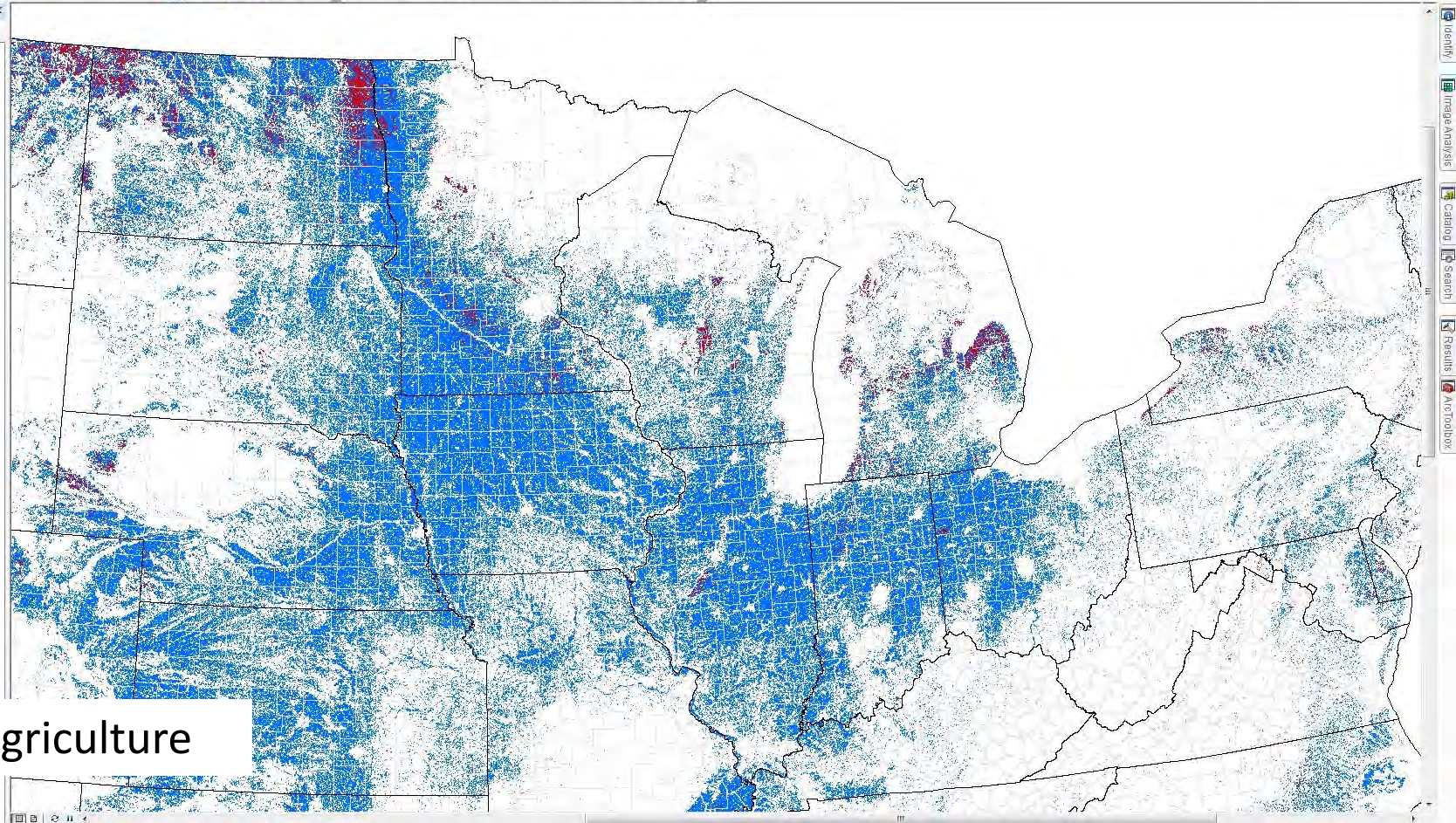




CDL: Orchards & Vineyards,  
Vegetables and Ground Fruit

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    - Malathion
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    - Mask
    - CDL Originals



NLCD Agriculture


# Using diazinon as an example

- Use Patterns
  - Registered use patterns are derived from labels and include information on crop and/or site
- Cross walking registered uses to general CDL and non-ag classes
  - Orchards and Vineyards
  - Vegetables and ground fruit
  - *Nurseries*
  - *Cattle Ear Tags*







### Legend

 Vegetables & Ground Fruit



### Legend

-  Vegetables & Ground Fruit
-  Orchards & Vineyards



### Legend



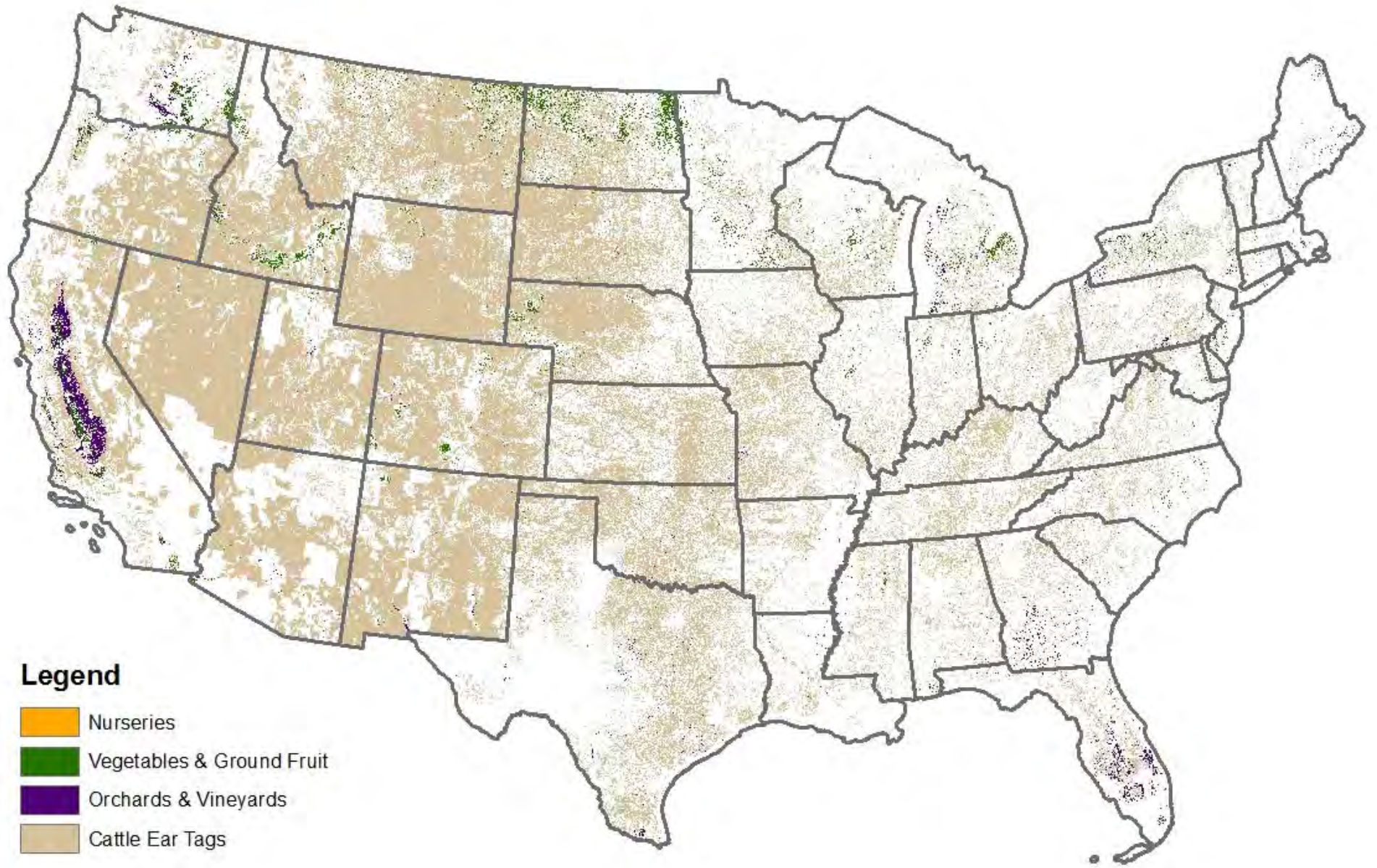
Nurseries



Vegetables & Ground Fruit



Orchards & Vineyards

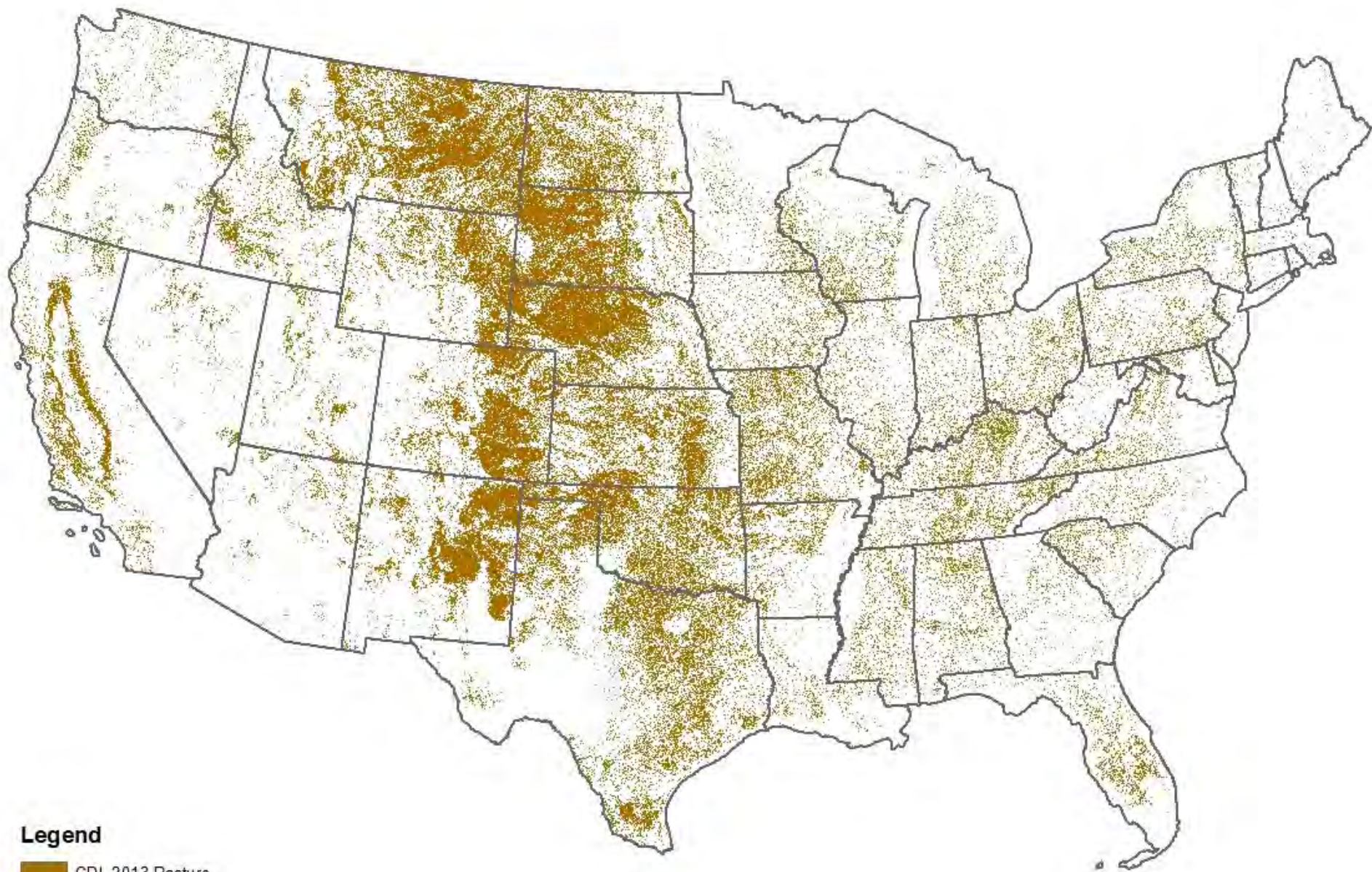


**Legend**


-  Nurseries
-  Vegetables & Ground Fruit
-  Orchards & Vineyards
-  Cattle Ear Tags

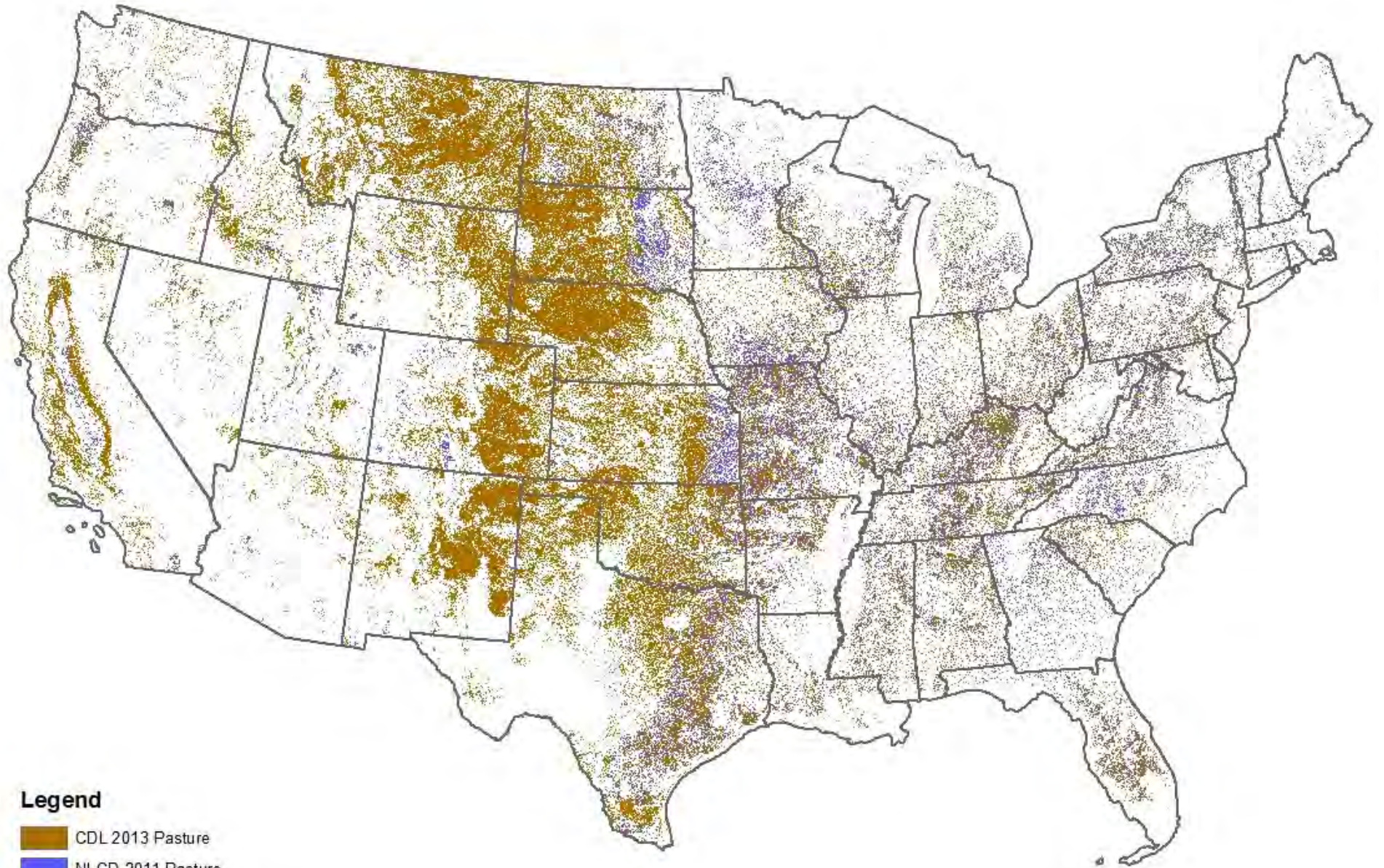
# Non-agricultural Pesticide Uses

- “Cattle Ear Tags”
  - Non-ag pesticide use label
  - Animal ear tags contain pesticide that is released over time
  - This use pattern can occur on a variety of land cover types
    - Rangeland
      - Pasture (grassland pasture)
      - Silvo-pasture (rangeland under forest)
      - Any rangeland within shrublands, wetlands, fallow crops, or any other non-developed land cover



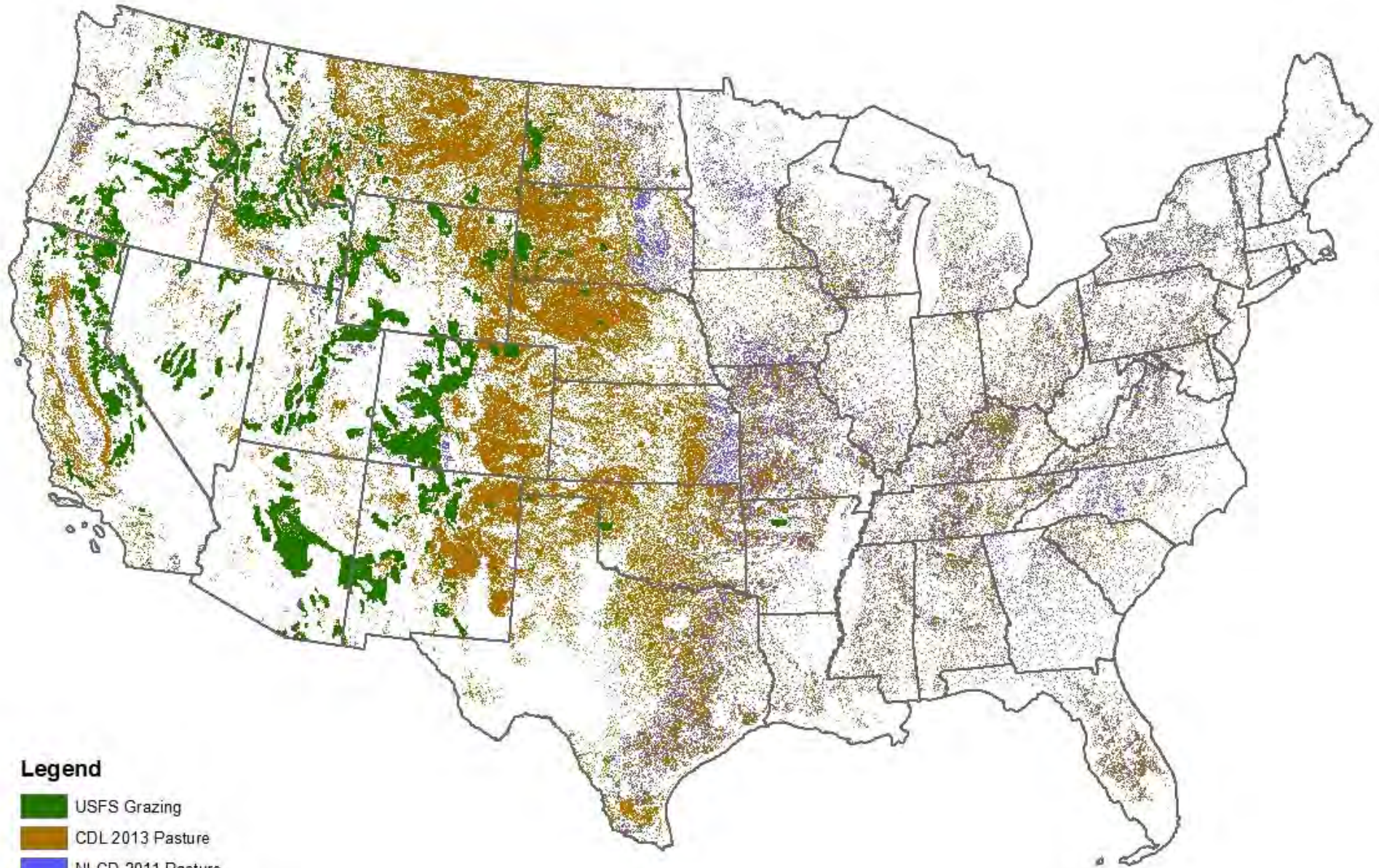
**Legend**

 CDL 2013 Pasture






**Legend**

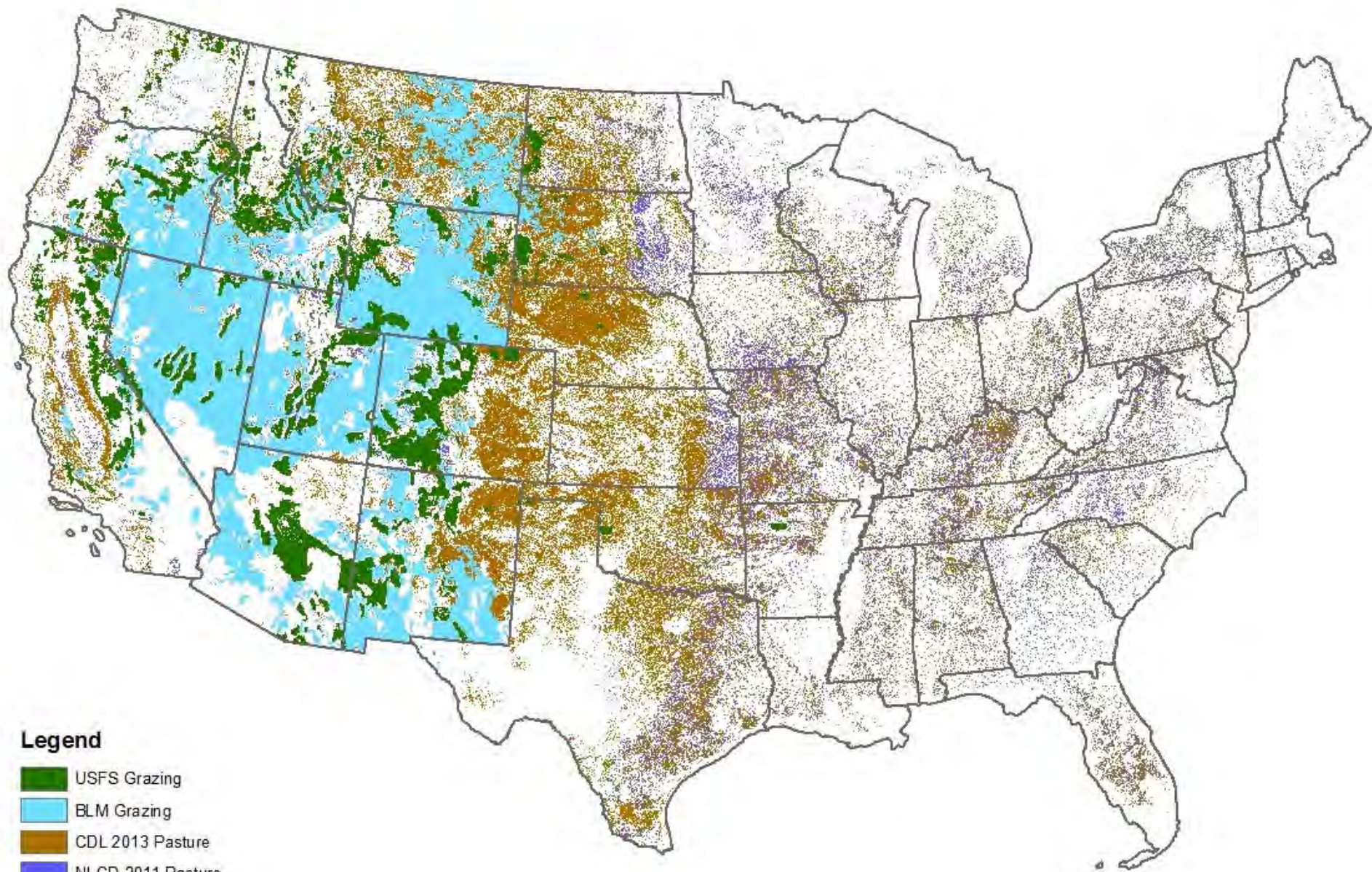
- CDL 2013 Pasture
- NLCD 2011 Pasture







**Legend**

-  USFS Grazing
-  CDL 2013 Pasture
-  NLCD 2011 Pasture



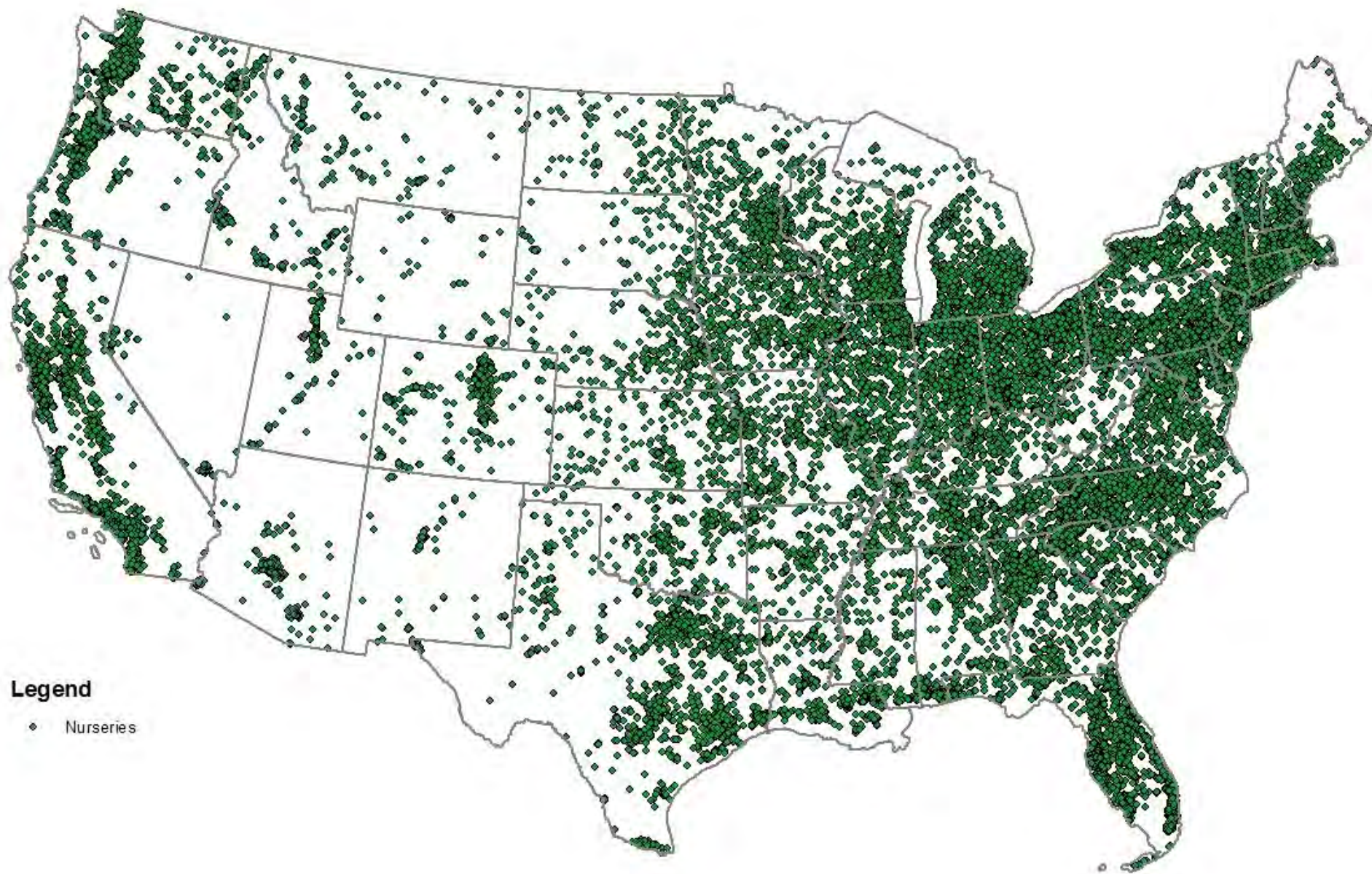


### Legend

-  USFS Grazing
-  BLM Grazing
-  CDL 2013 Pasture
-  NLCD 2011 Pasture

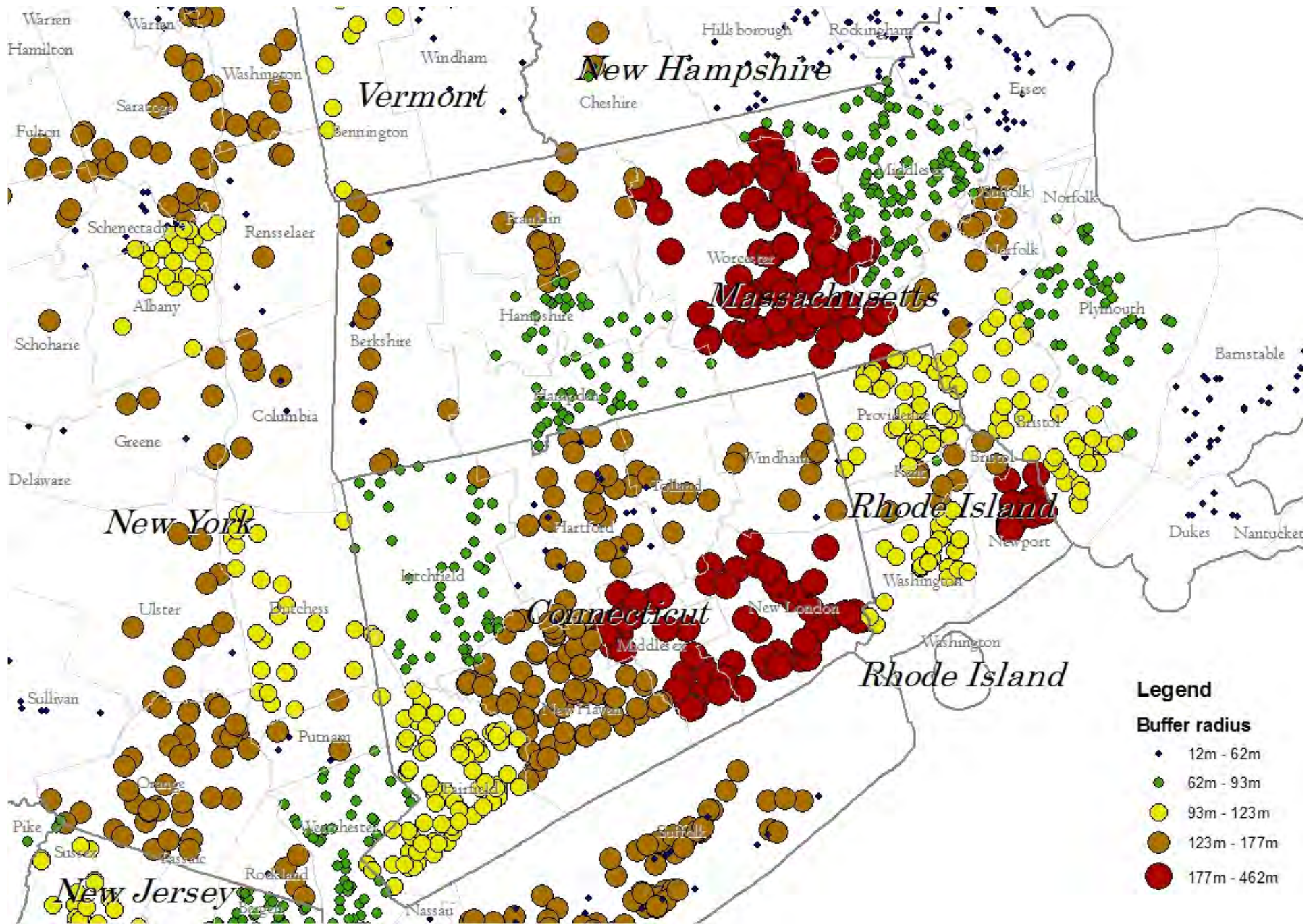
# Other Non-agricultural Pesticide Uses

- Plant Nurseries
  - Considered both an agricultural and non-ag pesticide use label
  - “Ornamentals grown outdoor in nurseries (trees, bushes, herbs, nonflowering plants, flowers, shrubs, vines)”
  - This use pattern can occur on a variety of land cover types
    - Identify point locations using Dun and Bradstreet database
      - 018, “Horticultural Specialties”
      - 526, “Retail Nurseries, Lawn and Garden Supply Stores”
  - D&B points need to be characterized as a spatial footprint
    - Census of Ag and D&B Facility size



**Legend**

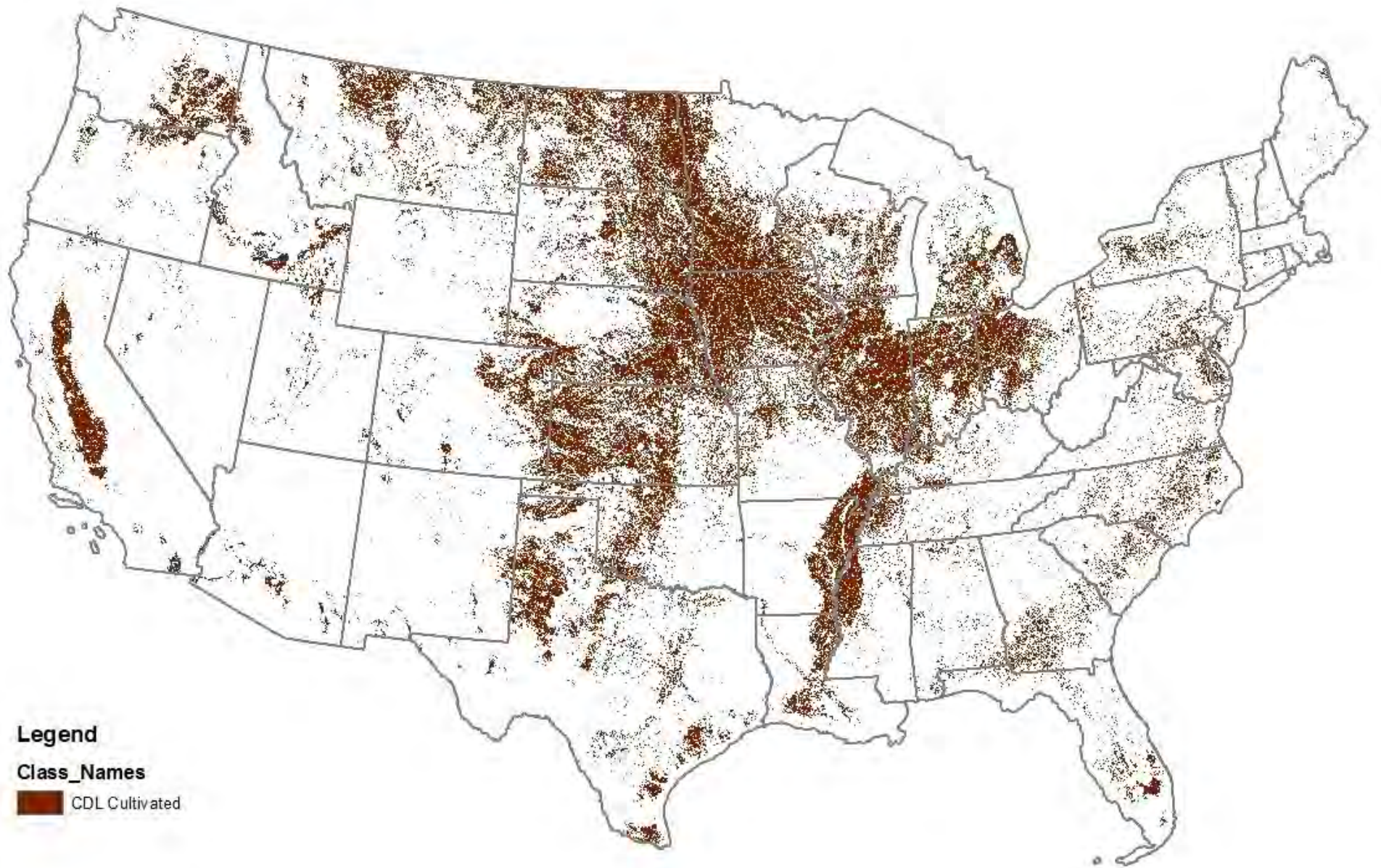
- ◆ Nurseries



*Graduated symbology is exaggerated for visualization*


# Using malathion as an example

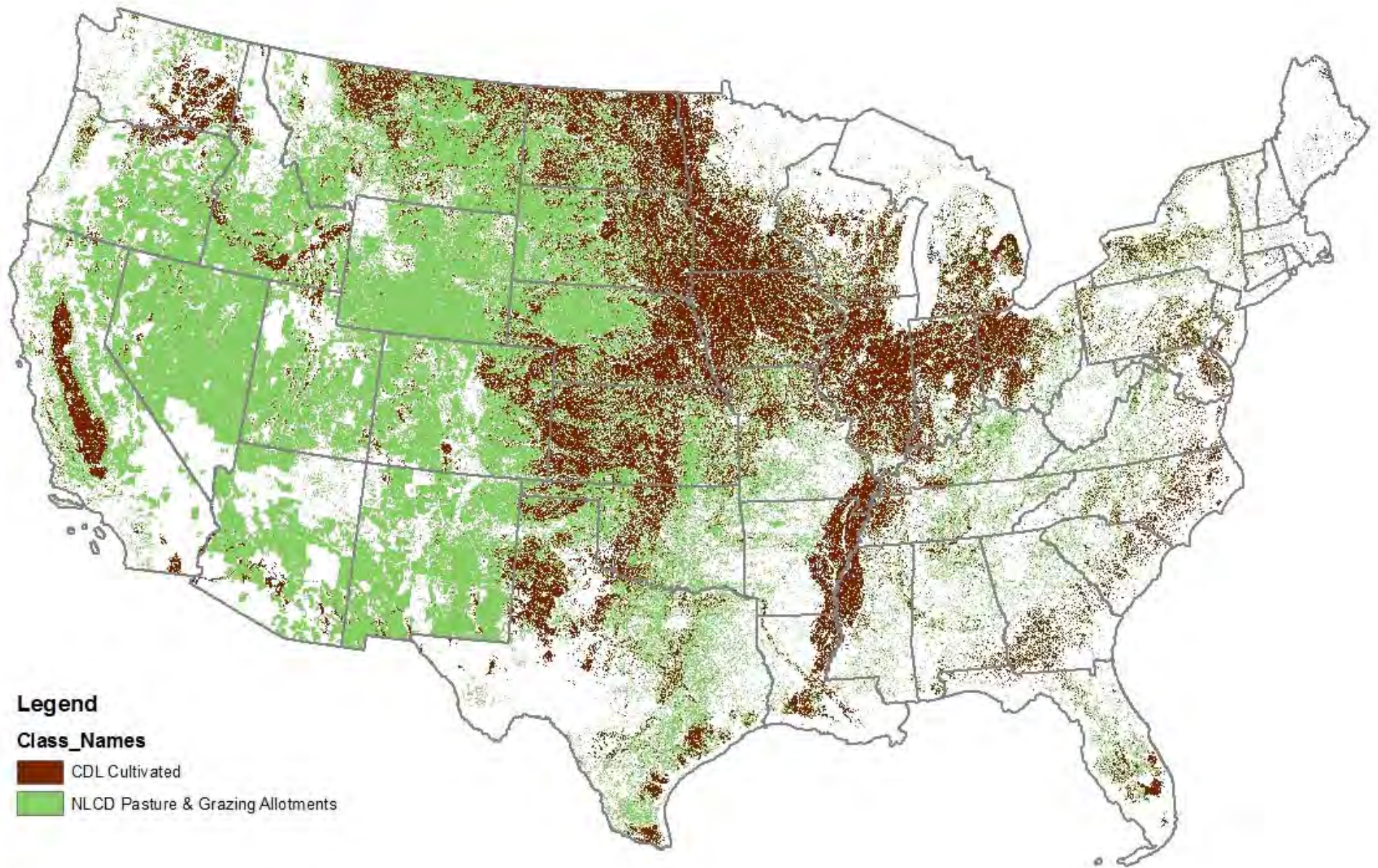
- Cross-walk registered uses to general CDL and non-ag classes
  - All 11 general agricultural classes (including pasture)
  - A variety of non-ag classes, including but not limited to:
    - Christmas Tree plantations
    - Ornamentals
    - Pine Seed orchards
    - Swamps/marshes/stagnant water
    - **Wide Area – Public Health Use**



**Legend**



**Class\_Names**

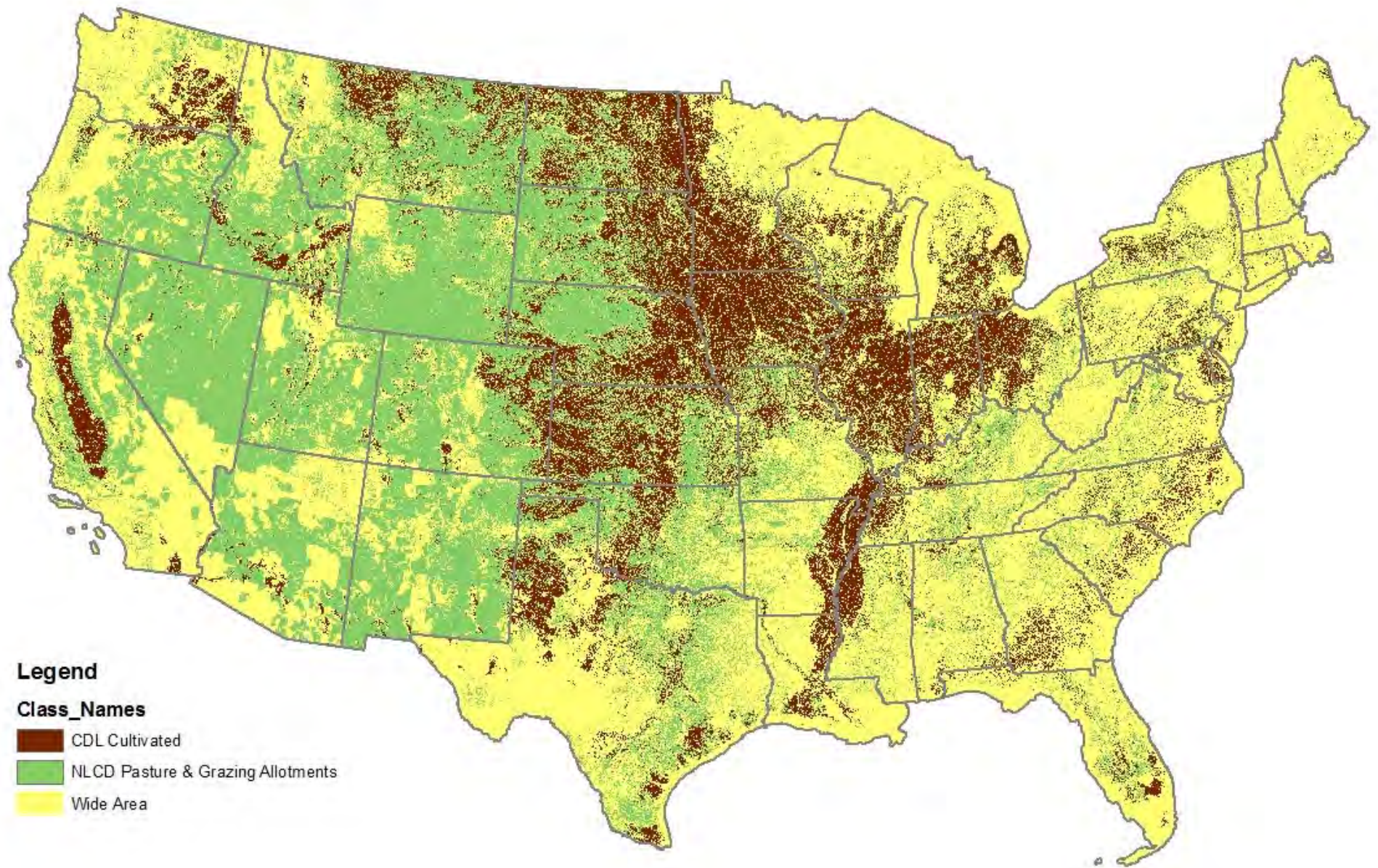
 CDL Cultivated



**Legend**

**Class\_Names**

-  CDL Cultivated
-  NLCD Pasture & Grazing Allotments



**Legend**

**Class\_Names**

-  CDL Cultivated
-  NLCD Pasture & Grazing Allotments
-  Wide Area





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