Mississippi Pecans from the Cropland Data Layer

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Abstract

This investigation used an enhanced Cropland Data Layer (CDL) and the public information of NAIP imagery and county parcel information to help the Mississippi Pecan Growers Association locate pecan orchards of possible commercial importance in the state.

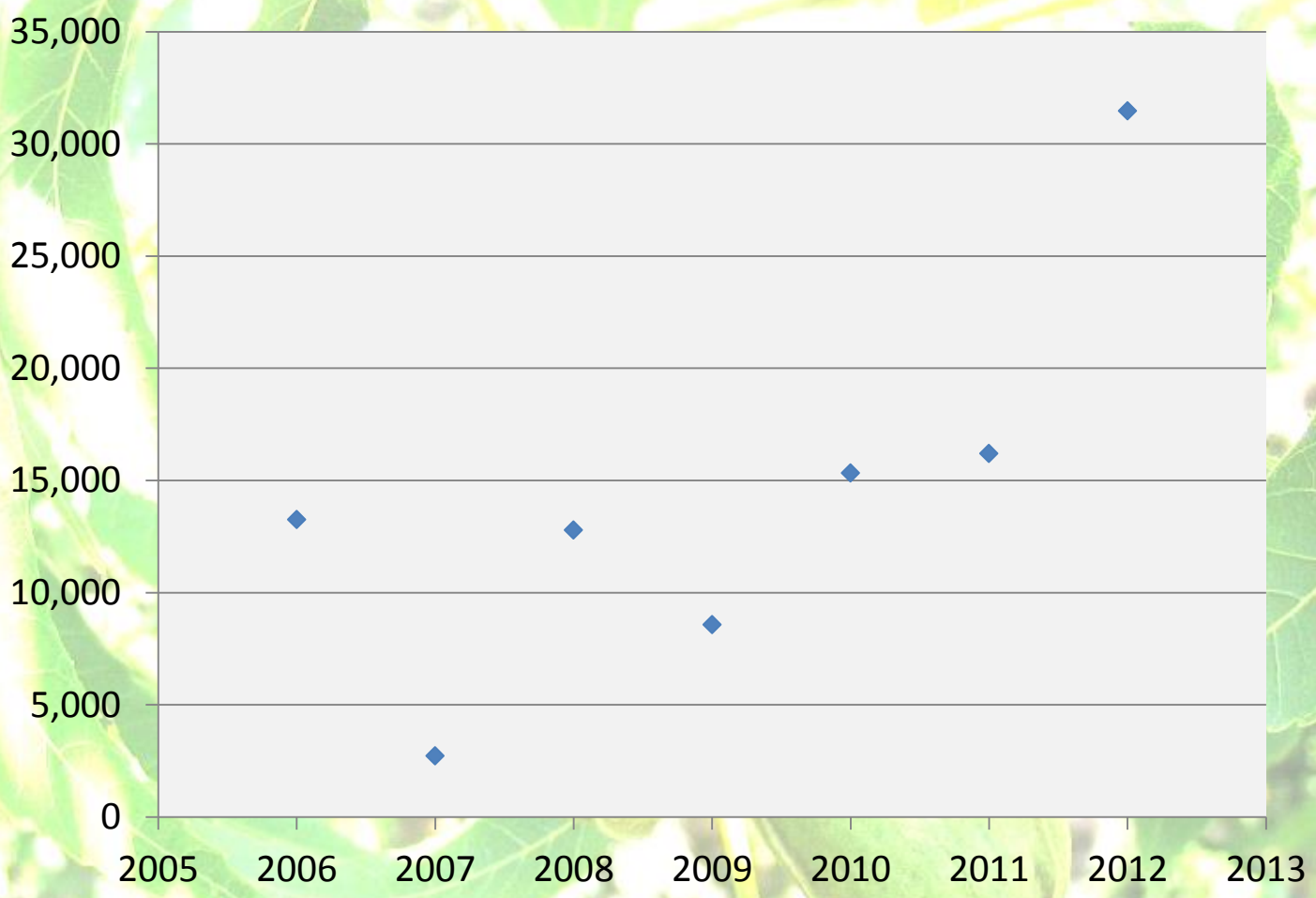
Pecan orchards of greater than 10 acres were located and the first map of Mississippi pecans was produced. This map gives the location and size of the orchards.

To date about 10 percent of the total acres have been ground truthed. The plan is to add or subtract orchards using ground truth done by the MSU County Extension Agents.

Introduction

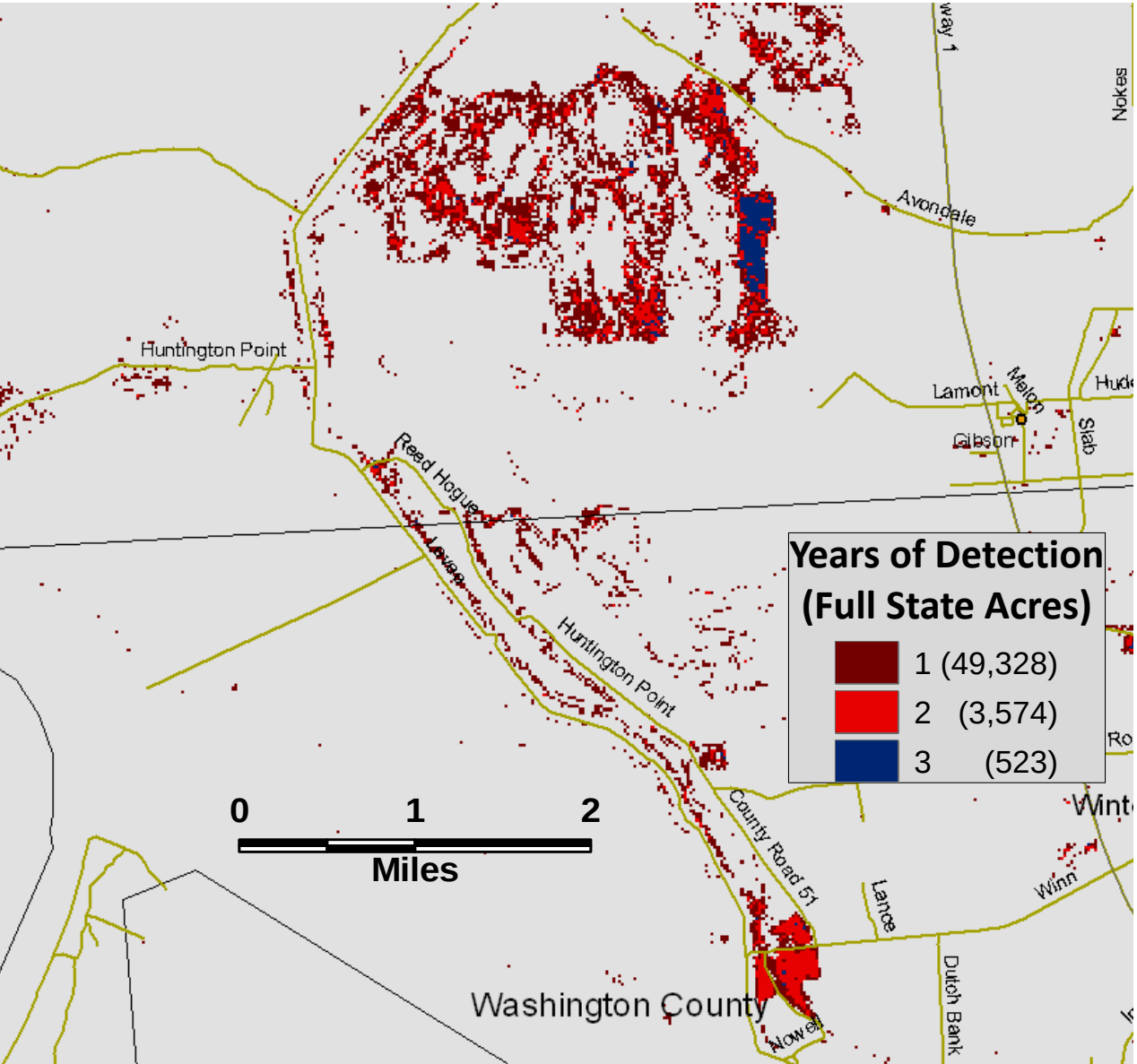
- The Cropland Data Layer (CDL) focus is major crops. Pecan detection is difficult for the CDL. Of the 4 million acres of cropland in the State of 30 million acres, pecan acres are 30,000 or less. In addition, reference data on pecans from USDA – Farm Service Agency is not updated annually, and pecans are native to Mississippi.
- This study was initiated to improve the identification of pecans using some changes to the basic NASS CDL method.
- In addition, to meet the needs of the Mississippi Pecan Growers Association, the data was used to locate pecan groves and orchards of possible commercial use.

Pecan Acres from the CDL



Pixel counting using CropScape for 2006-2009 shows pecans as other tree crops and 2010-2011 as pecans; the 2007 NASS Census of Agriculture reported 17,280 acres for pecans (Quick Stats 2, 8/6/2012 updated); and the standard 2012 CDL pixel count result was 31,462 acres. For 2010, MSU reported 14,000 to 16,000 acres (http://msucares.com/crops/comhort/pecan.html).

Pecan Cropping Intensity 2010-2012
Along Mississippi River, North of Greenville, MS



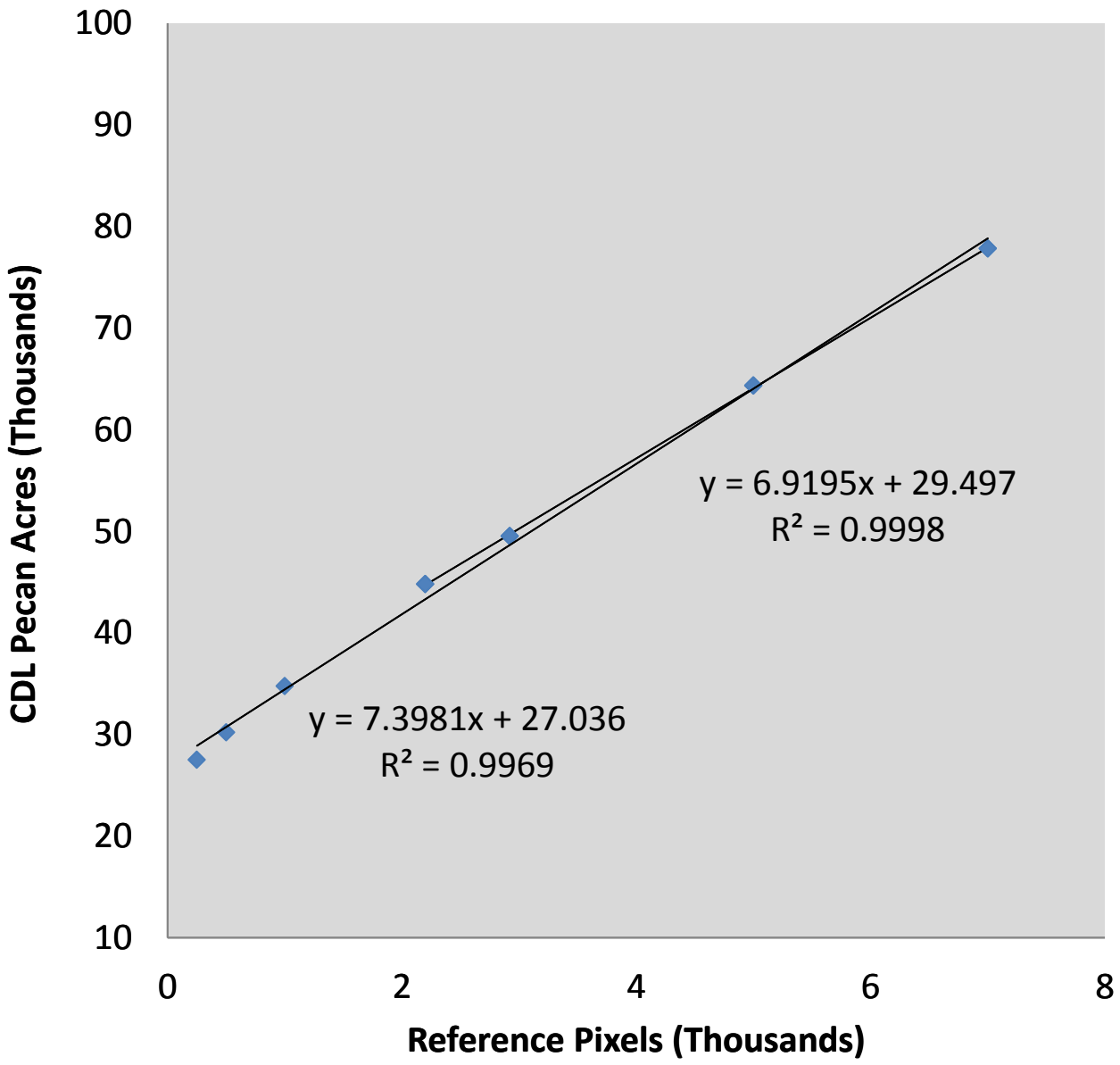
Many of the pecan acres in Mississippi are not in orchards but are natural groves or individual trees. Note the pecans along the Mississippi River levee.

Only 523 acres were measured by CDLs for all three years.

The addition of the 2010 – 2012 FSA reference data gave a total of 3,258 acres (reported to the FSA and clipped to remove edge effects) for reference data allowing preparation of a new 2012 CDL.

Methods

- CDLs were prepared using the standard NASS Imagine® method with National Land Cover Database and FSA reference data, and satellite imagery.
- Reference data pixels for 3 years were summed and recoded to pecans using Imagine.
- Imagine smart eliminate was used to prepare layers of groups of pecan pixels of 3 and 10 acres or greater found by the CDL.
- Parcel vector data over raster smart eliminated pecan CDL data over NAIP imagery was examined in ArcGIS® to determine acres of pecan concentrations per site.
- All acres were estimated by pixel counting and are not official NASS estimates.

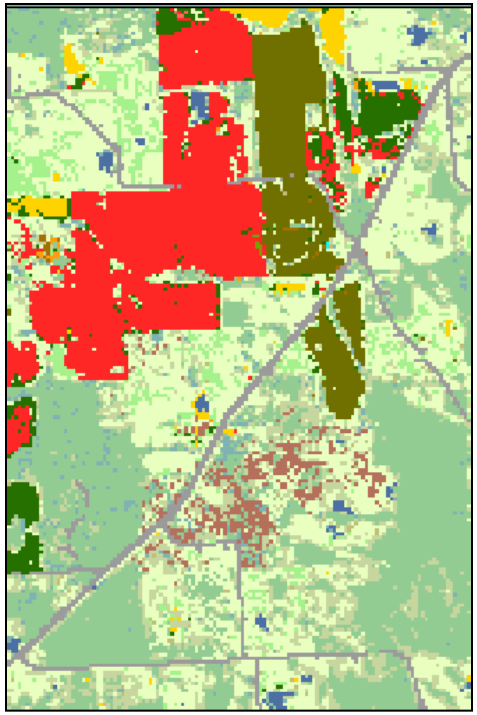


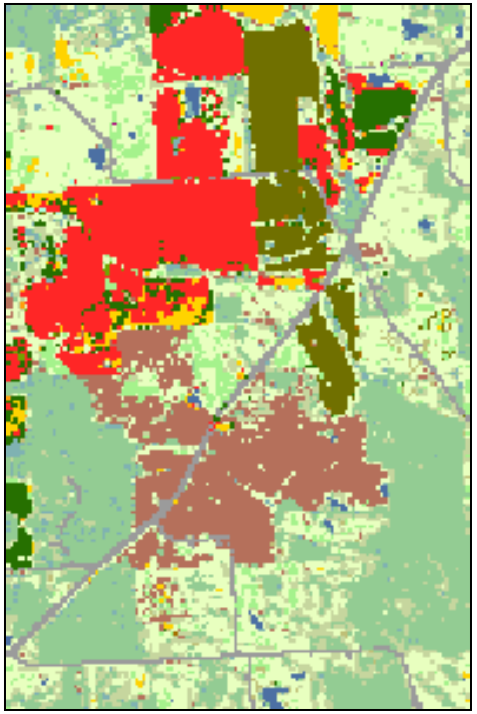
Multiple New 2012 CDL Measurements

Regression is routinely used by NASS to correct for over- or under-fitting by the classifier with the aid of reference fields of known acreage. The preparation of additional CDLs allows this additional regression.

The Y intercept of the regression line of the linear portion of this plot gives the acreage of pecans. The result of 29,497 acres is unenhanced by the addition of additional reference pixels.

New MS 2012 CDL
A Pecan Orchard Acres vs. Reference Pixels





Reference Pixels

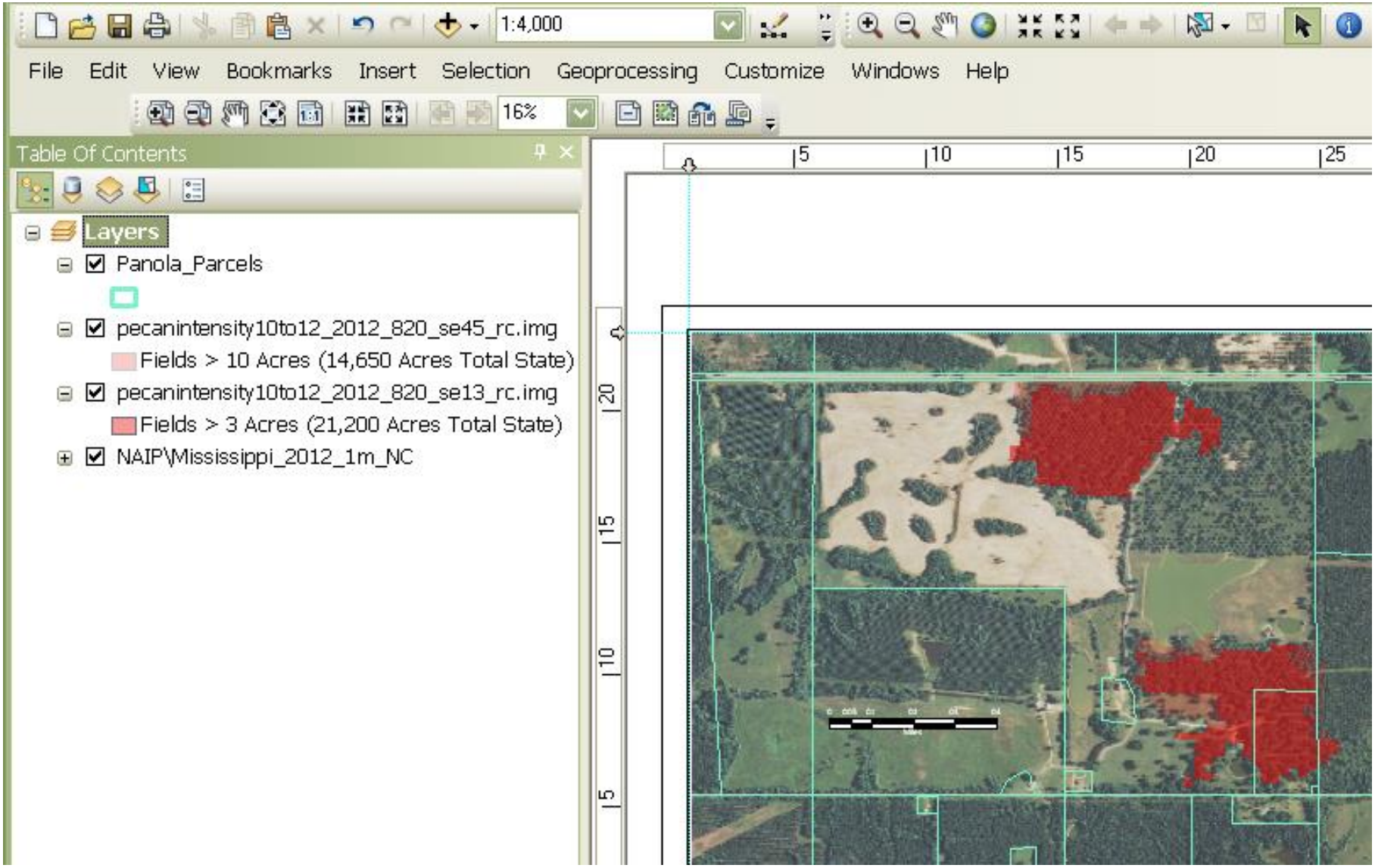
500

1000

CDL Classes

The orchard is more completely detected using 1,000 FSA combined reference pixels.

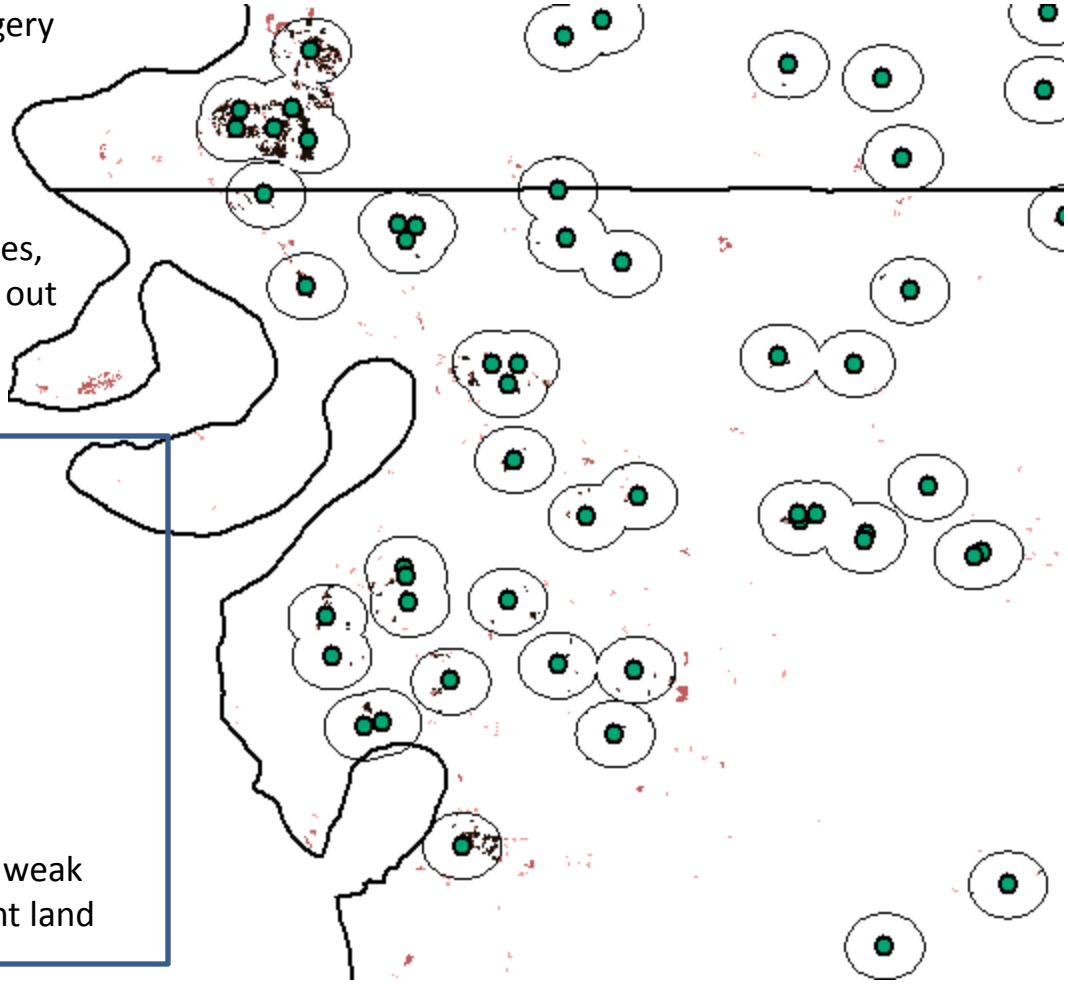
Identifying and Estimating Orchard and Grove Acres



Possible Commercial Pecan Orchards or Groves

An Update of Pecan CDL Map Using Identification, and Clipping with a 1 Mile Buffer

About this map. Once the CDL pecan map was prepared the parcel and USDA-FSA NAIP imagery was used to examine the classified areas. Some areas were of suspect identification, some identifications were incomplete, and some areas were on Government land. The lat/long of the identified orchards or groves, with a 1 mile applied buffer, were used to clip out areas with commercial possibilities.



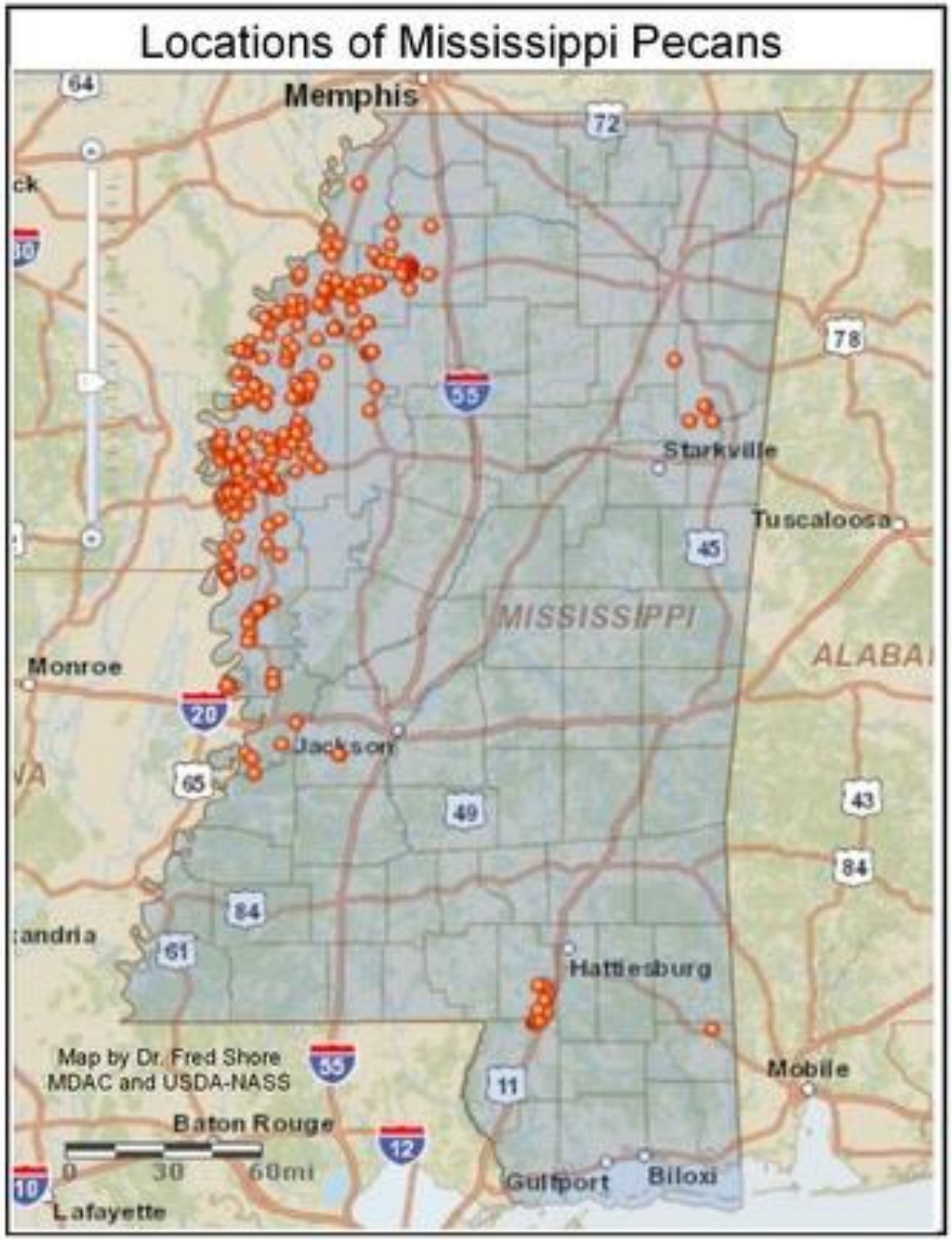
Pecan Potential Areas

Identified orchard or grove with buffer for clipping

Retained Pecans from CDL

Omitted Pecans from CDL with weak identification or on Government land

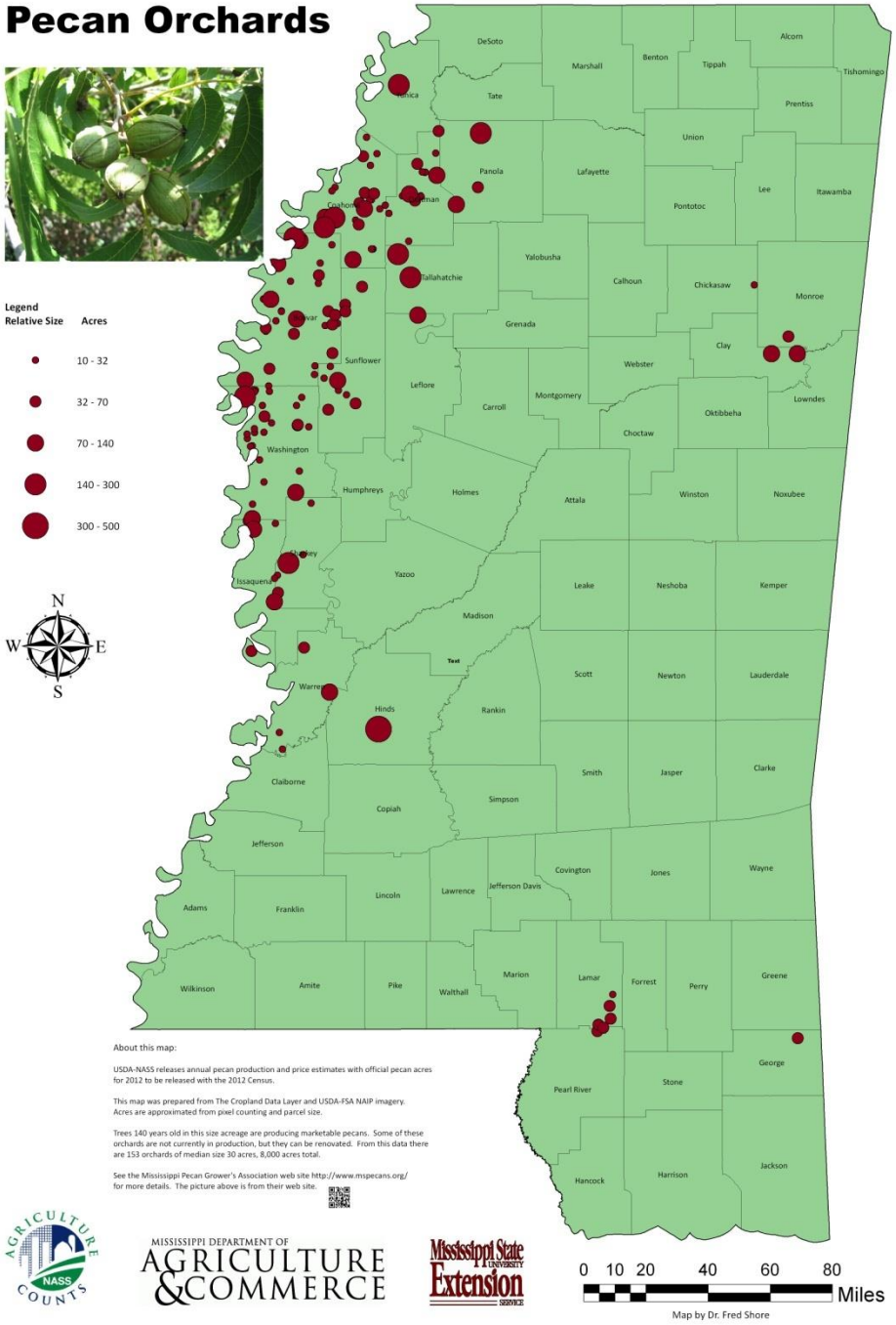
About this map: The resulting orchards and groves plotted with ArcGIS Online.



About this map:
Mississippi pecan orchard acres were approximated from pixel counting and parcel size using the CDL, parcel data, and USDA – FSA NAIP imagery and are displayed by relative size.

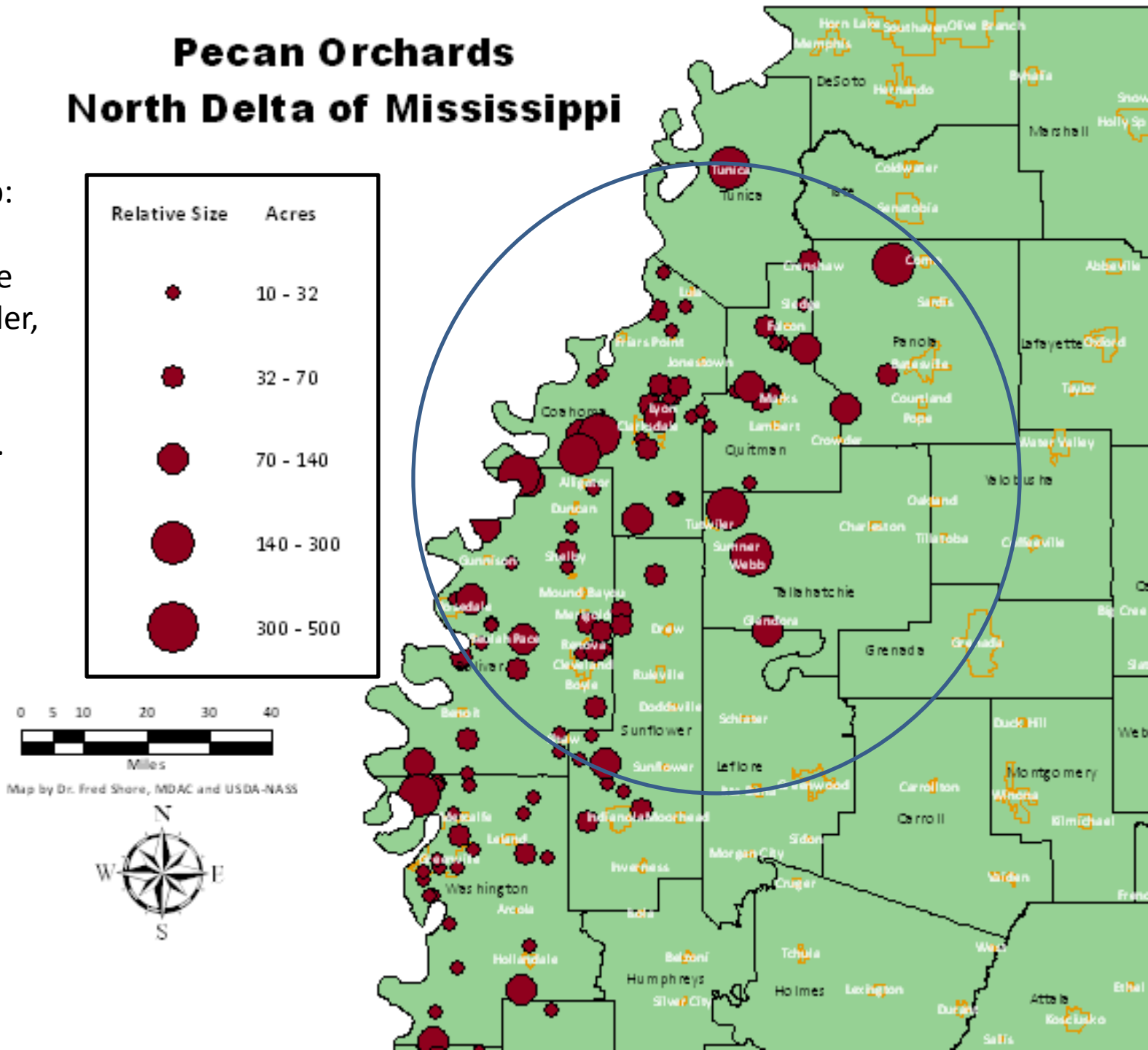
USDA-NASS releases annual pecan production and price estimates with official pecan acres for 2012 to be released with the 2012 Census.

Trees 140 years old in this size acreage are producing marketable pecans. Some of these orchards are not currently in production, but they can be renovated. From this data there are 153 orchards of median size 30 acres, 8,000 acres total.



Pecan Orchards
North Delta of Mississippi

About this map: pecans located within a 50 mile radius of Tutwiler, MS showing several many large orchards.



Acres* of Pecans in Mississippi, 2012

Method	Type of Pecans	Acres
CDL regression, 2010-2012 FSA training	Native and Orchards	29,497
CDL, smart eliminated, over 3 acres	Native and Orchards	21,200
CDL smart eliminated, over 10 acres	Native and Orchards	14,650
CDL smart elimination, over 3 acres selected with NAIP Examination	Native and Orchards	11,434
CDL, smart eliminated, over 3 acres, selected with NAIP, 1 mile buffer clip	Native and Orchards	10,216
CDL smart elimination, NAIP, orchards only, over 10 acres	Orchards over 10 acres	7,890

*These measurements are all from pixel counting and are not official NASS estimates. The 2012 Census of Agriculture will give the official estimate of pecan acres.

Results

- The Mississippi pecan acreage for 2012 was calculated using regression and updated reference data as 29,497 acres (R^2=0.9998). This result is for orchards and native pecans using a relatively small number of reference pixels. Low acre crops usually exhibit this type of behavior (sensitive to changes) while major crops, with a large number of ground truth pixels, give an even response over a wide range.

- Orchards were measured by this study at an estimated 7,890 acres for 153 pecan orchards over 10 acres each, median size of 30 acres.

- The first Mississippi map of pecan orchard location and size was produced.

Discussion

- The official acres for Mississippi pecans will be given with the 2012 Census of Agriculture.

- The map for pecan orchards is the information needed by the Mississippi Pecan Growers Association for helping define their industry and encourage growth.

- This map will be refined by additional data from the MSU County Extension Agents.

Acknowledgements

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