

# ***GIS Applications for the Mississippi Cropland Data Layer , 1999-2006***

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Acknowledgements: Commissioner Lester Spell, Jr., D.V.M., MDAC,  
Dr. Joseph H. McGilberry, Former Director, Mississippi Cooperative Extension Service,  
James Brown, Mississippi Department of Transportation,  
and the USDA Field Enumerators in  
Mississippi were critical to the success of this project.

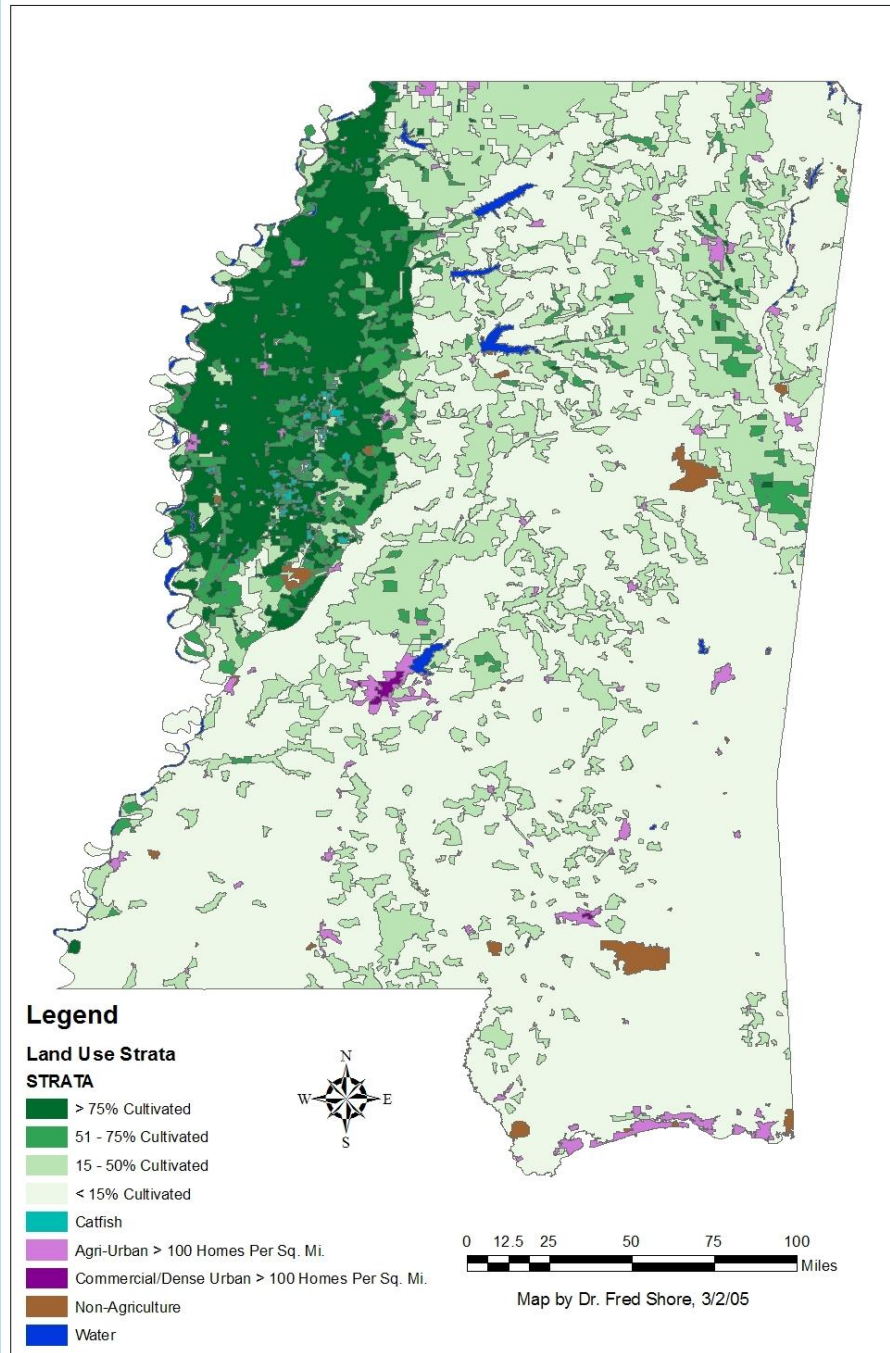


# The Cropland Data Layer in Mississippi

- **Multi-temporal processing based on USDA-NASS programs started in the 1970s and the LARSYS software from Purdue University.**
- **Mississippi project started in 1999 using the Public Domain Peditor and RSP software programs of NASS.**
- **A cooperative project of NASS, Mississippi State University, and the Mississippi Department of Agriculture and Commerce.**
- **ESRI ArcGIS® maps are used to communicate project team information and for client displays including multi-year overlays.**

# June Agricultural Survey (JAS) Segment Selection

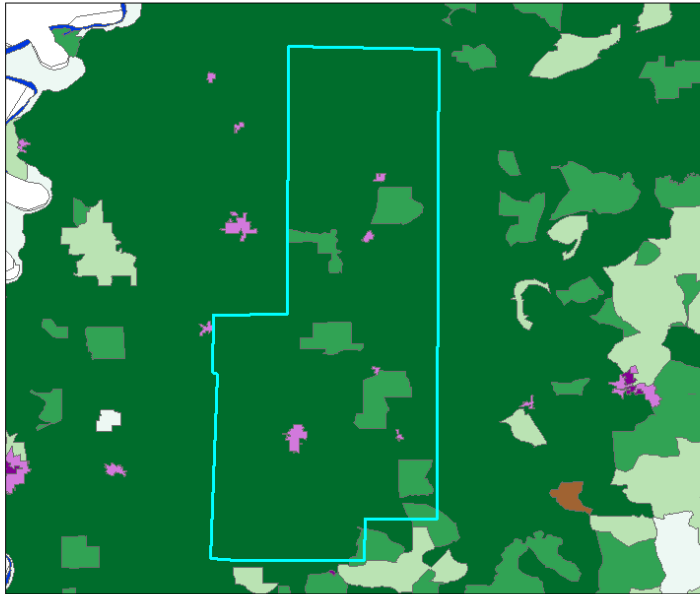
This map shows the stratification of the State based on agricultural land use as revealed by satellite imagery. Statistically weighted selection of study segments in each strata allows direct expansion of crop acreages to give the JAS State-wide crop acreage estimates.



# A New Stratum

Note that changes have occurred and catfish ponds have been added.

Mississippi Stratum, Sunflower County, 1998



**Legend**

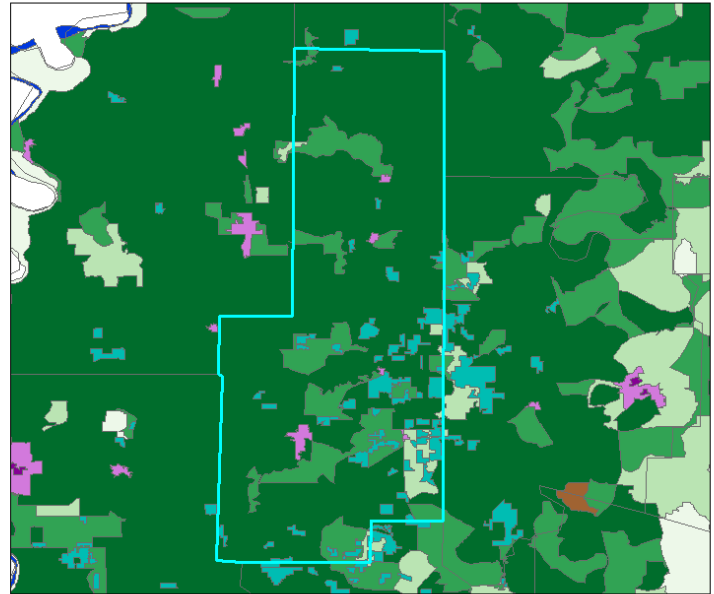
- STRATA
- >75% Cultivated
  - 51-75% Cultivated
  - 15-50% Cultivated
  - < 15% Cultivated
  - Agri-Urban > 20 Homes per Sq. Mi.
  - Co.,mercial/Dense Urban > 20 Homes per Sq. Mi.
  - Non-Agriculture
  - Water



Map by Dr. Fred Shore, 3/4/05



Mississippi Stratum, Sunflower County, 2004



**Legend**

- Land Use Strata, 2004
- STRATA
- > 75% Cultivated
  - 51 - 75% Cultivated
  - 15 - 50% Cultivated
  - < 15% Cultivated
  - Catfish
  - Agri-Urban > 100 Homes Per Sq. Mi.
  - Commercial/Dense Urban > 100 Homes Per Sq. Mi.
  - Non-Agriculture
  - Water

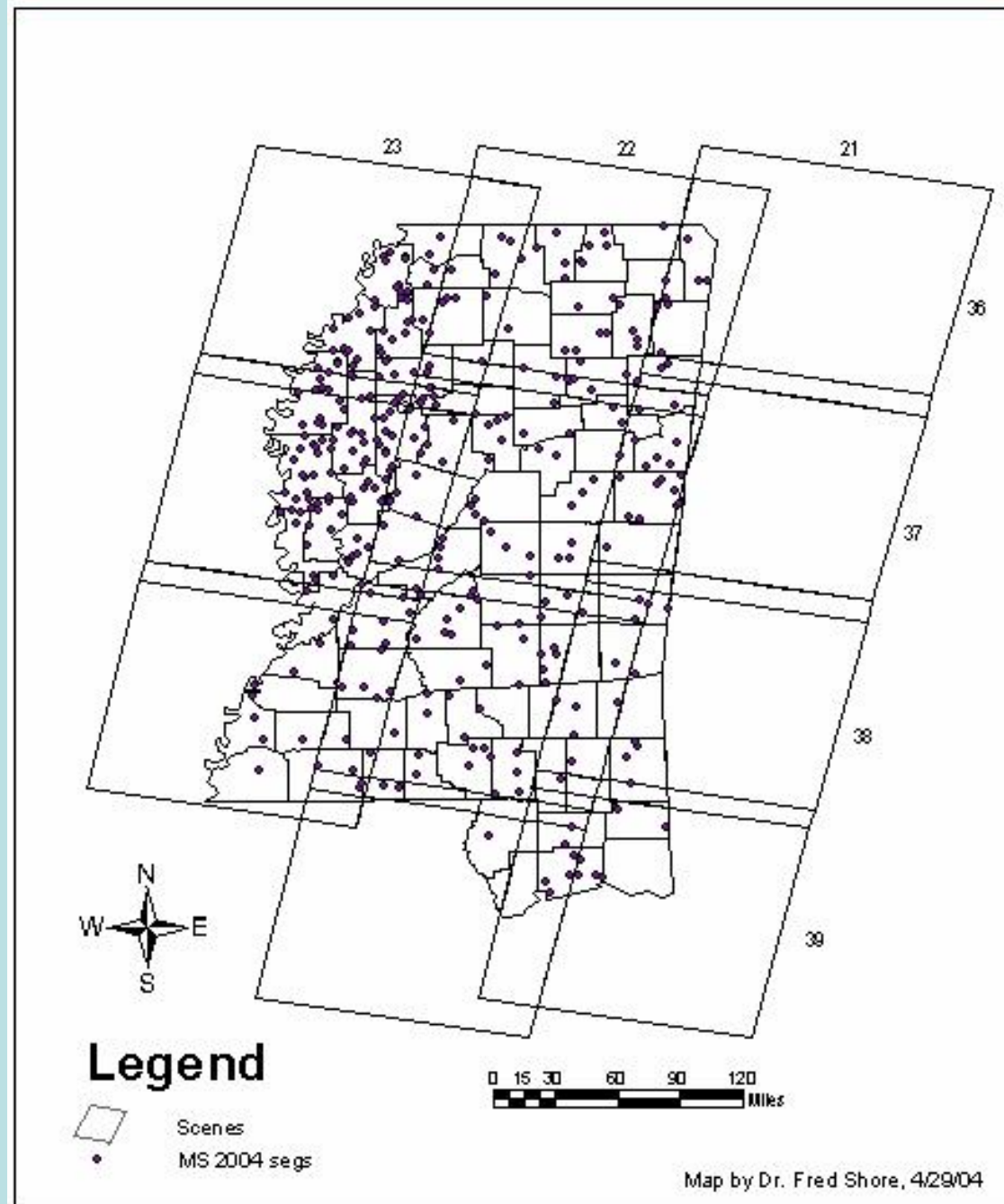


Map by Dr. Fred Shore, 3/3/05



# Study Segments

This map locates each of the JAS study segments (356 in 2004) with the location of Landsat scenes (11 scenes minimum). The field data and imagery are processed to obtain the Cropland Data Layer.



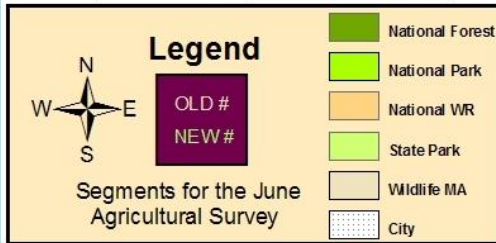
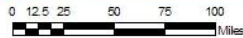


# Segment Locator Map

## 2004 Washington County Sample Segments 6001 and 6010

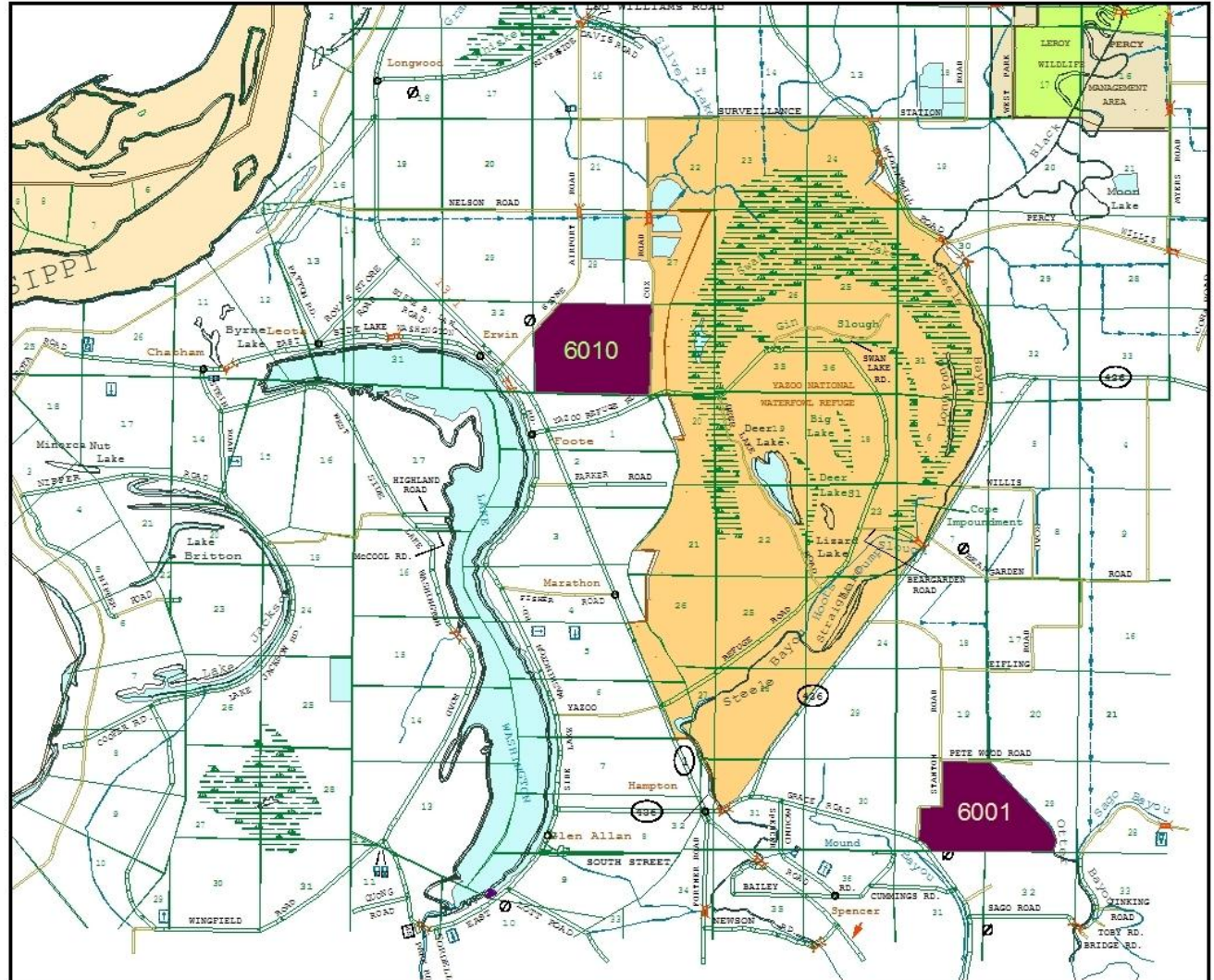


Map Locator



USDA/NASS/MDAC/MSU

Map by Dr. Fred Shore



Segment Area Map





# Mississippi 2004

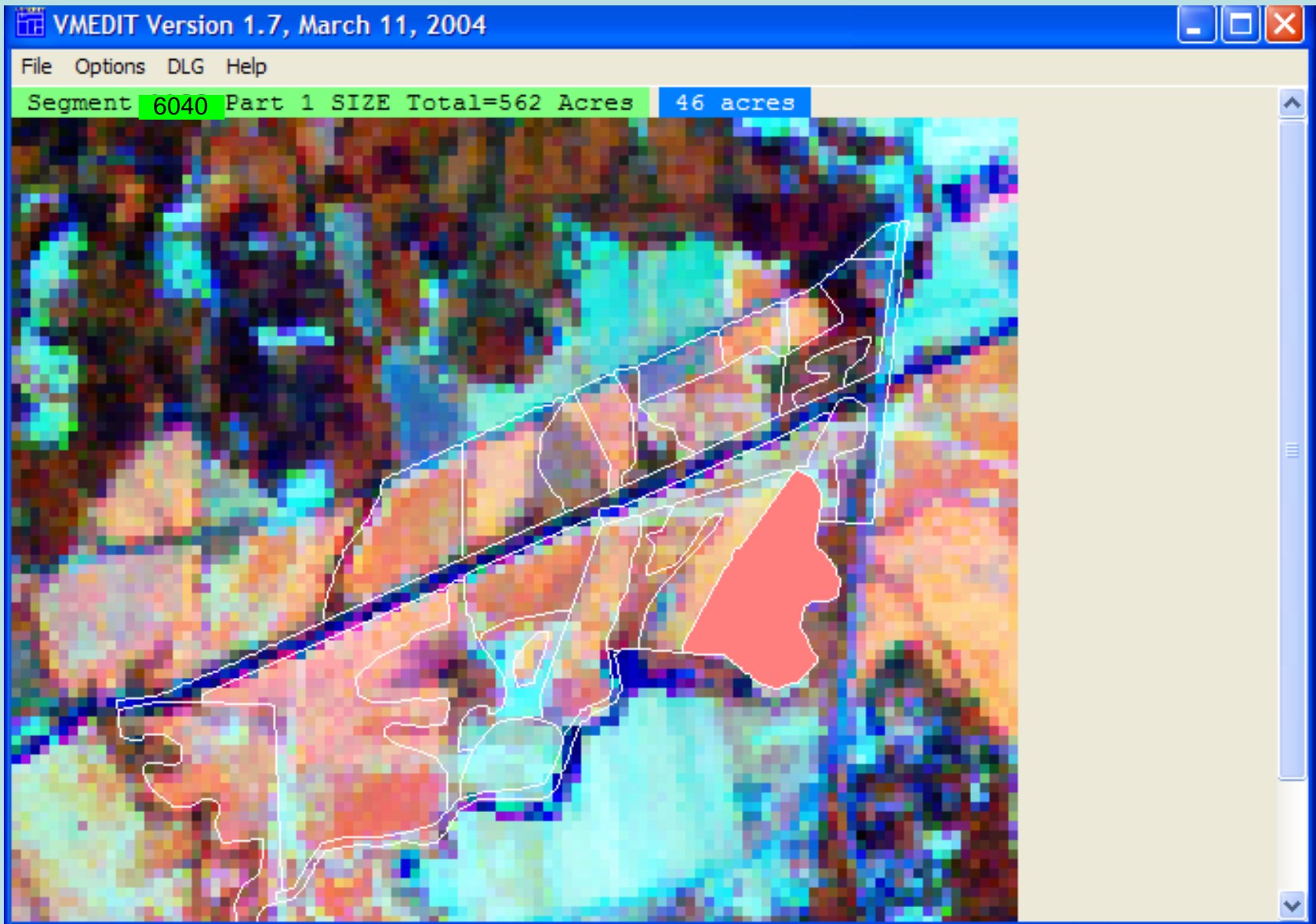
## JAS Labeled Photo/Map

Field/Operator/Crop information, 1:8000 Scale



# Remote Sensing Project (RSP)

Software Acreage Measurement/Mouse Digitizing of Field Outlines  
Overlaid on An Image from a Previous Year





# Field/Segment Boundaries on a High Resolution Photo

The segment boundary is shown in wide lines and the field boundaries in thin lines with acres shown for each field.



## 2006 Segment 6001, Test County

MSU, USDA-NASS, MDAC Map by Dr. Fred Shore, 4/13/06

Enumerator Caution: photo, acres, and field lines may be inaccurate.

# MS Landsat Scenes 2006

Each scene, bounded in yellow, is easy to select using the USGS Viewer.

The image shows a screenshot of the USGS Global Visualization Viewer web application. The interface includes a menu bar with 'Sensor', 'Resolution', 'Map Layers', 'Tools', 'File', and 'Help'. On the left, there is a map of the United States with a red dot indicating the current scene's location. Below this is a control panel with the following fields and buttons:

- WRS-2 Path / Row: 23 / 37 (Go)
- Lat / Long: 33.2 / -90.9 (Go)
- Max Cloud: 100% (with up/down arrows and left/right arrows)
- Scene Information: ID: 5023037000610010, Cloud Cover: 0%, Qlty: 9, Date: 2006/4/10
- Month: Apr, Year: 2006 (Go)
- Buttons: Prev Scene, Next Scene
- Section: Landsat 4-5 TM Scene List
- Buttons: Add, Delete, Order
- Bottom status bar: Landsat 4-5 TM, 1000m, No Limits Set

The main display area shows a satellite image of a landscape with a yellow rectangular bounding box highlighting a specific scene. The USGS logo is visible in the bottom right corner.

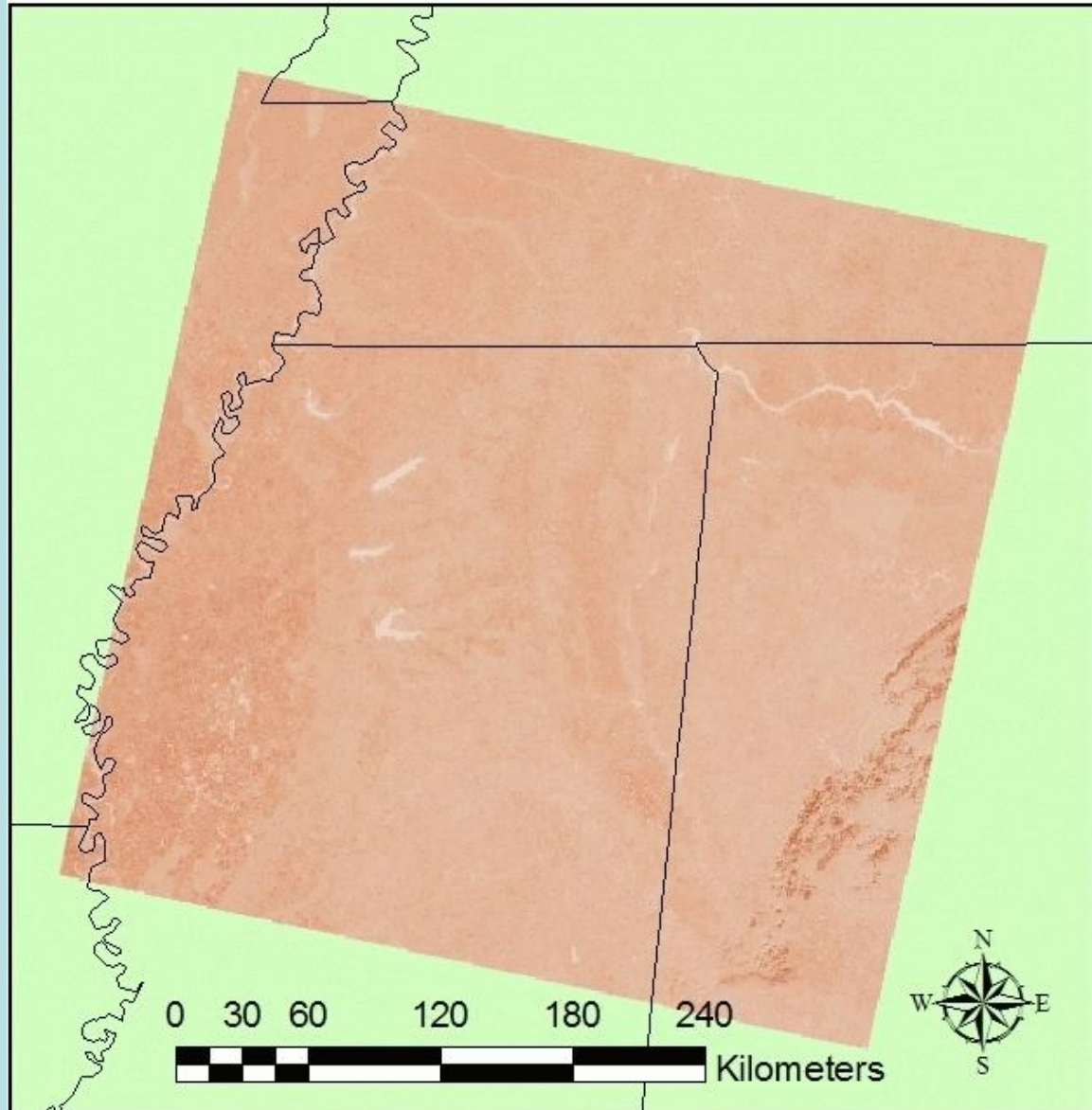


# Indian Remote Sensing (IRS)

AWiFS scenes each cover 350 km<sup>2</sup> at an average resolution of 56 m (vs. Landsat TM scenes at 185 km<sup>2</sup> and 30 m resolution).

Shown as false color IR:  
Band 5 (short wave IR) /  
Band 3 (red) / and Band 2 (green) as red/green/blue.  
An additional IR band is also obtained (vs. 7 bands for Landsat TM scenes).

Indian Remote Sensing (IRS)  
RESOURCESAT-1  
Advanced Wide Field Sensor (AWiFS)  
Scene 280-48-A, 9/04/05



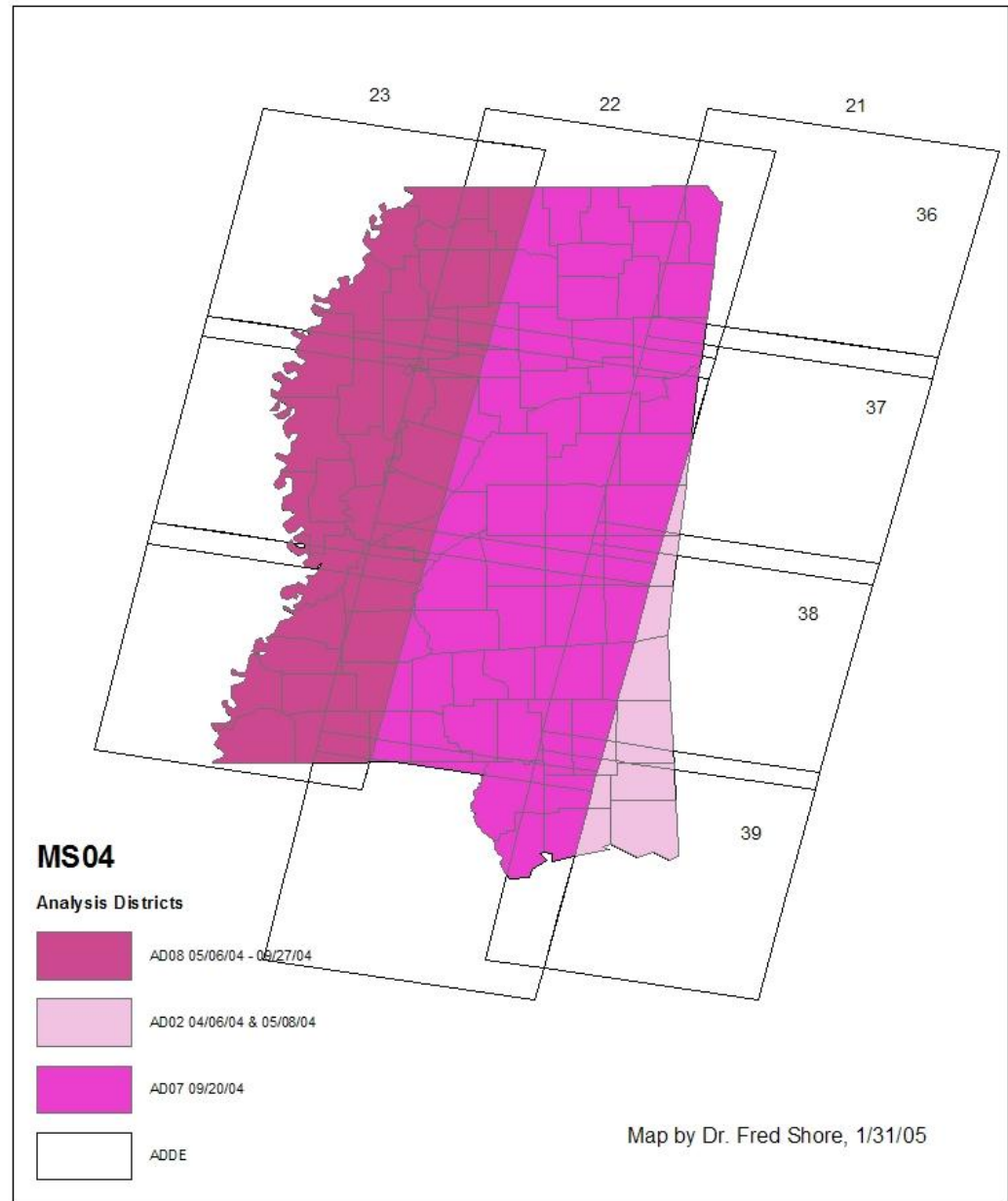


# **Multi-Temporal Crop Signatures for Image Classification**

- **Computer processing using Peditor and RSP.**
- **Use of two satellite scenes of different dates with approximately the same area coverage.**
- **Use of the ground truth data.**
- **Clustering the crop signatures and training the classifier.**
- **Classification of all scenes and making the mosaic.**

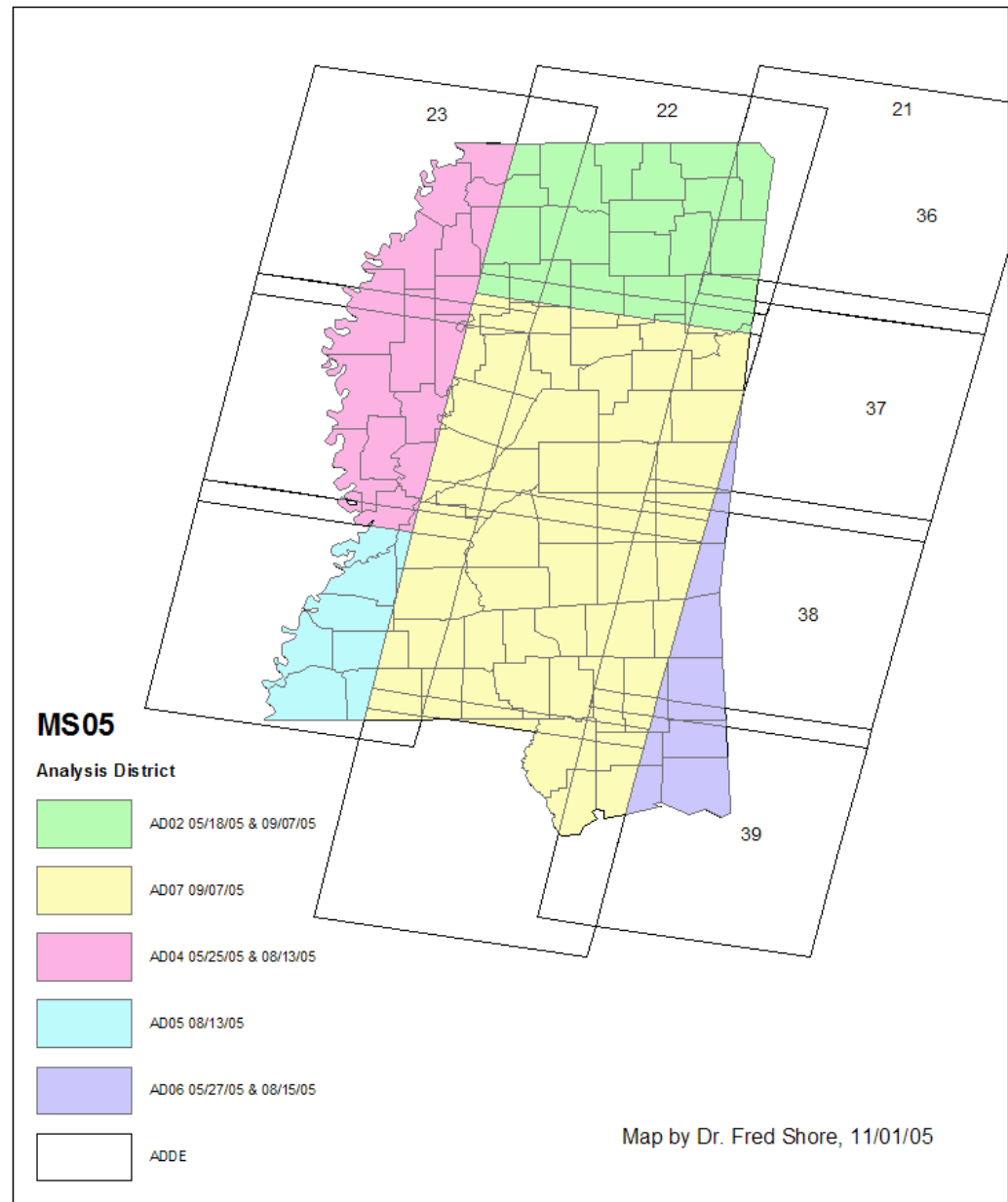
# Image Processing for MS CDL, 2004

Note that Analysis Districts categorized using multi-temporal scenes can be combined with Analysis Districts categorized using scenes of a single date to give the final mosaic.



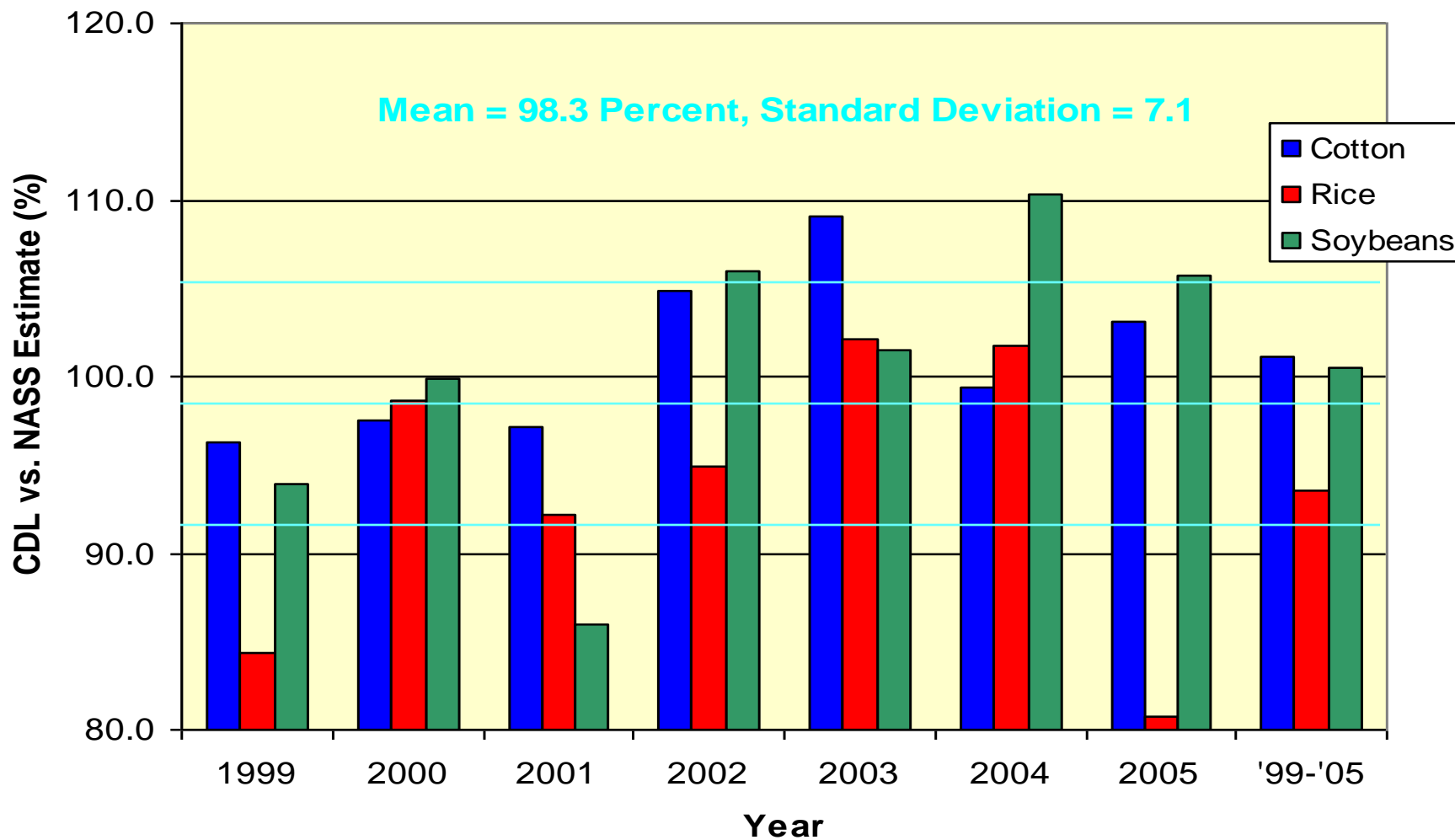
# Image Processing for MS CDL, 2005

Note that three Analysis Districts categorized using multi-temporal scenes and two Analysis Districts prepared using uni-temporal scenes were combined to give the final mosaic.



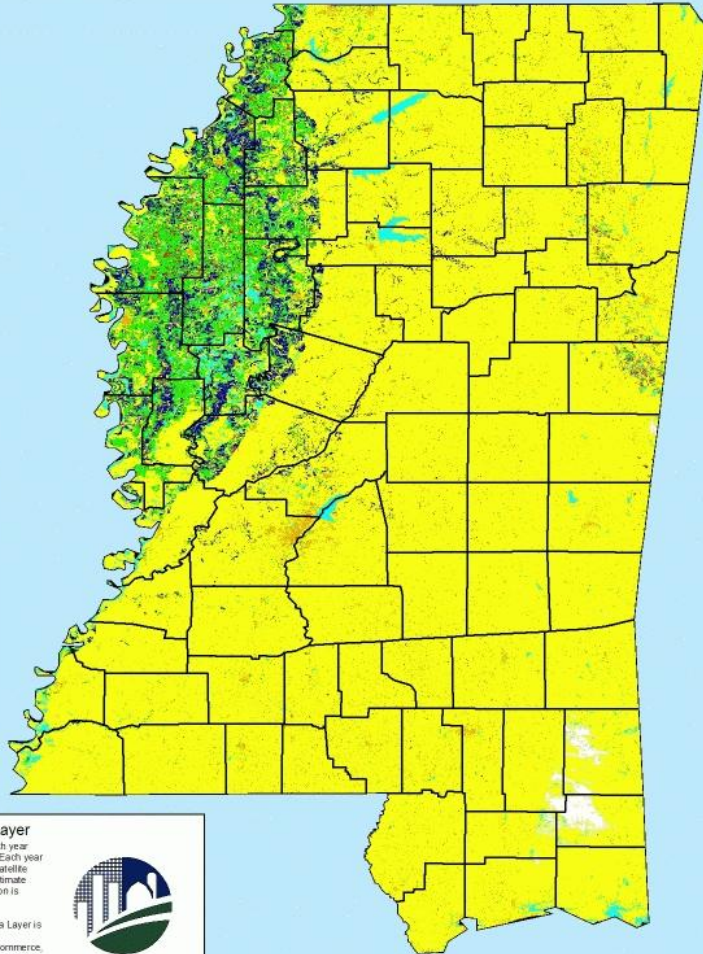


# Mississippi Major Crop Planted Acres Estimates, 1999-2005 Cropland Data Layer Value as Percent of the Official Estimate



# Single Year ArcGIS CDL Presentation Maps

## Mississippi Cropland Data Layer, 2004



- CROPS**
- Corn
  - Cotton
  - Rice
  - Sorghum
  - Soybeans
  - Hay/Other Crops
  - Fallow/Idle Cropland
  - Trees/Pasture/Non-Ag
  - Clouds
  - Urban
  - Water

### Mississippi Cropland Data Layer

Mississippi farmers select crops to plant each year depending on the weather and the market. Each year the USDA-NASS uses field personnel and satellite imaging to help provide the best possible estimate of crop production. This statistical information is important in predicting the US economy.

Compilation of the Mississippi Cropland Data Layer is a cooperative effort of the USDA-NASS, the Mississippi Department of Agriculture and Commerce, and the Mississippi State University Cooperative Extension Service.

Landsat imagery was processed and enhanced for this map. The official result is available on disk from USDA-NASS at (800) 727-9540.

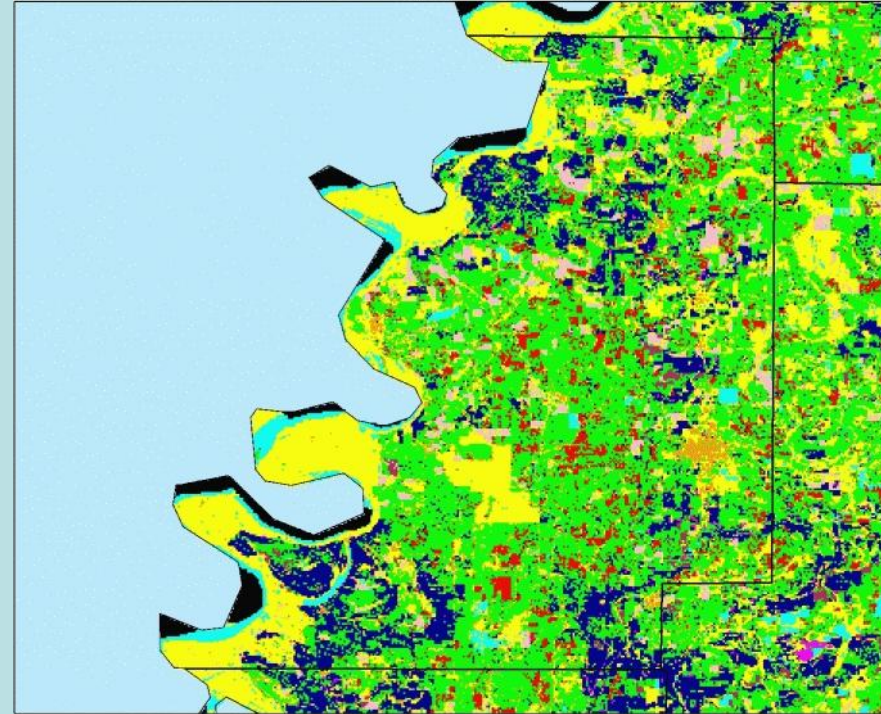


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USDA-NASS/MDAC/MSU  
Map by Dr. Fred Shore

## Bolivar County, Mississippi Cropland Data Layer, 2004



Bolivar County Area Map



### Mississippi Cropland Data Layer

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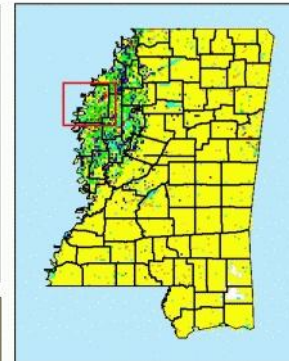
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  - Clouds
  - Urban
  - Water



Locator Map 0 15 30 60 90 120 Miles

USDA-NASS/MDAC/MSU

Map by Dr. Fred Shore

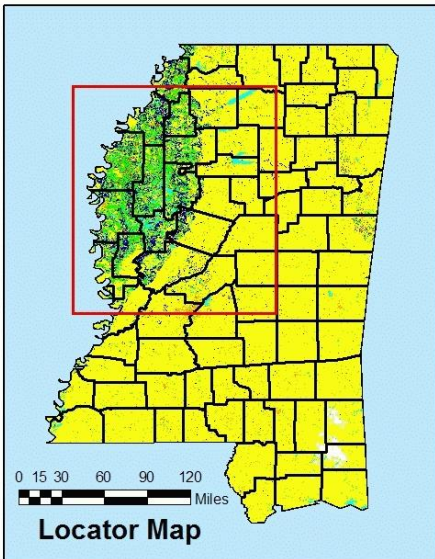


# Presentation Map: The Mississippi Delta, 2004

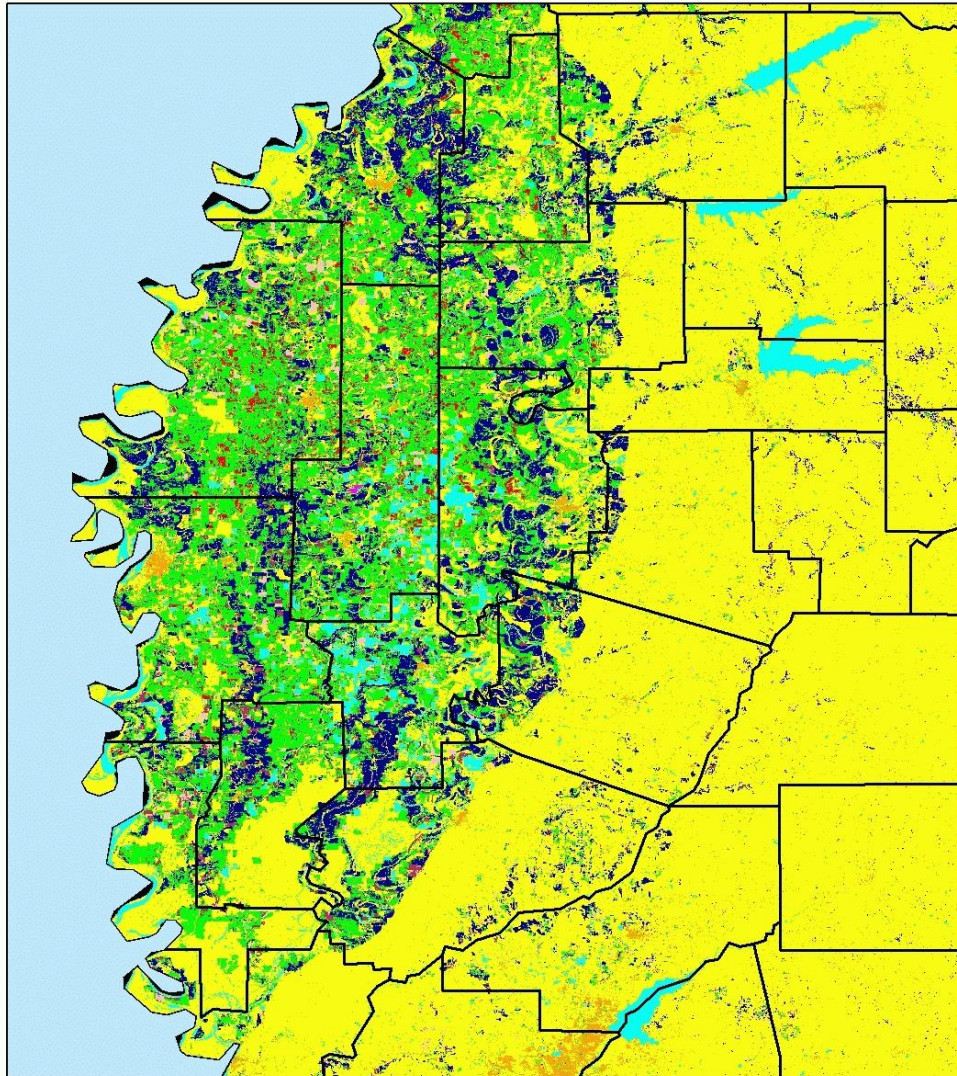
## The Delta, Mississippi Cropland Data Layer, 2004

### CROPS

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USDA-NASS/MDAC/MSU  
Map by Dr. Fred Shore



**Mississippi Delta Area Map**



### Mississippi Cropland Data Layer

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**NASS**

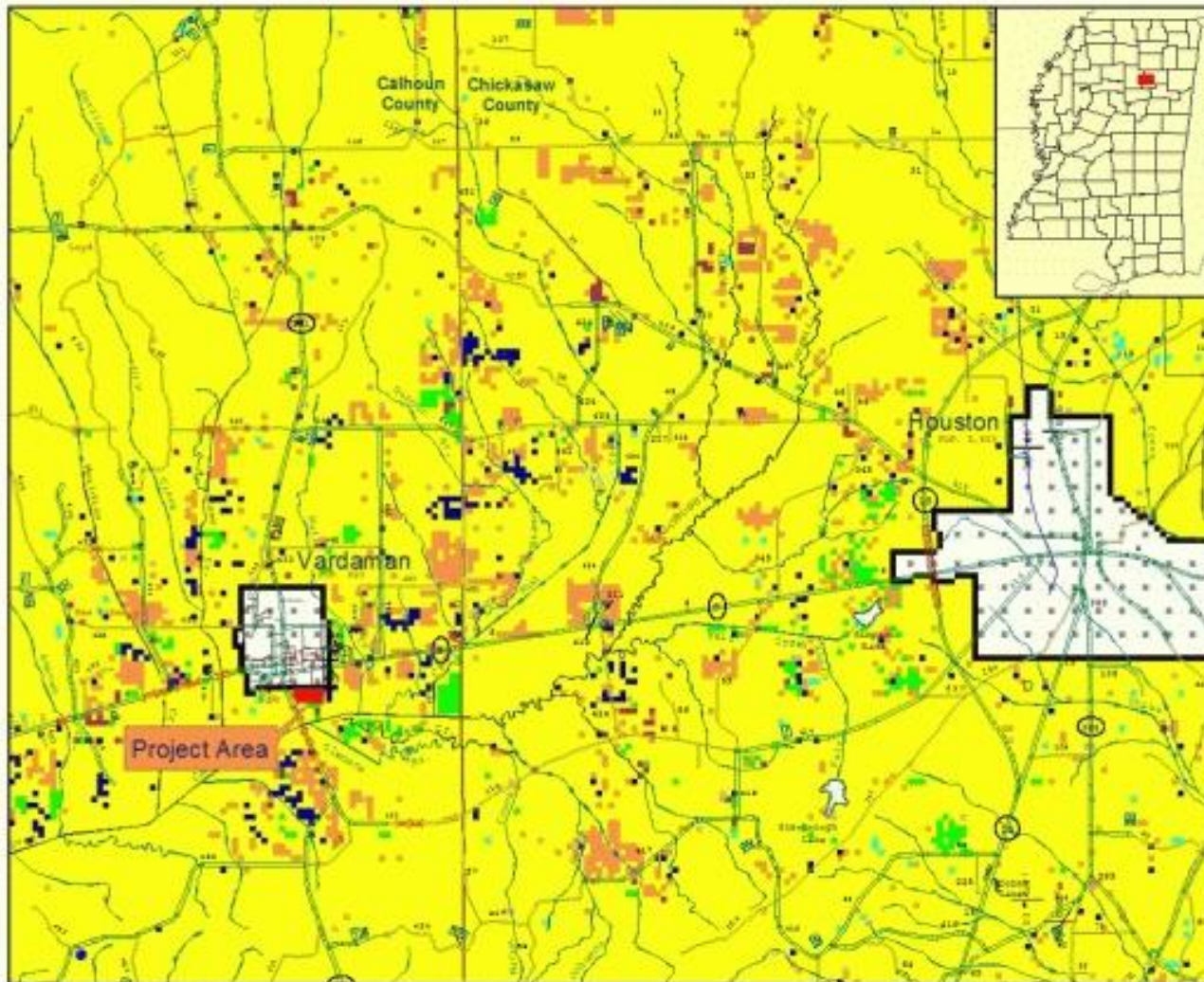


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& COMMERCE**

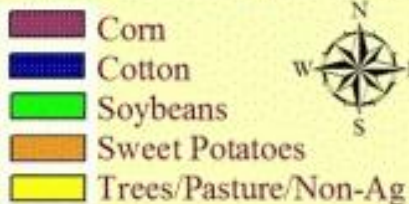


# Optimizing Location of a Proposed Sweet Potato Processing Plant

## 2004 Sweet Potatoes Vardaman - Houston Area



### Cropland Data Layer Crops



USDA-NASS Official Estimates  
15,300 Harvested Acres in Mississippi  
Average Yield of 170 Cwt./acre

USDA-Farm Service Agency  
Planted Acre Estimates  
Calhoun County 6,770 acres  
Chickasaw County 5,290 acres

MDAC/USDA-NASS/MSU  
Map by Dr. Fred Shore

Vardaman - Houston Area Map

0 0.5 1 2 3 4  
Miles



# The Basic Cropland Data Layer Presentation

The Mississippi Delta showing the Cropland Data Layer classifications obtained using satellite images, and the June Agricultural Survey.

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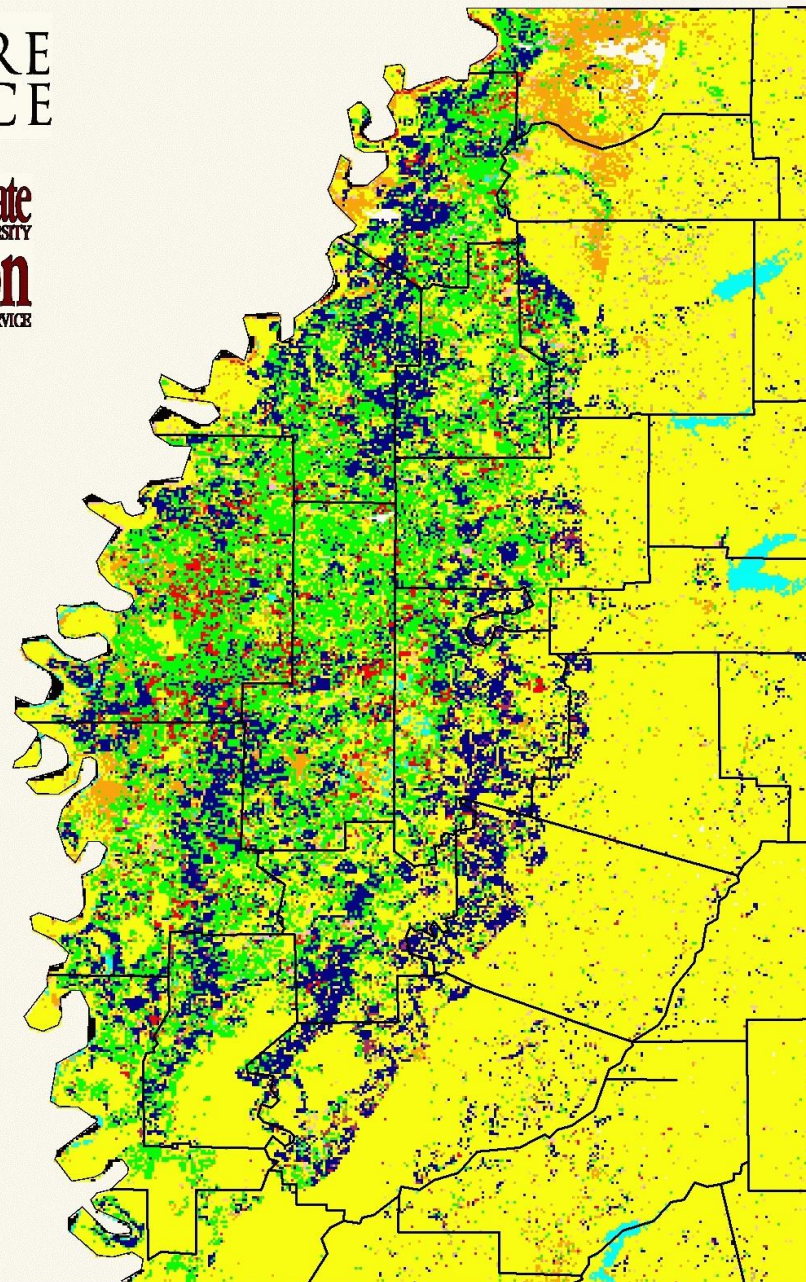


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## CROPS

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# Multiyear Overlays Cotton

The variation of land use for cotton in the Delta over a 6 year period is shown in this map.

The darker the shade of blue, the more years the same land was used to grow cotton.

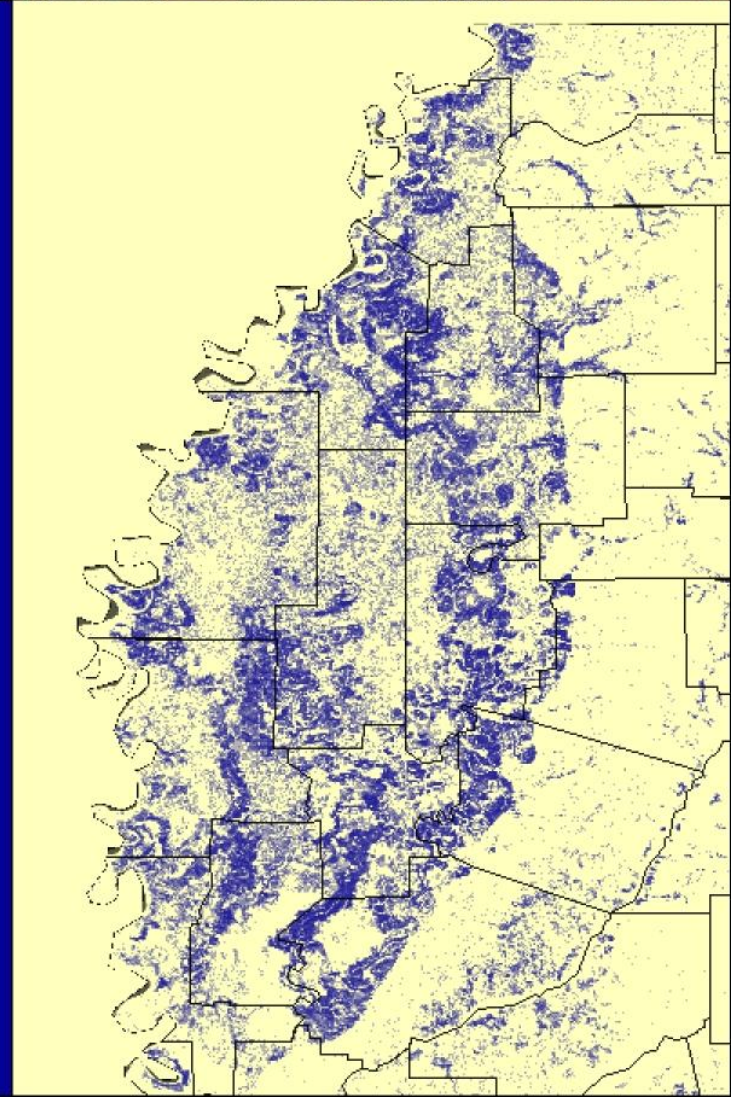
Frequency of Acreage Planted to Cotton, 1999-2004



In the crescent moon-shaped part of northwestern Mississippi known as The Delta, cotton is usually planted in sandy soil along existing or ancient rivers and creeks.

Cotton crop rotations are used but high cotton prices can lead to the same land being used for cotton every year.

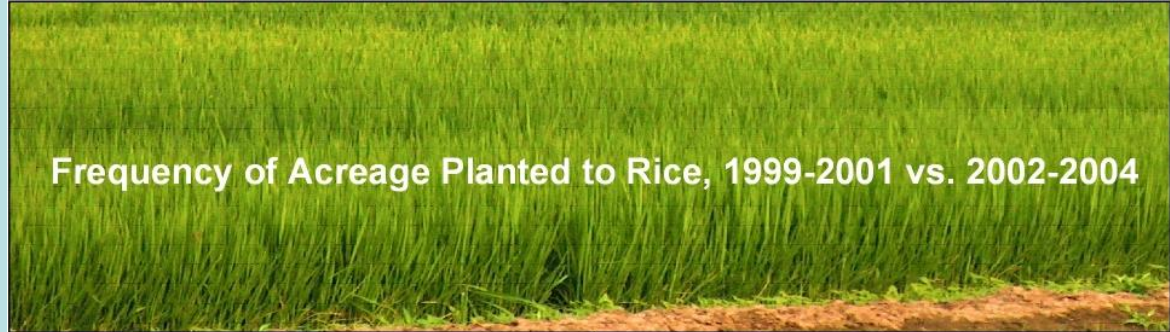
Map shows satellite cotton classification range from the Cropland Data Layer by Dr. Fred Shore.



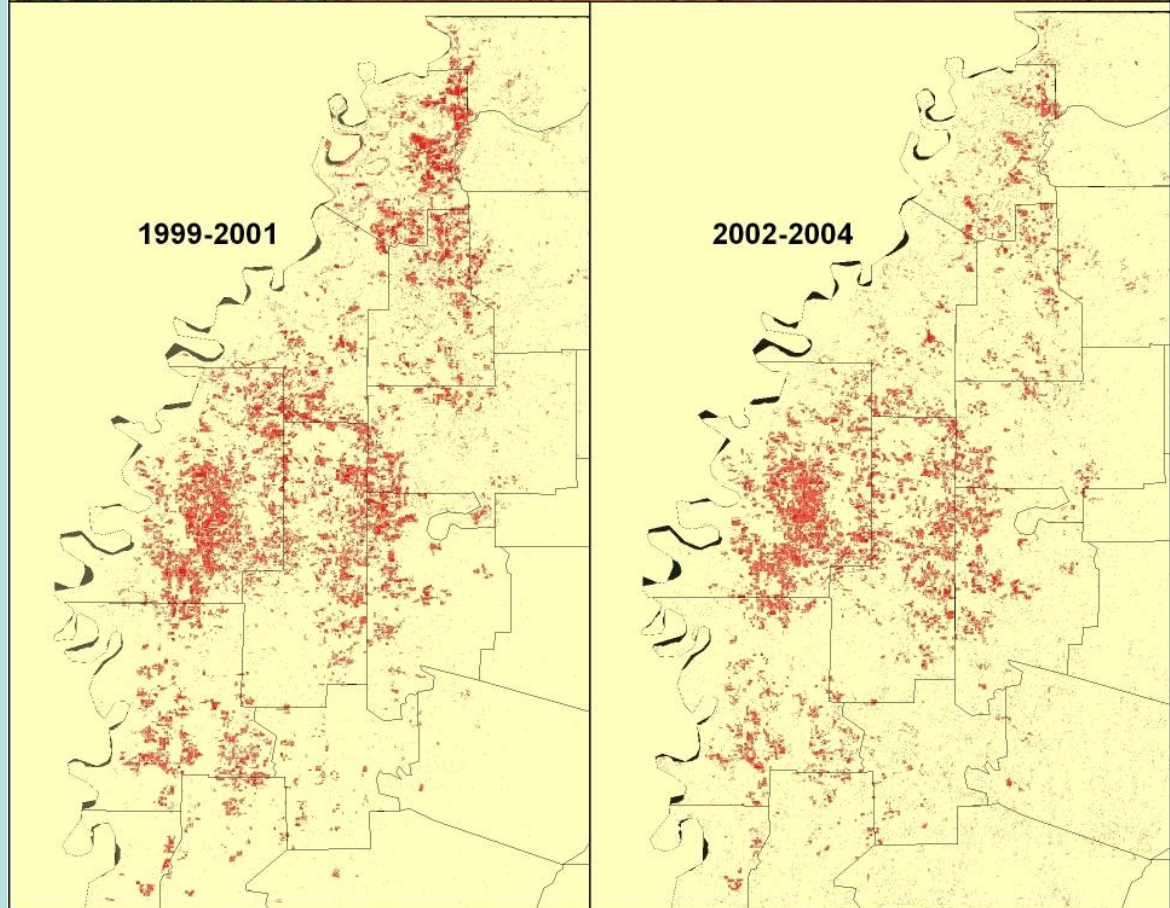


# Multiyear Overlays Rice

With the three year rotation schedule, comparing two 3-year periods gives similar land use areas. Note that almost all areas had only one year of rice growth as shown by the red color.



Frequency of Acreage Planted to Rice, 1999-2001 vs. 2002-2004



In the crescent moon-shaped part of northwestern Mississippi known as The Delta, rice is usually planted in heavy clay soils.

Rice rotation with 2 years of soybeans is recommended. Notice the similar rice land use patterns for each of these 3 year periods.

Maps show satellite rice classification range from the Cropland Data Layer by Dr. Fred Shore.



# The Basic Cropland Data Layer Presentation

Note that the largest crop acreage is soybeans but the most profitable crop is cotton with rice second most profitable.

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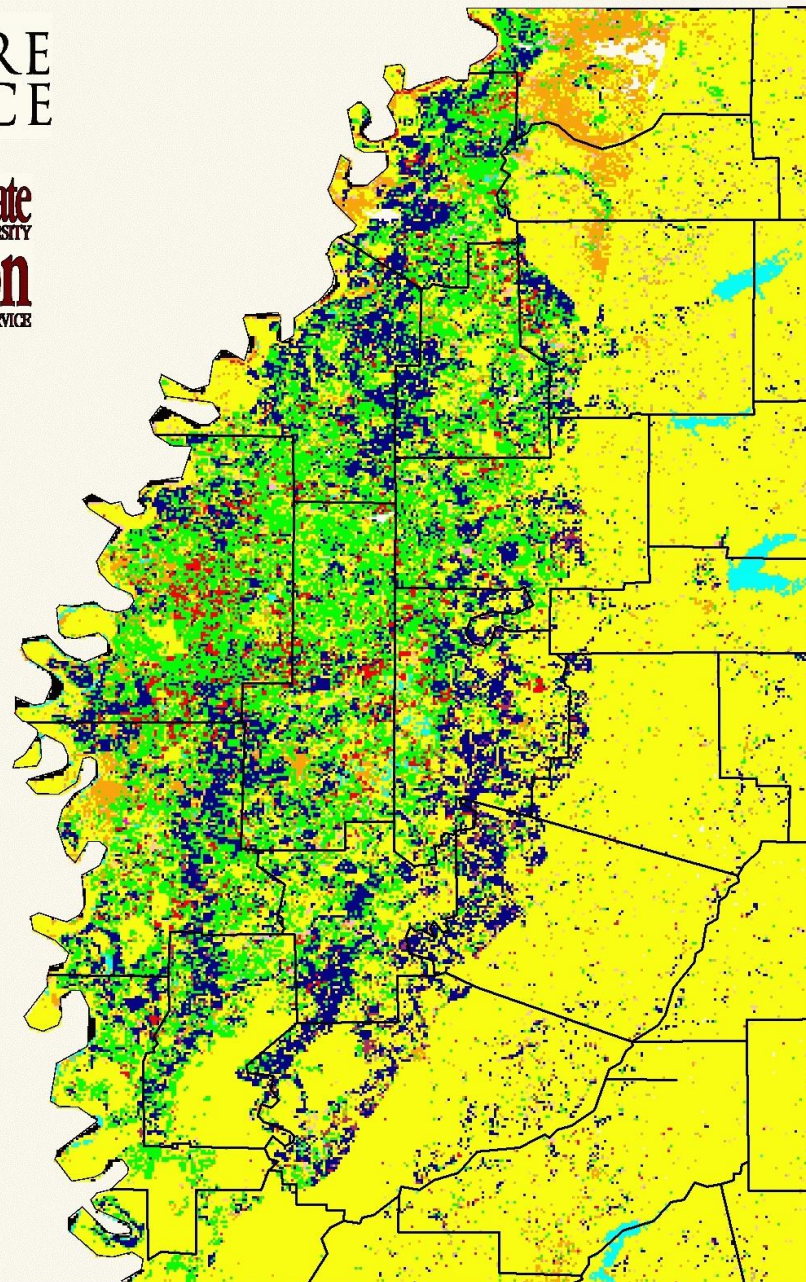


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## CROPS

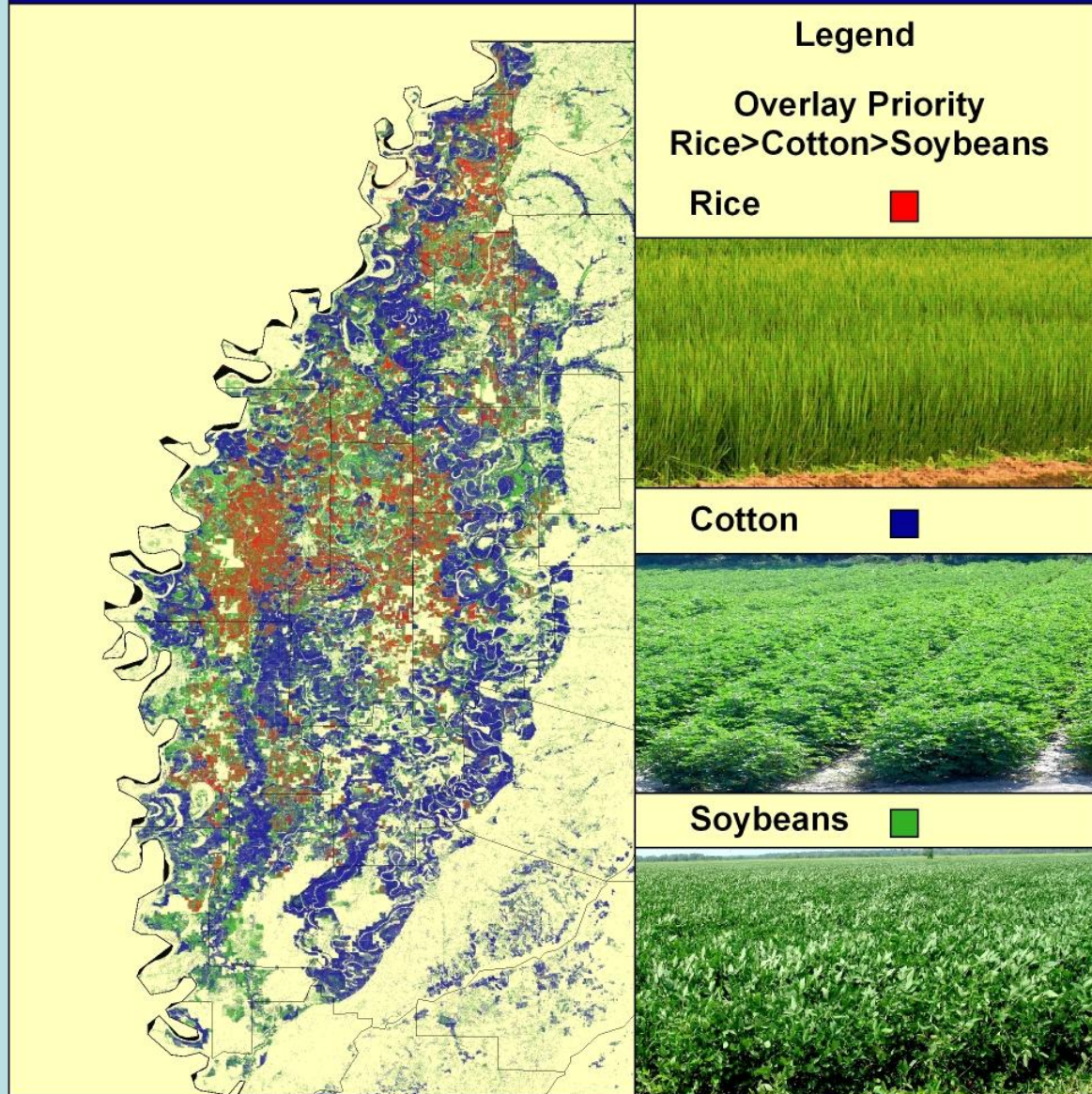
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# Crop Overlays by Priority

Overlaying soybeans with cotton and then overlaying both with rice reveals that potential rice acreage is nearly equivalent to the cotton acreage.



In the crescent moon-shaped part of northwestern Mississippi known as The Delta, cotton is the most profitable crop with rice second.

On an annual basis there are more acres planted to soybeans than any other crop. This overlay display shows good land for cotton and rice and land used for soybeans that could be used in rotation with rice.

Map shows satellite classification ranges from the Cropland Data Layer by Dr. Fred Shore.



# ArcGIS Statistical Posters to Show Mississippi Agricultural Production

Mississippi Agricultural Statistics Service

## Mississippi's Rank Among States In Agricultural Commodities, 2004

Commodity	Production or Number	Unit	Rank
<b>Crop</b>			
All Cotton	2,346,000	bales	3
All Rice	16,146,000	cwt	4
Sorghum for Grain	1,422,000	bu	13
Sorghum for Silage	13,000	tons	20
Sweetpotatoes	2,601,000	cwt	3
Soybeans	61,500,000	bu	13
Winter Wheat	7,155,000	bu	29
All Hay	1,656,000	tons	32
Corn for Grain	59,840,000	bu	21
Corn for Silage	210,000	tons	41
All Pecans	1,000,000	lbs	10
Watermelons	378,000	cwt	13
Potted Poinsettias	203,000	pots sold	34
<b>Livestock</b>			
Catfish-foodsize	388,000,000	lbs sold	1
Broilers	827,800,000	number	4
Eggs	1,600,000,000	number	17
All Cattle & Calves <sup>1</sup>	1,070,000	number	30
Beef Cows <sup>1</sup>	564,000	number	21
Milk Cows <sup>1</sup>	26,000	number	36
Milk	379,000,000	lbs	37
Hogs & Pigs <sup>2</sup>	315,000	number	21
Honey	1,170,000	lbs	24

<sup>1</sup> January 1, 2005.

<sup>2</sup> December 1, 2004.

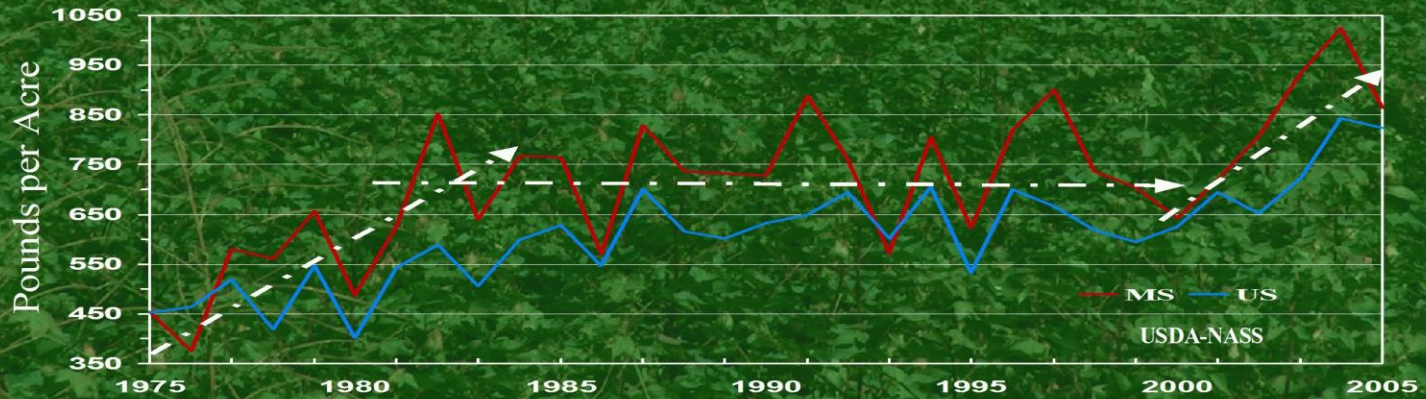
Last Update - 01/20/2006

Next Update Expected - 01/20/2007

# Mississippi Cotton Yield Changes, 1975-2005



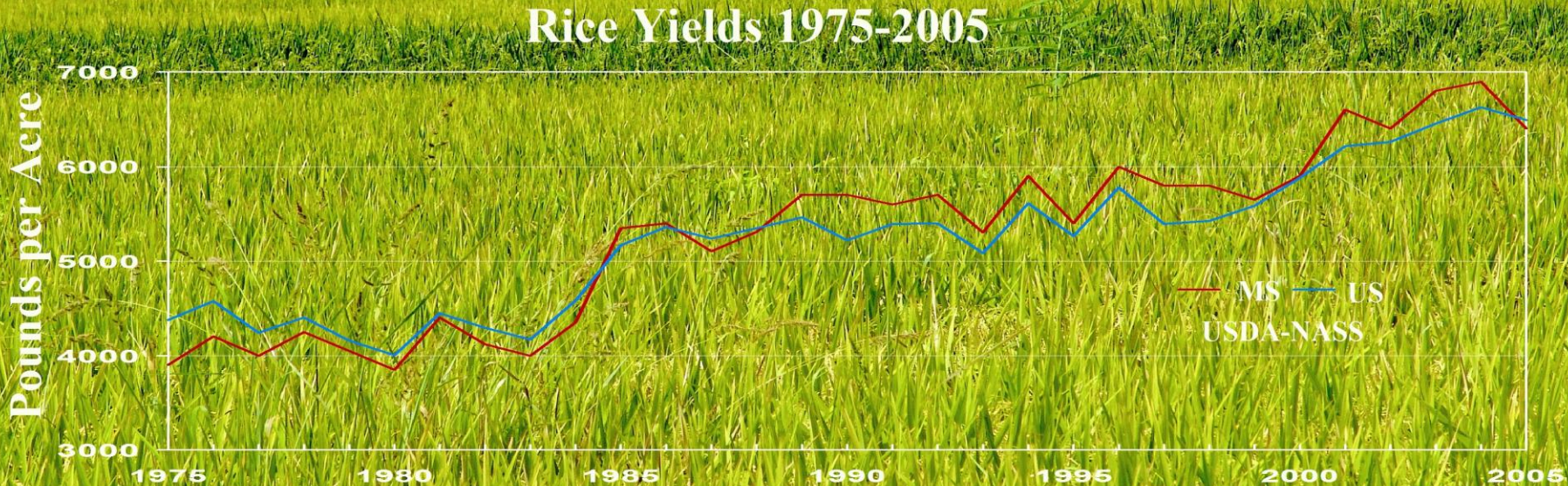
Cotton Yields 1975-2005



Cotton yields in Mississippi and the United States increased steady for decades. However, during the 1980's yield increases remained relatively flat. Since 2000, cotton yields have resumed their historic advances.



# Mississippi Rice Yield Changes, 1975-2005



After a rapid jump in 1985, Mississippi long grain rice yields have increased at the same rate as National rice yields. Mississippi is the 4<sup>th</sup> leading state in rice production.



# Food-Size Catfish Production, 1995-2005



Mississippi catfish production remains first in the U.S. in spite of the recent drop in production.

# ***GIS Applications for the Mississippi Cropland Data Layer Cropland, 1999-2006 Results***

- Annual Cropland Data Layers are available on disk from USDA-NASS (800) 727-9540 and on-line at [www.mdac.state.ms.us](http://www.mdac.state.ms.us) and <http://www.nass.usda.gov/research/Cropland/SARS1a.htm>.
- The Cropland Data Layer is useful for crop acreage estimates and for visual presentations of cropland coverage.
- The Segment Locator Maps and other ArcGIS presentations make data collection easier during the June Agricultural Survey.
- Multi-layer ArcGIS maps allow land use patterns and crop rotations to be observed.
- Adding pictures and graphs to ArcGIS maps allow a more dramatic presentation of agricultural statistics and give a useful way to print large-format posters.