Remote Sensing for Cropland Monitoring in Mississippi, 1999-2004

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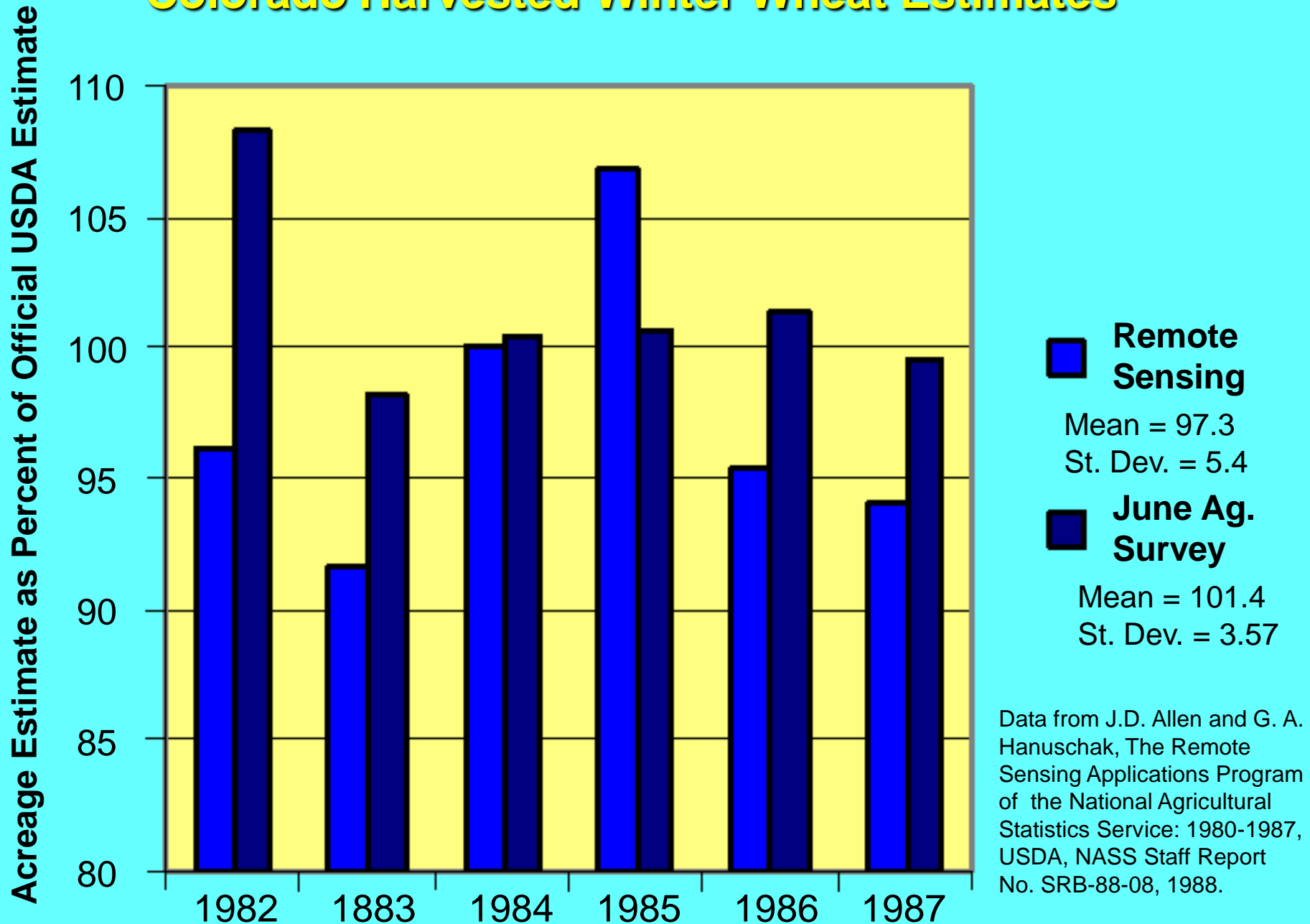National Agricultural Statistics Service
Jackson, MS, USA

Rick Mueller
Research and Development Division
National Agricultural Statistics Service
Fairfax, VA, USA

Colorado Harvested Winter Wheat Estimates

Acreage Estimate as Percent of Official USDA Estimate (y-axis: 80, 85, 90, 95, 100, 105, 110)

x-axis: 1982, 1883, 1984, 1985, 1986, 1987

Remote Sensing
Mean = 97.3
St. Dev. = 5.4

June Ag. Survey
Mean = 101.4
St. Dev. = 3.57

Data from J.D. Allen and G. A. Hanuschak, The Remote Sensing Applications Program of the National Agricultural Statistics Service: 1980-1987, USDA, NASS Staff Report No. SRB-88-08, 1988.

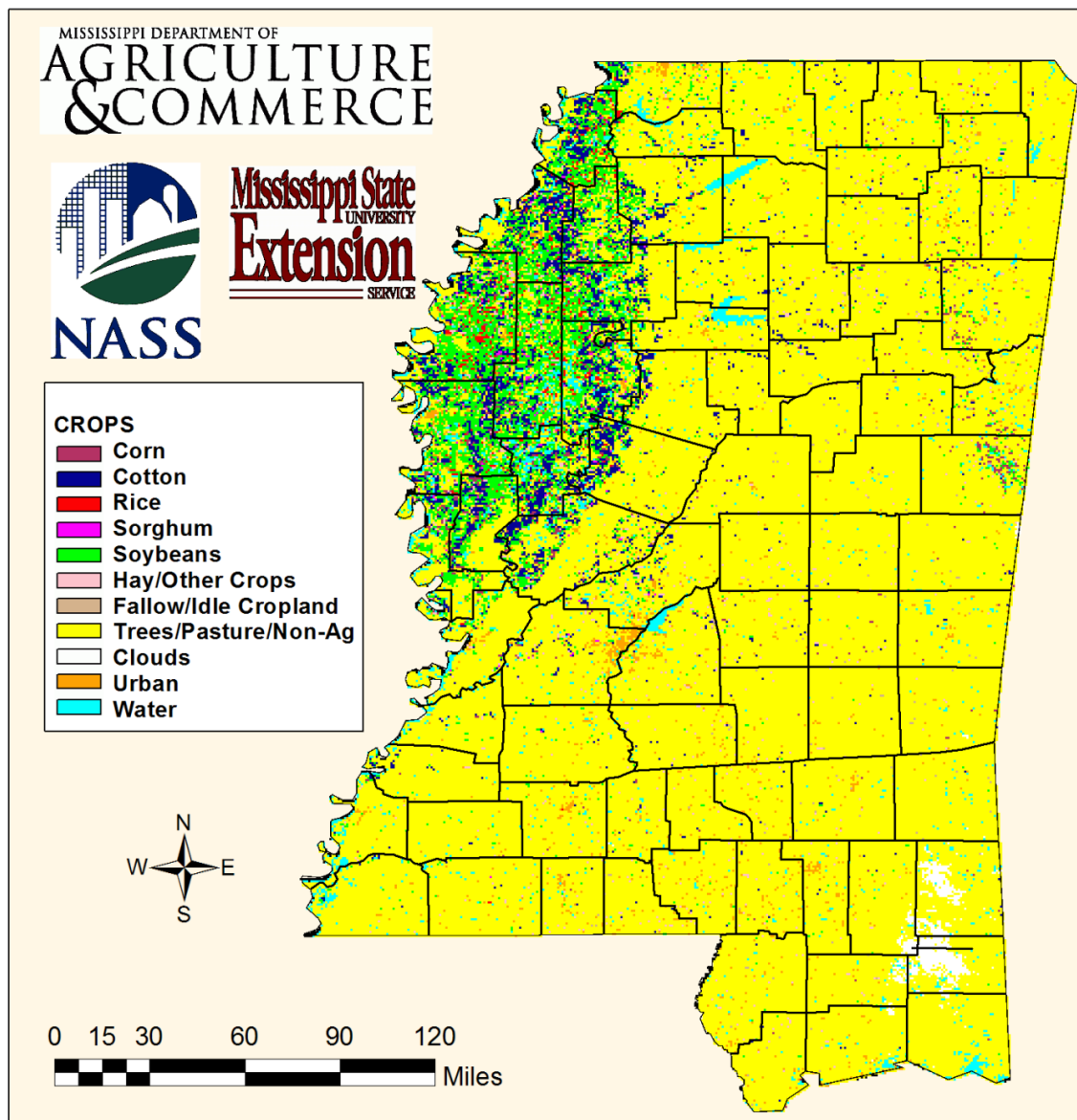# The Cropland Data Layer in Mississippi

- **Based on USDA/NASS programs started in the 1970s and the LARSYS software from Purdue University.**

- **Mississippi cooperative project started in 1999 using the Peditor and RSP software programs of NASS**

- **A cooperative project of NASS, Mississippi State University, and the Mississippi Department of Agriculture and Commerce**

Data Collection for the MS 2004 Cropland Data Layer

- **June Agricultural Survey area frame sample selection of 356 segments by strata, generally 1 square mile per segment.**

- **June Agricultural Survey field observations.**

- **Landsat 5 satellite imagery scenes with little or no clouds.**

The Mississippi Cropland Data Layer, 2004

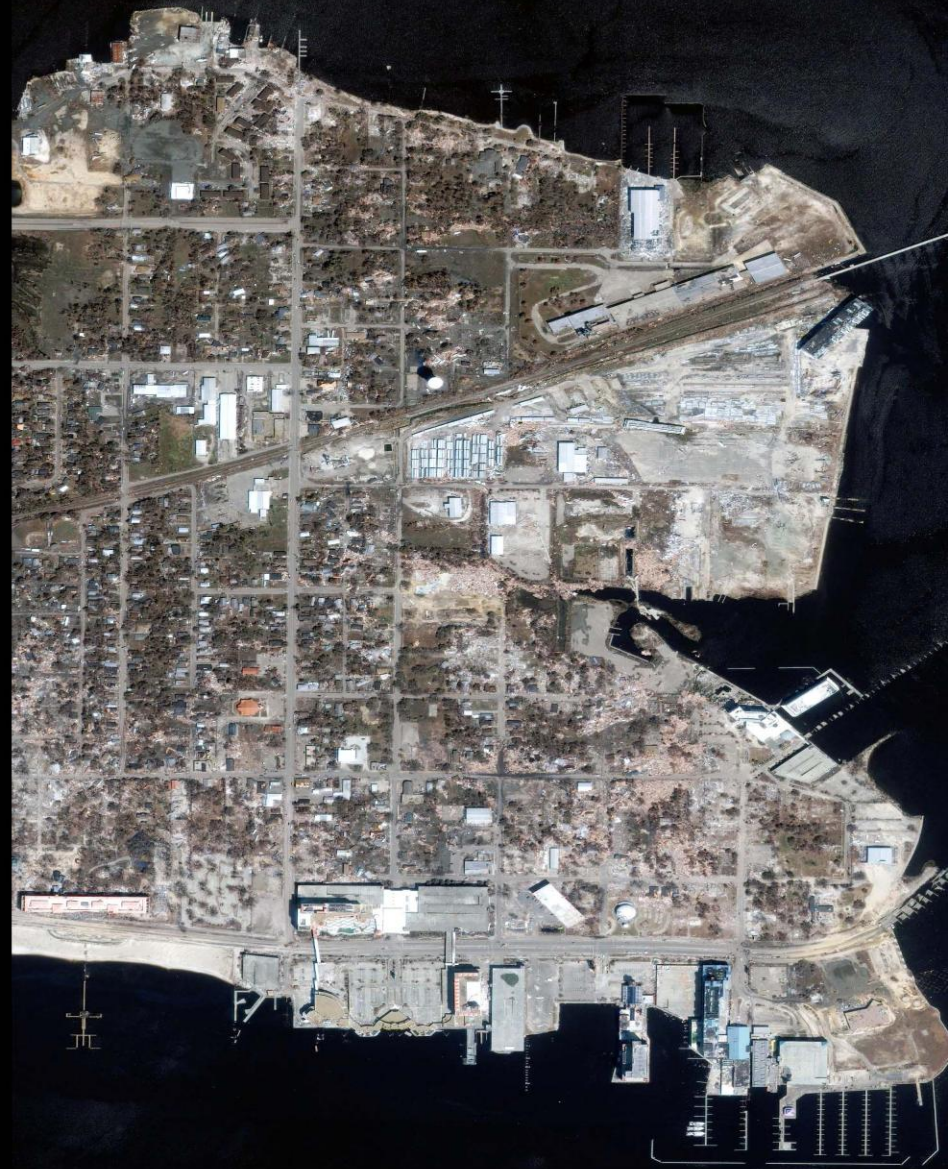Mississippi Cropland Data Layer, 2004

MISSISSIPPI DEPARTMENT OF AGRICULTURE & COMMERCE

NASS

Mississippi State University Extension SERVICE

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

0 15 30   60   90   120   Miles

November 13, 2001   Biloxi, Mississippi   September 2, 2005

www.spaceimaging.com

MAPPING THE DESTRUCTION

HURRICANE KATRINA ▸ In Depth

Path of the storm | Landfall | New Orleans | Levee repairs

HURRICANE KATRINA

Date	Time	Wind speed
30 Aug	**4am**	**50mph**

— Path of storm
■ Hurricane
■ Tropical storm

Jackson
Mobile
Biloxi
New Orleans
Miami

Gulf of Mexico
BAHAMAS
CUBA

TN · AR · MS · AL · GA · LA · TX · FL

23 Aug   25   28   29   30

GETTY IMAGES

Comparative Satellite imagery of power outages caused accross the Gulf Coast region pre- and post-Hurricane Katrina
(Image source: U.S. Air Force image)

Comparative Satellite imagery of power outages caused accross the Gulf Coast region pre- and post-Hurricane Katrina (Image source: U.S. Air Force image)

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(Image source: U.S. Air Force image)

After Katrina, Landsat 5 View

June Agricultural Survey Segment Selection

Mississippi Stratum, 1999

Legend

STRATA

- > 75% Cultivated
- 51 - 75% Cultivated
- 15 - 50% Cultivated
- < 15% Cultivated
- Agri-Urban > 20 Homes Per Sq. Mi.
- Commercial/Dense Urban > 20 Homes Per Sq. Mi.
- Non-Agricultural
- Water

0 15 30   60   90   120
Miles
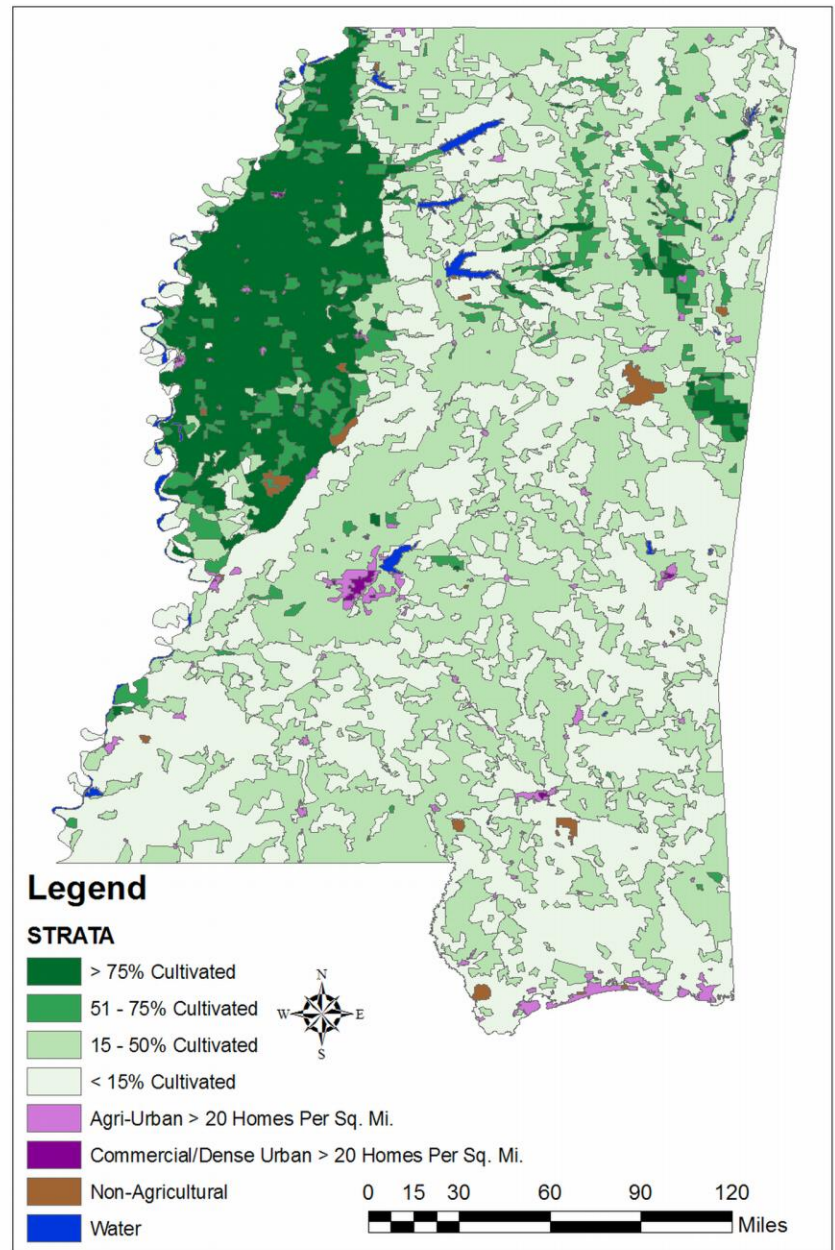
Mississippi Data Collection

Landsat Path/Row Scenes and 2004 Segments
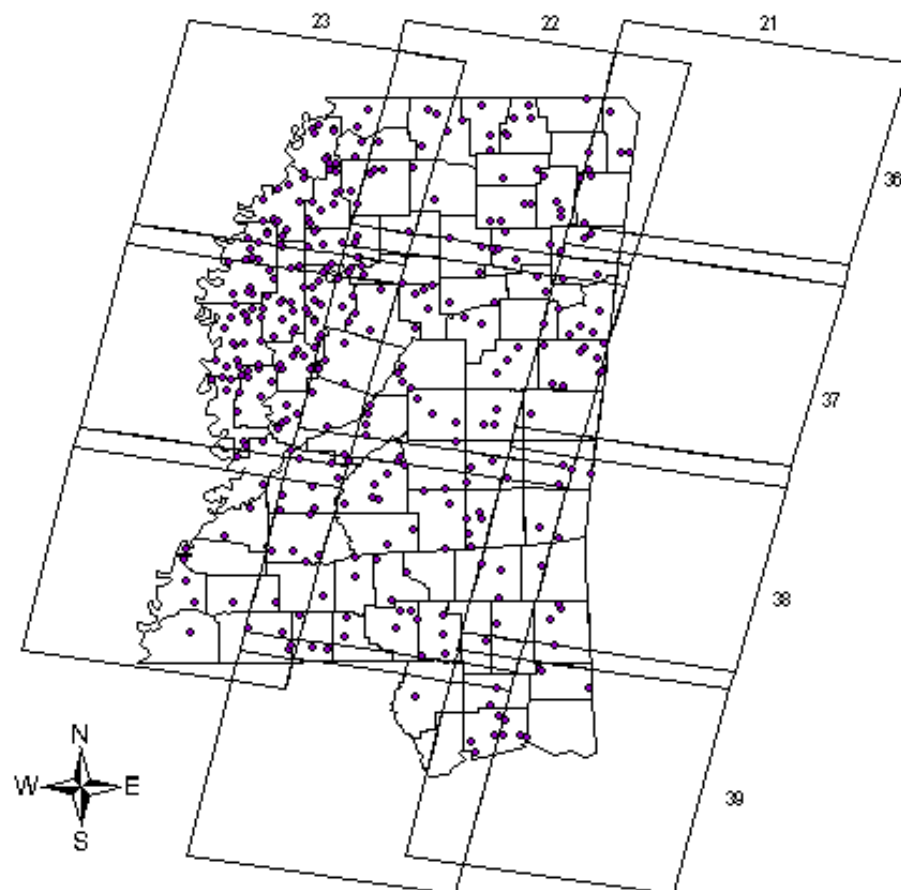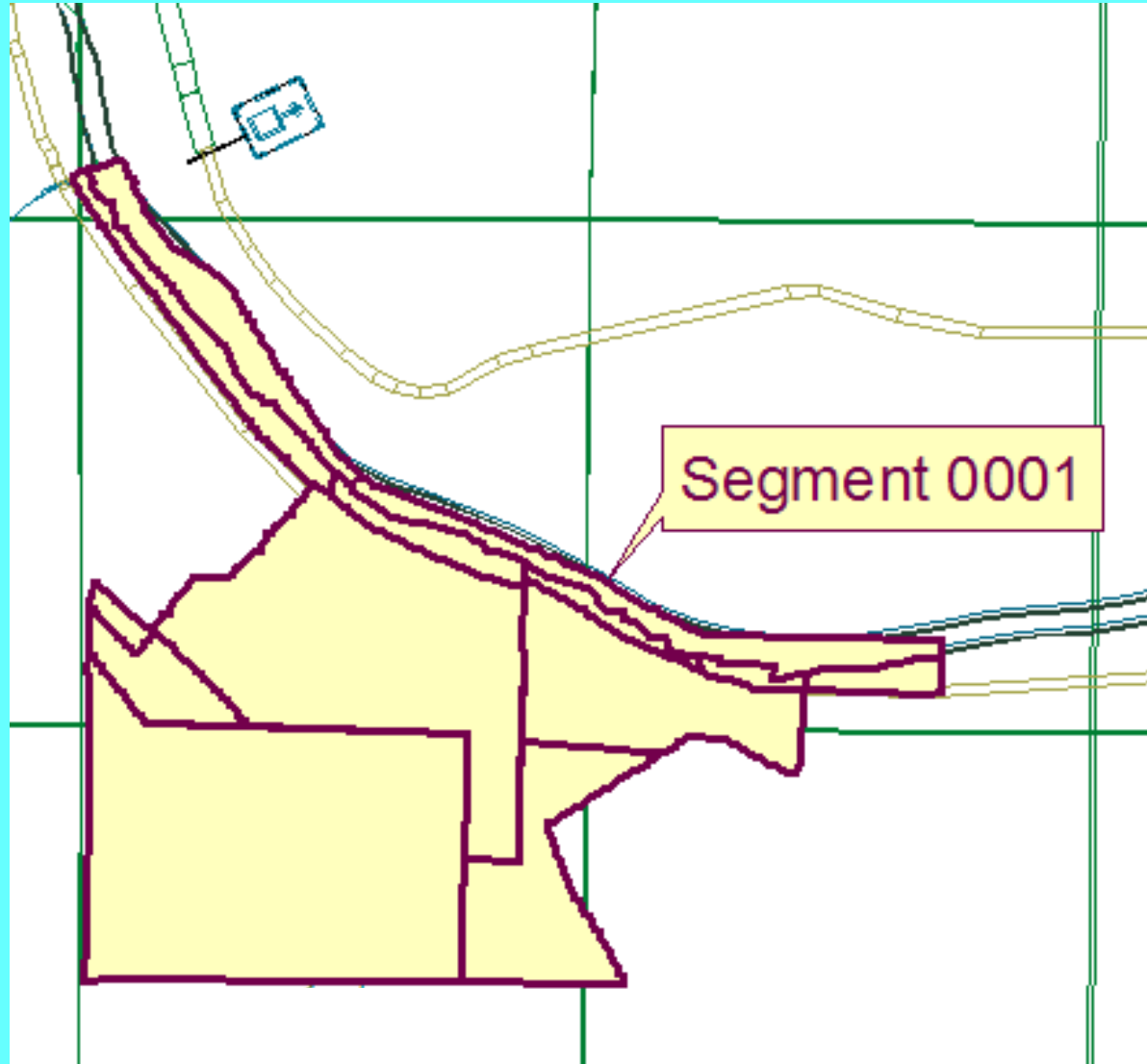
Legend

Scenes

MS 2004 segs

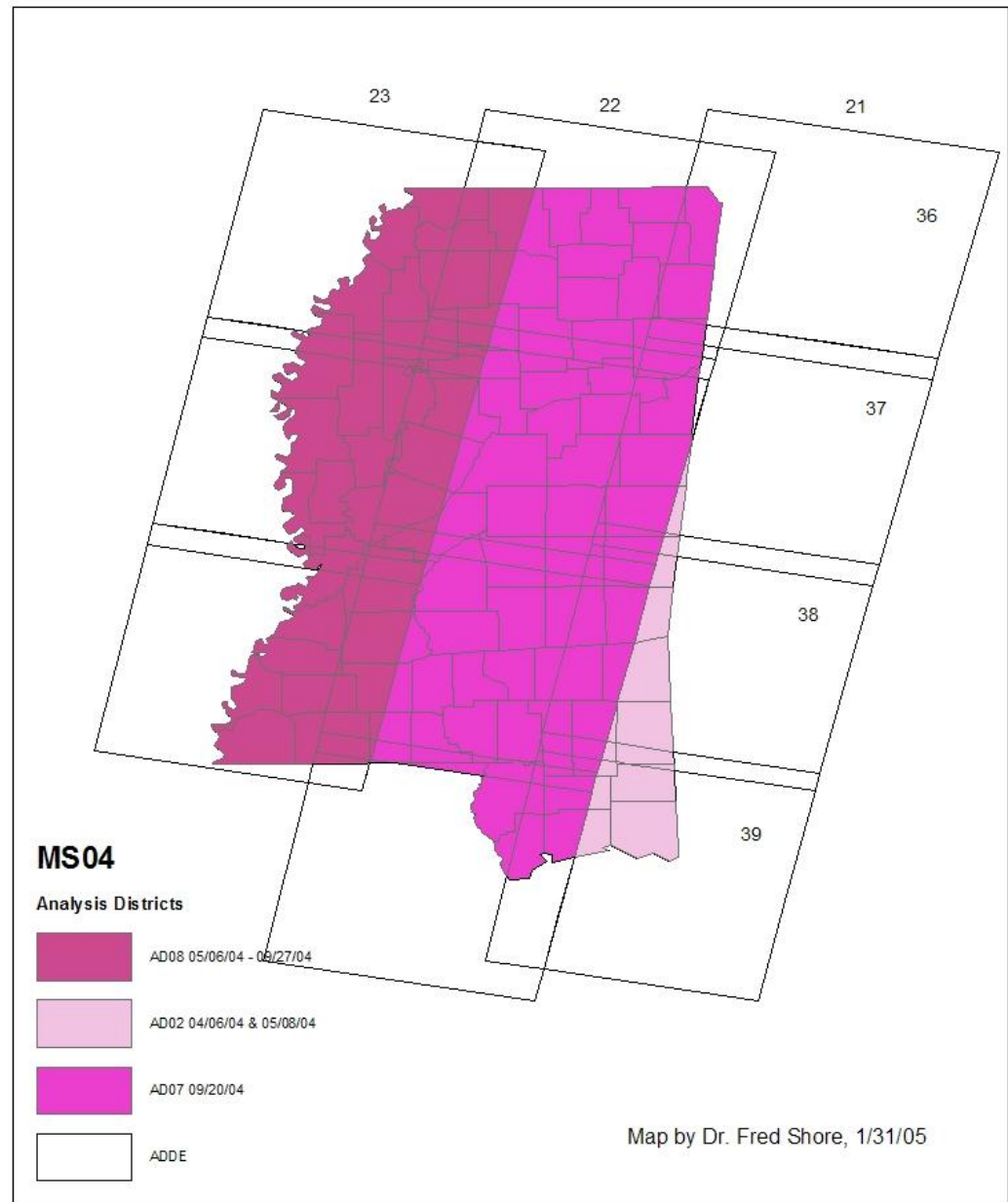Map by Dr. Fred Shore, 4/29/04

Segment Locator Map and Field Locations

Segment 0001

# Multi-Temporal Crop Signatures

- **Computer processing using Peditor and RSP.**

- **Use of two Landsat scenes of different dates with 7 bands each.**

- **Use of the ground truth data from the June Agricultural Survey.**

- **Clustering the crop signatures and training the classifier.**

- **Classification of all scenes and making the mosaic.**

Image Processing for MS CDL, 2004

MS04 Analysis Districts, 2004

23 22 21

36

37

38

39

MS04

Analysis Districts

AD08 05/06/04 - 09/27/04

AD02 04/06/04 & 05/08/04

AD07 09/20/04

ADDE

Map by Dr. Fred Shore, 1/31/05

Mississippi State-Wide
Cropland Data Layer Acreage Estimation Results, 2004

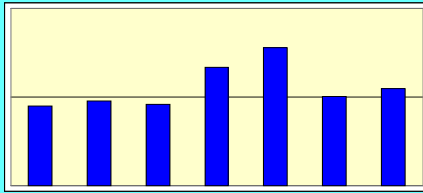**2004 Acreage Estimates** (Mean= 100.0, St. Dev. = 24.7)
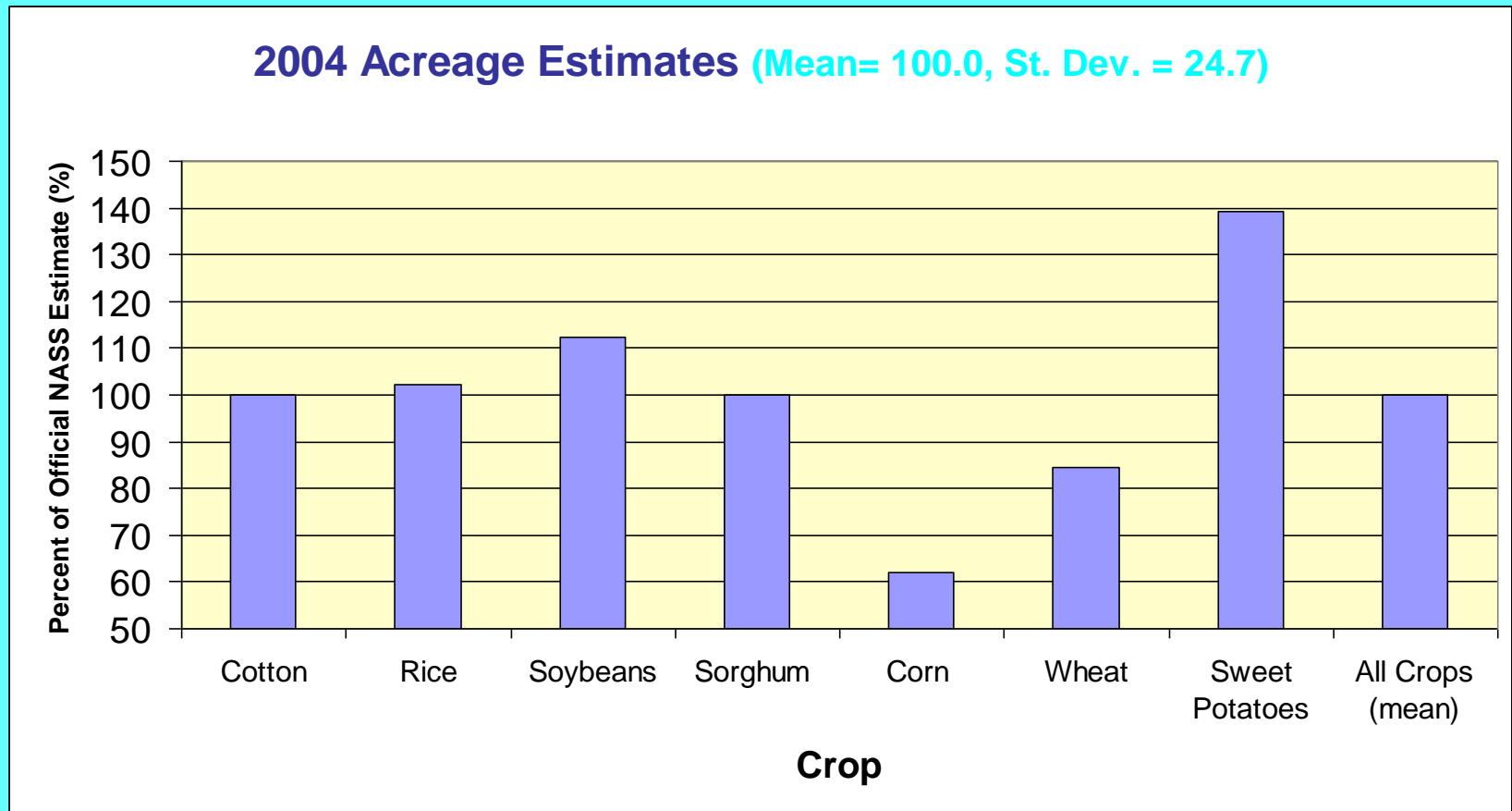
Mississippi Major Crop Estimates, 1999-2004
Cropland Data Layer Value as Percent of the Official Estimate
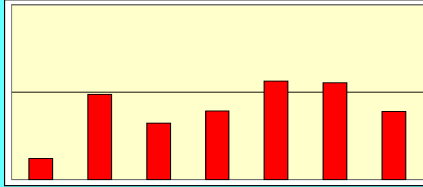Mean = 100.28, Standard Deviation = 7.09
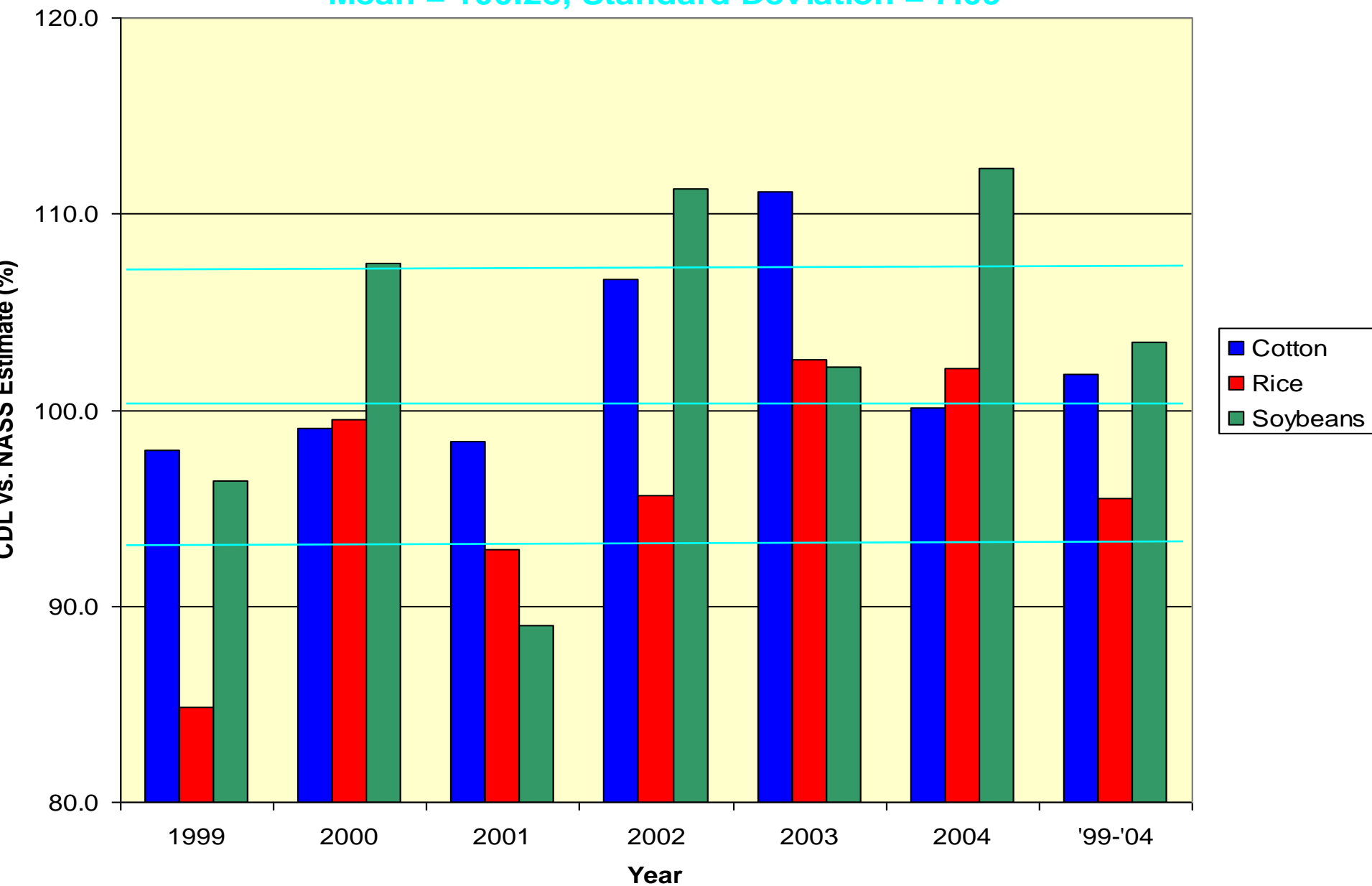
Cropland Data Layer Indications vs. NASS Official Estimates in Percentages by Crop
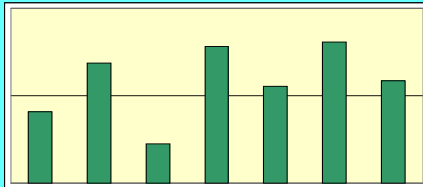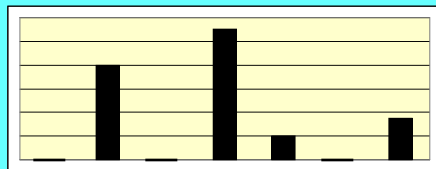
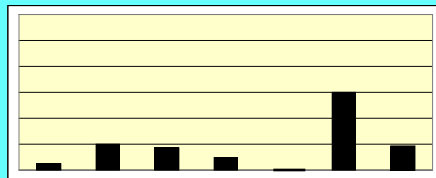Cotton, Mean + 101.9 %, ST. Dev. = 5.4

Rice, Mean = 95.5 %, St. Dev. = 6.7

Soybeans, Mean = 103.5 %, St. Dev. = 9.1

Landsat Scene Date vs. Optimum Date (Delta Area)

Early Scene, Mean = 3.5 Weeks, St. Dev. = 4.8

Late Scene, Mean = 1.9 Weeks, St. Dev. = 2.2

Percent of Range Shown: 80-120%

Range of Weeks Shown: 0-12 Weeks

1999 2000 2001 2002 2003 2004 '99-'04

Year

The Basic Cropland Data Layer Presentation

Mississippi Delta 2004, Cropland Data Layer
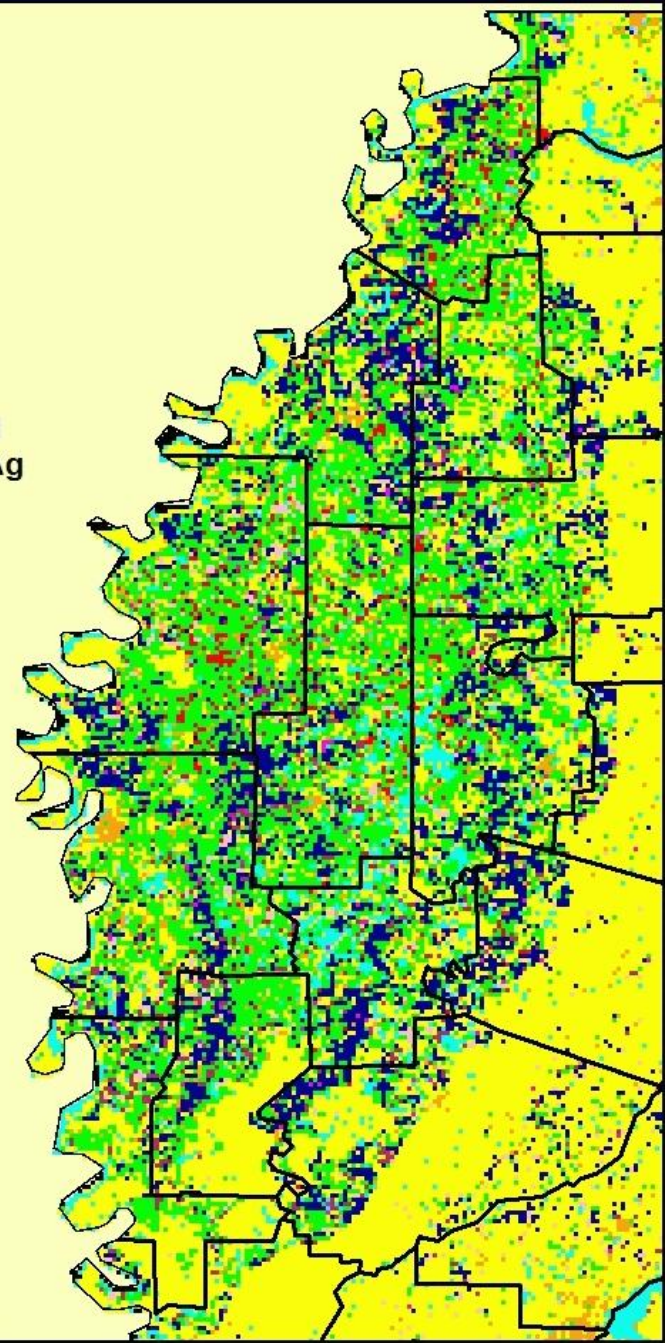
CROPS
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- Trees/Pasture/Non-Ag
- Clouds
- Urban
- Water

0 5 10   20   30   40
Miles

USDA-NASS/MDAC/MSU

Map by Dr. Fred Shore
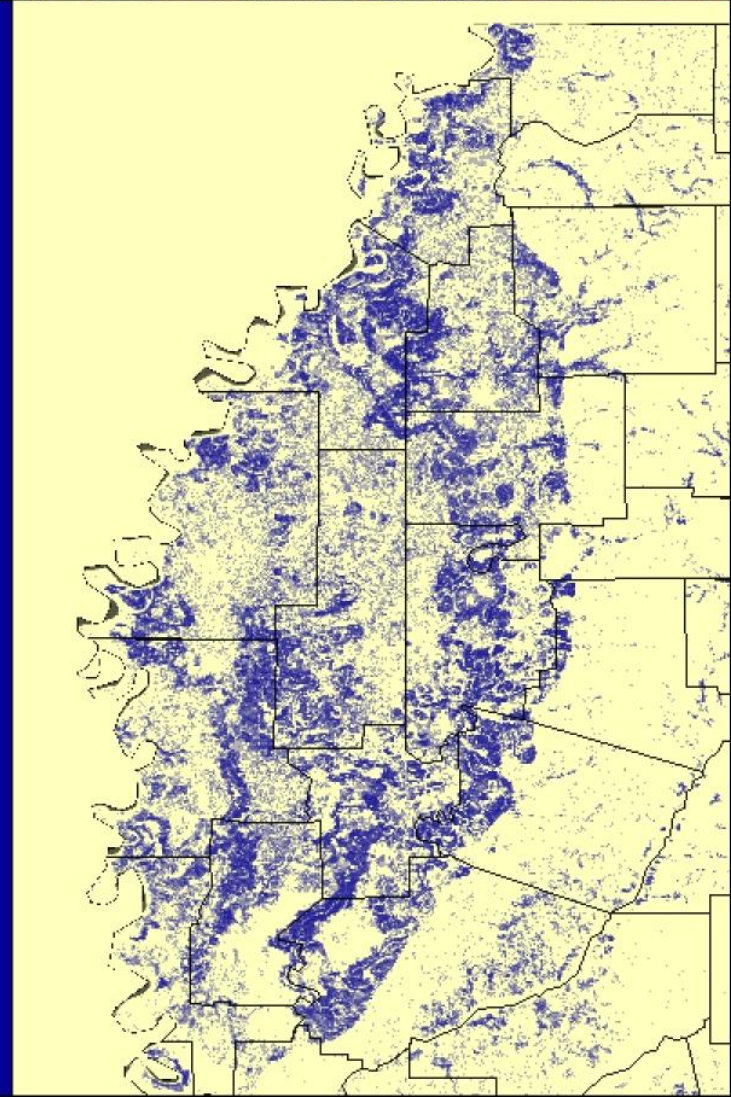
Multiyear Overlays
Cotton

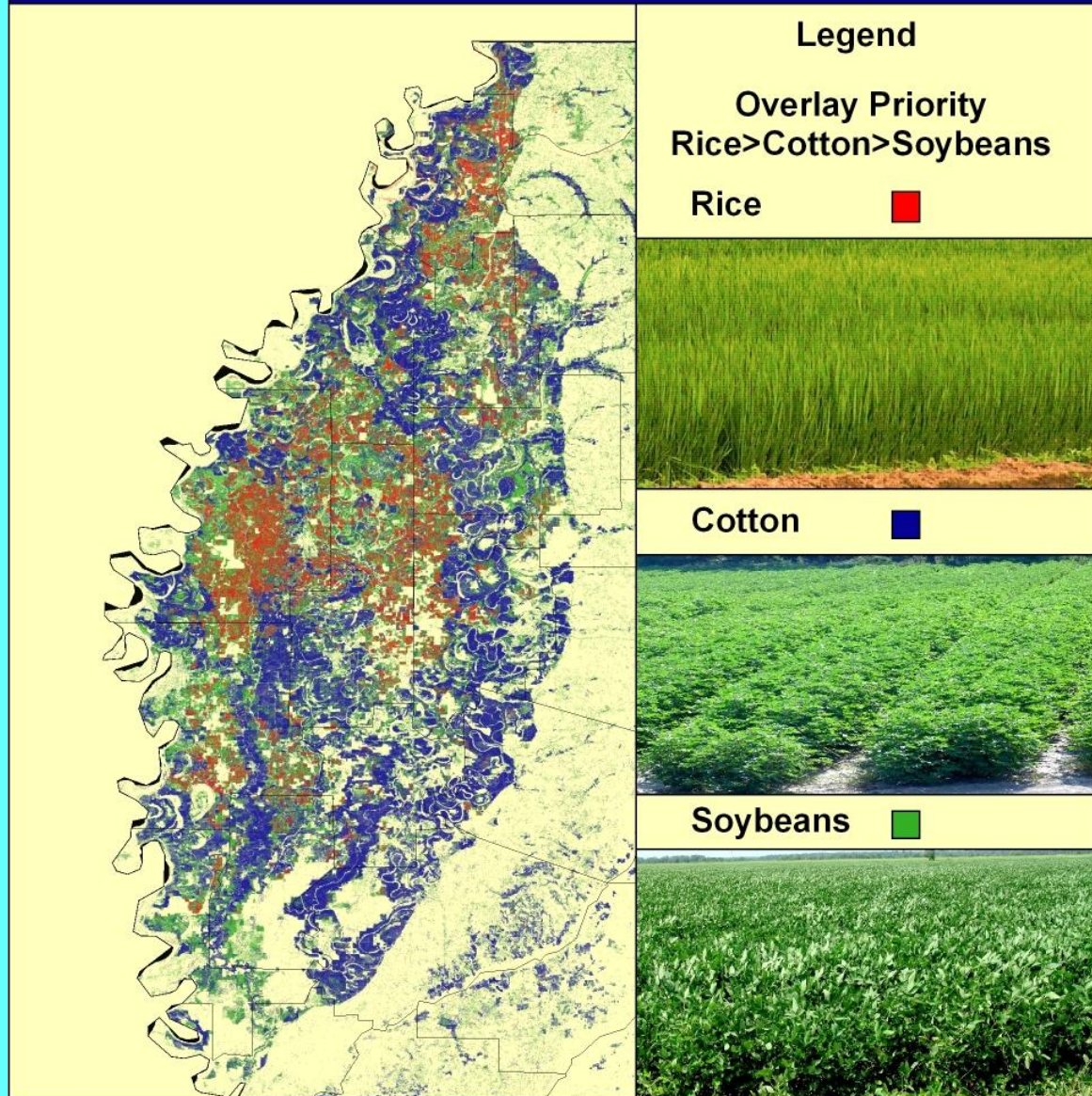**Frequency of Acreage Planted to Cotton, 1999-2004**

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.

Crop Overlays by Priority

Land Use for Major Crops in the Mississippi Delta, 1999-2004

Legend

Overlay Priority
Rice>Cotton>Soybeans

Rice ■ (red)

Cotton ■ (blue)

Soybeans ■ (green)

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.

Results

- The Cropland Data Layer for Mississippi vs. the official USDA-NASS estimate gave a 0.26% difference from the mean with a standard deviation of 7.5% for the major crops in this 6 year period.

- The optimum date of Landsat scene selection for the multi-temporal processing is less critical than previously thought.

- GIS presentations can be multiyear to allow better land use determinations.

- Further Cropland Data Layer information is available at www.mdac.state.ms.us and www.nass.usda.gov/ms/.