



MISSISSIPPI DEPARTMENT OF  
**AGRICULTURE  
& COMMERCE**

**Mississippi State**  
UNIVERSITY  
**Extension**  
SERVICE

# ***Object-Oriented Representation of Mississippi Remote Sensing Data***

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# Mississippi Agricultural Production

## Mississippi's Rank Among States In Agricultural Commodities, 2005

Commodity	Production or Number	Unit	Rank
All Cotton	2,147,000	bales	3
All Rice	16,832,000	hundredweight	4
Sorghum for Silage	12,000	tons	10
Sweetpotatoes	3,114,000	hundredweight	3
Soybeans	58,830,000	bushels	13
Winter Wheat	3,250,000	bushels	32
All Hay	2,117,000	tons	30
Corn for Grain	47,085,000	bushels	21
Corn for Silage	160,000	tons	41
All Pecans	1,000,000	pounds	14
Watermelons	435,000	hundredweight	13
Potted Poinsettias	156,000	pots sold	35
Catfish-foodsize	348,000,000	pounds sold	1
Broilers	853,400,000	number	4
Eggs	1,627,000,000	number	15
All Cattle & Calves <sup>1</sup>	1,070,000	number	28
Beef Cows <sup>1</sup>	536,000	number	21
Milk Cows <sup>1</sup>	25,000	number	36
Milk	381,000	pounds	36
Hogs & Pigs <sup>2</sup>	375,000	number	21
Honey	1,280,000	pounds	23

<sup>1</sup> 1/1/2006

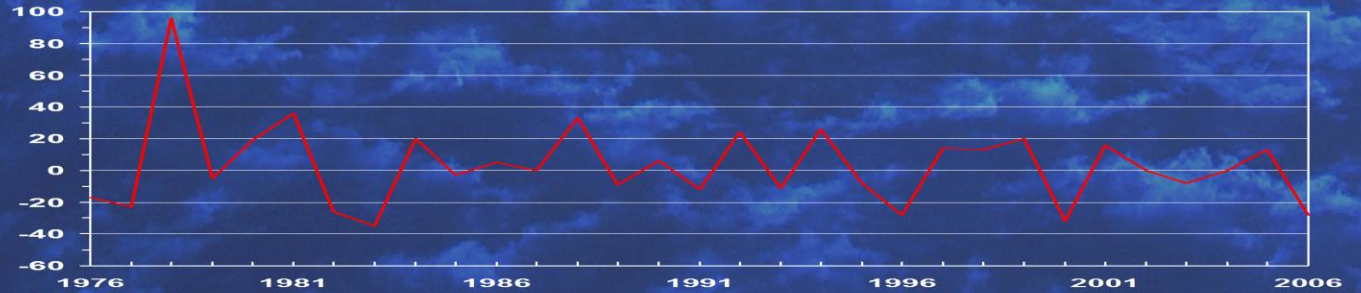
<sup>2</sup> 12/1/2005

# Planting Decisions

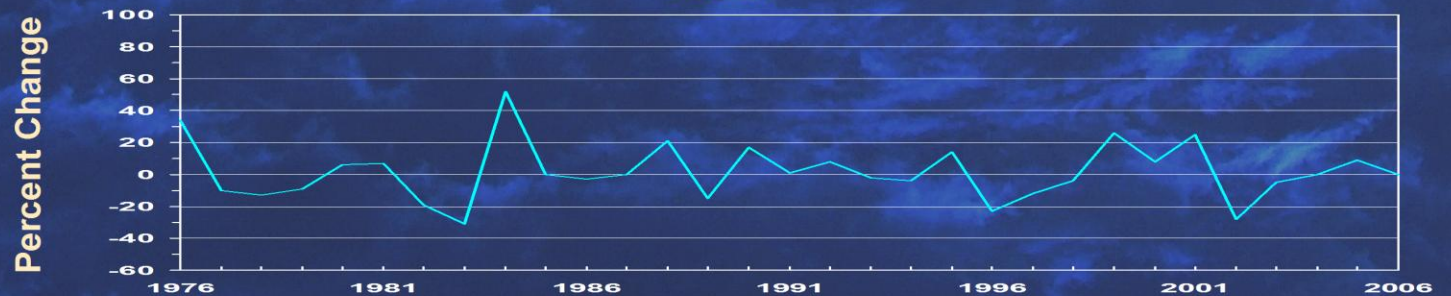


## Mississippi Crop Planted Acreage (Percent Change Each Year)

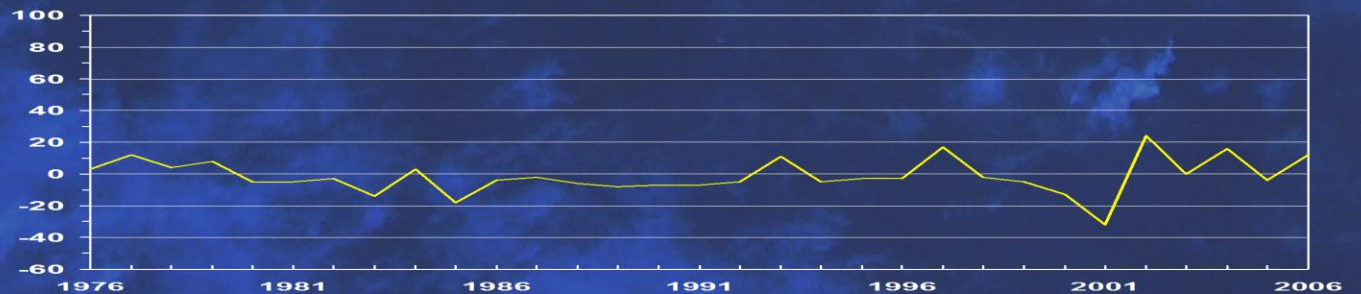
### Rice



### Cotton



### Soybeans





# ***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 project of NASS, Mississippi State University, and the Mississippi Department of Agriculture and Commerce.**

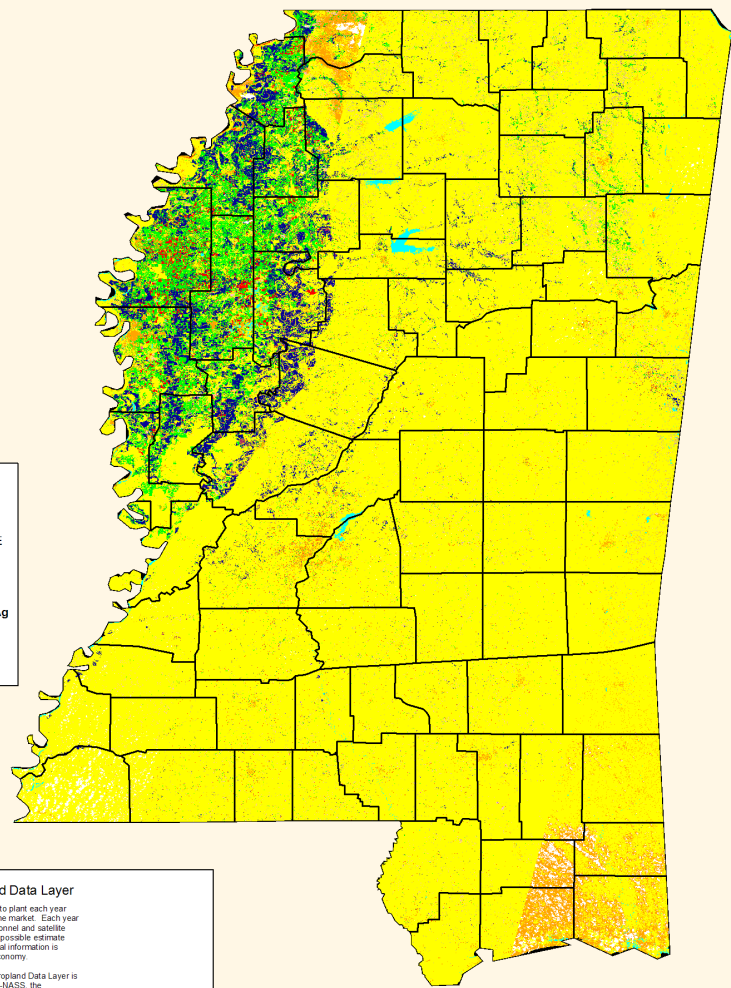
# ***Multiyear Data from the Mississippi Cropland Data Layer Classifications***

## **Methods**

- **Generating the Cropland Data Layer. RSP/Peditor, the USDA-NASS public domain software, is used to produce standard acreage estimates and classified images.**

# Single Year State and County Maps

## Mississippi Cropland Data Layer, 2005



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

**Mississippi Cropland Data Layer**

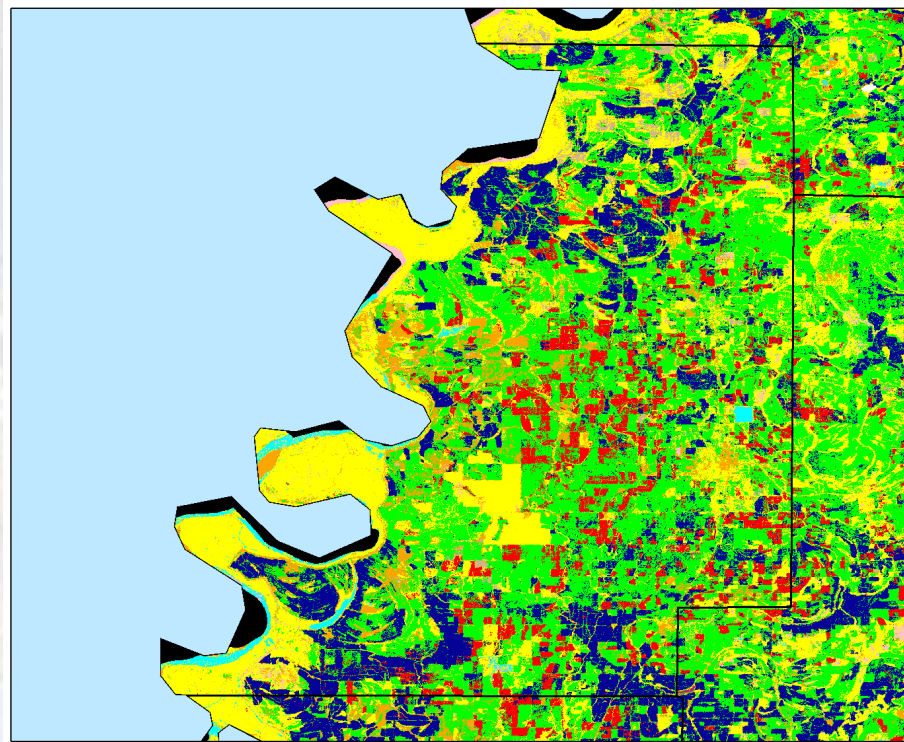
Mississippi farmers select crops to plant each year depending on the weather and the market. Each year the USDA-NASS uses field personnel and satellite imaging to help provide the best possible estimate of crop production. This statistical information is important in predicting the US economy.

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 Program.

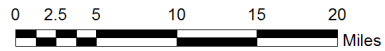
Landsat imagery was processed and enhanced for this map. The official result is available on disk from USDA-NASS at (800) 727-9540.

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

## Bolivar County, Mississippi Cropland Data Layer, 2005



Bolivar County Area Map



**Mississippi Cropland Data Layer**

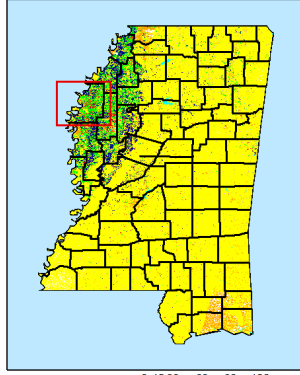
Mississippi farmers select crops to plant each year depending on the weather and the market. Each year the USDA-NASS uses field personnel and satellite imaging to help provide the best possible estimate of crop production. This statistical information is important in predicting the US economy.

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- CROPS**
- Corn
  - Cotton
  - Rice
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  - Clouds
  - Urban
  - Water

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



Locator Map

# Map Uses of the Cropland Data Layer

The Cropland Data  
Layer as a layer over  
the classified forests of  
Mississippi

## Mississippi Land Covers, 2005

### 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.

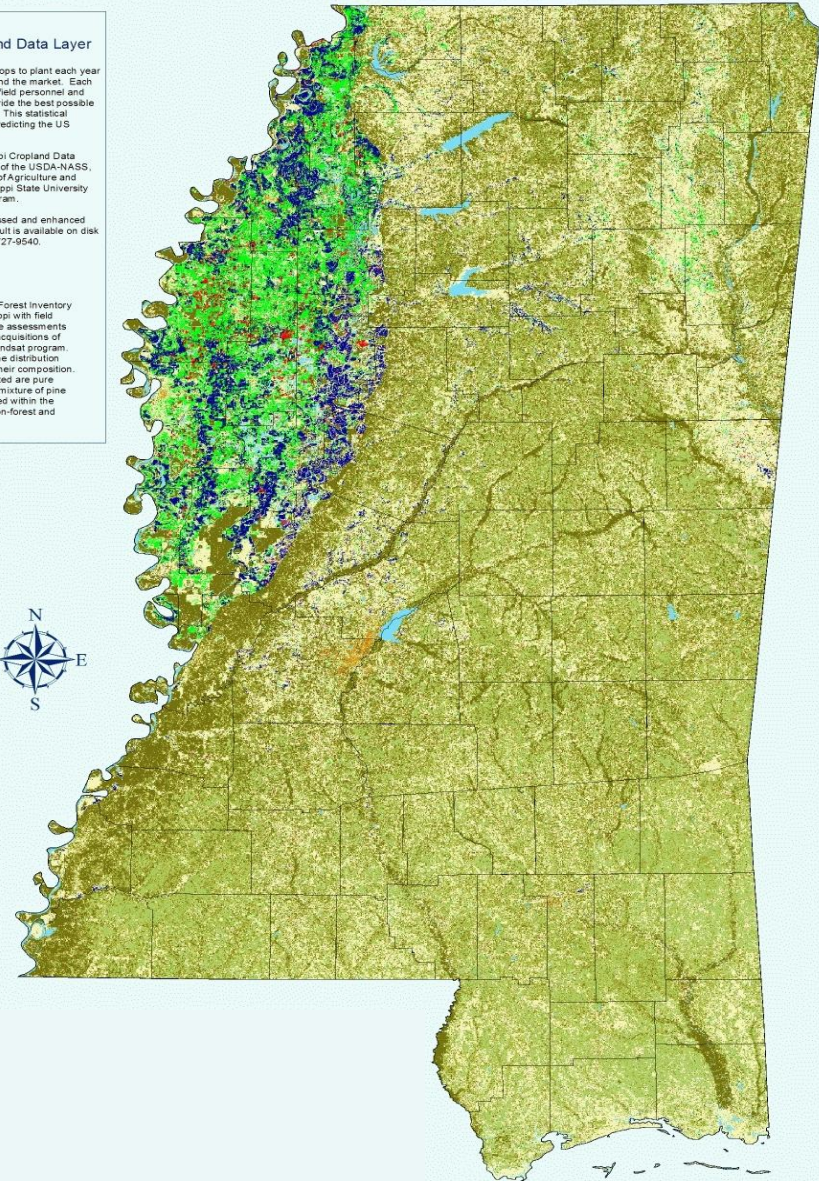
Compilation of the Mississippi Cropland Data Layer is a cooperative effort of the USDA-NASS, the Mississippi Department of Agriculture and Commerce, and the Mississippi State University Cooperative Extension Program.

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

### Forests by Type

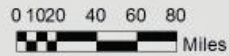
The Mississippi Institute for Forest Inventory assesses forests in Mississippi with field inventory procedures. These assessments are designed from periodic acquisitions of satellite imagery from the Landsat program. This map of forests shows the distribution of forest types based upon their composition. The three forest types depicted are pure hardwood, pure pine, and a mixture of pine and hardwood. Also, included within the classification are areas of non-forest and bodies of water.

### Legend





# Mississippi Map

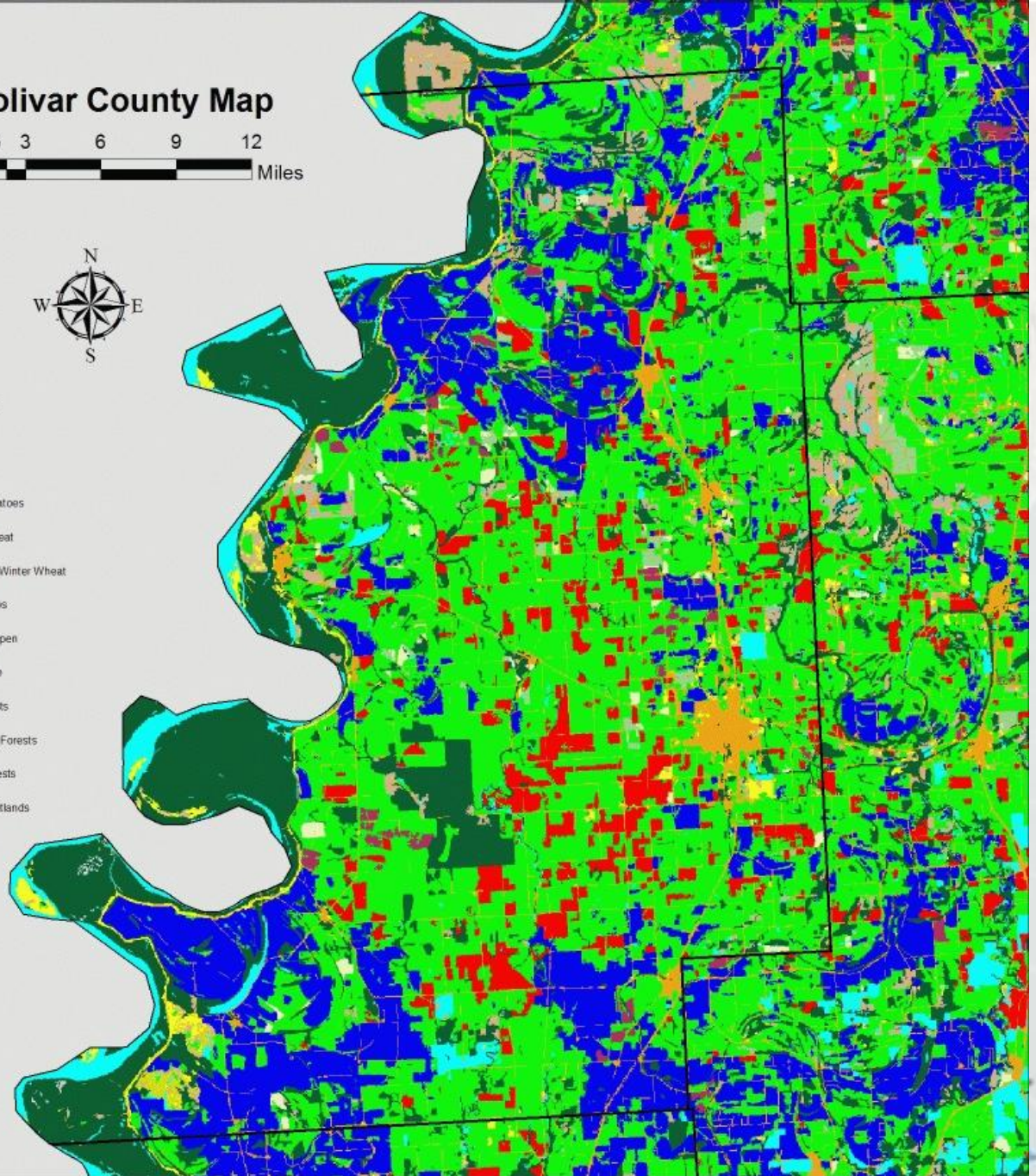
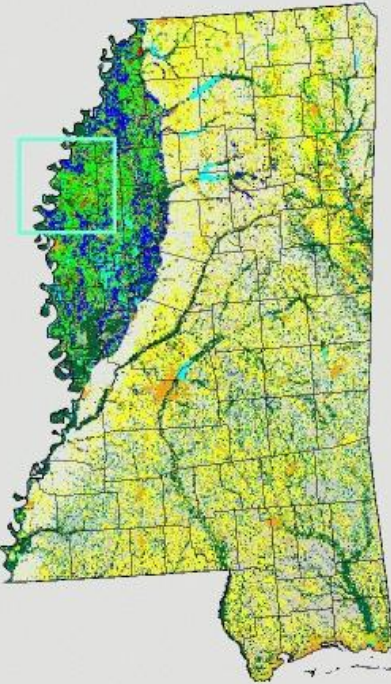


# Bolivar County Map



## Legend

- Corn
- Cotton
- Rice
- Sorghum
- Soybeans
- Hay
- Peanuts
- Sweet Potatoes
- Winter Wheat
- Soybeans/Winter Wheat
- Other Crops
- Pasture, Open
- Fallow, Idle
- Pine Forests
- Hardwood Forests
- Mixed Forests
- Woody Wetlands
- Wetlands
- Urban
- Water



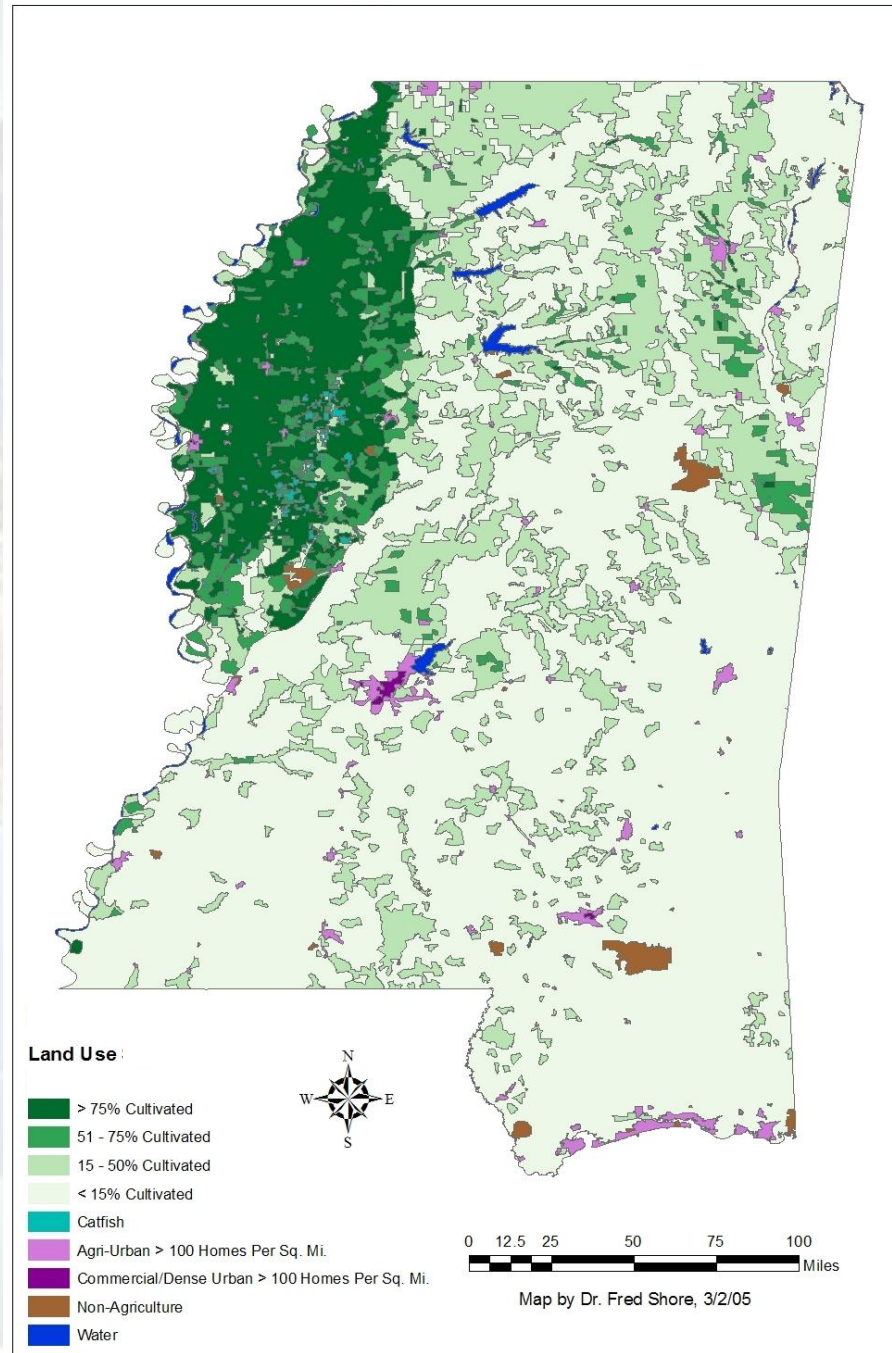
Land Cover Maps  
From Satellite, 2006

Maps by Dr. Fred Shore

# June Agricultural Survey (JAS) Segment Selection

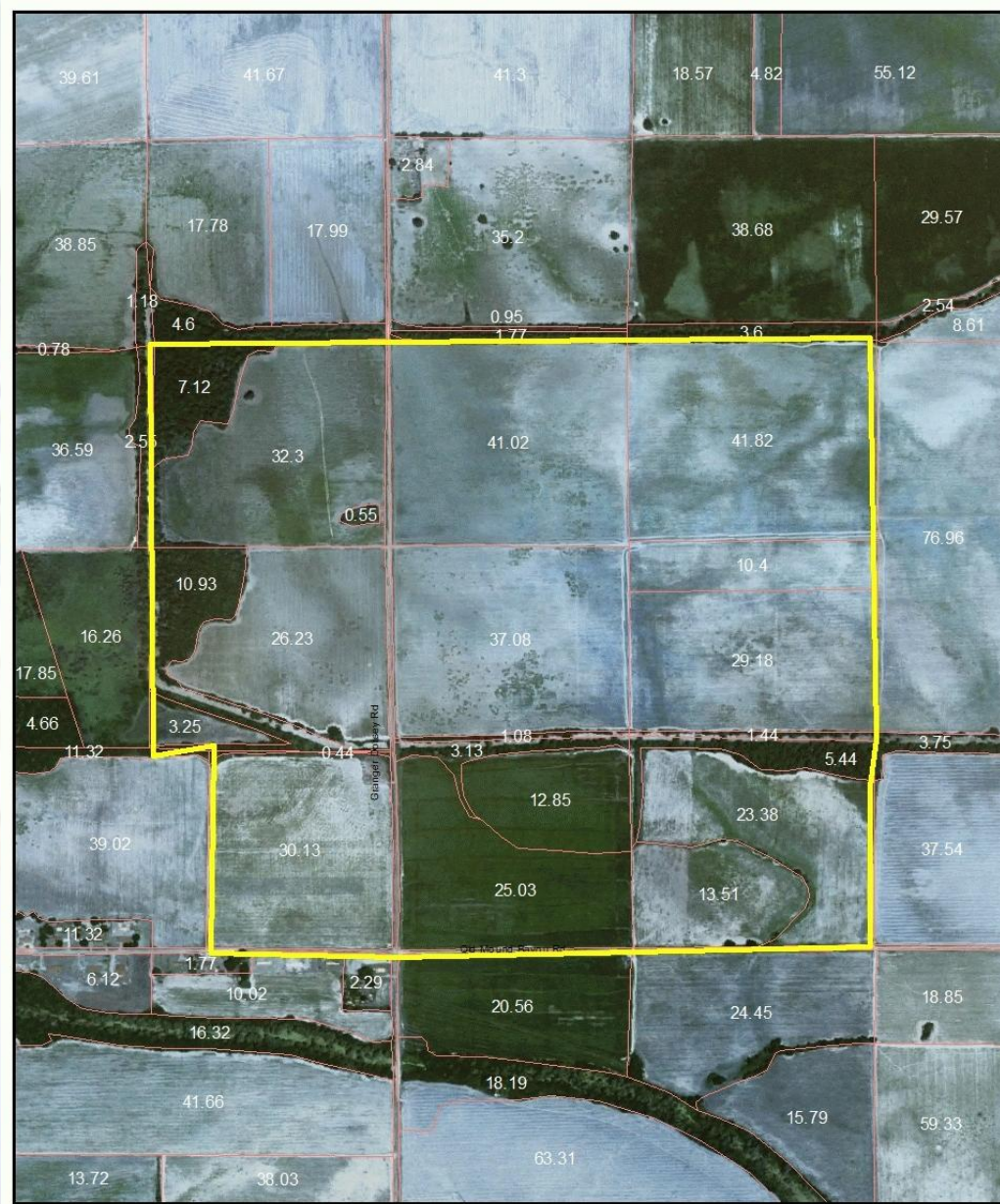
Selection of study segments in each strata allows direct expansion of field acreages to give crop acreage estimates in the JAS.

Data compliments of the NASS Area Frame Section, Fairfax, VA.



# ***Field/Segment Boundaries on a High Resolution Photo***

The segment boundary is shown in yellow and the field boundaries in pink with acres shown for each field.

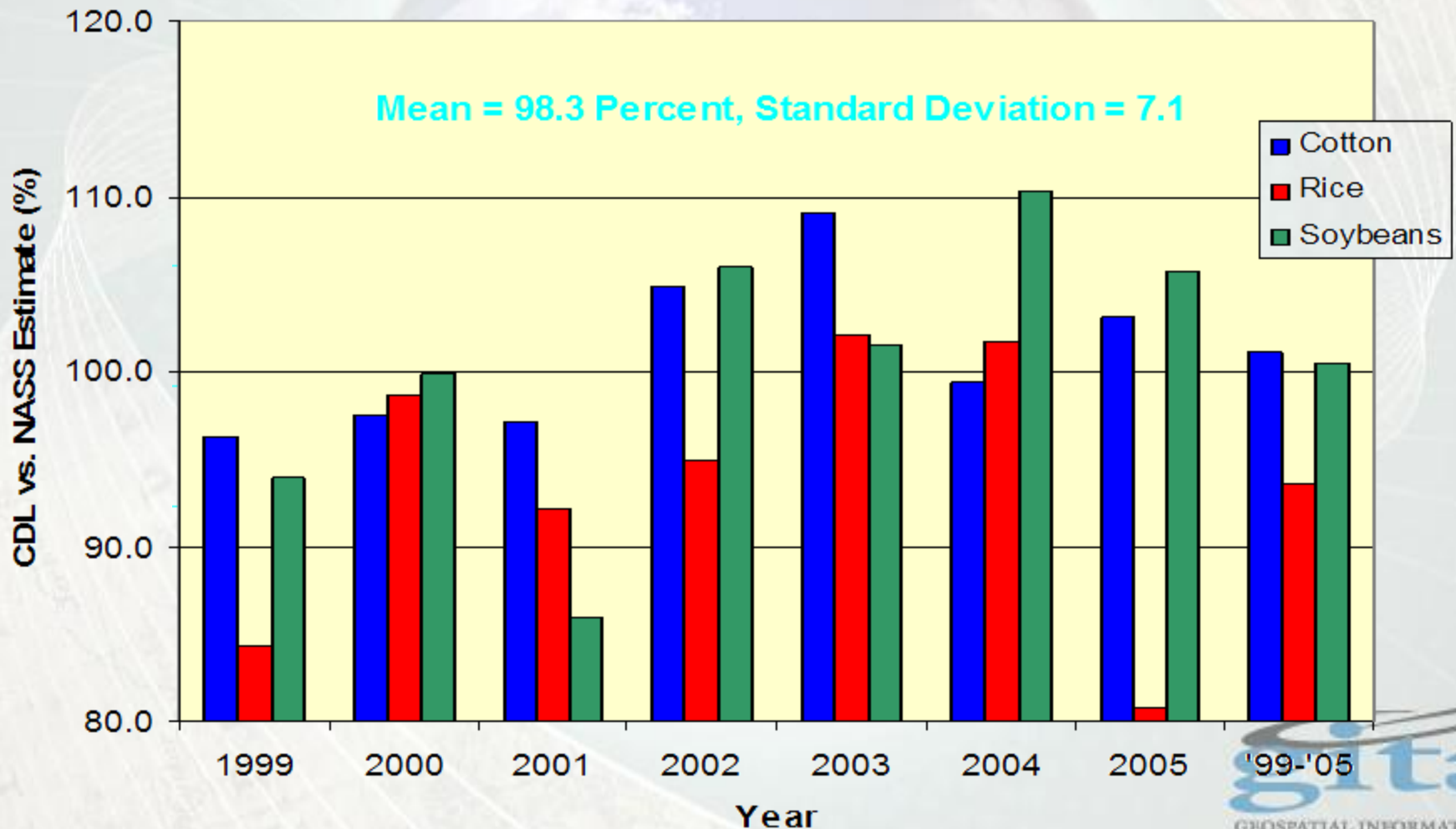


## **Sample Segment Map, Mississippi 2007**

MSU, USDA\_NASS, MDAC Map by Dr. Fred Shore, 3/7/07

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

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



# *Multiyear Overlays Cotton*

The variation of land use for cotton in the Delta over a 7 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, 1999-2005

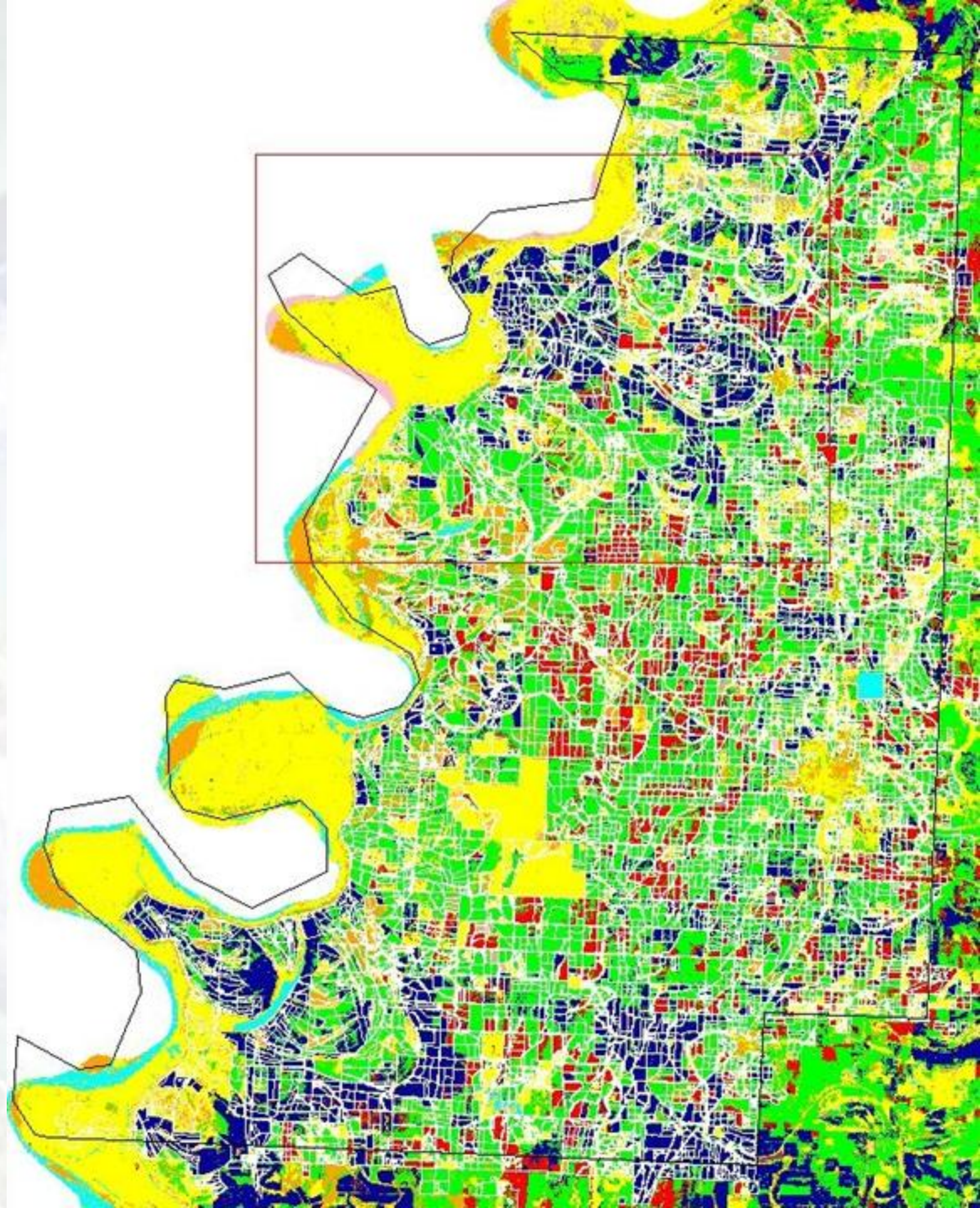


# ***Object-Oriented Representation of Mississippi Remote Sensing Data***

## **Methods**

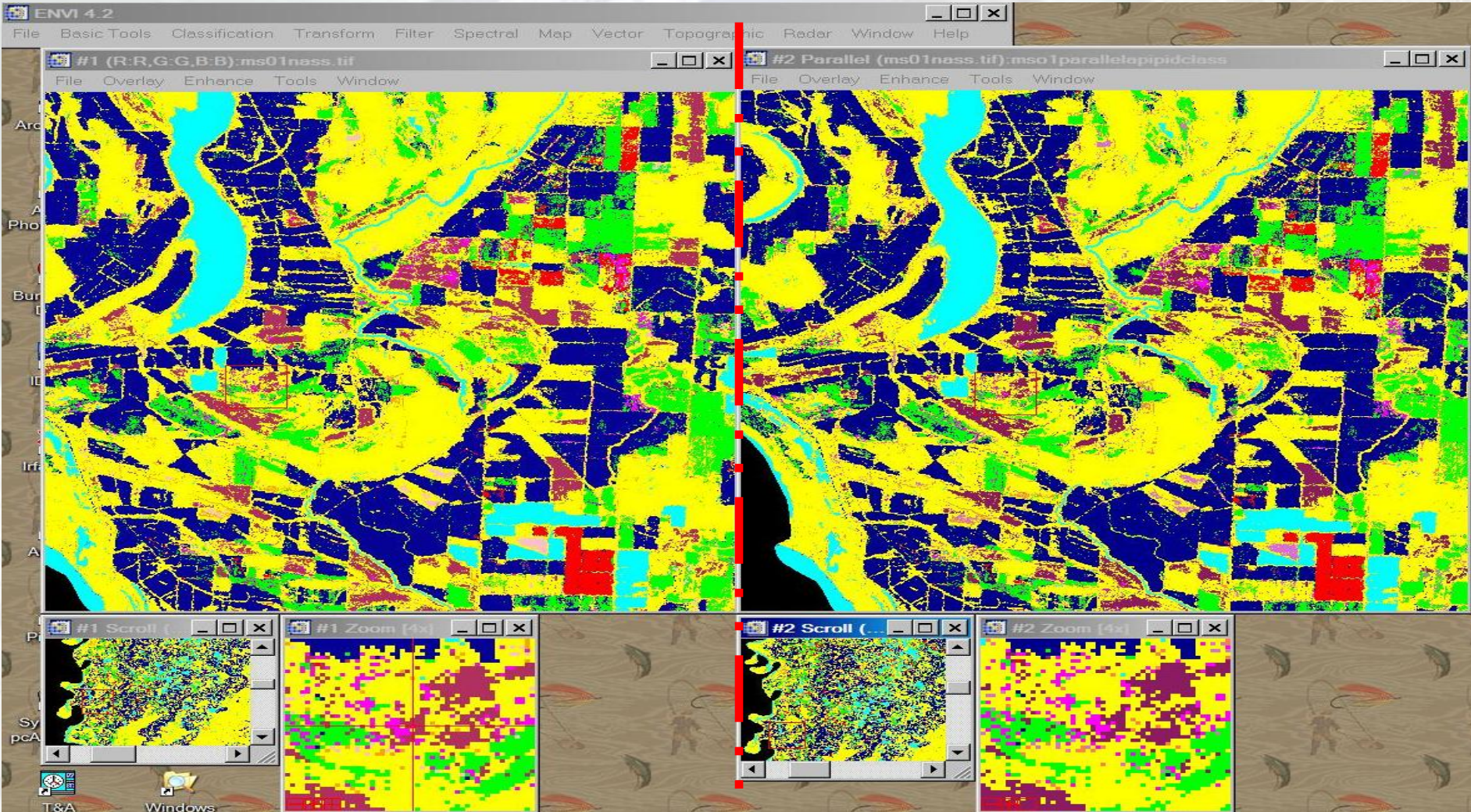
- **Integrating the GIS layer with SAS. ENVI 4.2/IDL® is used to capture field-level classification data. SAS® is used to convert the ENVI output to a data set and run queries on the data.**

***Bolivar  
County CDL  
2005 with  
Field  
Polygon  
Overlay in  
White***



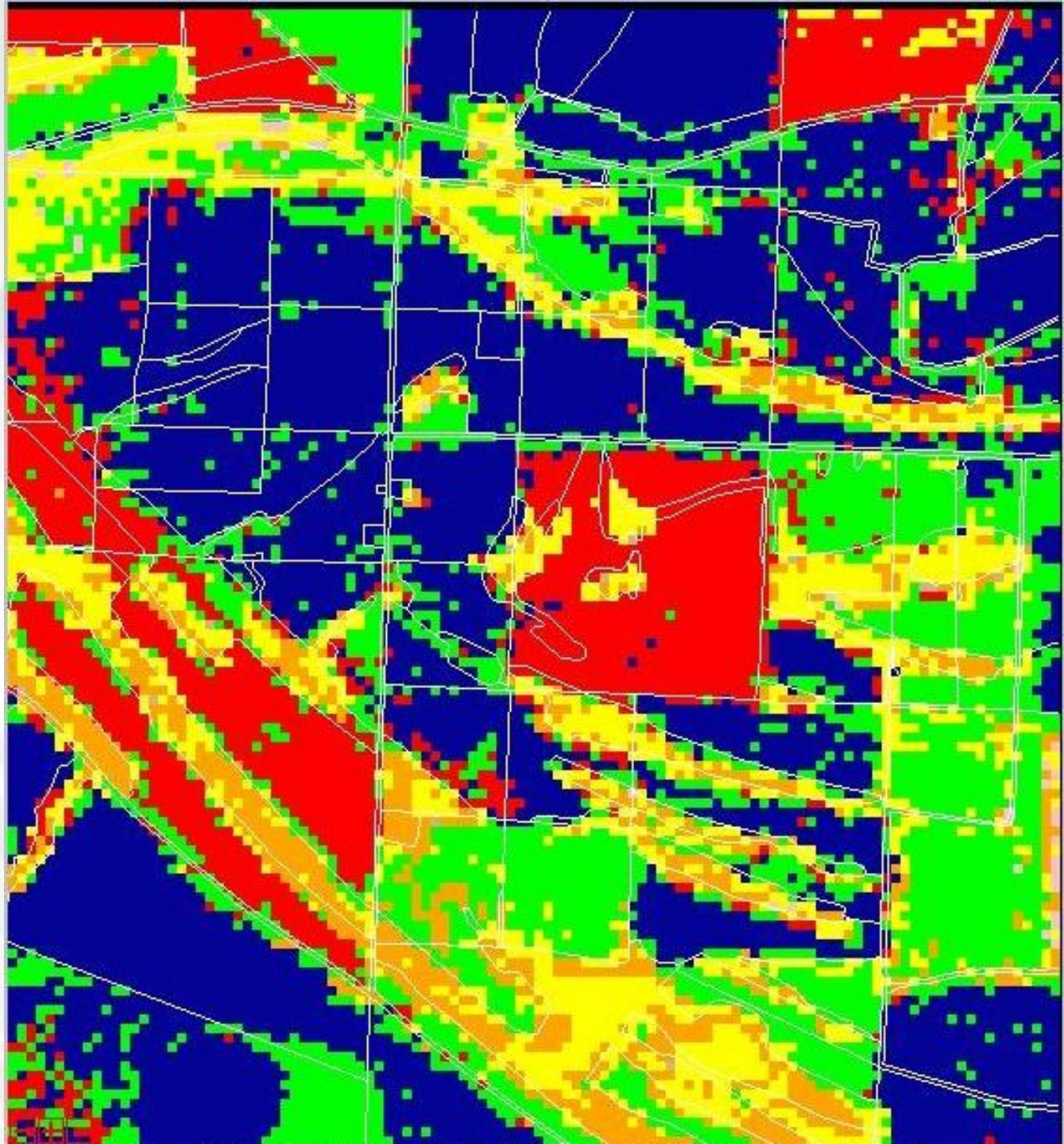
# CDL Reclassification Using ENVI

CDL Mosaic | ENVI Result





***Field  
Level  
Overlay  
of MS  
CDL05  
Bolivar  
County***



# Field Level CDL ENVI Data Extraction

Bolivar County had 15,203 fields in 2005

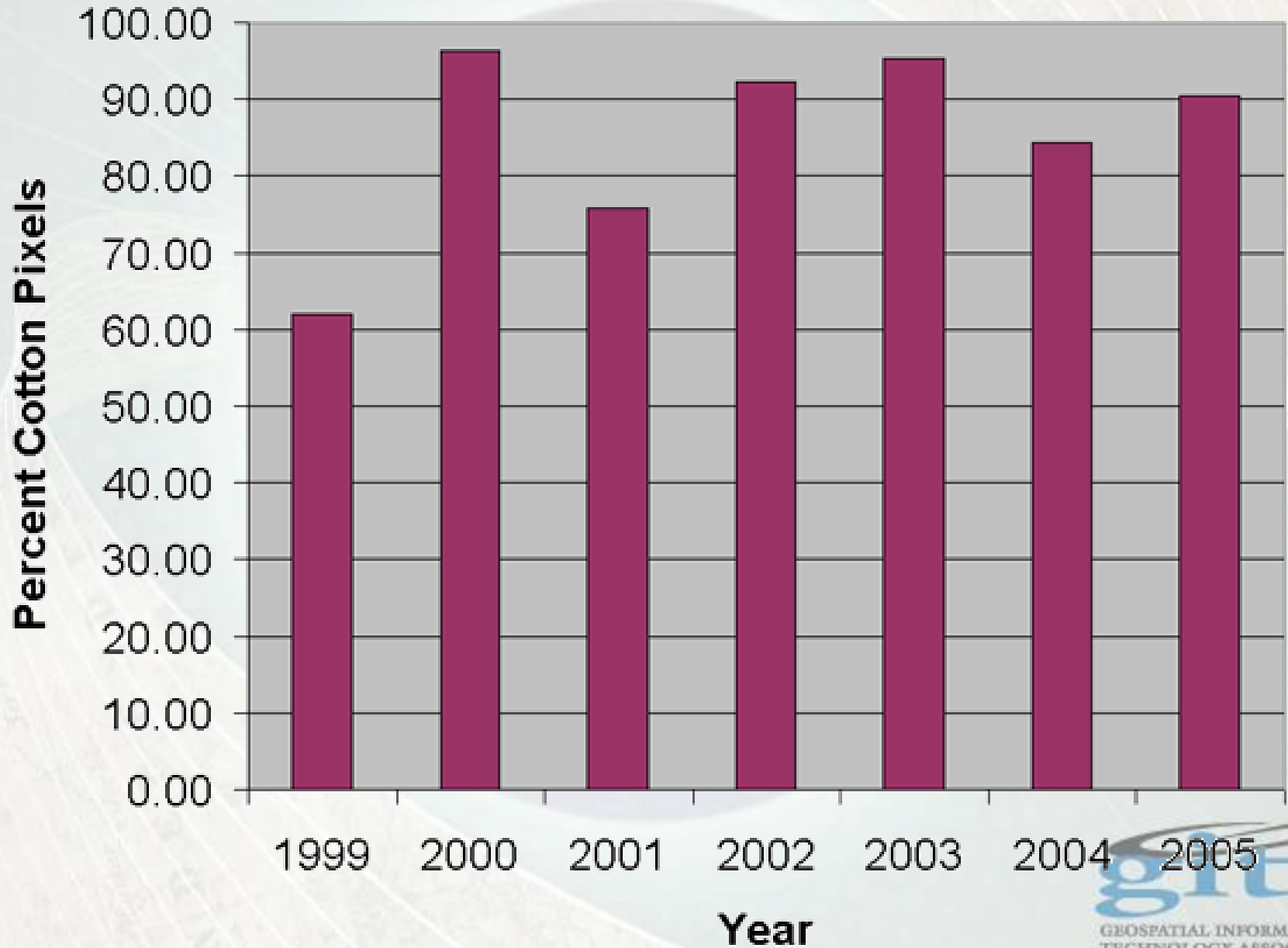
MS05 Output Stats, 8/21/06

ImageFile Name: C:\RSI\CLASSSTATS\MS05ENVIClass

ShapeFile Name:C:\RSI\CLASSSTATS\Bolivar05\clu\_a\_MS011.shp

Field:			1	282TPixels
Class	Pixels	AccPixels	Percent	Acc Percent
Uncl	0	0	0.000000	0.000000
Corn	0	0	0.000000	0.000000
Cott	255	255	90.425529	90.425529
Rice	0	255	0.000000	90.425529
Sorg	0	255	0.000000	90.425529
Soyb	24	279	8.510638	98.936165
Hay/ Fall	0	279	0.000000	98.936165
Tree	1	280	0.354610	99.290771
Clou	0	280	0.000000	99.290771
Urba	2	282	0.709220	99.999992
Wate	0	282	0.000000	99.999992

# *Bolivar County Field 1 Cotton*

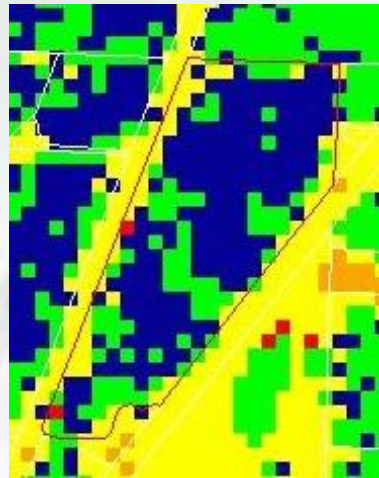


# Field 1 by Year

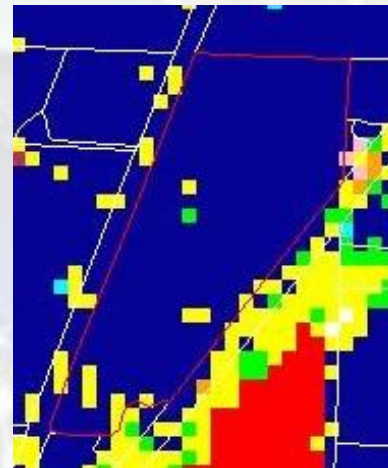
## Legend

### CROPS

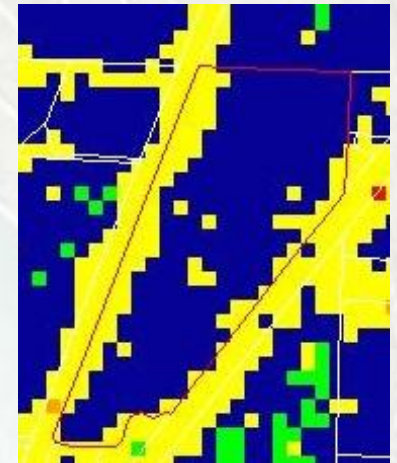
- Corn
- Cotton
- Rice
- Sorghum
- Soybeans
- Hay/Other Crops
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- Water



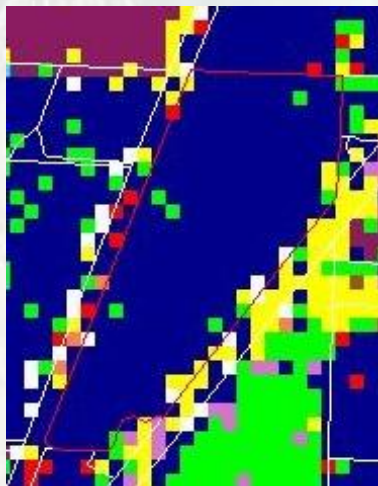
1999



2000



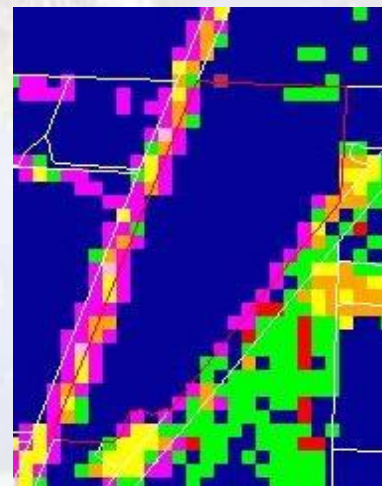
2001



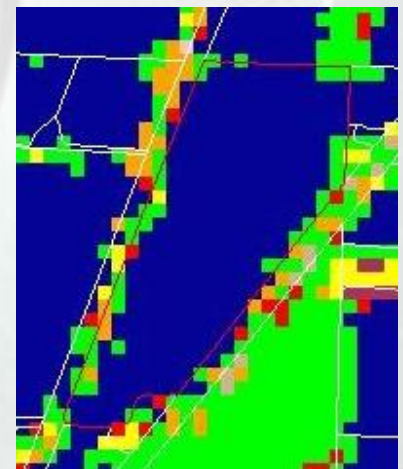
2002



2003



2004



2005

# ***Bolivar County Field 1***

2005 Aerial Image, 2006 Flag/Field Picture

Bolivar County  
Field 1



# ***Multiyear Data from the Mississippi Cropland Data Layer Classifications***

## **Methods**

- **Annual change probabilities from data modeling. The combination of the pixel count file and the acres from the field attribute table give data sets amenable to queries.**

# SAS Output Selected Fields Where cott Pixels Exceeded 50 Percent

09:08 Tuesday, August 29, 2006

	c	c	c	c	c	c	c	c								
	o	o	o	o	o	o	o	o								
	t	t	t	t	t	t	t	t								
	t	t	t	t	t	t	t	t								
	—	—	—	—	—	—	—	—								
	p	p	p	p	p	p	p	p								
	e	e	e	e	e	e	e	e								
	r	r	r	r	r	r	r	r	c	c	c	c	c	c	c	c
	c	c	c	c	c	c	c	c	o	o	o	o	o	o	o	o
	e	e	e	e	e	e	e	e	u	u	u	u	u	u	u	u
	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n	n
	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t	t
	f	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
O	i	1	2	2	2	2	2	2	1	2	2	2	2	2	2	2
b	e	9	0	0	0	0	0	0	9	0	0	0	0	0	0	0
s	l	9	0	0	0	0	0	0	9	0	0	0	0	0	0	0
	d	9	0	1	2	3	4	5	9	0	1	2	3	4	5	

363	946	31.73	92.65	80.32	13.25	88.35	97.99	93.57	.	c	c	.	c	c	c
373	956	57.04	93.92	88.17	3.74	94.40	93.77	94.27	c	c	c	.	c	c	c
375	958	56.26	98.27	90.59	2.48	95.97	96.11	95.82	c	c	c	.	c	c	c
376	959	53.85	100.00	53.85	0.00	84.62	76.92	76.92	c	c	c	.	c	c	c
384	970	50.78	95.38	85.94	11.52	99.41	2.15	4.69	c	c	c	.	c	.	.
385	971	2.20	66.67	75.82	9.89	6.59	0.00	0.00	.	c	c	.	.	.	.
405	999	41.92	94.01	6.59	6.59	98.20	1.80	0.60	.	c	.	.	c	.	.
406	1000	1.69	98.37	40.68	5.93	98.31	0.00	5.09	.	c	.	.	c	.	.
420	1020	0.00	0.00	78.17	88.33	93.40	88.33	86.29	.	.	c	c	c	c	c
422	1022	0.00	1.28	55.70	5.06	41.77	22.79	45.57	.	.	c	.	.	.	.
435	1036	38.24	5.58	68.07	96.22	97.06	91.18	91.60	.	.	c	c	c	c	c
436	1037	17.39	4.35	78.26	100.00	100.00	60.87	82.61	.	.	c	c	c	c	c
447	1048	57.55	0.00	61.32	93.87	99.06	92.45	98.11	c	.	c	c	c	c	c
450	1051	0.00	1.35	84.53	91.72	96.73	84.53	94.77	.	.	c	c	c	c	c

# SAS Query Cotton and Corn Rotation

c	c	c	c	c	c	c	c	c	c	c	c	c	c
o	o	o	o	o	o	o	o	o	o	o	o	o	o
u	u	u	u	u	u	u	u	u	u	u	u	u	u
n	n	n	n	n	n	n	n	n	n	n	n	n	n
t	t	t	t	t	t	t	t	t	t	t	t	t	t
-	-	-	-	-	-	-	-	-	-	-	-	-	-
1	2	2	2	2	2	2	1	2	2	2	2	2	2
9	0	0	0	0	0	0	9	0	0	0	0	0	0
9	0	0	0	0	0	0	9	0	0	0	0	0	0
9	0	1	2	3	4	5	9	0	1	2	3	4	5

.	c	c	.	c	c	c	.	.	.	C	.	.	.
c	c	c	.	c	c	c	.	.	.	C	.	.	.
c	c	c	.	c	c	c	.	.	.	C	.	.	.
c	c	c	.	c	c	c	.	.	.	C	.	C	.
.	c	c	.	c	.	.	.	.	.	C	.	.	.
.	c	.	.	c	.	.	.	.	.	C	.	.	.
.	c	.	.	c	.	.	.	.	.	C	.	.	.
.	.	c	c	c	c	c	.	C	.	.	.	.	.
.	.	c	c	c	c	c	.	C	.	.	.	.	.
c	.	c	c	c	c	c	.	C	.	.	.	.	.
.	.	c	c	c	c	c	.	C	.	.	.	.	.



# ***Multiyear Data from the Mississippi Cropland Data Layer Classifications***

## **Methods**

- **Events and trends in multiyear land cover changes. The SAS data sets organized in lookup table format are a way to integrate multiyear and single year data and observe annual crop changes.**

# Sample Lookup Table, Cotton Acres by Field Classification, 1999

Obs	Year	FREQ	freq_var*	CALCACRES	Cott_Acres
1	1999	2784	-Total-	179,022.49**	40,996.70
2	1999	202	ccccccc	13,698.67	9,487.58
3	1999	166	scccccc	11,118.09	3,206.04
4	1999	54	sscscss	4,418.70	281.77
5	1999	29	_cccccc	2,128.08	804.85
6	1999	27	ccccccsc	1,508.81	1,021.90
7	1999	27	ssc_sss	3,150.03	292.89
8	1999	24	ccccccs	1,269.43	901.14
9	1999	22	sRcRsss	1,119.32	104.08
10	1999	20	sscccc	1,863.18	246.41
11	1999	18	scccccs	972.48	247.53
12	1999	17	sccccsc	1,678.35	455.46

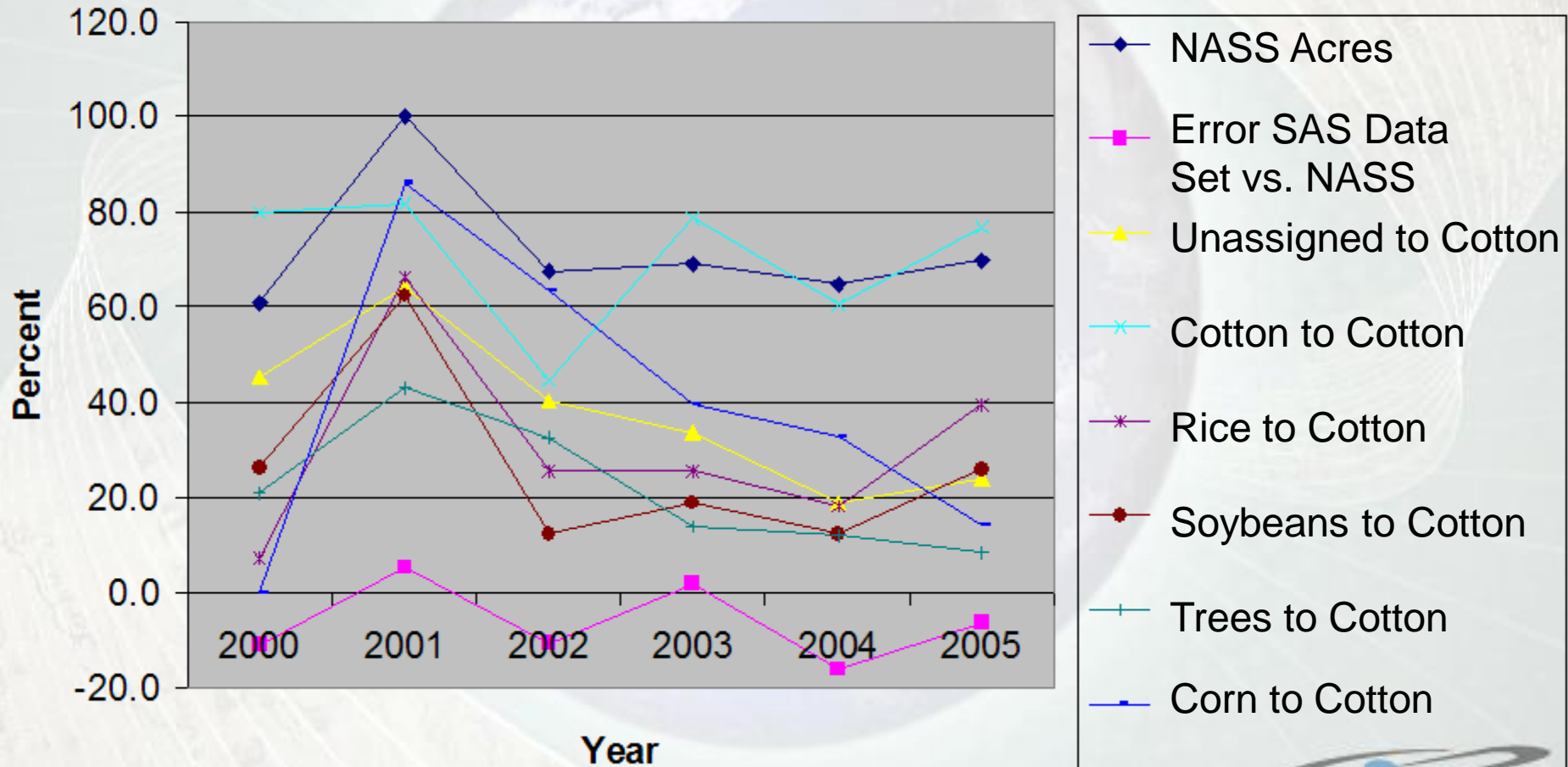
\*c=cotton, \_=unassigned, H=hay, R=rice, s=soybeans, T=trees, u=unclassified, W=water; \*\*1999-2005 fields with cotton history.

# Total Changes 2001 from 2000 by Field Type for Fields with Cotton History

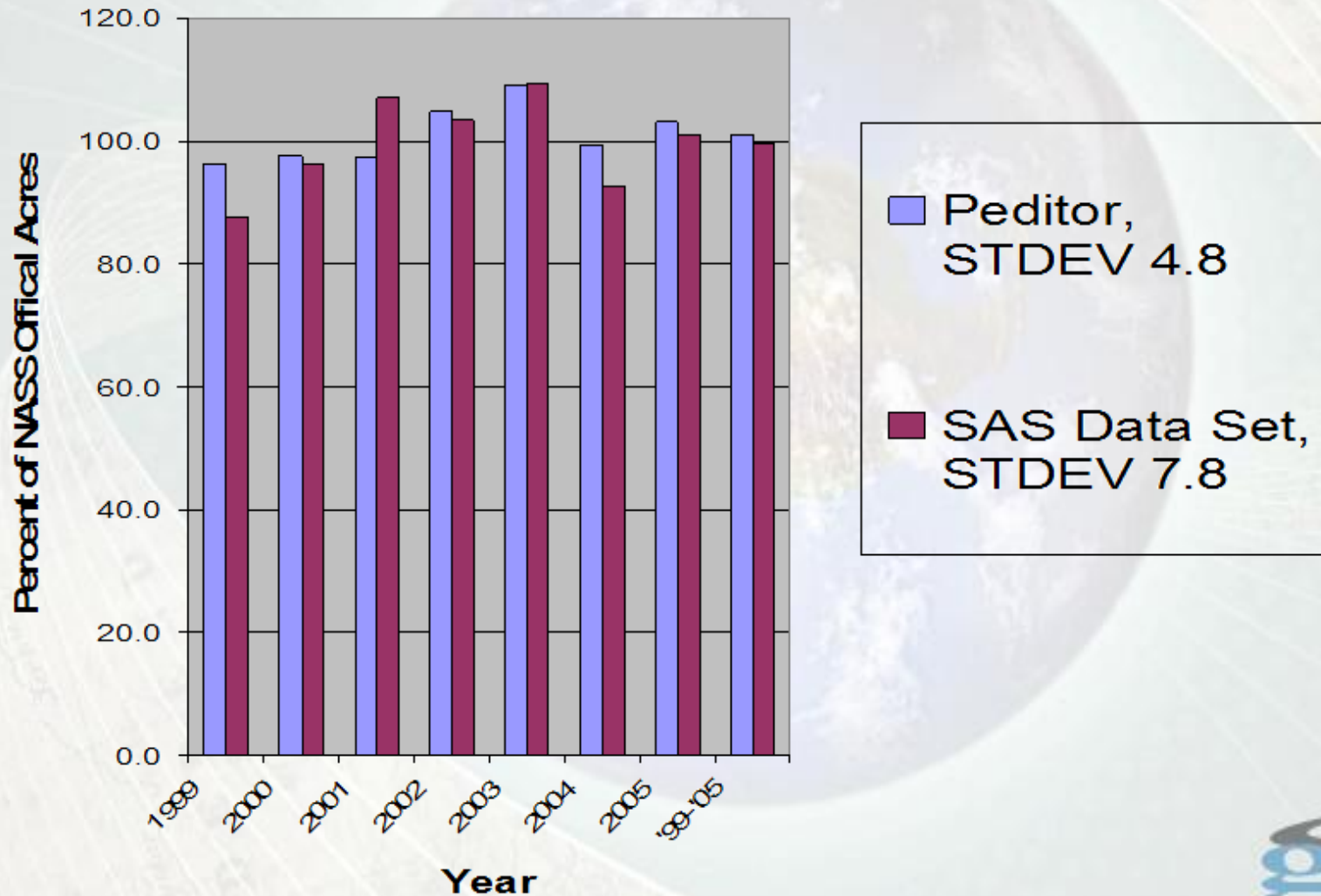
Obs	Frequency	Total	Subtotal	YEAR	CALCACRES	COTT_ACRES	2000*	2001*	% by Frequency	% by Acres
All Total	2784	x		2000	179022	65546			100	100
257	249	x		2000	15295	3334	_		8.94	8.54
1305	1039	x		2000	64859	55726	c		37.32	36.23
1324	16	x		2000	859	37	H		0.57	0.48
1671	340	x		2000	22586	436	R		12.21	12.62
2753	1072	x		2000	71727	5810	s		38.51	40.07
2782	23	x		2000	994	63	T		0.83	0.56
2785	1	x		2000	36.84	0.2224	W		0.04	0.02
2832	42	x		2000	2586	139	X		1.51	1.44
325	67		x	2000	4059.66	3022.12	c	_	6.45	6.26
1136	810		x	2000	53119.74	46664.66	c	c	77.96	81.90
1138	1		x	2000	56.91	31.5801	c	H	0.10	0.09
1143	4		x	2000	270.35	209.05	c	R	0.38	0.42
1153	9		x	2000	455.21	334.04	c	s	0.87	0.70
1285	131		x	2000	6140.76	4803.95	c	T	12.61	9.47
1302	16		x	2000	715.46	629.82	c	u	1.54	1.10
1304	1		x	2000	41.12	30.9129	c	W	0.10	0.06

\*c=cotton, \_=unassigned, H=hay, R=rice, s=soybeans, T=trees, u=unclassified, W=water

# Annual Changes to Cotton by Field Type for Fields with Cotton History, Bolivar County



## Estimation Comparison, Peditor (MS) and SAS Data Set (Bolivar Co.)



# ***Object-Oriented Representation of Mississippi Remote Sensing Data Conclusions***

A field database of pixel counts from the Cropland Data Layer for 7 years was obtained, for Bolivar County, 1999-2005:

- The frequency of single year land use for cotton was greatest in 2001 (56.06% of the fields with >50% cotton). This unusual planting of cotton coincides with the 1996 Farm Bill ending in 2001 and, perhaps more importantly, high price expectations.
- About 16% of the cotton acres per year are from the same fields.
- A total of about twice the acres of the annual cotton acreage estimate has cotton history.
- Cotton acreage estimates per year from the database agree well with previous estimates.

# ***Object-Oriented Representation of Mississippi Remote Sensing Data***

## ***Discussion***

- The use of field polygons to subset multiyear remote sensing data is an effective way to quantify land use.
- Examination of the resulting database reveals single year exceptions and multiyear trends that are not available through the traditional single year analysis .
- The published Cropland Data Layers for Mississippi and other states can be obtained from USDA-NASS by calling (800) 727-9540 and on-line from [www.mdac.state.ms.us](http://www.mdac.state.ms.us) and from <http://datagateway.nrcs.usda.gov/GatewayHome.html>.

# ***Acknowledgements***

Commissioner Lester Spell, Jr., D.V.M., Mississippi Department of Agriculture and Commerce, Dr. Vance H. Watson, Interim Director, Mississippi Cooperative Extension Service, and the USDA Field Enumerators in Mississippi were critical to the success of this project.