The Chesapeake Bay Watershed Cropland Data Layer

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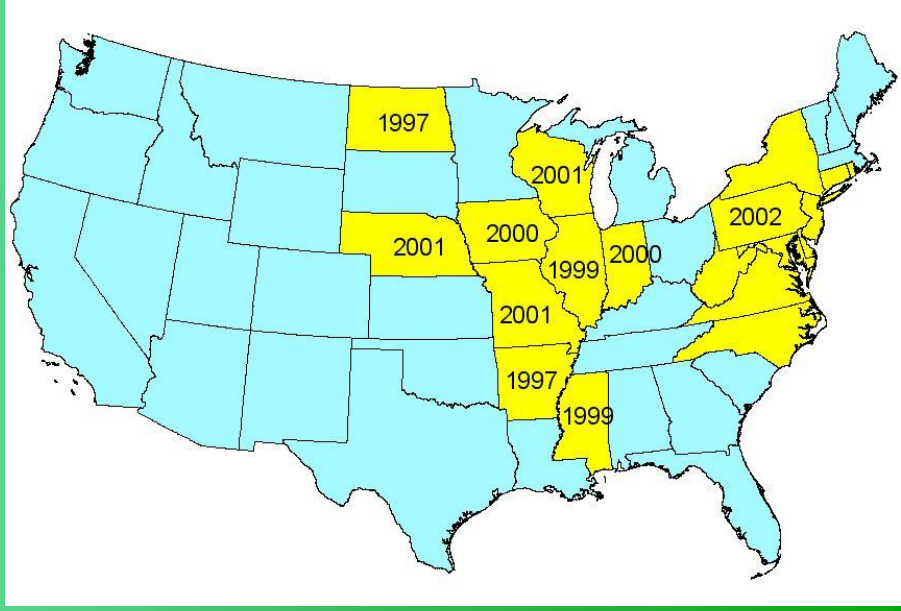
Spatial Analysis Research
Pecora 16

Cropland Data Layer Purpose



- Combine remote sensing imagery and NASS survey data to produce *supplemental* acreage estimates for the state's major commodities

- Production of a crop-specific digital land cover data layer for distribution in industry standard "GIS" format

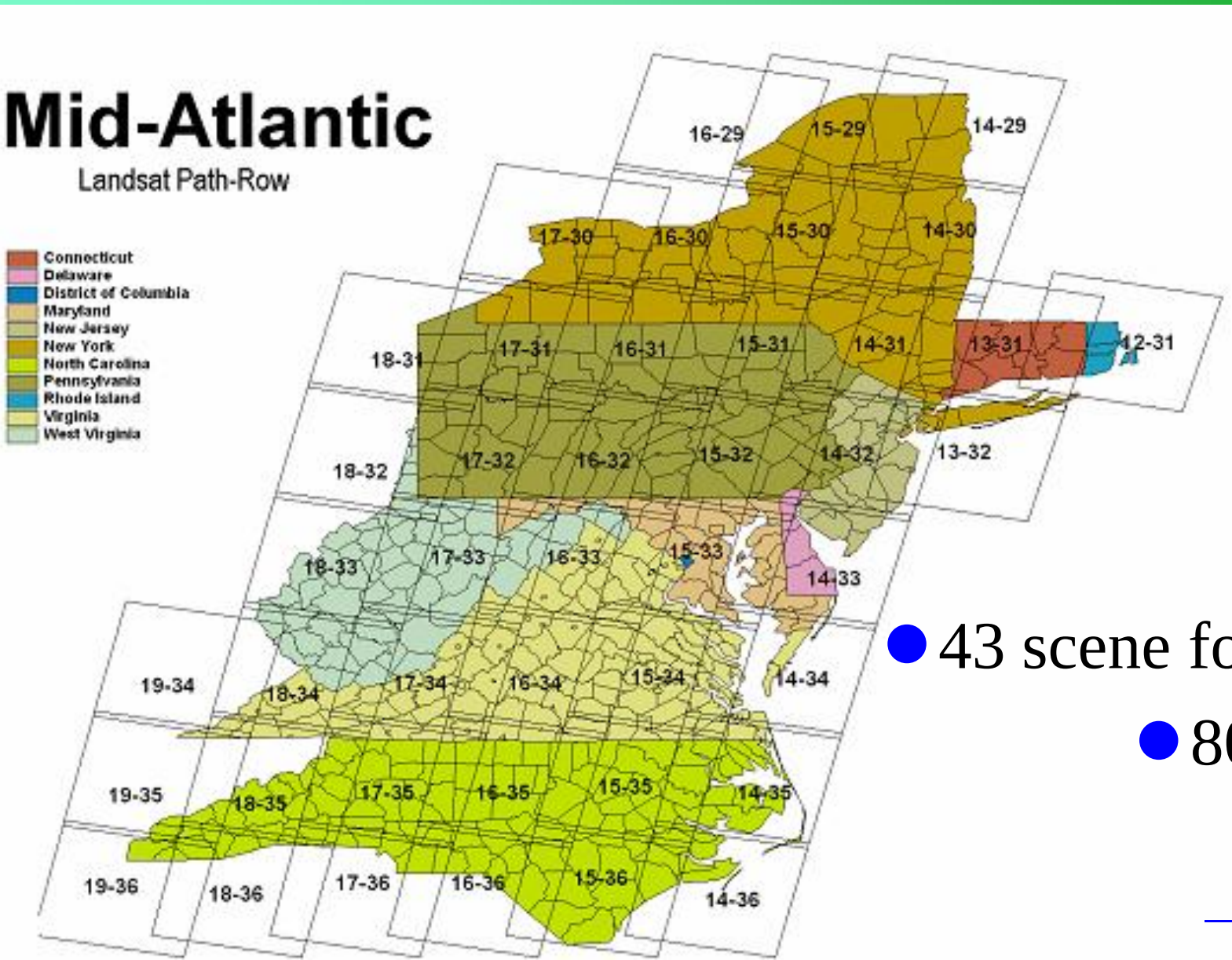
10 State - Chesapeake Bay Watershed

- Towson University (CGIS)– project sponsor
- Based on crop year 2002
  - Agricultural Census: Agricultural Coverage Evaluation Survey (ACES)
  - June Agricultural Survey (JAS)
- Utilized both Landsat TM & ETM
- Map the agricultural extent and variety

Cropland Data Layer Background

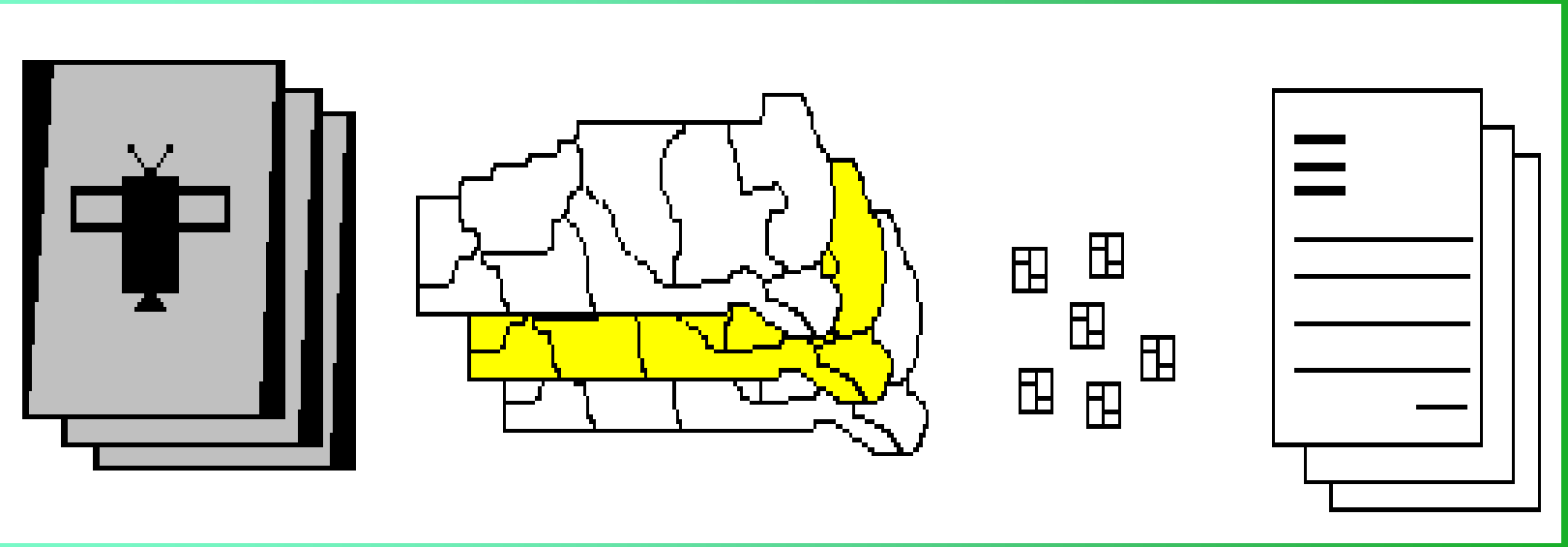
- June Agricultural Survey (JAS) – National in Scope
  - 41,000 farms visited
  - 11,000 one-square mile sample area segments visited
  - Most states contain between 150 – 400 segments
  - Planted acreage estimate
- Dependant upon the ground survey data
  - Unbiased statistical estimator of crop area
    - State and county level estimates

Project Scope



- 43 scene footprints
- 80 scenes
  - 36 TM
  - 44 ETM

Cropland Data Layer Inputs



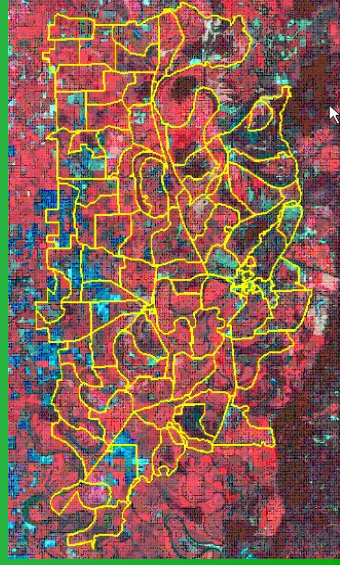
Satellite Images

Area Frame Strata Boundaries

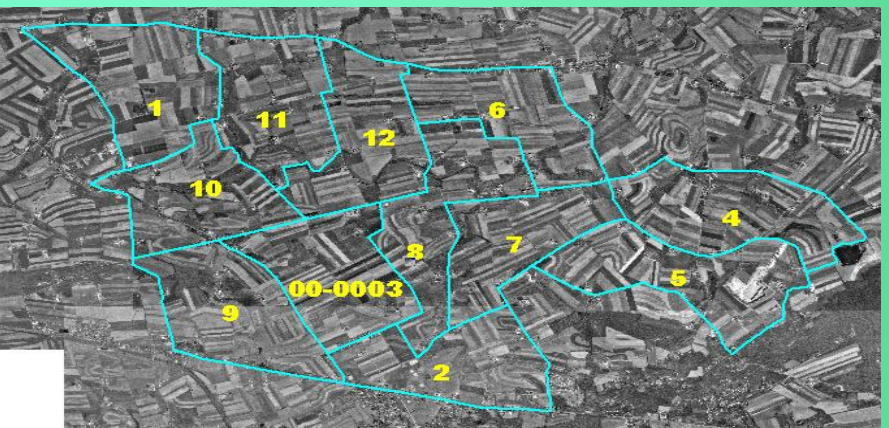
Segment Boundaries

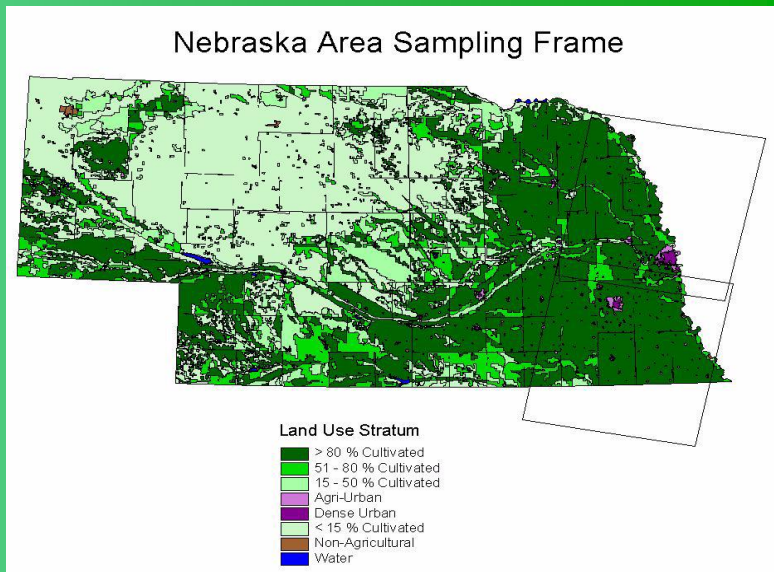
Section D from Area Questionnaire

Area Sampling Frame



- Stratify based on percent cultivated land
- Subdivide strata into primary sampling units or PSU's
  - Selected PSU's divided into secondary sampling units or segments





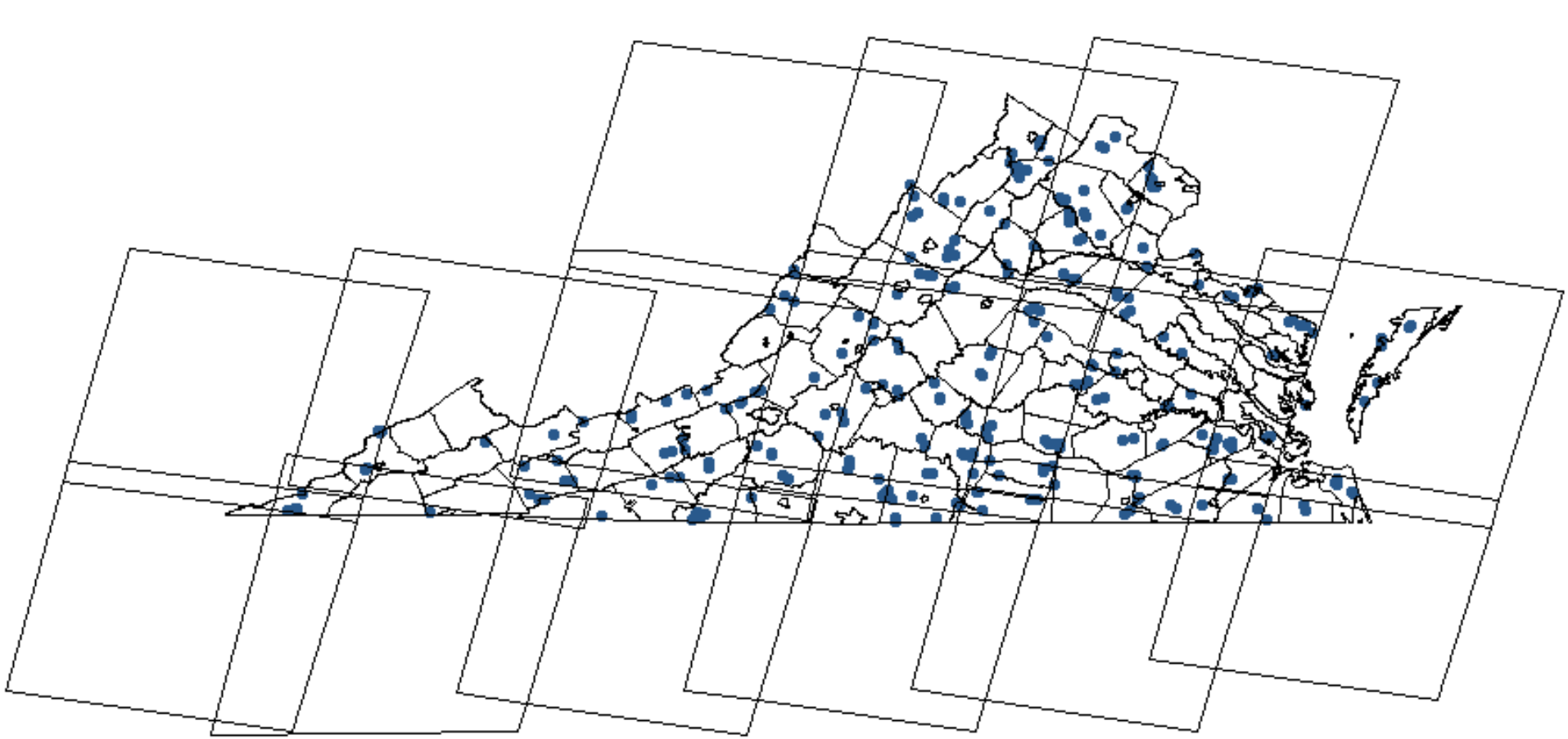
2002 Segment Sample Size

June Agricultural Survey

Agricultural Coverage Evaluation Survey

State	JAS	ACES	Total
CT	8	14	22
DE	23	1	24
MD	61	9	70
NC	319	29	348
NJ	48	16	64
NY	96	87	183
PA	179	101	280
RI	8	1	9
VA	146	132	278
WV	66	17	83
Total	**954**	**407**	**1361**

2002 Virginia Segment Locations

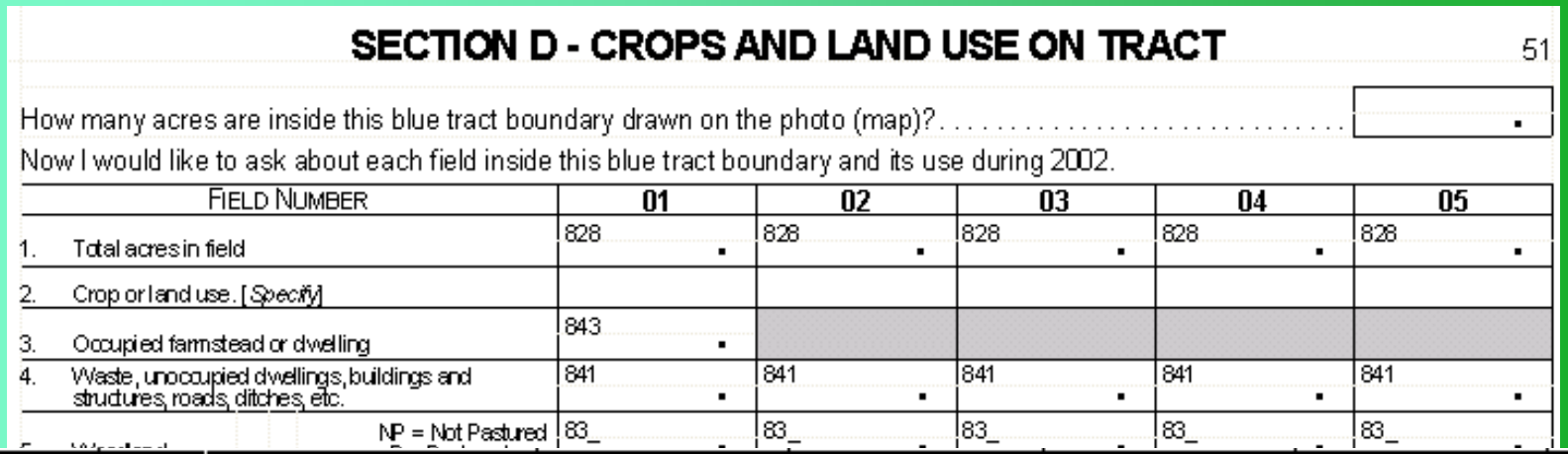


Enumerator records field extents, cover types and acreage

1 sq. mi. JAS segment annotated by enumerator on a 1:8,000-scale NAPP photo

2002 JAS Questionnaire

- Enumerators account for all land usage in segment
  - Draw off field location by direct observation
  - Directly link questionnaire to segment photo



SECTION D - CROPS AND LAND USE ON TRACT 51

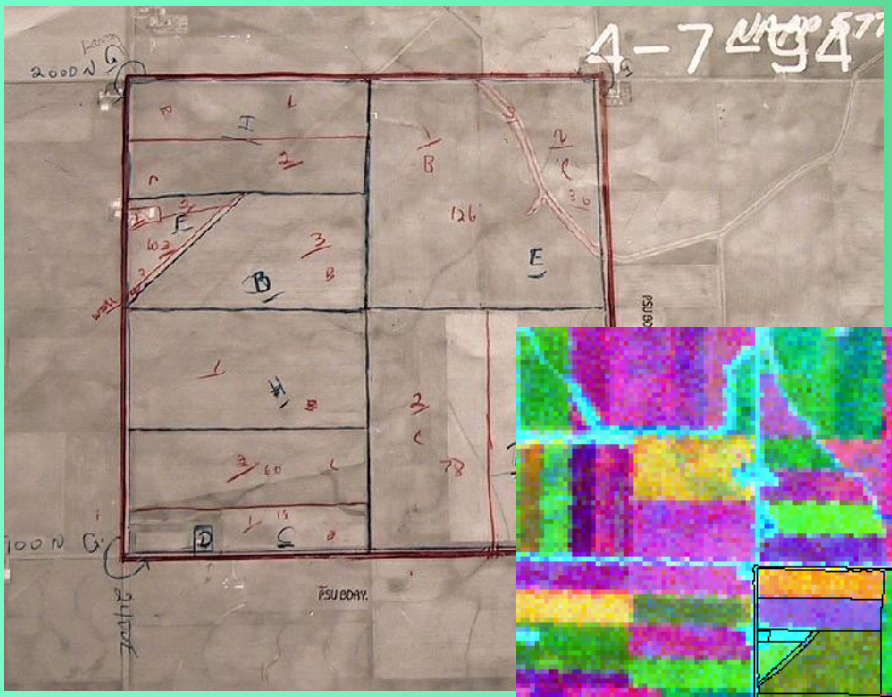
How many acres are inside this blue tract boundary drawn on the photo (map)? . . . . . .

Now I would like to ask about each field inside this blue tract boundary and its use during 2002.

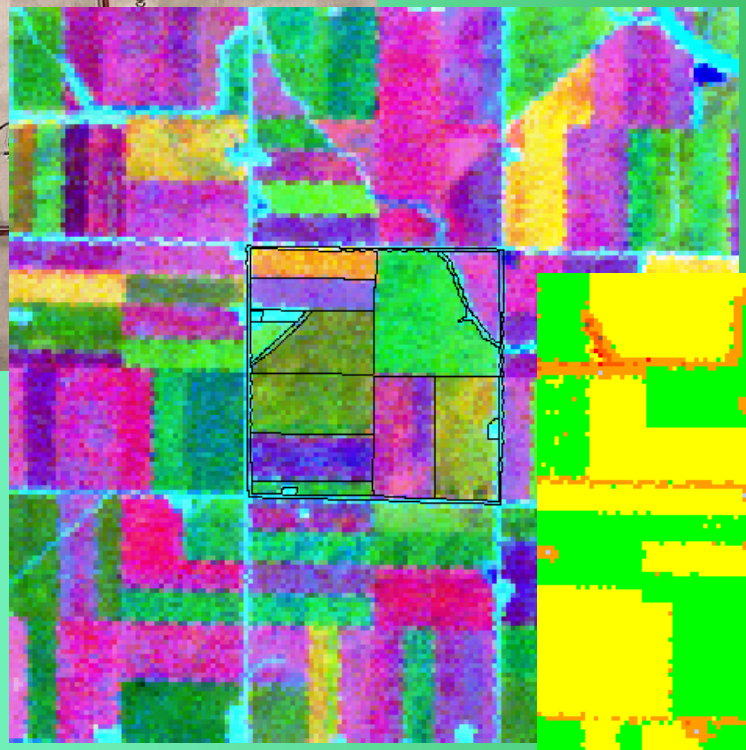
FIELD NUMBER	01	02	03	04	05
1. Total acres in field	828	828	828	828	828
2. Crop or land use. [*Specify*]					
3. Occupied farmstead or dwelling	843				
4. Waste, unoccupied dwellings, buildings and structures, roads, ditches, etc.	841	841	841	841	841
NP = Not Pastured	83_	83_	83_	83_	83_

16.	**Winter Wheat** (*include cover crop*)	Planted	540	540	540	540	540
17.		For grain or seed	541	541	541	541	541
22.	**Barley** (*include cover crop*)	Planted	535	535	535	535	535
23.		For grain or seed	536	536	536	536	536
24.	**Corn** [*Exclude popcorn and sweet corn*]	Planted and to be planted	530	530	530	530	530
25.		For grain or seed	531	531	531	531	531
27.	**Sorghum** [*Exclude crosses with Sudan*]	Planted and to be planted	570	570	570	570	570
28.		For grain or seed	571	571	571	571	571

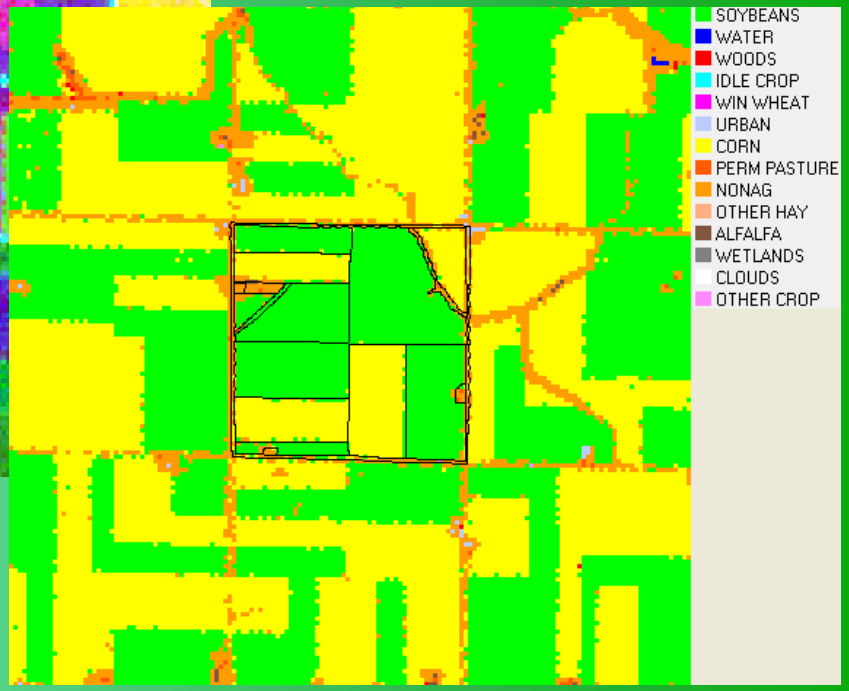
Segment Processing



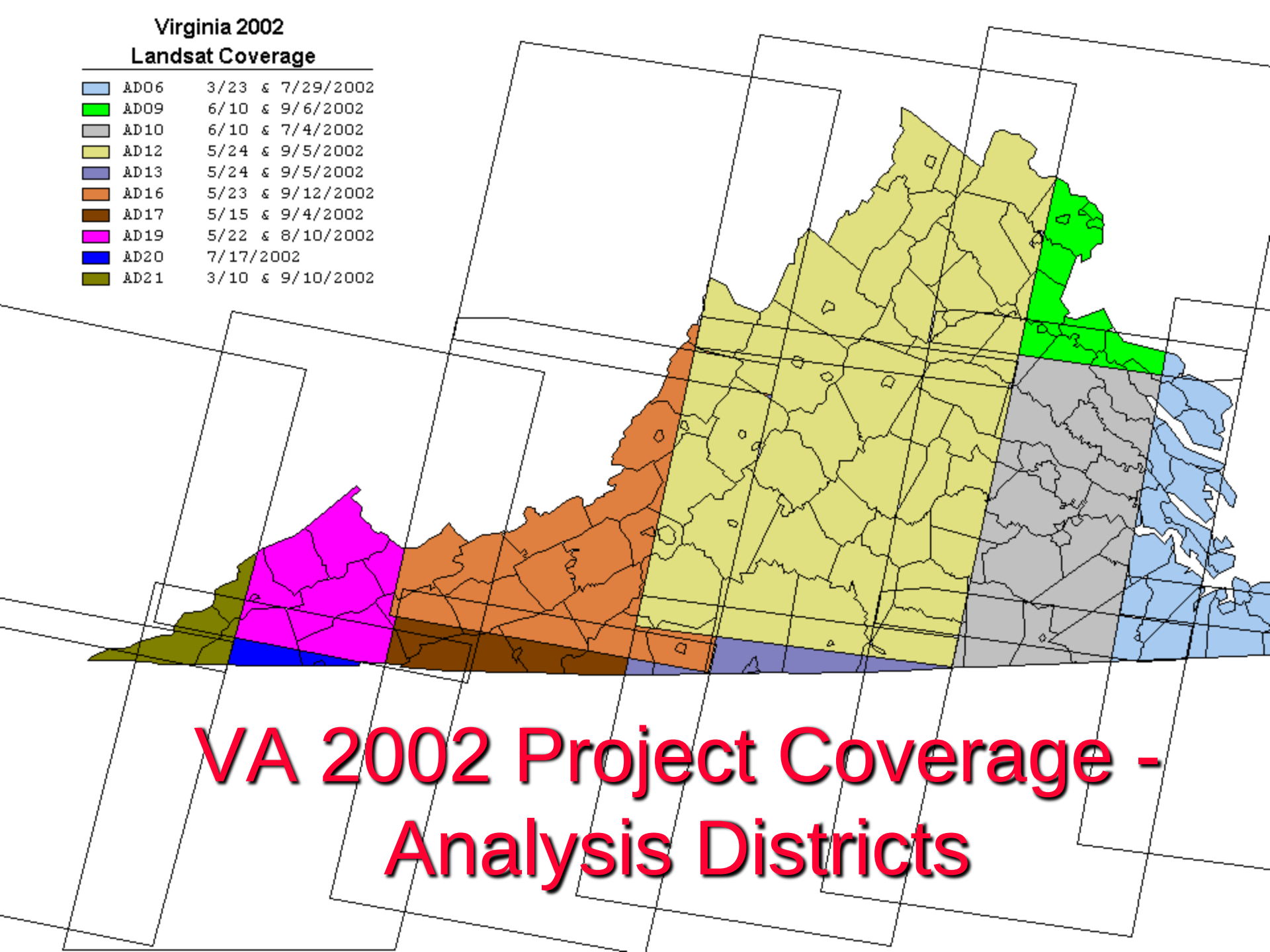
Field Enumeration



Digitizing & Labeling



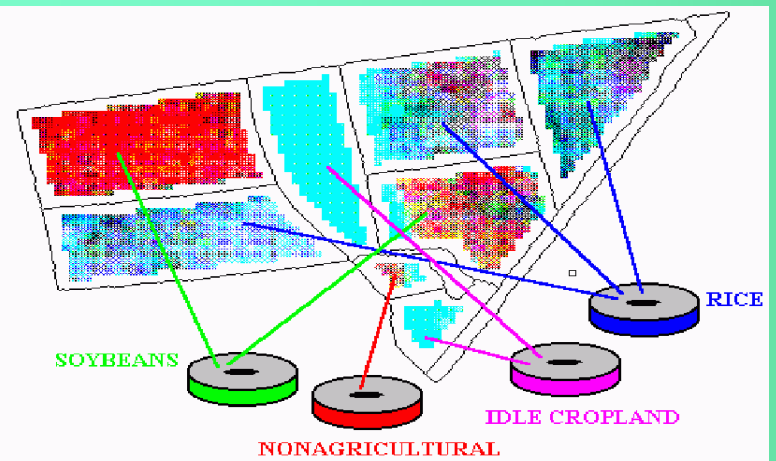
Classification

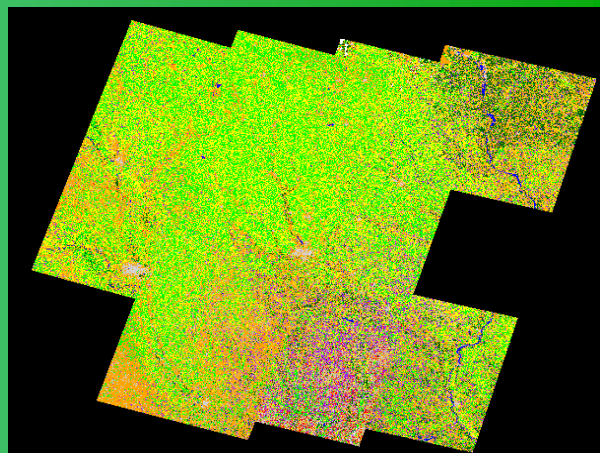


VA 2002 Project Coverage - Analysis Districts

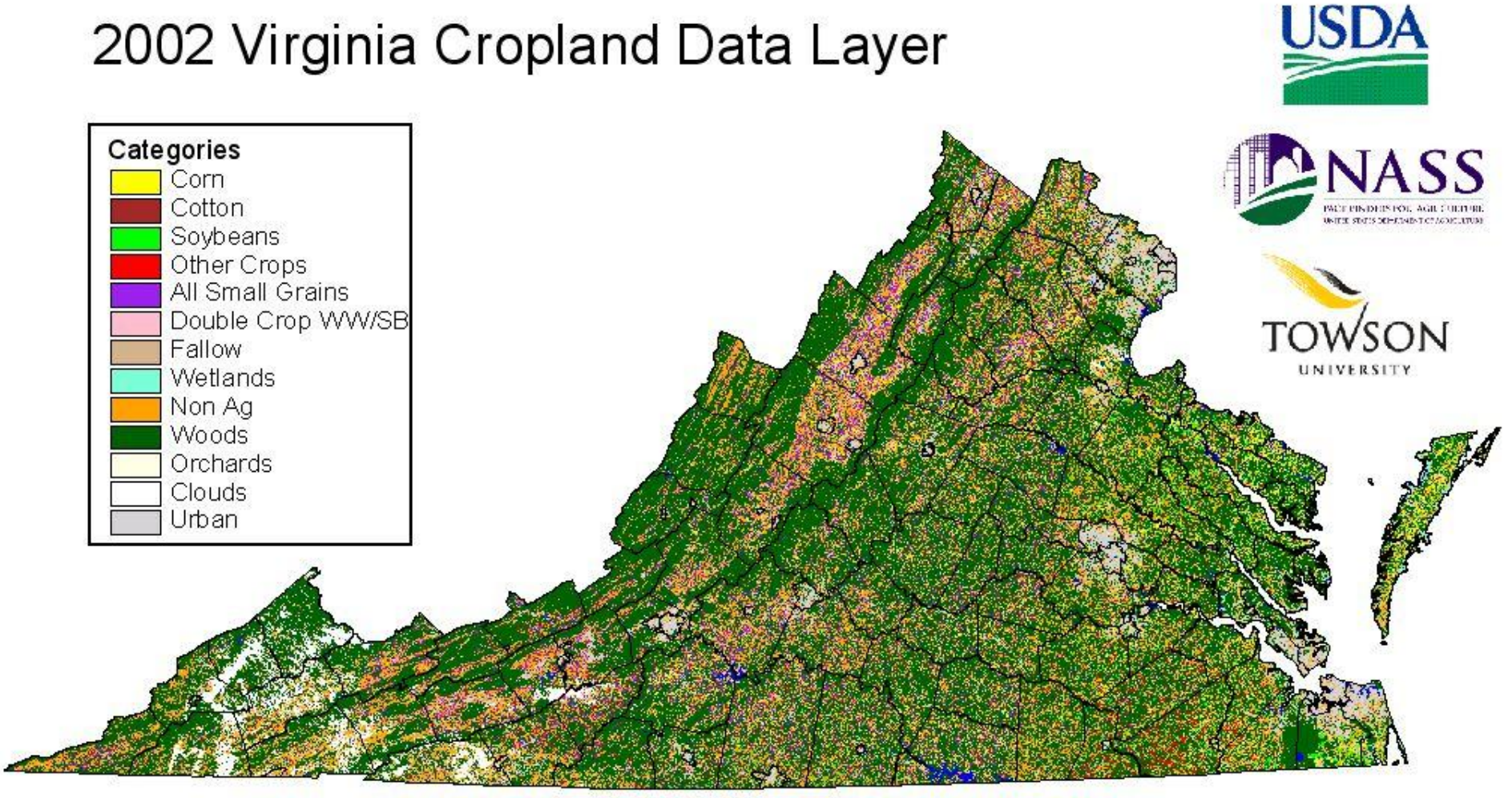
Image Processing by Analysis District

- Modified ISODATA clustering by cover type
- Maximum likelihood classification
- Stitch scenes together to produce a statewide mosaic
- Release crop specific product in public domain

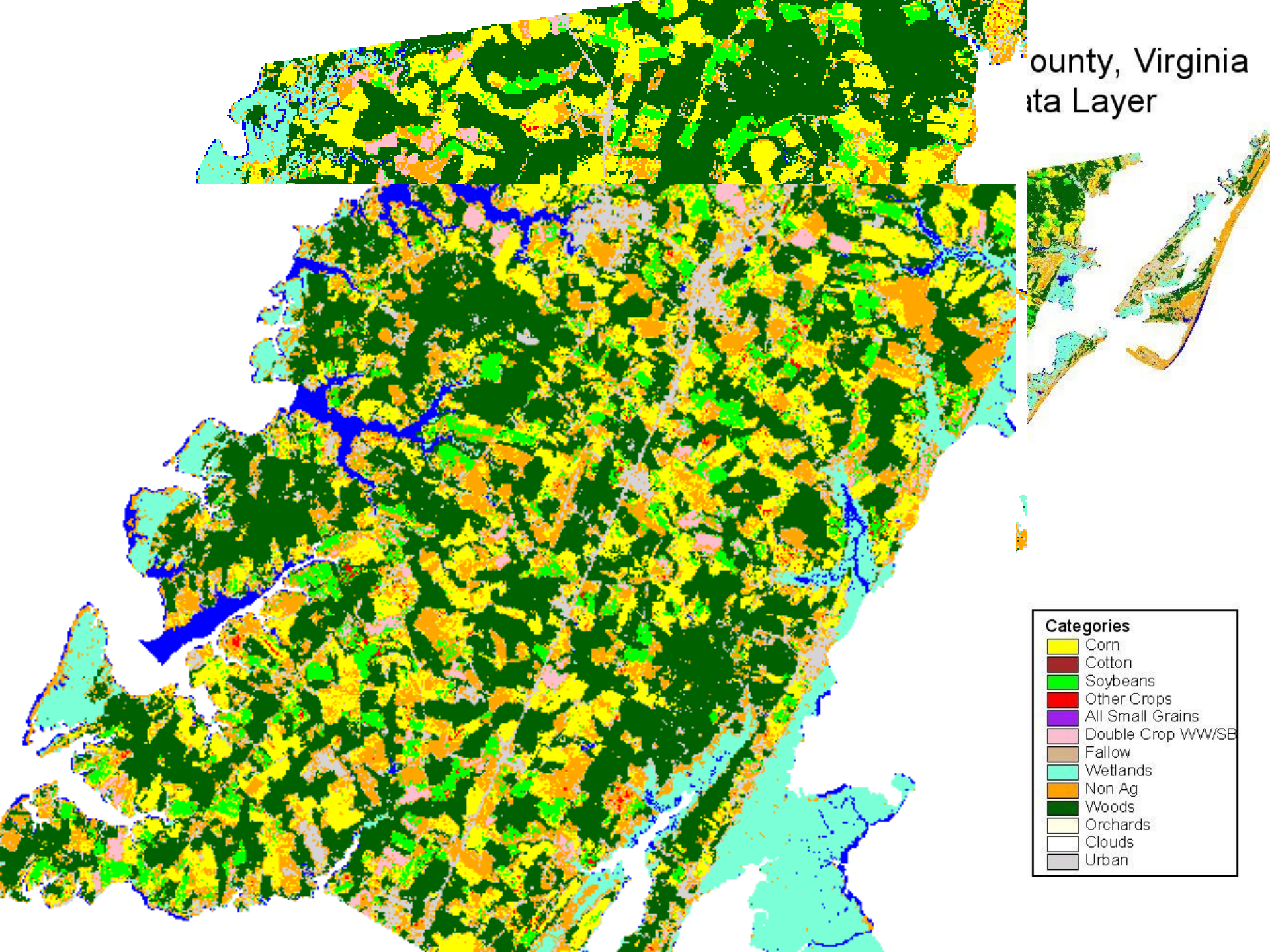


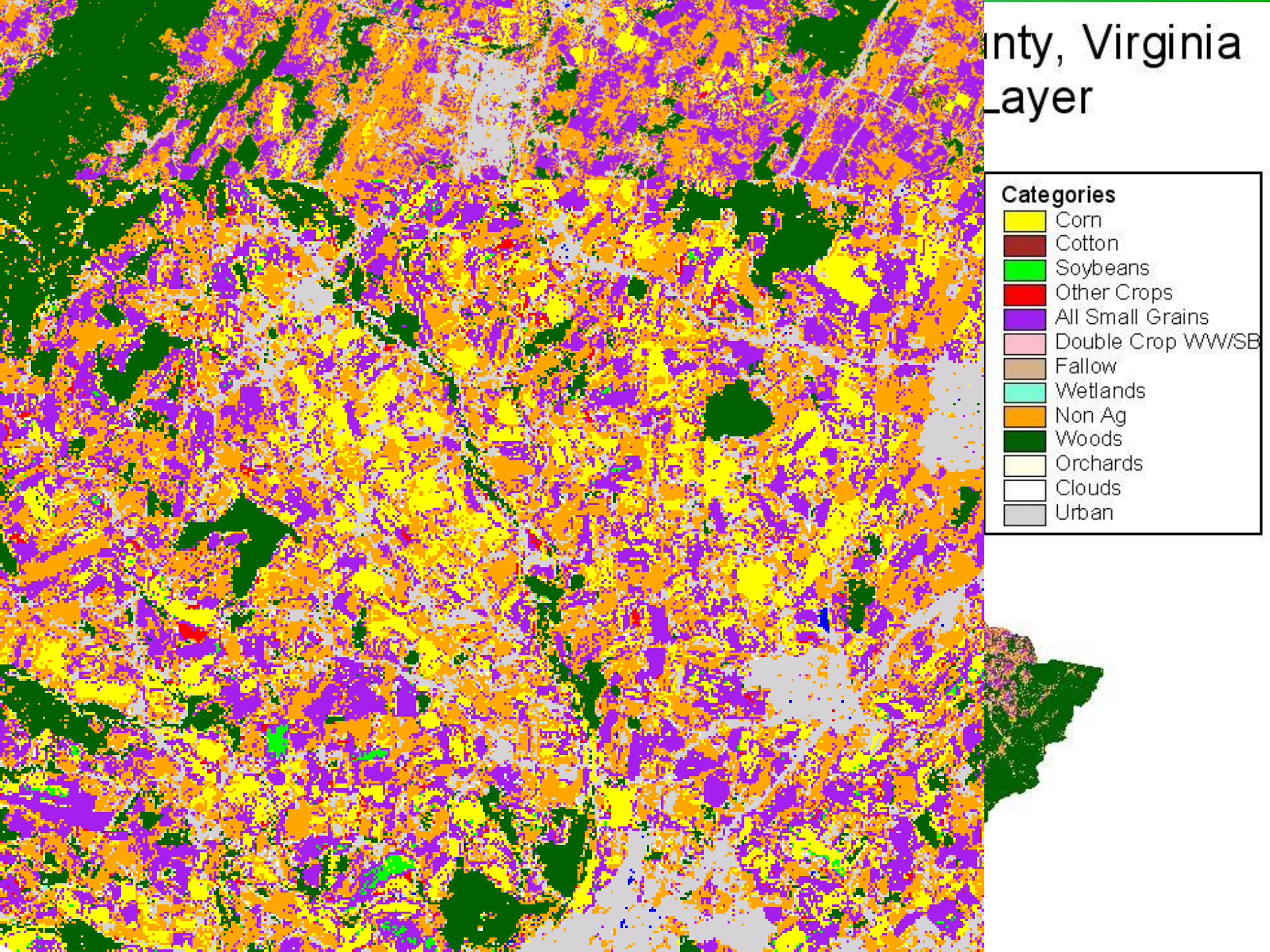


Statewide Categorized Mosaic



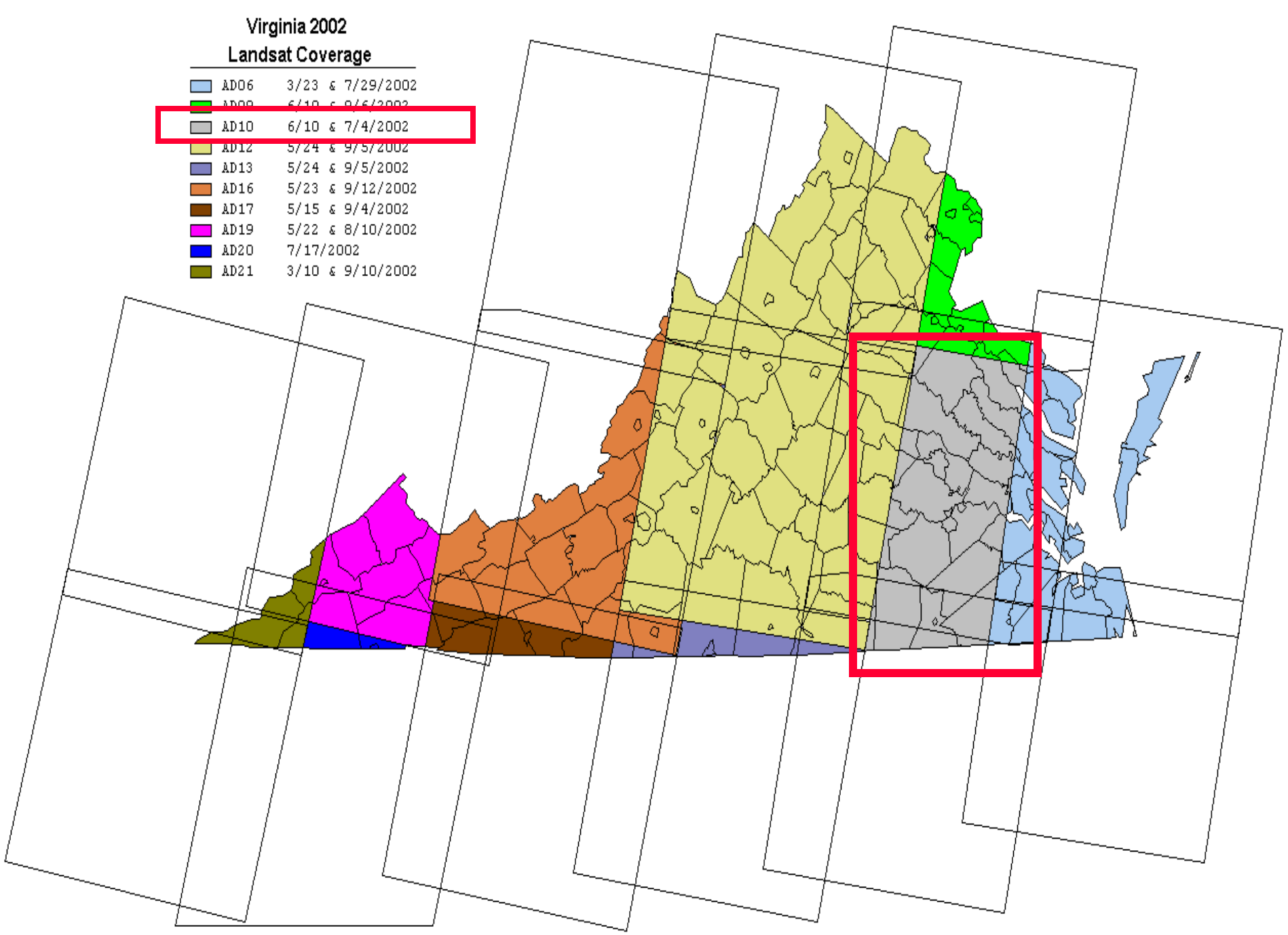
ounty, Virginia
ata Layer




nty, Virginia
Layer
Categories
Corn
Cotton
Soybeans
Other Crops
All Small Grains
Double Crop WW/SB
Fallow
Wetlands
Non Ag
Woods
Orchards
Clouds
Urban

Accuracy Assessment of the 2002 Virginia Cropland Data Layer by Crop

CATEGORIZATION OF VIRGINIA 2002 CROPS					
Regression Analysis By Crop R-Squared and Slope Values From Sample Estimation					
R-Squared			Slope Coefficients		
Analysis District	Strata 13	Strata 20	Analysis District	Strata 13	Strata 20
CORN					
AD06	0	0.688	AD06	0	0.1614
AD10	0.972	0.972	AD10	0.1898	0.1898
AD12	0.735	0.735	AD12	0.2242	0.2242
SOYBEANS					
AD06	0	0.743	AD06	0	0.2251
AD10	0.908	0.908	AD10	0.2511	0.2511
COTTON					
AD10	0	0.714	AD10	0	0.2116
WINTER WHEAT					
AD10	0.991	0.991	AD10	0.2294	0.2294
ALFALFA					
AD12	0.631	0.631	AD12	0.2204	0.2204
AD16	0	0.984	AD16	0	0.2574


Virginia 2002
Landsat Coverage
AD06 3/23 & 7/29/2002
AD10 6/10 & 7/4/2002
AD12 5/24 & 9/5/2002
AD13 5/24 & 9/5/2002
AD16 5/23 & 9/12/2002
AD17 5/15 & 9/4/2002
AD19 5/22 & 8/10/2002
AD20 7/17/2002
AD21 3/10 & 9/10/2002

Accuracy assessment of Analysis District 10 by major cover type

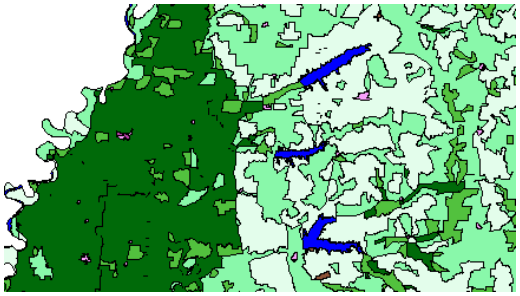
ANALYSIS DISTRICT AD10
LANDSAT TM/ETM+ PATH: 15, ROW(S): 34 & 35 - (06/10 + 07/04/2002)
253 CROP / COVER TYPE SIGNATURES, 14 CHANNELS

Category	Crop Cover	Orig. # Category	Orig. # Pixels	Percent Correct	Commission Error	Kappa Coefficient
1	Corn	14	1309	95.03	4.09	94.22
2	Cotton	2	148	40.54	40.59	39.88
5	Soybeans	27	825	94.06	4.9	93.48
10	Peanuts	4	220	96.36	24.56	96.25
11	Tobacco	4	154	94.81	9.32	94.71
24	Win Wheat	2	126	99.21	2.34	99.2
26	WW/Soybean	7	593	98.92	4.4	98.74
44	Other Crop	3	59	98.31	17.14	98.29
62	Perm Past	8	635	60.00	30.22	57.49
63	Woods	48	3932	83.6	0.72	74.43
63	Wood Past	4	440	81.59	50.55	80.22
	Overall	253	9235	85.86		82.28

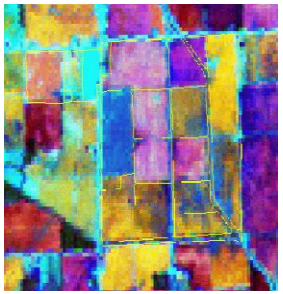
Program Summary

Raw Satellite Image

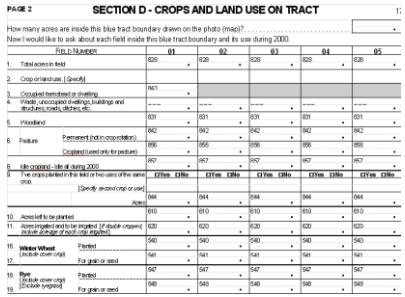
Area Sampling Frame



Segment Boundaries



JAS Questionnaire

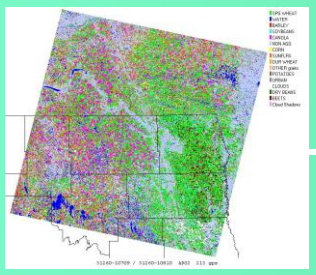


PAGE 2 **SECTION D - CROPS AND LAND USE ON TRACT**

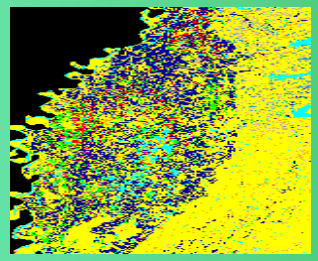
How many acres are inside this blue tract boundary drawn on the photo (map)?

Now I would like to ask about each field inside this blue tract boundary and its use during 2000.

	FIELD NUMBER	01	02	03	04	05
1.	Total acres in field	828	828	828	828	828
2.	Crop or land use. [Specify]					
3.	Occupied farm shed or dwelling	843				
4.	Waste, unoccupied dwellings, buildings and structures, roads, ditches, etc.					
5.	Woodland	831	831	831	831	831
6.	Pasture — Permanent (not in crop rotation)	842	842	842	842	842
	Cropland (used only for pasture)	856	856	856	856	856
7.	Idle cropland - Idle all during 2000	857	857	857	857	857
8.	Tree crops planted in the field or hedgerows of the same crop.	CTYes CINo	CTYes CINo	CTYes CINo	CTYes CINo	CTYes CINo
	[Specify second crop or use]	866	844	844	866	844
	Acres					
10.	Acres left to be planted	810	810	810	810	810
11.	Acres irrigated and to be irrigated. [If double cropped, include acreage of each crop irrigated]	820	820	820	820	820
16.	**Winter Wheat** — Planted	840	840	840	840	840
17.	(Include cover crop) — For grain or seed	841	841	841	841	841
18.	**Rye** — Planted	847	847	847	847	847
19.	(Include cover crop) (Include ryegrass) — For grain or seed	848	848	848	848	848



Categorized Images



Mosaicked CDL

soybeans	2001	AR	Clay	21	129000	127000
soybeans	2001	AR	Conway	29	21000	20000
soybeans	2001	AR	Craighead	31	87000	85500
soybeans	2001	AR	Crawford	33	13000	12500
soybeans	2001	AR	Crittenden	35	166000	162500
soybeans	2001	AR	Cross	37	150000	149000
soybeans	2001	AR	Desha	41	87000	86000
soybeans	2001	AR	Drew	43	21000	20500
soybeans	2001	AR	Faulkner	45	7000	7000
soybeans	2001	AR	Franklin	47	2000	2000

Estimates

Chesapeake Bay Watershed Conclusion

- Project sponsor: Towson U.
- Produced for crop year 2002
- Categorization & accuracy assessment
  - GeoTIFF images
- Planned release for early Nov 2005

In no case is farmer reported data revealed or derivable from the public use Cropland Data Layer

NASS

TOWSON UNIVERSITY

www.nass.usda.gov/research/Cropland/SARS1a.htm