“We’re looking for residue…Have you seen any?”

Delaware’s Cropland Transect Survey

Marcia Fox & Tyler Monteith

DNREC Watershed Assessment and Management Section

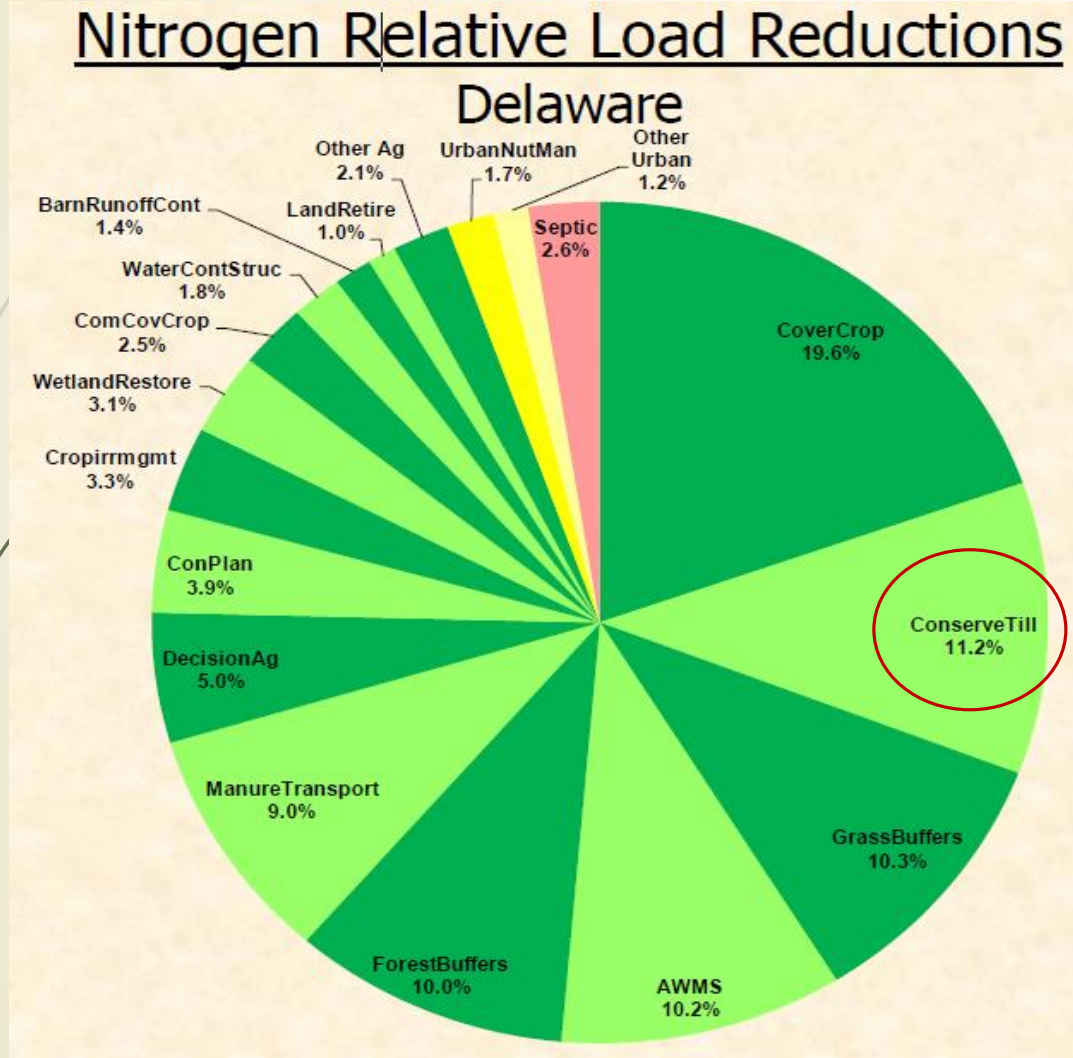
Why residue?

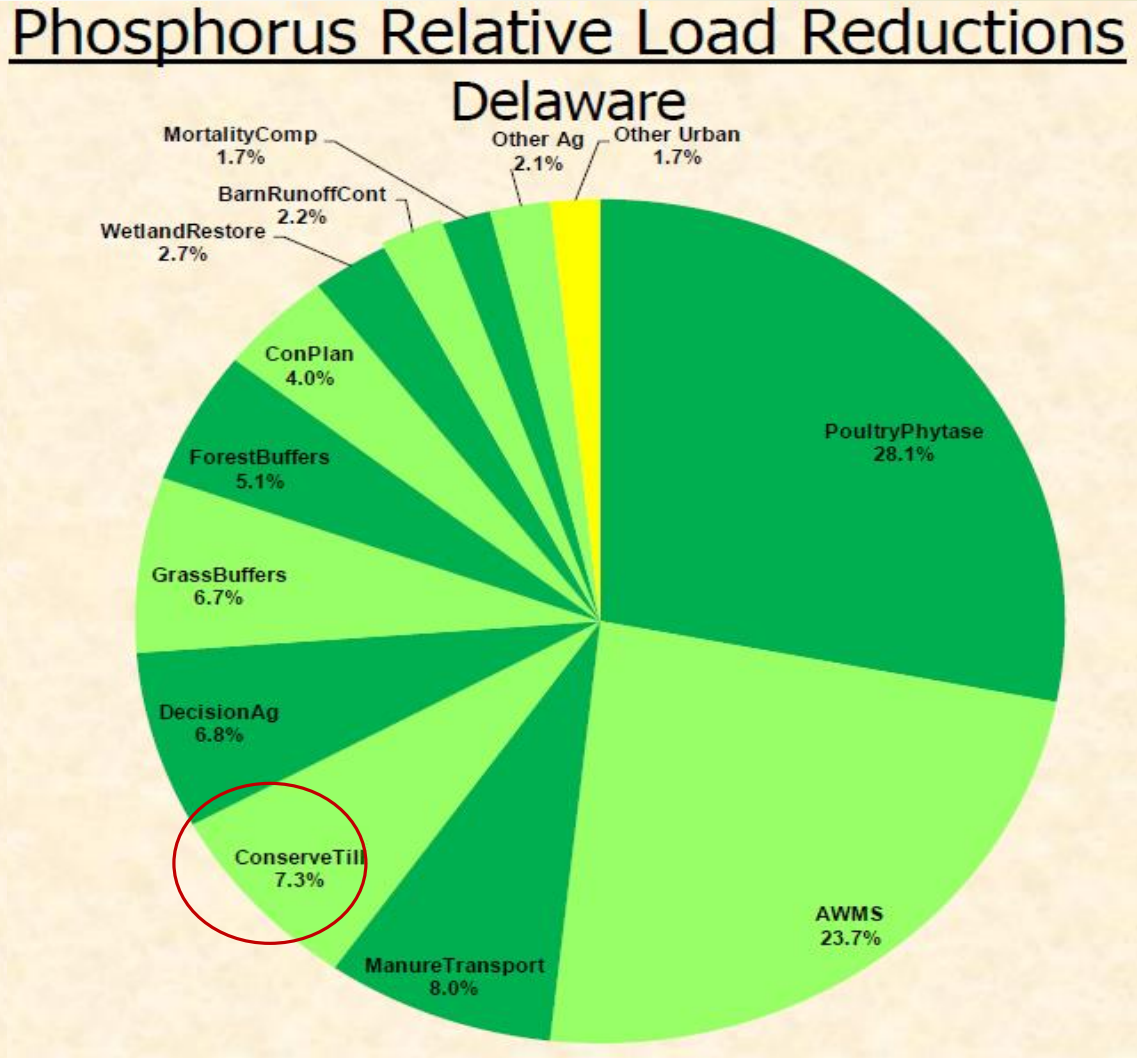
- What is residue?
  - Leftover crops from previous plantings
    - Stalks, stems, stubble, leaves, other crops, seed pods…
- Why is residue important?
  - Increased water infiltration and storage
  - Decreased soil erosion and soil-bound nutrient losses
  - Increased nitrogen retention due to increased organic matter
- Why are we looking for it?
  - Nutrient reduction credits from the Chesapeake Bay Program
  - Currently underreported in Chesapeake Bay Progress Submissions

Previous Tillage Practice Reporting

- Previously using historic Conservation Technical Information Center (CTIC)
  - Privatization of CTIC caused a data shortage and lack of data updates
    - Hasn't been updated since 2004
  - Cons-Till was being simulated by Chesapeake Bay Program Watershed Model
    - Applied a default amount of conservation-tillage based on land-use
    - This means loss in cons-till credit due to loss in agricultural land-use from Chesapeake Bay Program projections
  - Only reporting:
    - Conservation Tillage (+30% residue at planting)
    - Continuous No-Till (applied as an efficiency on top of CT land-use)

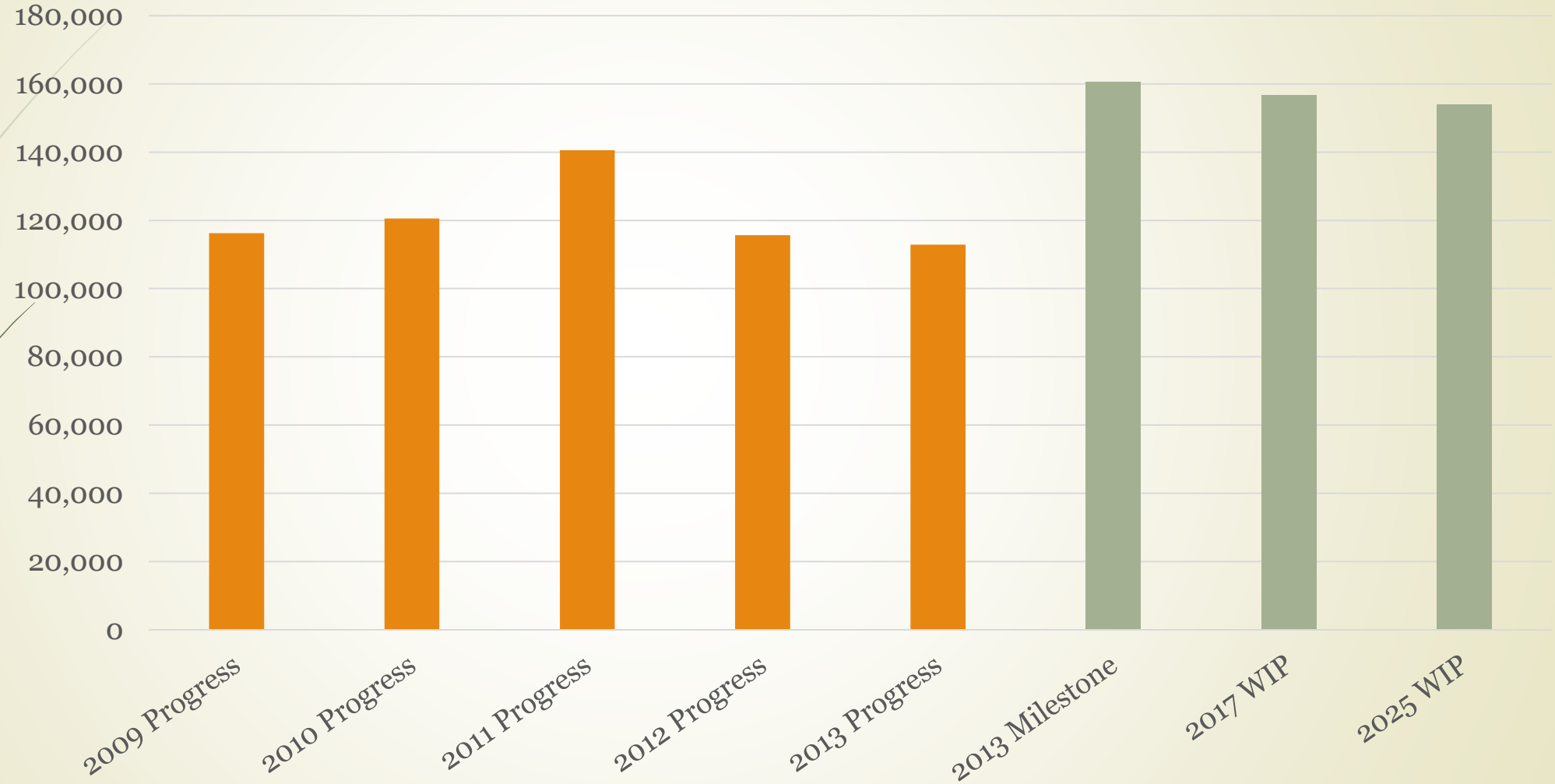
We rely on Conservation Tillage Practices in our WIP!





Courtesy of Matt Johnston, UMD Chesapeake Bay Program Office

Reported Conservation-Tillage (acres)



New HRMSD Category

- Conservation Tillage Panel
  - Greatest benefit for water quality found when crop reside >60%
  - Created new practice “High-Residue, Minimum Soil Disturbance”
    - Reduced TSS by 64%
  - Replaces continuous no-till practice

Adoption of CTIC Study and Goals

- Creation of consistent source of data for tillage practices
  - Source of a substantial portion of our load reductions in WIP
  - Include the incorporation of HRMSD practice for further reductions
- Adopted PA survey from CTIC
- Delawarized it!
  - Collect unaccounted cover crop data
    - Traditional vs. Commodity
    - Cost shared vs. Non-cost shared

Establishing a Statistically Valid Transect Procedure

- 110 miles along predominately cropland
- After majority of main crops planted, but before crop canopy closes
- “Windshield Observations”
- Driver, Navigator, Recorder, Observers
- QA/QC Team involving similar participants
- Need approximately 460 observations
- Make stops at specified intervals (.2-.5 miles) and observe both sides of road

CROPS	
corn	edible beans and peas
soybeans (full season)	barley
soybeans (double-cropped)	canola
winter wheat	forage crop (seeding year only)
oats	potatoes
grain (other)	sorghum
sunflowers	permanent pasture
vegetables and other crops	fallow
rye	hay
specialty crops (orchard, sod,..)	none

Cover Crops	
Annual Ryegrass (ARG)	Annual legume
Brassica (winter hardy)	Forage Radish
Triticale	Oats (winter hardy)
Rye (Ref. Species)	Annual Legume + Grass
Oats (winter killed)	Forage Radish + Grass

Cover Crop Planting Method	
Drill	Aerial
Broadcast	Other

Please contact Marcia Fox (302-739-9939) or Mark Dubin (###-###-####) with any questions en route or after. A list of survey team contact information may also be found on back.

LAND-USE KEY	
CODE	DESCRIPTION
AGRICULTURAL	
AFO	Animal feeding operations (barnyard)
PR	Pasture with riparian area (unfenced stream)
AP	All other pasture
ALF	Alfalfa (includes mixed with other seed combos)
GR	Grass (for hay)
AOC	All other crops (those not included in survey) (treefarm)
FCRP	Fallow and CRP
NON-AGRICULTURAL	
CM	Construction/mining
DI	Developed-impervious (over 30% impervious)
DP	Developed-pervious (under 30% impervious)
FOR	Forest (undisturbed)
FD	Forest- disturbed (more than one road or currently
WB	Water bodies

Don't forget to make notes… indicate (1) breaks in route, (2) route changes, (3)extended intervals to obtain observations or (4) other pertinent information on the line immediately following the most recent observation. Also make note on map of changes indicating reference point (ie. A-12 (page A, point 12)etc).

How It All Went Down (February)

Original Planning Meeting (March)

- Collaborative decision of survey teams & dates of survey
  - Utilized knowledge of planting times and current conditions from ag partners
- Drawing of survey routes
  - Broke up by county
  - Made sure to hit most ag land as possible without double-backing
- Adaptive Management!
  - Always prepared to change


Road Type:
Major
Minor
1 in = 1 m

Training (May)

- Classroom session
  - Survey details
  - Measuring techniques
- Outdoor session
  - Field observations and calibrations
  - Tested fields with varying crops and levels of residue at UD Coop
  - Bead, calculation, and quadrat test


4X4
University of Delaware
Plant & Soil Sciences
Nutrient Management


YELLOWSTONE
NATIONAL PARK

Data Recording

Sample

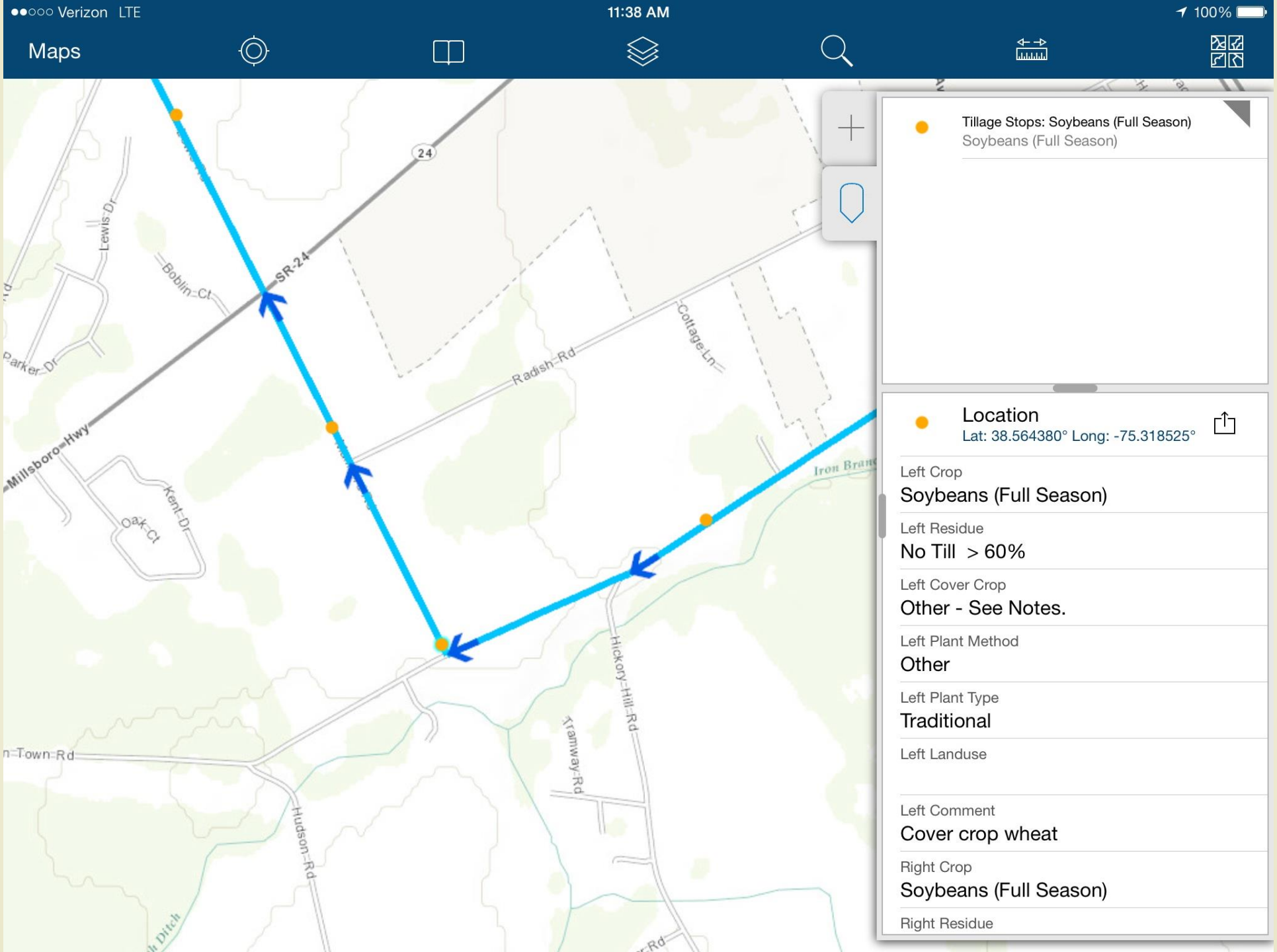
Transect Data Collection Form

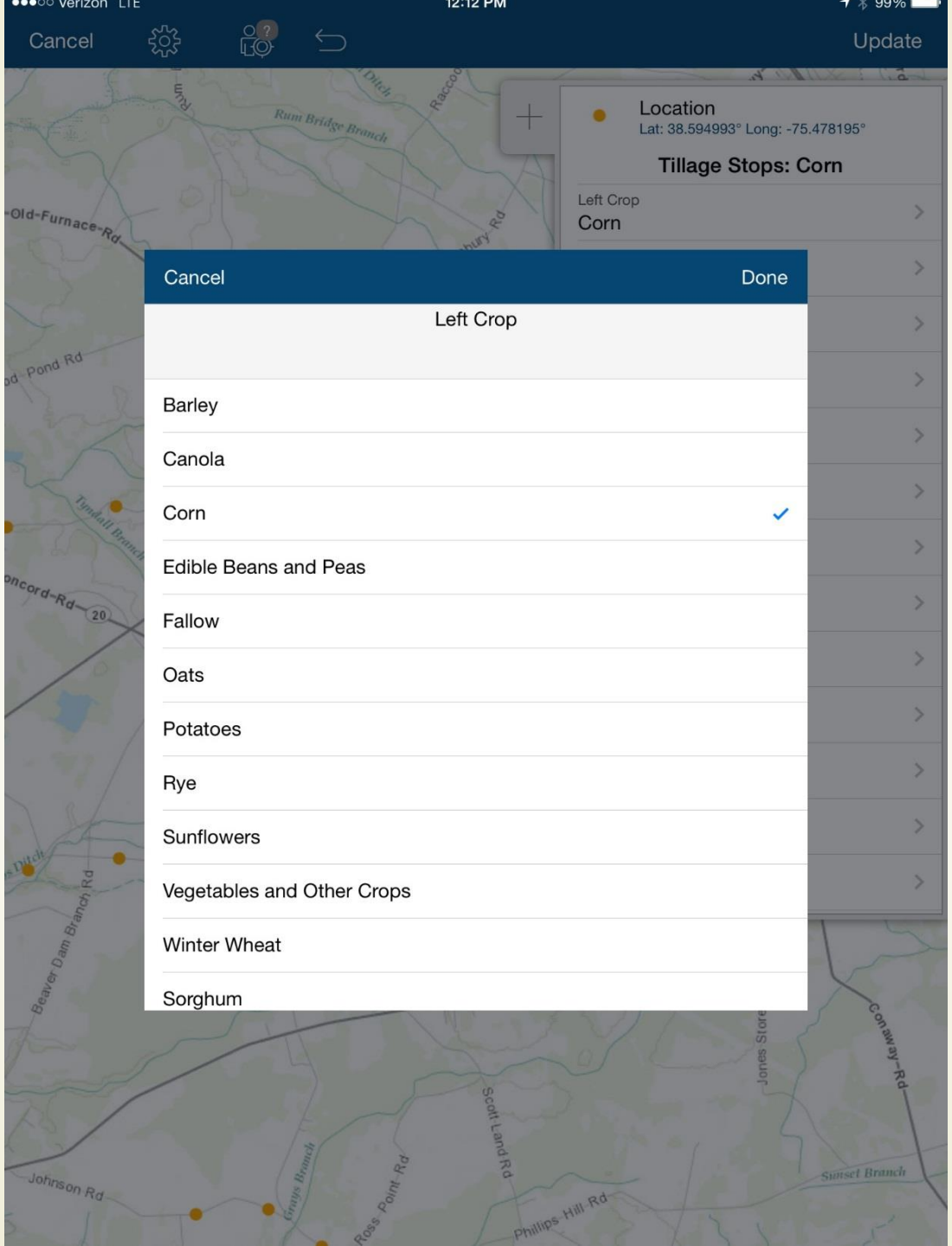
2002 Crop Year

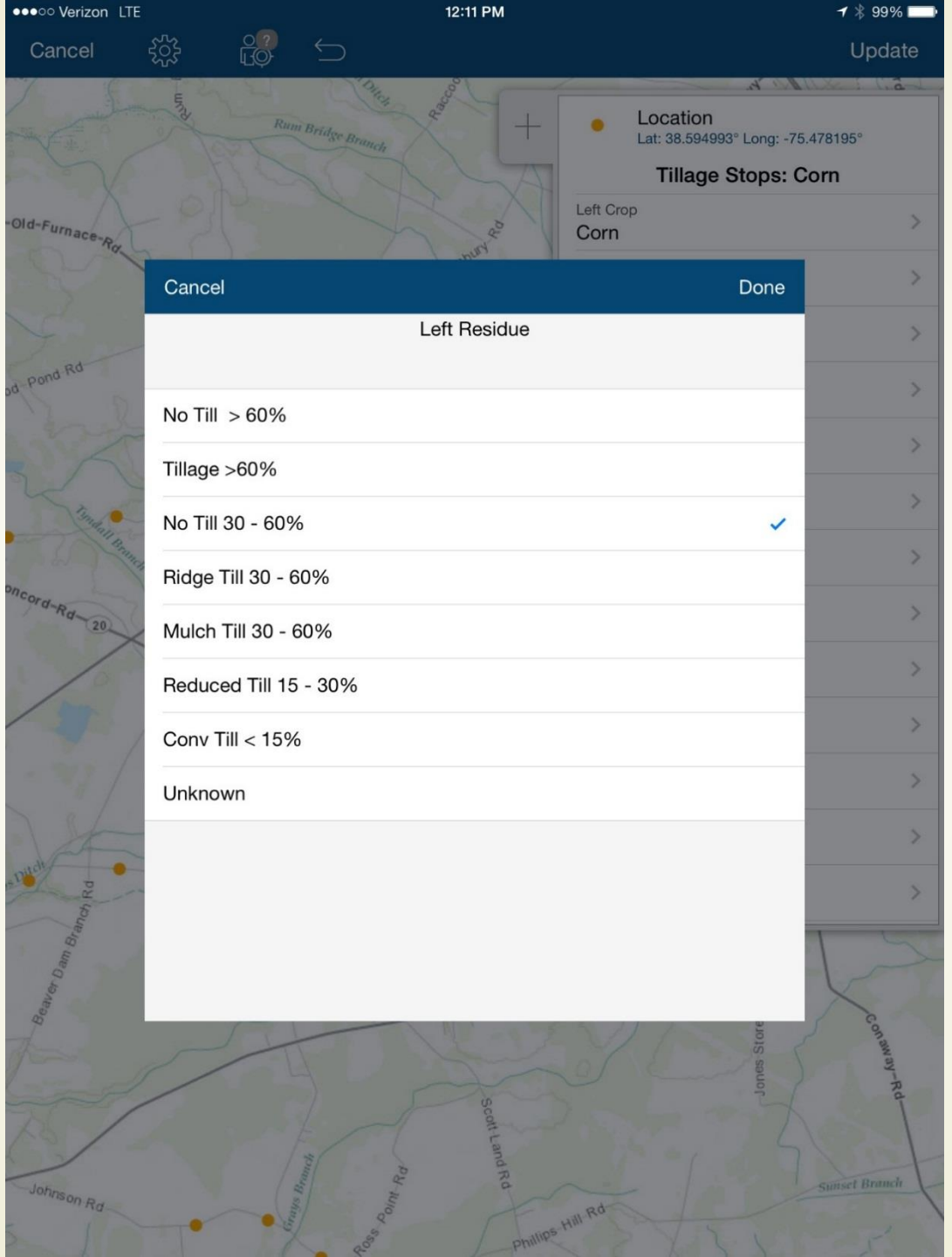
Crop	No-till > 30% residue	Ridge-till > 30% residue	Mulch-till > 30% residue	Reduced-till 15-30% residue	Conv-till <15% residue	Unknown	N/A
corn							
corn	23 25/237 = 10.5%	3 1.2%					
184,000 Ac	19320 Ac	2200 Ac	60 25.3% 46,550 Ac	67 28.3% 52,100 Ac	82 34.6% 63,700 Ac	= 237	
soybeans		11					
soybeans				1111			
182,000 Ac	66 29.3% 56,250 Ac	2 0.9% 1700	60 26.7% 51,260	34 15.1% 29,000	63 28% 53,760	- 225	
wheat							
21,500 Ac						25	

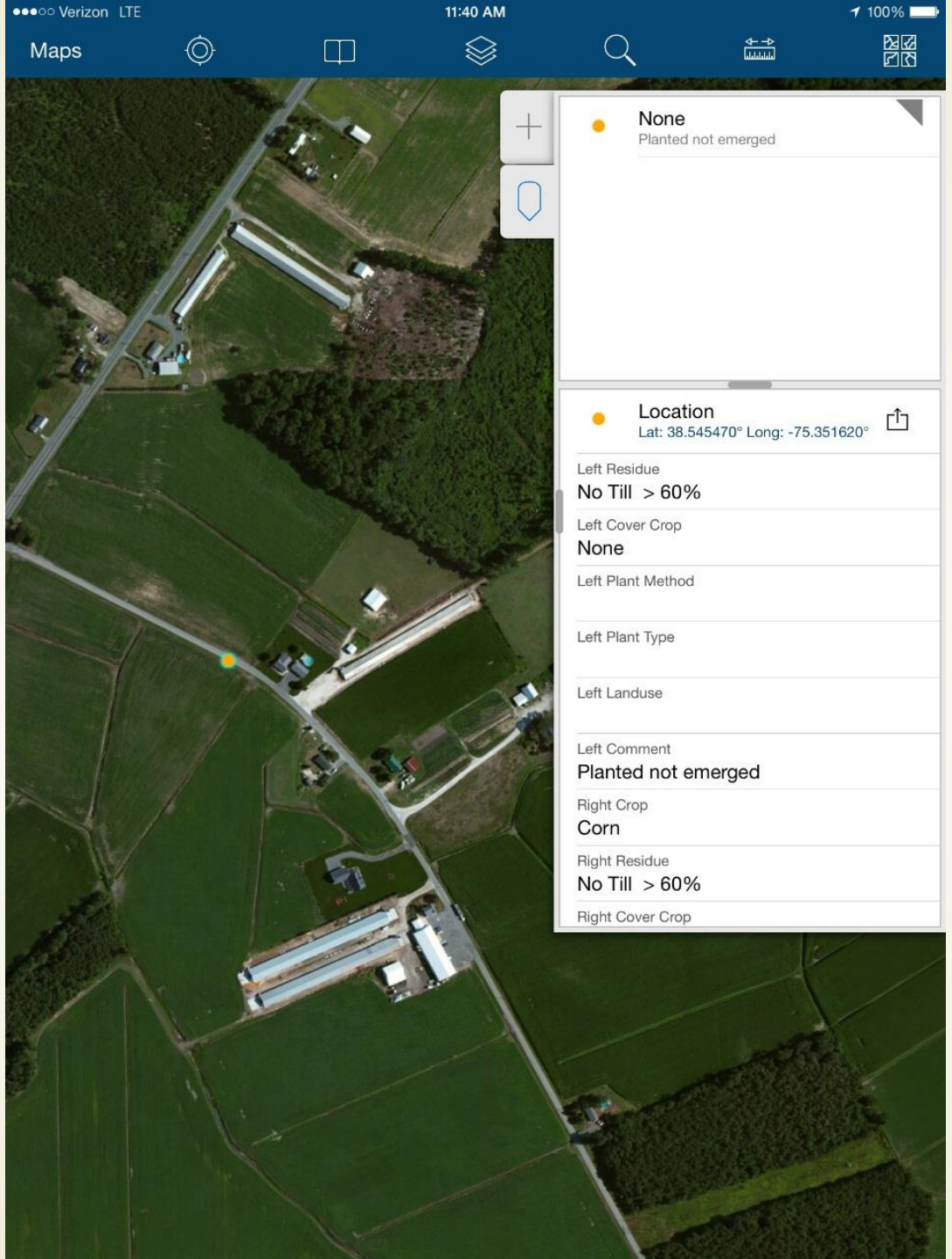
App Development (May)

- Developed an app with IT department utilizing ESRI ArcCollector (GIS)
  - Supported by Android or iOS
  - Collected and updated data in the field
  - Streamlined recording for faster and more reliable entry
- Downloadable through Apple's App Store
- Purchased iPads for data collection


Verizon LTE
11:38 AM
100%
Maps
Tillage Stops: Soybeans (Full Season)
Soybeans (Full Season)
Location
Lat: 38.564380° Long: -75.318525°
Left Crop
Soybeans (Full Season)
Left Residue
No Till > 60%
Left Cover Crop
Other - See Notes.
Left Plant Method
Other
Left Plant Type
Traditional
Left Landuse
Left Comment
Cover crop wheat
Right Crop
Soybeans (Full Season)
Right Residue
SR-24
24
Millsboro-Hwy
Lewis-Dr
Boblin-Ct
Parker-Dr
Radish-Rd
Cottage-Ln
Oak-Ct
Kent-Dr
Hickory-Hill-Rd
Tramway-Rd
Hudson-Rd
n-Town-Rd


Cancel
Update
Location
Lat: 38.594993° Long: -75.478195°
Tillage Stops: Corn
Left Crop
Corn
Cancel
Done
Left Crop
Barley
Canola
Corn
Edible Beans and Peas
Fallow
Oats
Potatoes
Rye
Sunflowers
Vegetables and Other Crops
Winter Wheat
Sorghum


Verizon LTE
12:11 PM
99%
Cancel
Update
Location
Lat: 38.594993° Long: -75.478195°
Tillage Stops: Corn
Left Crop
Corn
Cancel
Done
Left Residue
No Till > 60%
Tillage >60%
No Till 30 - 60%
Ridge Till 30 - 60%
Mulch Till 30 - 60%
Reduced Till 15 - 30%
Conv Till < 15%
Unknown
Rum Bridge Branch
Old-Furnace-Rd
Pond Rd
Concord-Rd
Beaver Dam Branch Rd
Johnson Rd
Ross Point Rd
Scott Land Rd
Phillips Hill Rd
Conaway Rd
Sunset Branch

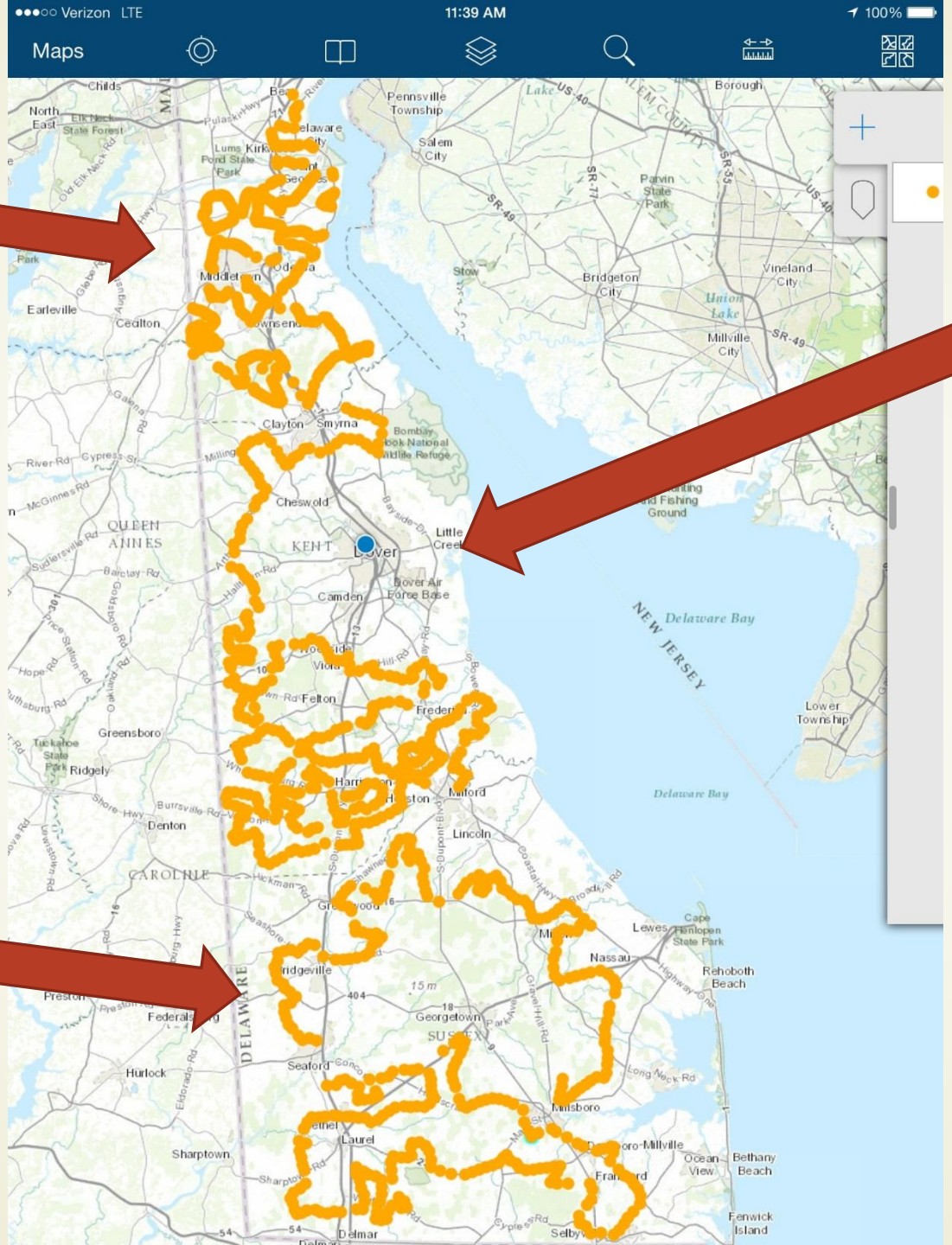

Verizon LTE
11:40 AM
100%
Maps
None
Planted not emerged
Location
Lat: 38.545470° Long: -75.351620°
Left Residue
No Till > 60%
Left Cover Crop
None
Left Plant Method
Left Plant Type
Left Landuse
Left Comment
Planted not emerged
Right Crop
Corn
Right Residue
No Till > 60%
Right Cover Crop


Survey Time!
(June)

New Castle County
- 133 miles
- 470 observations

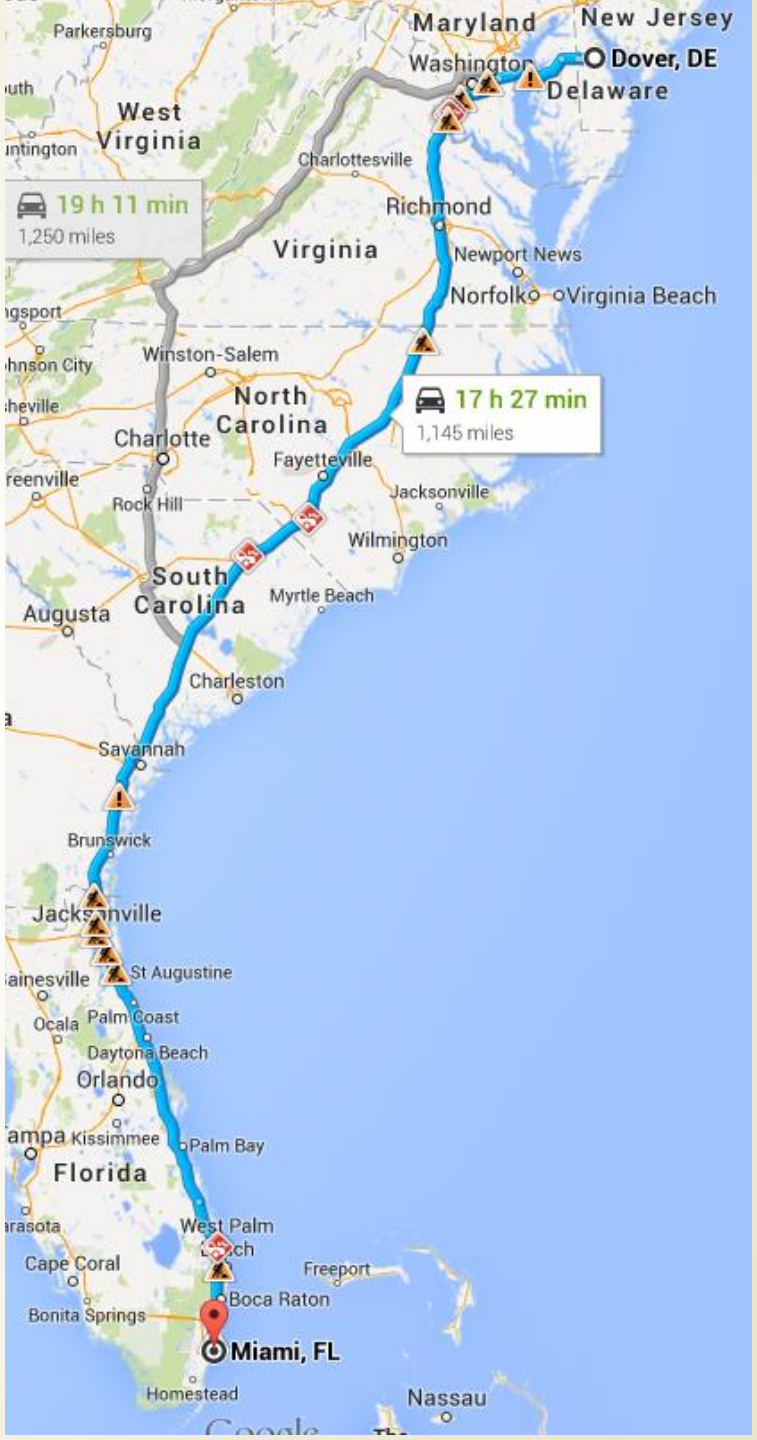
Kent County
- 206 miles
- 504 observations

Sussex County
- 202 miles
- 497 observations

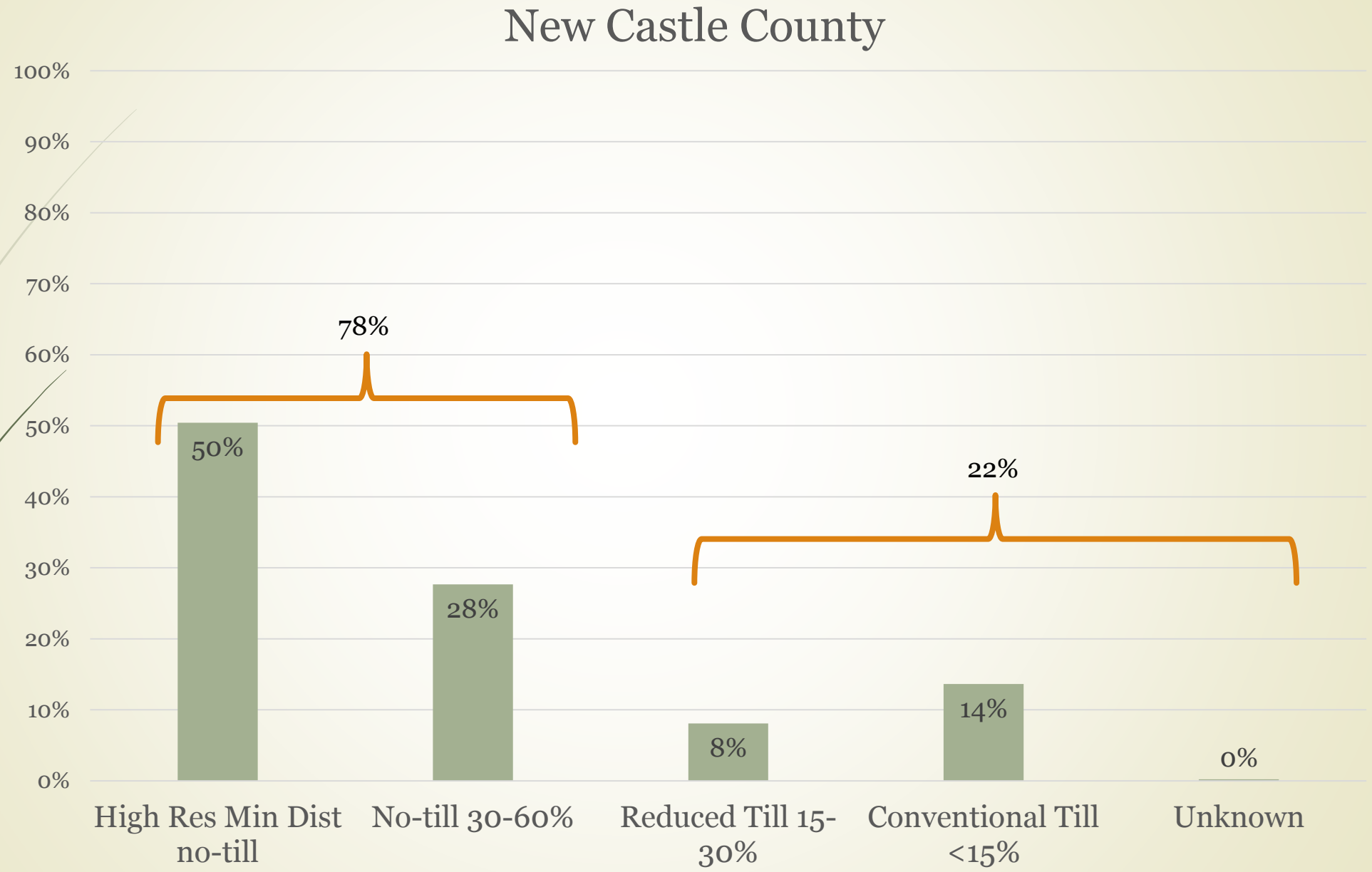


Survey Stats

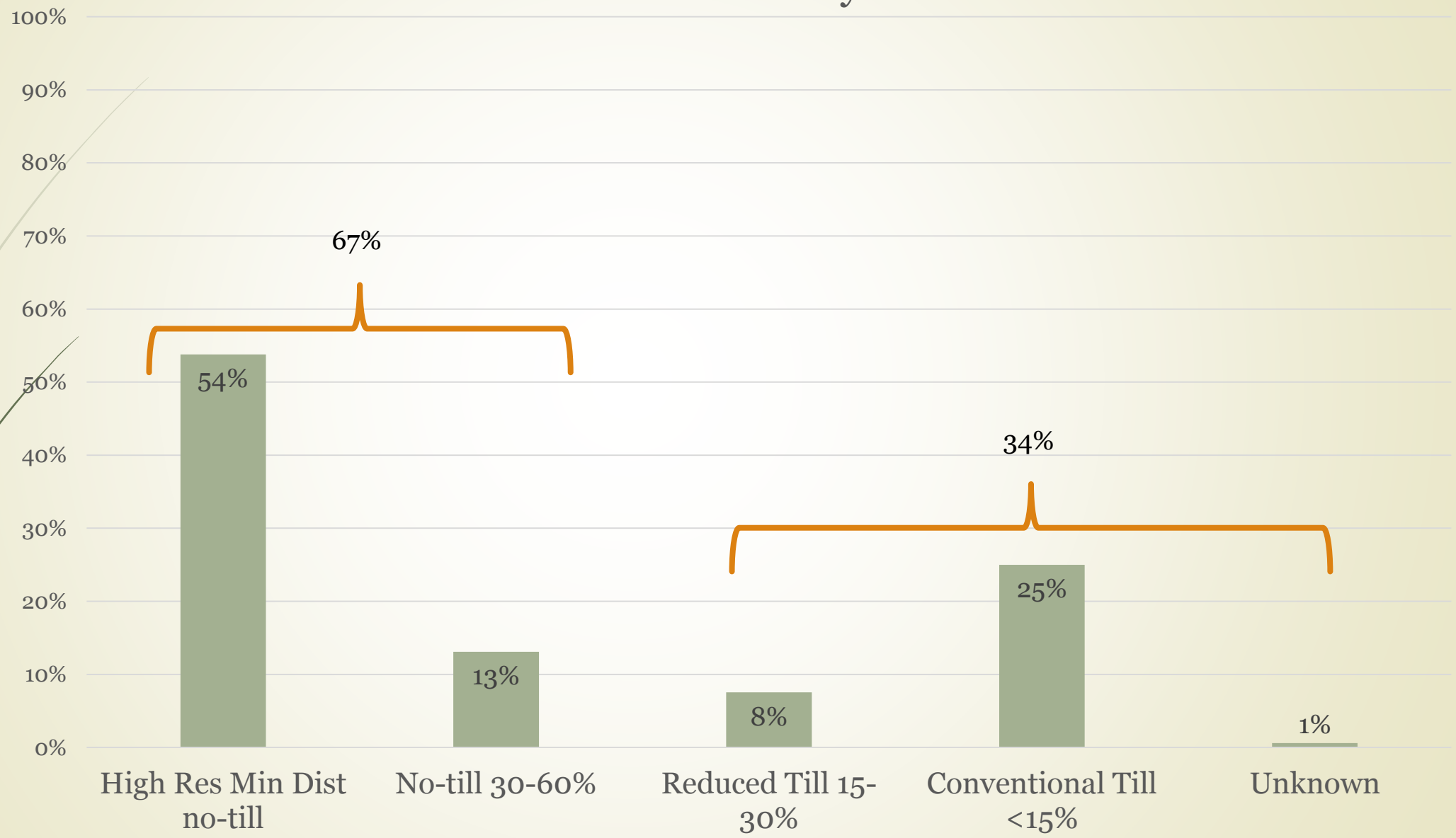
- Spent approximately 72 hours in the van over 6 days for the whole team (Observers & QA/QC)
- Drove 1,082 miles of strictly transect
  - Almost equivalent of driving from Dover, DE to Miami, FL
- Total of 1,974 vehicle stops



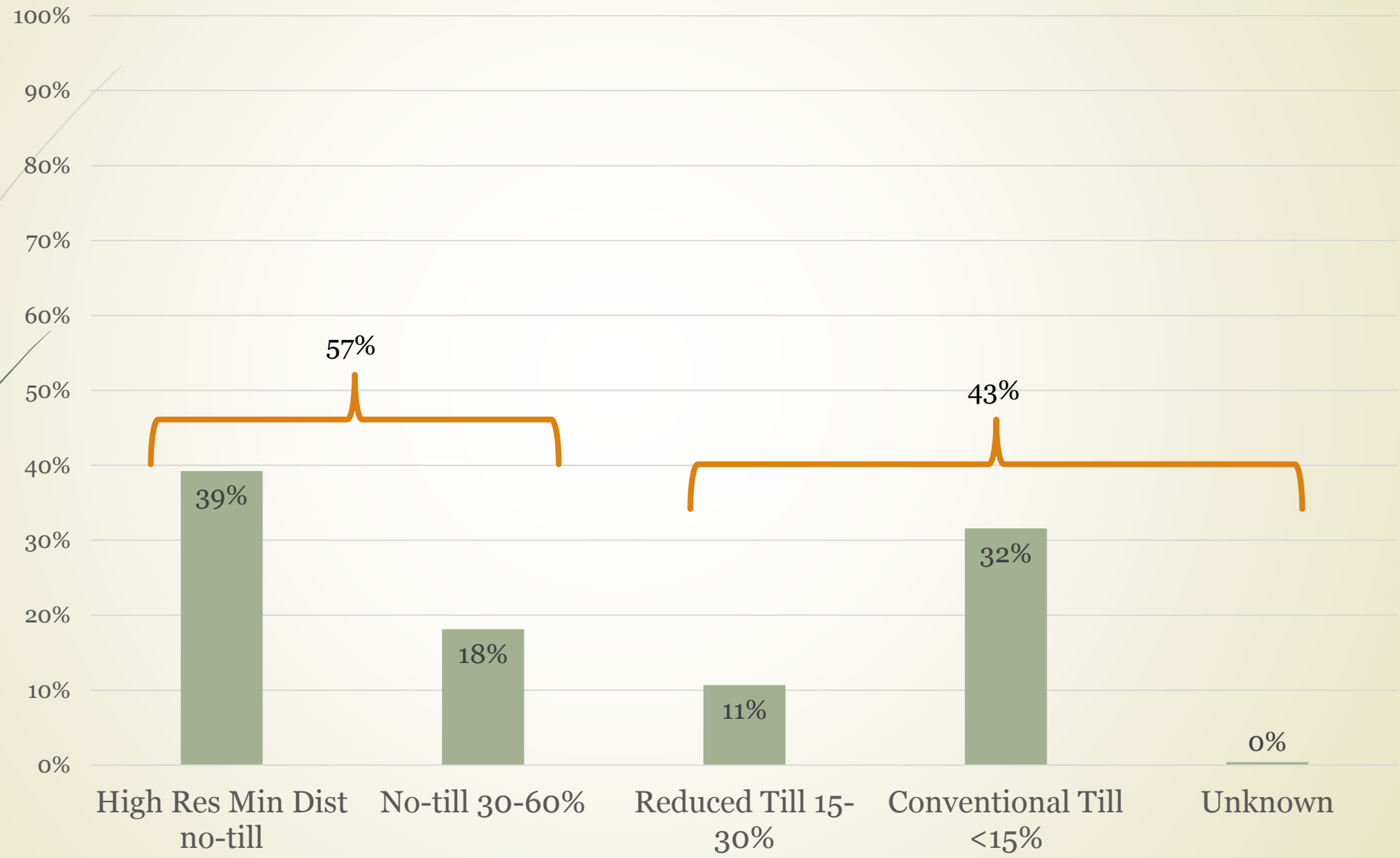
Results


New Castle County
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
78%
22%
50%
28%
8%
14%
0%
High Res Min Dist no-till
No-till 30-60%
Reduced Till 15-30%
Conventional Till <15%
Unknown

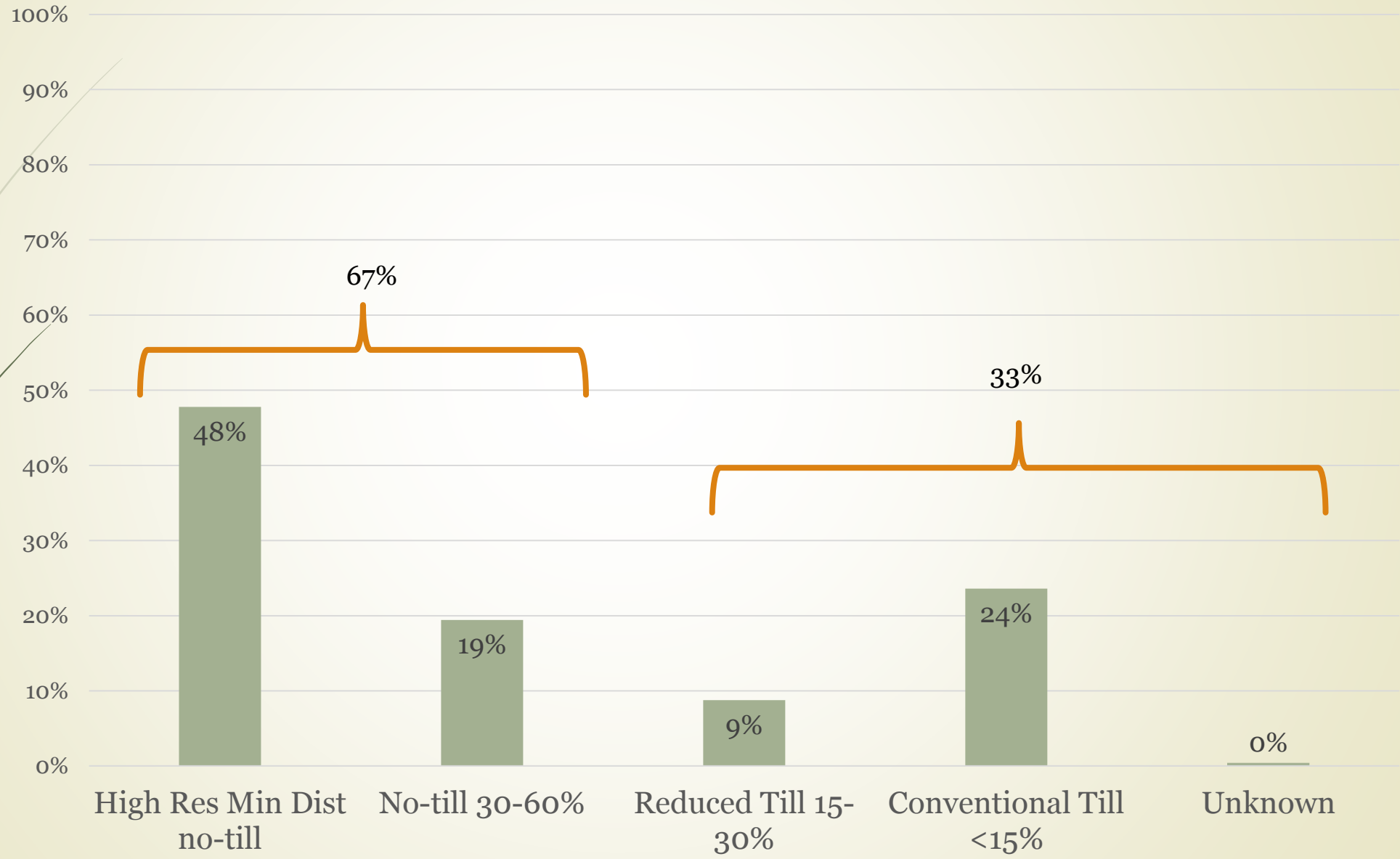
Kent County


100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
67%
54%
13%
34%
8%
25%
1%
High Res Min Dist no-till
No-till 30-60%
Reduced Till 15-30%
Conventional Till <15%
Unknown

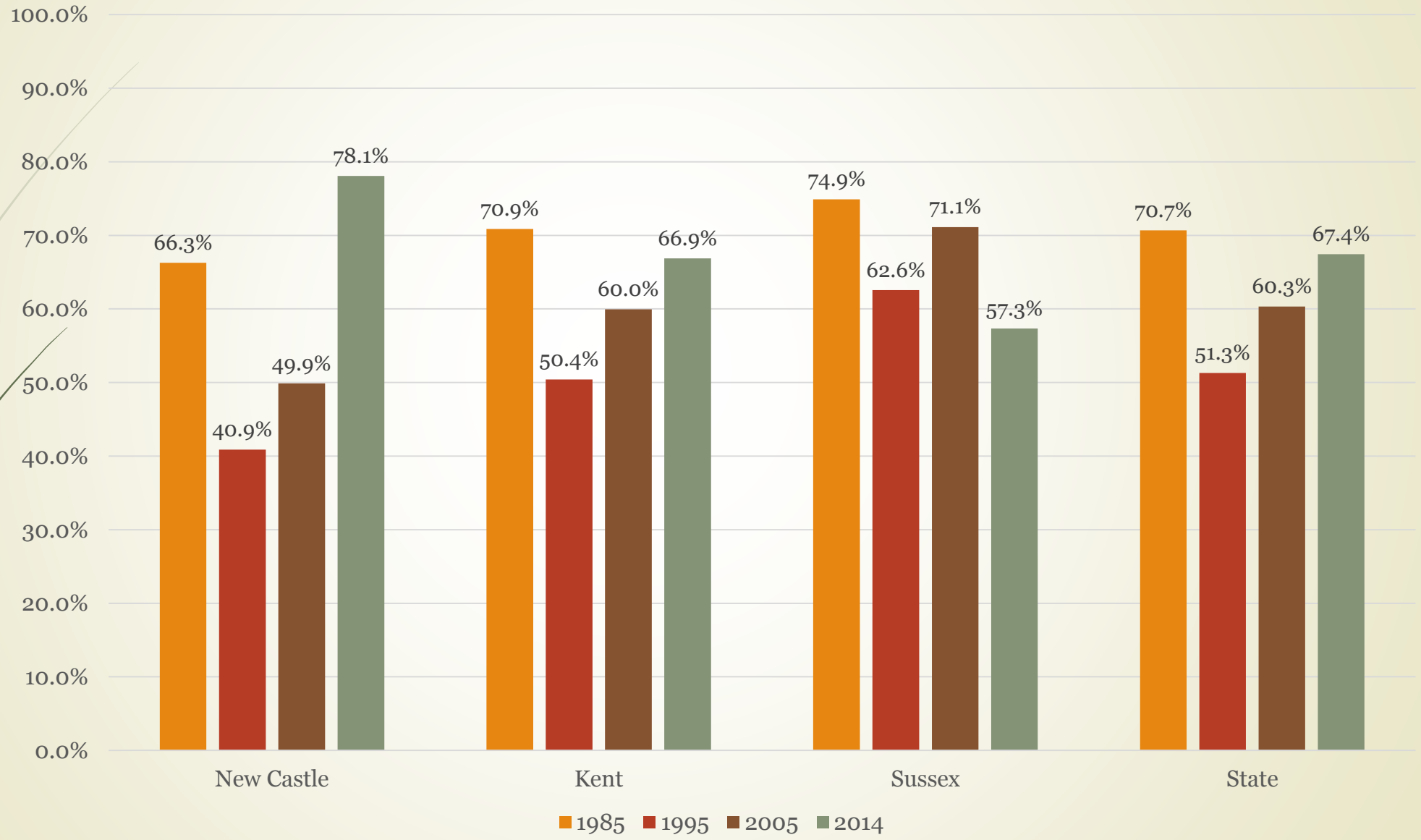
Sussex County



State-Wide Implementation



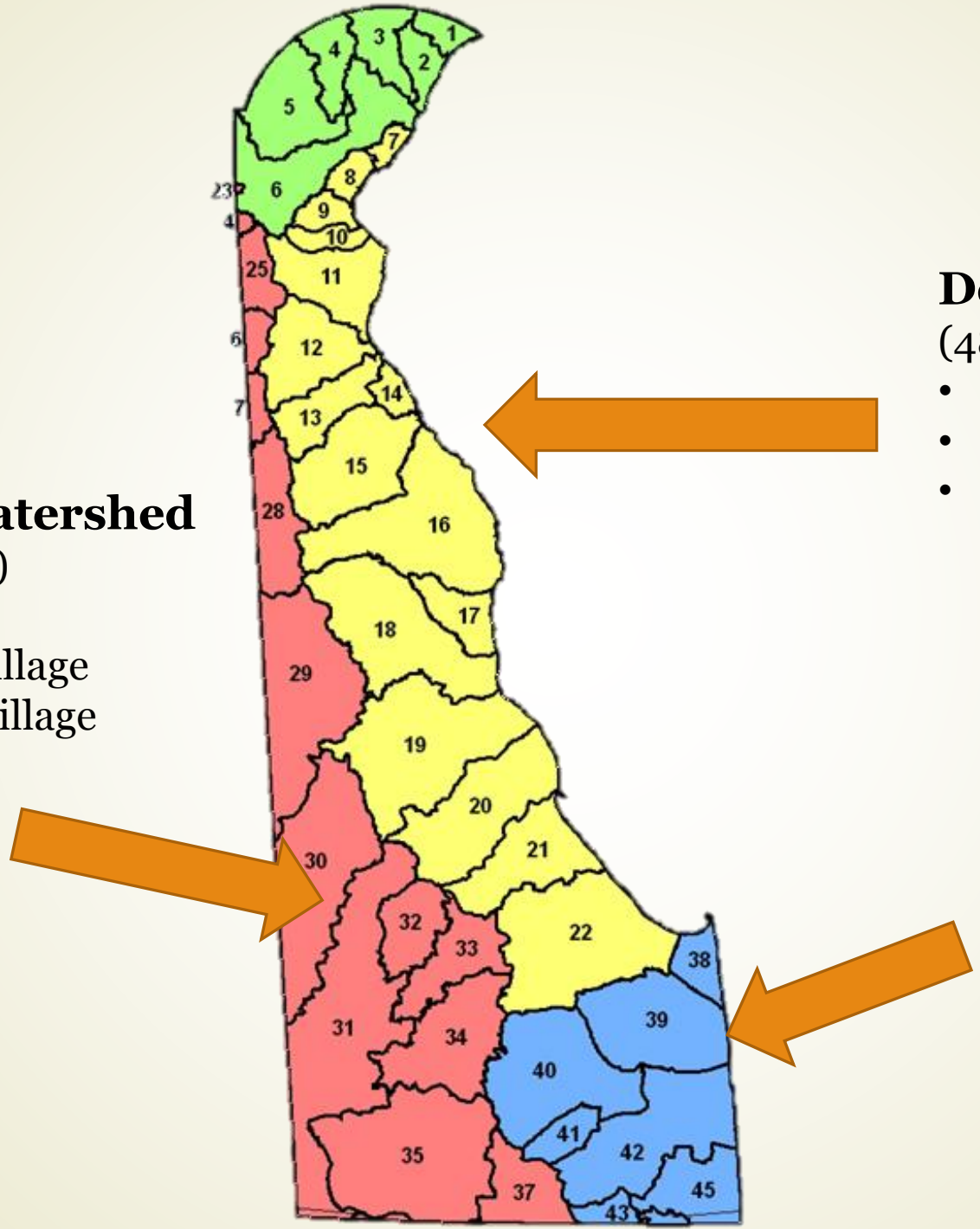
Historic Conservation Tillage



Applied Acreages

	High-Residue, Min Soil Disturbance	Conservation-Tillage	Conventional Tillage
New Castle County	28,352.0	15,877.12	12,474.88
Kent County	79,597.08	19,162.26	50,116.68
Sussex County	91,915.59	42,422.58	101,342.83
Total	**199,864.67**	**77,461.96**	**163,934.39**

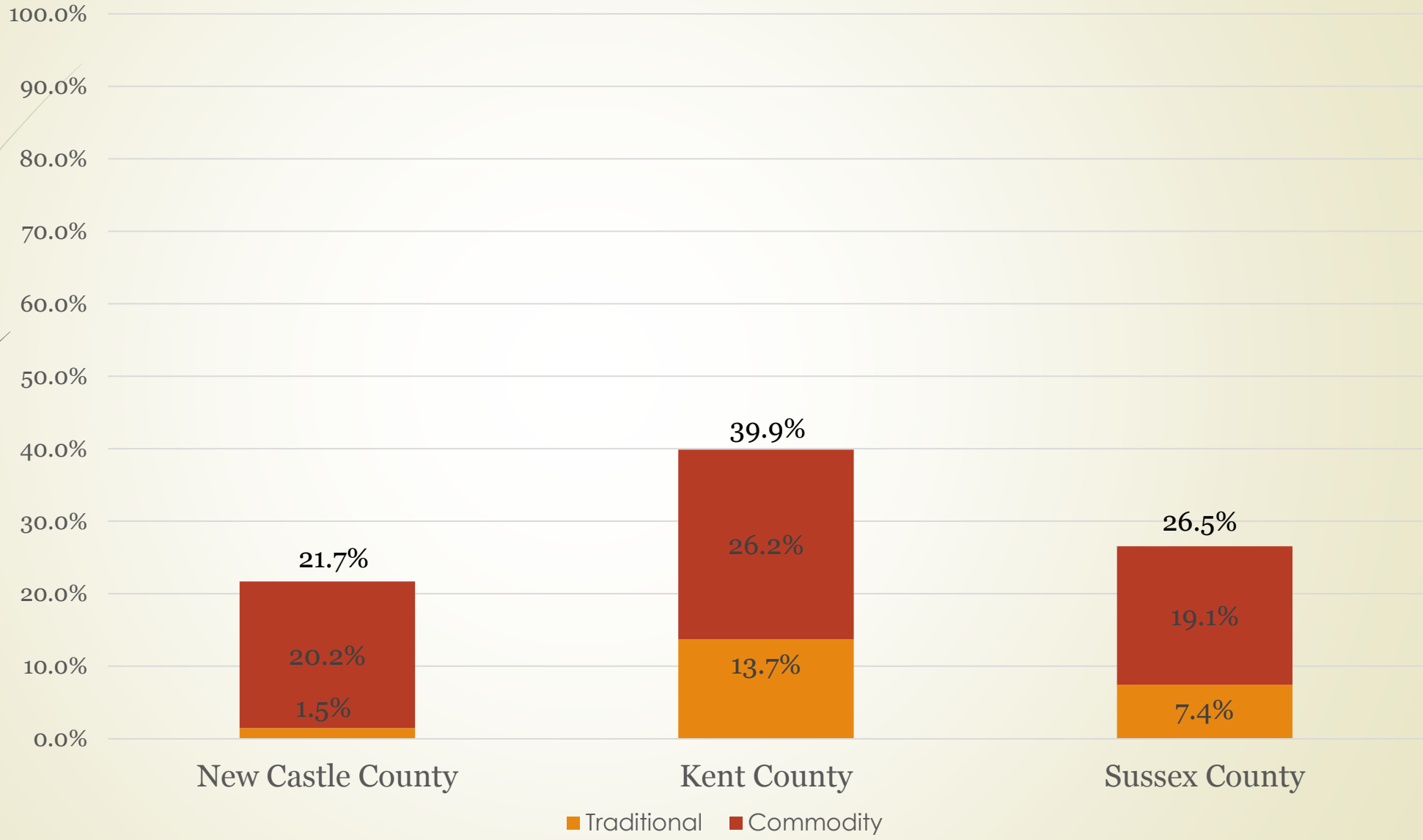
Chesapeake Bay Watershed
(43.24% of Observations)
- 47.5% HRMSD
- 17.3% Conservation Tillage
- 35.2% Conventional Tillage



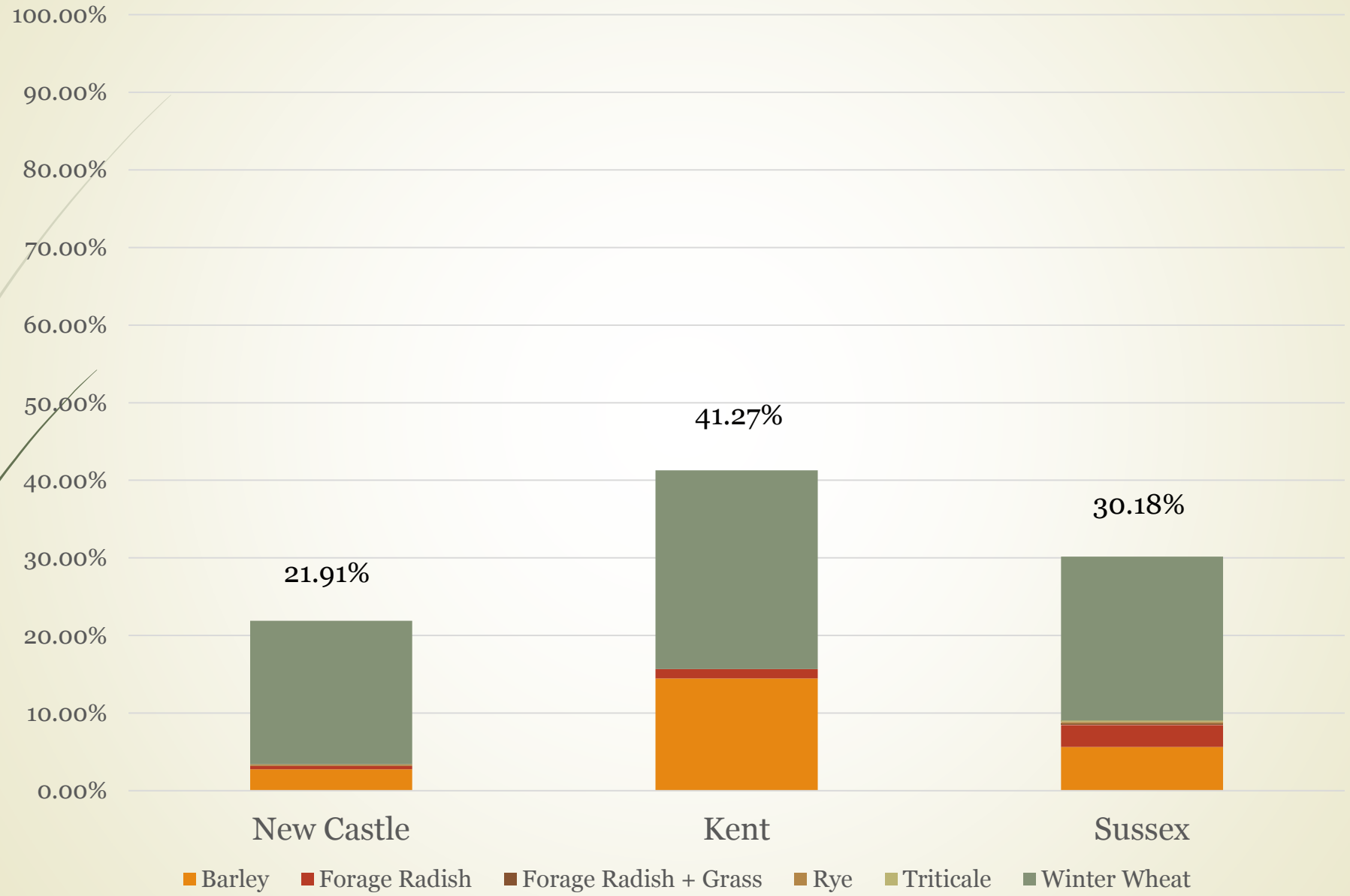
Delaware Bay
(48.13% of Observations)
- 49.3% HRMSD
- 21.3% Conservation Tillage
- 29.3% Conventional Tillage

Inland Bays
(8.63% of Observations)
- 41.7% HRMSD
- 18.9% Conservation Tillage
- 39.4% Conventional Tillage

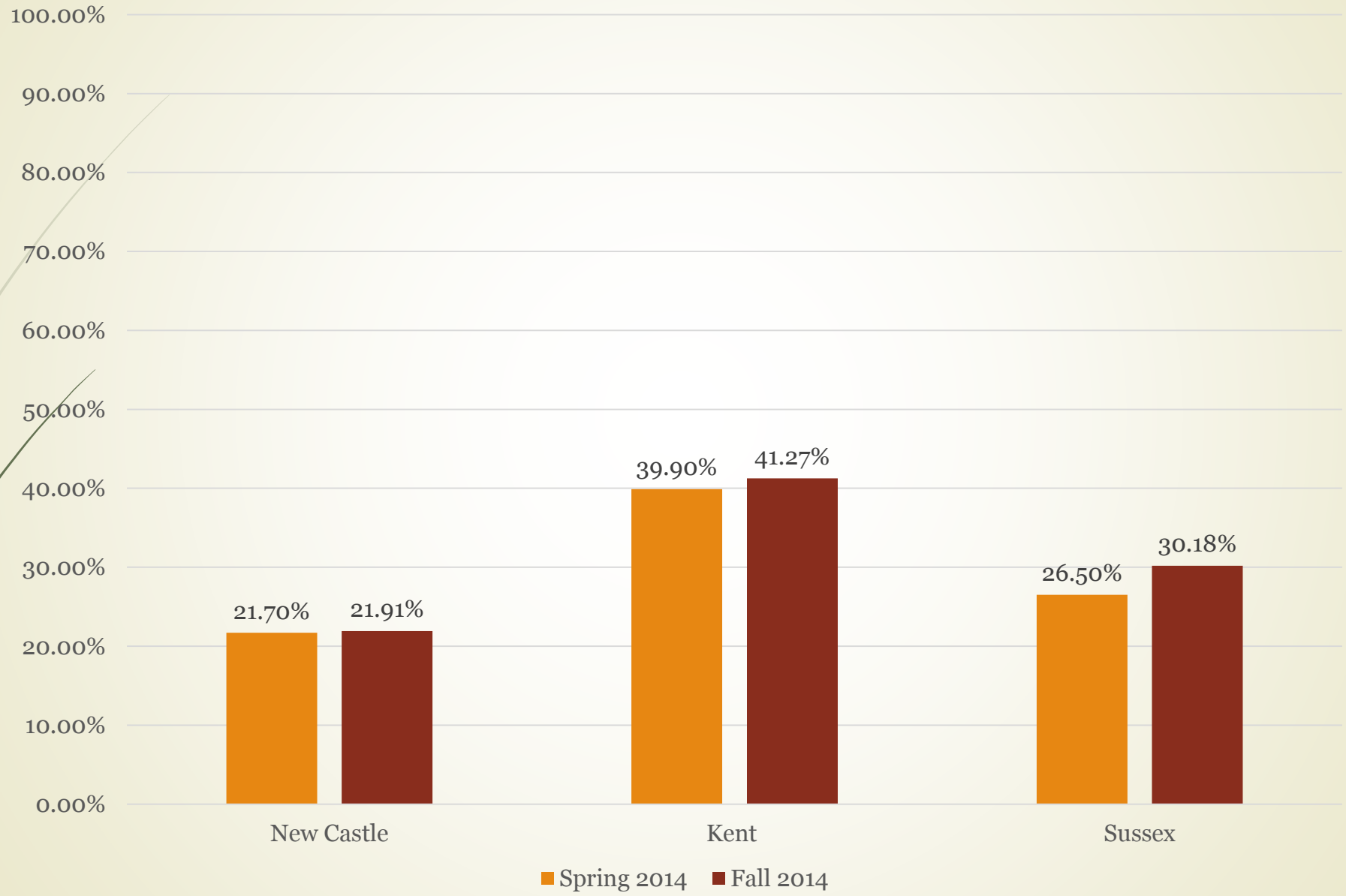
2014 Spring Cover Crop Survey



2014 Cover Crop Survey



Cover Crop Survey Comparison



2014 Applied Acreages of Cover Crops

	New Castle	Kent	Sussex
Cover Crop Observations (%)	21.91%	41.27%	30.18%
Harvest Cropland (acres)	53,507 Acres	141,758 Acres	226,056 Acres
Estimated Cover Crop Coverage (acres)	11,726.00 Acres	58,503.30 Acres	68,226.16 Acres

Future Efforts, Modifications, and Reporting

- Met with Ag Partners in November
  - Discussed Winter Cover Crop Survey
    - Conducted December 1st
  - Agreed to conduct residue survey in 2015
  - Modifications to app
- Submitted 2014 Residue Data to Chesapeake Bay Program
  - County-wide implementation percentages submitted for progress runs
- Data will be provided to CTIC
  - Currently unable to accept data

Conclusions

- What does this all mean?
  - Many farmers are doing the right thing – not for the Bay or water quality but for their own benefit
    - Economics
    - Soil Health
  - We need to conduct annual surveys to capture on the ground changes
  - Data can be used to target programs for audiences (ie. vegetable growers or plain sect farmers) or areas (watershed, highly erodible land)

For More Information, Please Contact:

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Head Observers - Ben Coverdale (DDA) & Shawn Tingle (UD)

QA/QC Expert – Dr. Richard Taylor (UD)