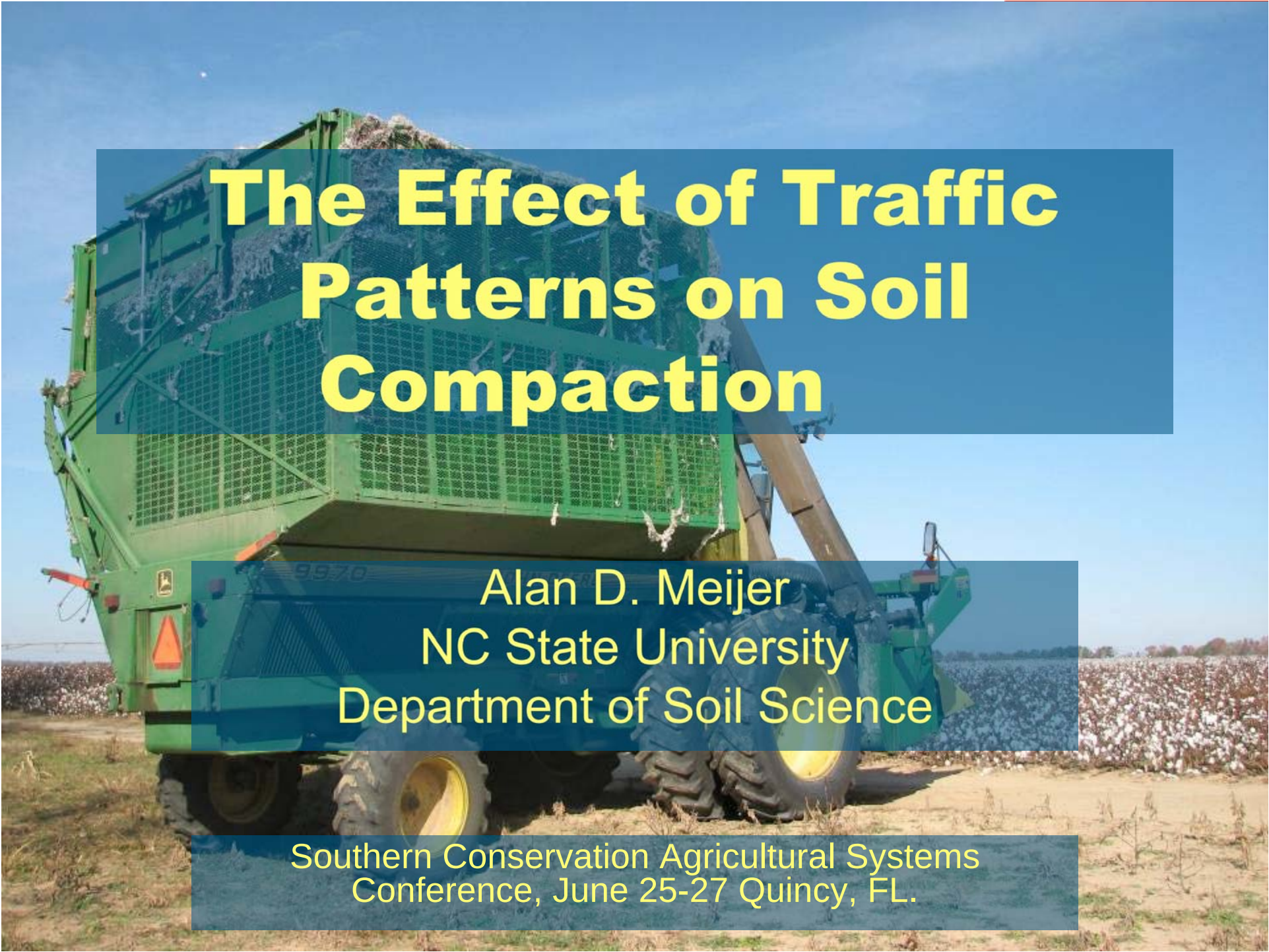


A green John Deere 9970 combine harvester is shown from a rear three-quarter view, positioned in a field of mature cotton plants. The harvester's grain tank is full of cottonseed. The background shows a clear blue sky and a line of trees in the distance. The harvester has large, treaded tires and a yellow wheel hub.

The Effect of Traffic Patterns on Soil Compaction

Alan D. Meijer
NC State University
Department of Soil Science

Southern Conservation Agricultural Systems
Conference, June 25-27 Quincy, FL.

Introduction

- Vernon G. James Research & Extension Center



Introduction

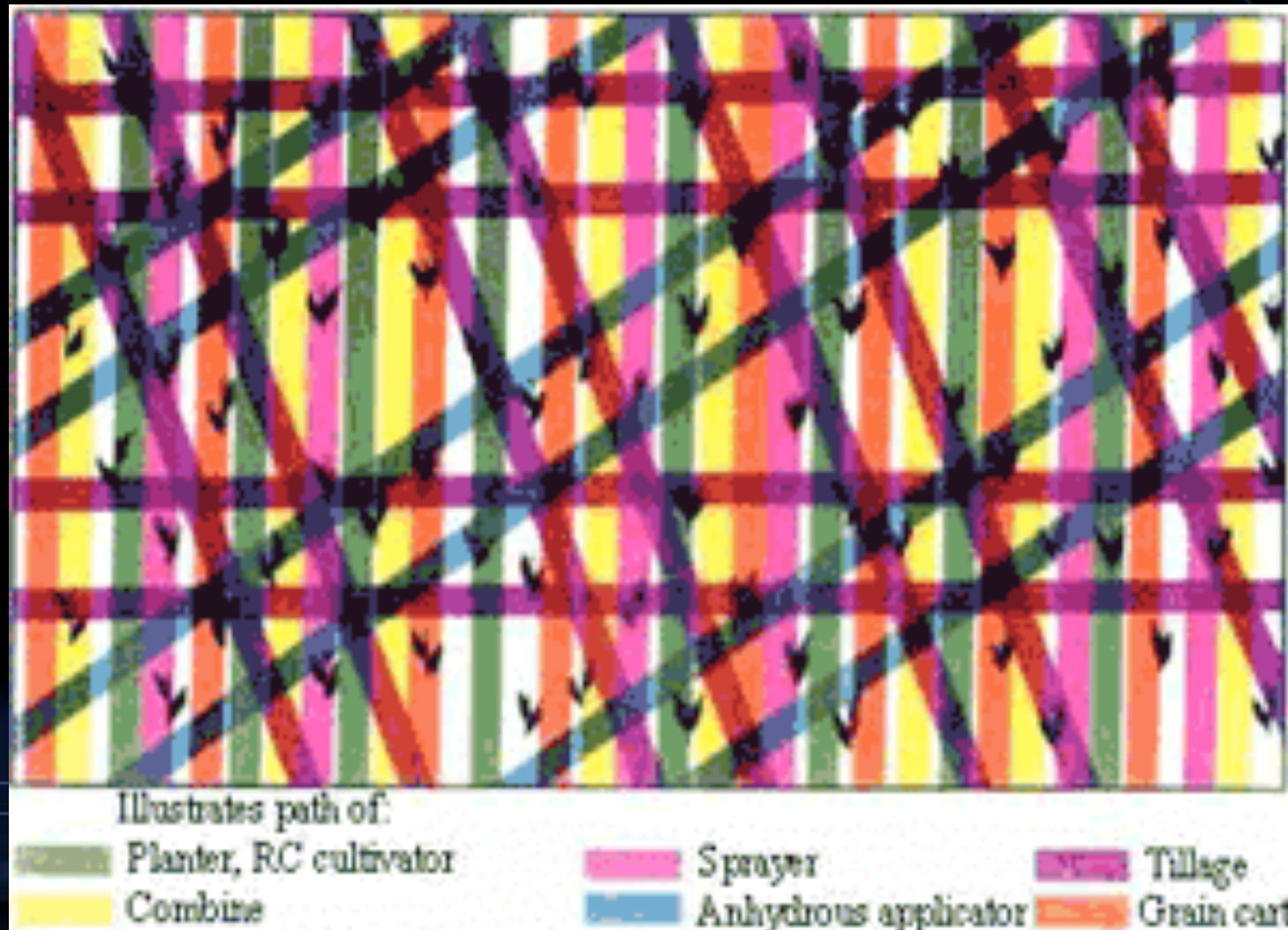
- Soil Compaction
- Major problem
 - Physical barrier to roots
 - Reduced water and fertilizer intake.
 - Reduced Aeration
 - Soil Structure Deterioration
- Equipment traffic is major cause.



Introduction

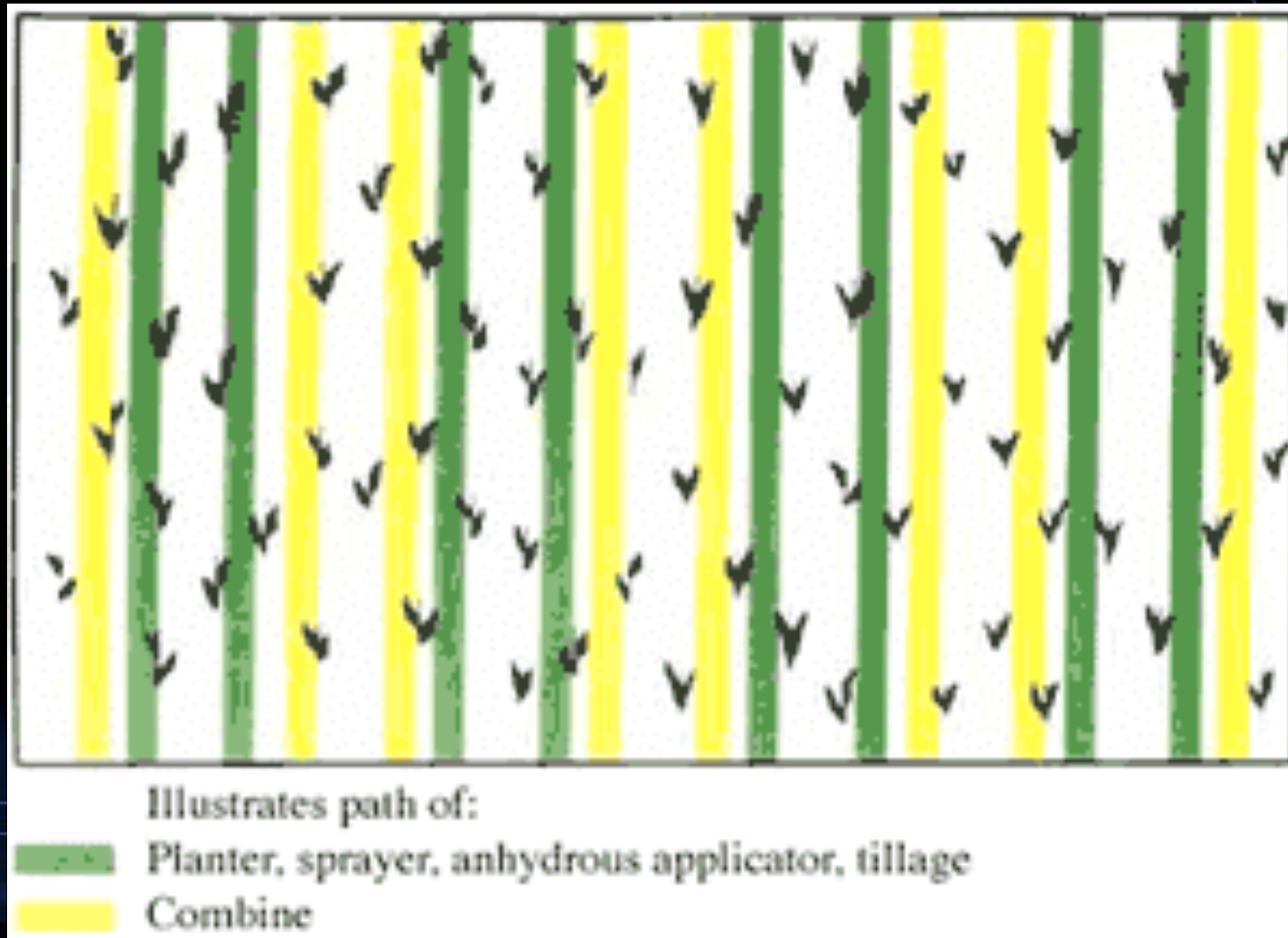
- Traffic Patterns
 - Up to 90% of land covered by tracks in one year.
 - Up to 90% of compaction occurs in first pass.

Uncontrolled Traffic



Source: Management Strategies to Minimize and Reduce Soil Compaction. 1999. University of Nebraska, G89-896-A.

Controlled Traffic



Source: Management Strategies to Minimize and Reduce Soil Compaction. 1999. University of Nebraska, G89-896-A.

Traffic and Coverage by Tillage System

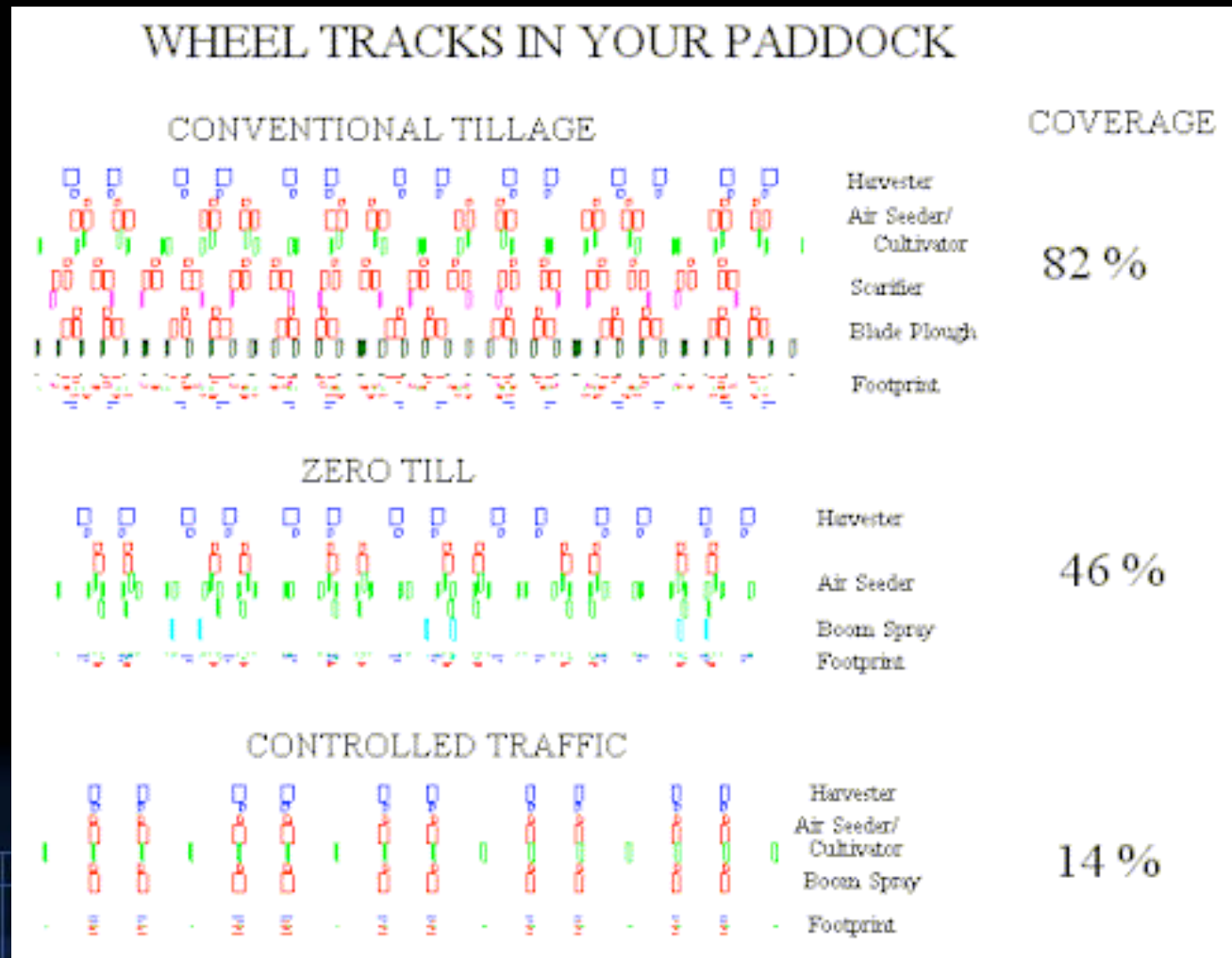
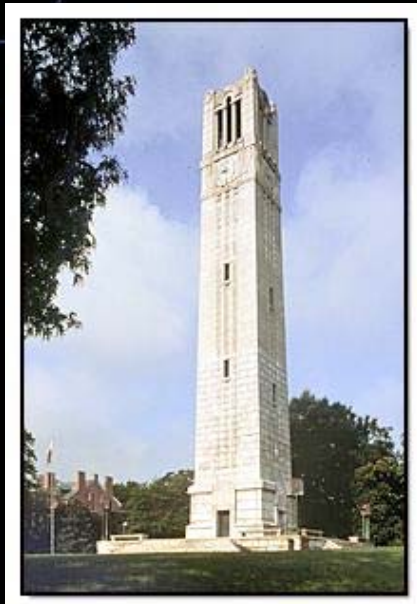


Image: http://www.gyral.com.au/controlled_traffic.htm

Objectives

1. To determine the amount of land covered by wheel traffic in a given year.
2. To determine the effect of that traffic on soil bulk density.

Materials & Methods



Materials & Methods

1. Bulk density samples taken prior to field operations.
2. Traffic mapped during growing season, from first operations in spring through harvest.
3. Bulk density sampled again in fall, targeting areas of field that received:
 1. 0 tracks
 2. 1 track
 3. 2 tracks
 4. 4+ tracks

Materials & Methods

GPS

- Used GPS to map the pass of every tractor, combine, and sprayer that travelled over the study fields.
- Farm Works SiteMate software in field.



Materials & Methods

Bulk Density

- Used AMS Core Sampler to sample for bulk density at 0-4, 4-8, 8-12, and 12-16 inch depths.
- Samples oven-dried at 105°C for 24h.
- Weighed.
- Bulk density = grams dry soil / volume of sampler. (g/cm^3)



Materials & Methods

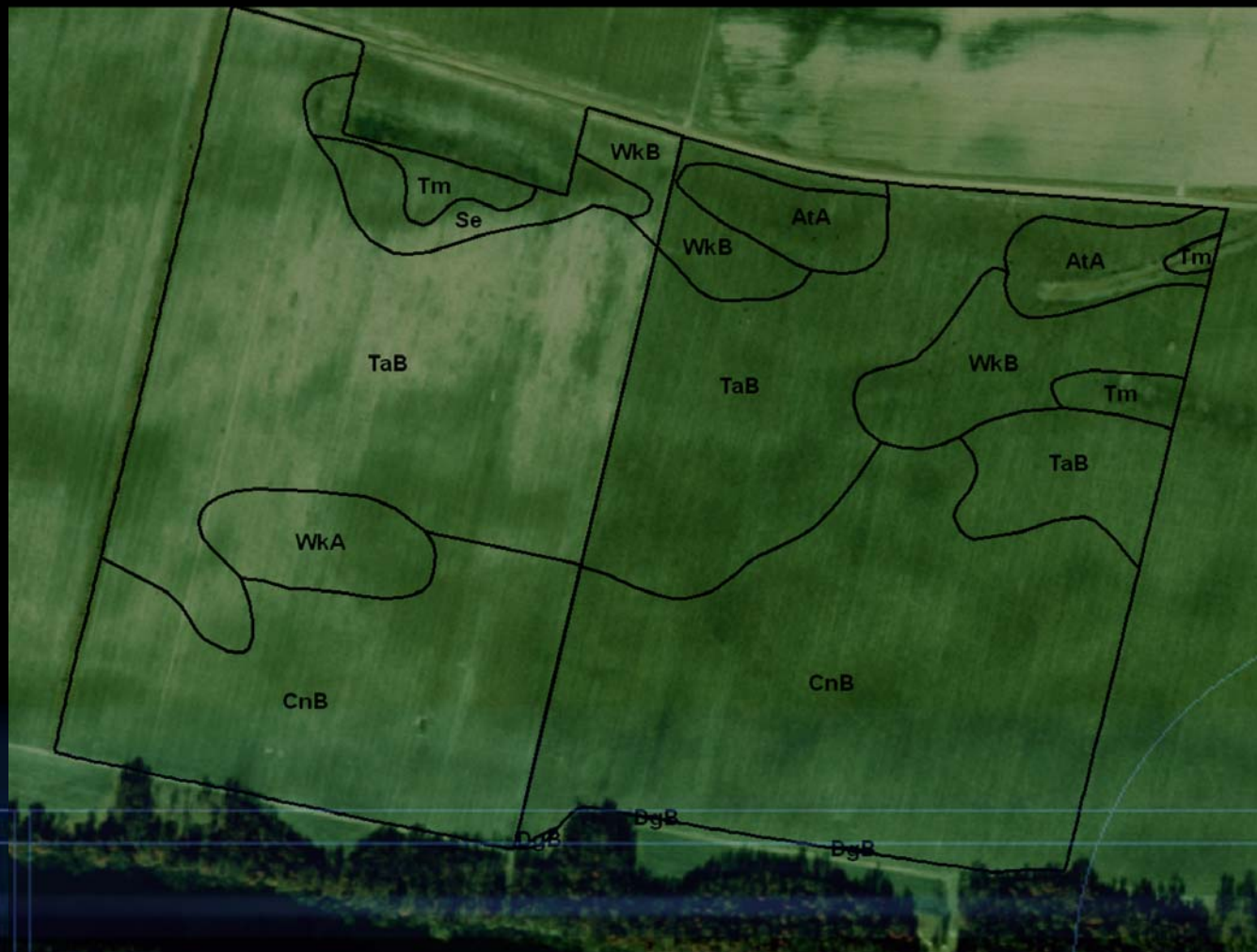
Fields, Cooperators, Cropping Systems

Field	Cooperator	County	Crop/Tillage System	Soil Type
P10	Daren Hubers	Hyde	Corn / Conventional*	Ponzer muck
L1	Joseph Leggett	Bertie	Cotton / Strip	Conetoe and Tarboro loamy sands
L2	Joseph Leggett	Bertie	Corn / Conventional	Conetoe and Tarboro loamy sands

*Conventional tillage, but for organic production

Materials & Methods

Fields L1, L2 – Bertie County

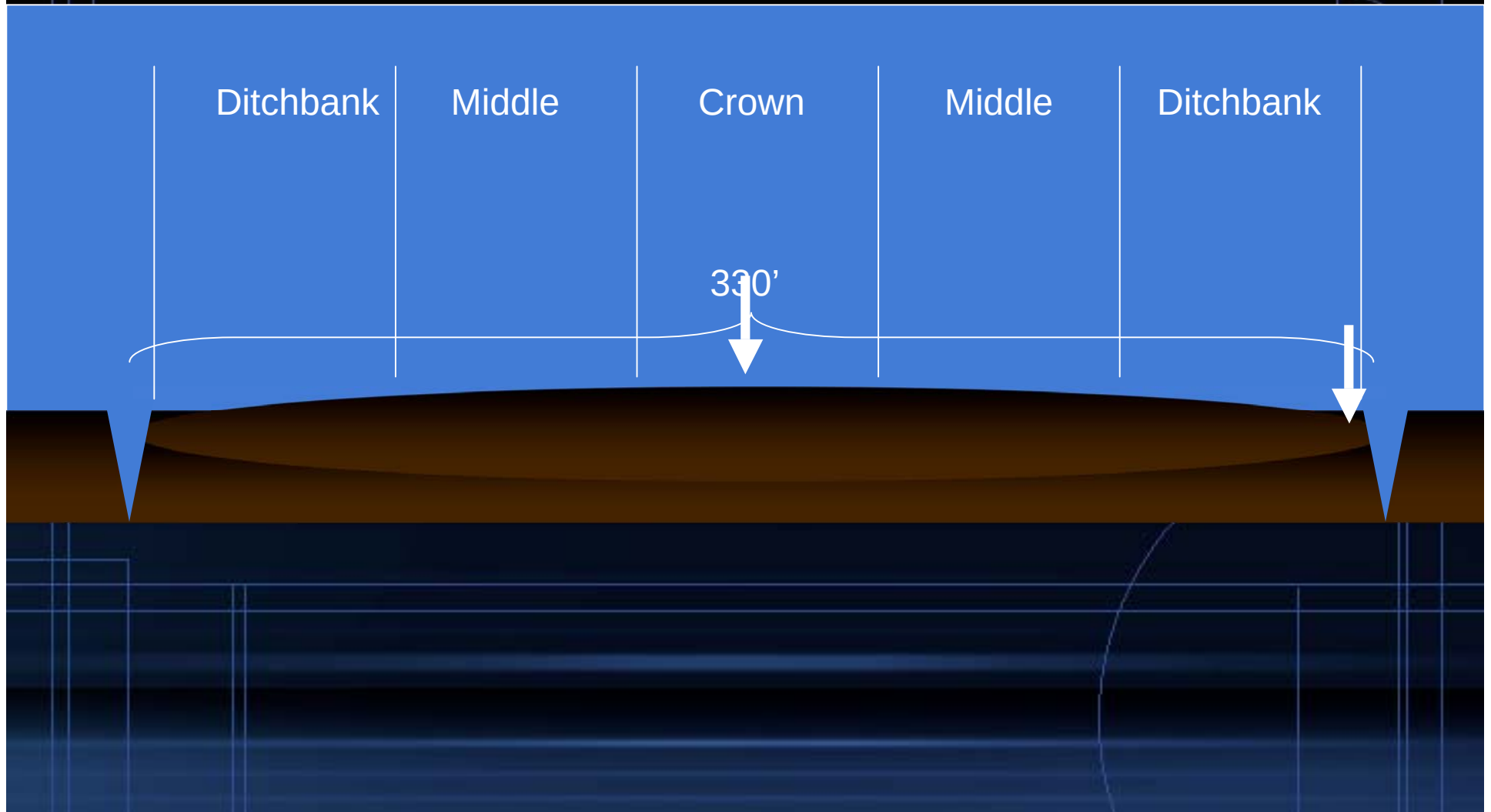


Materials & Methods

Field P10 – Hyde County



Materials & Methods



Materials & Methods

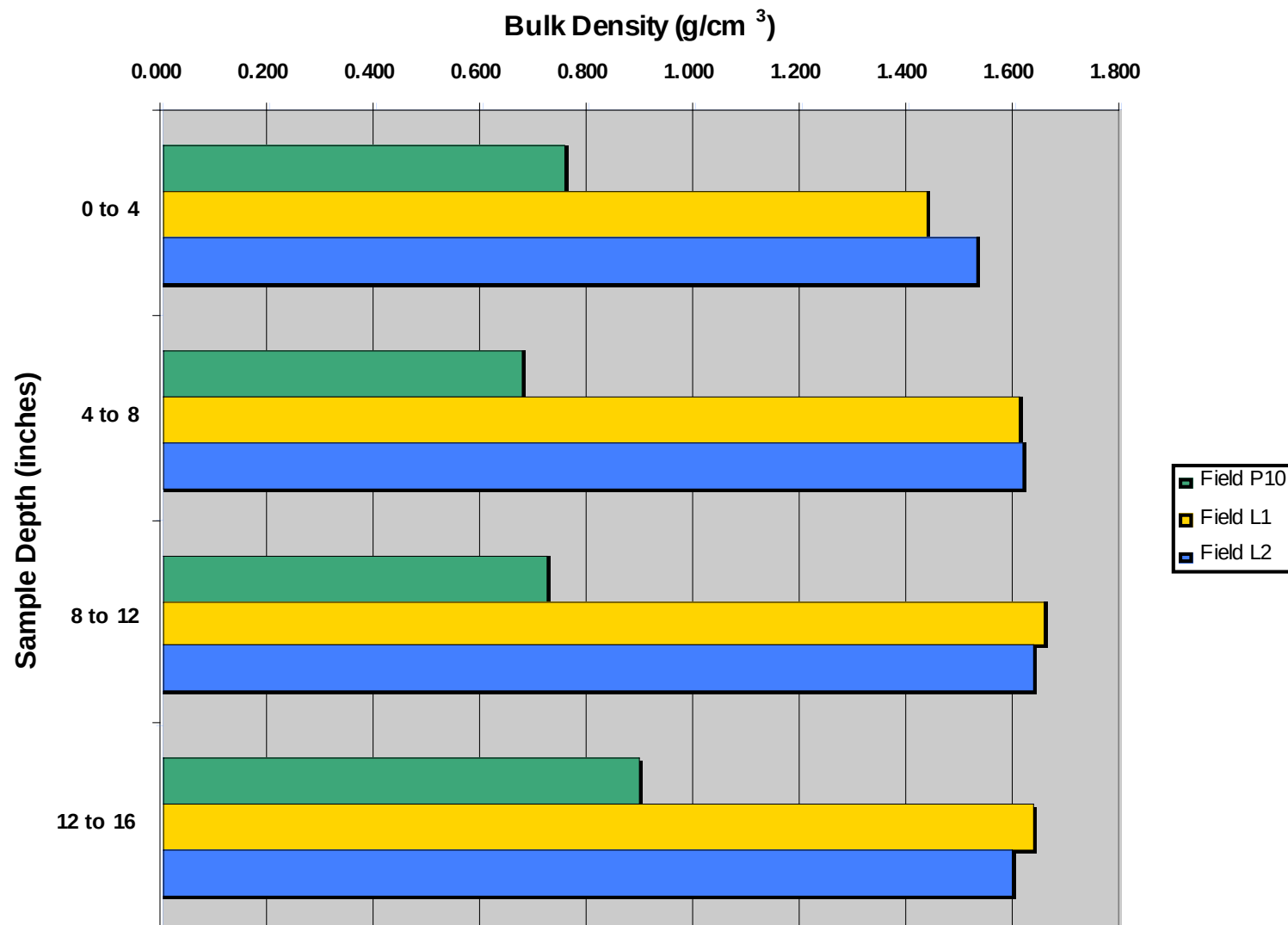
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Using GIS to Create Tracks



Results

Initial Soil Bulk Density



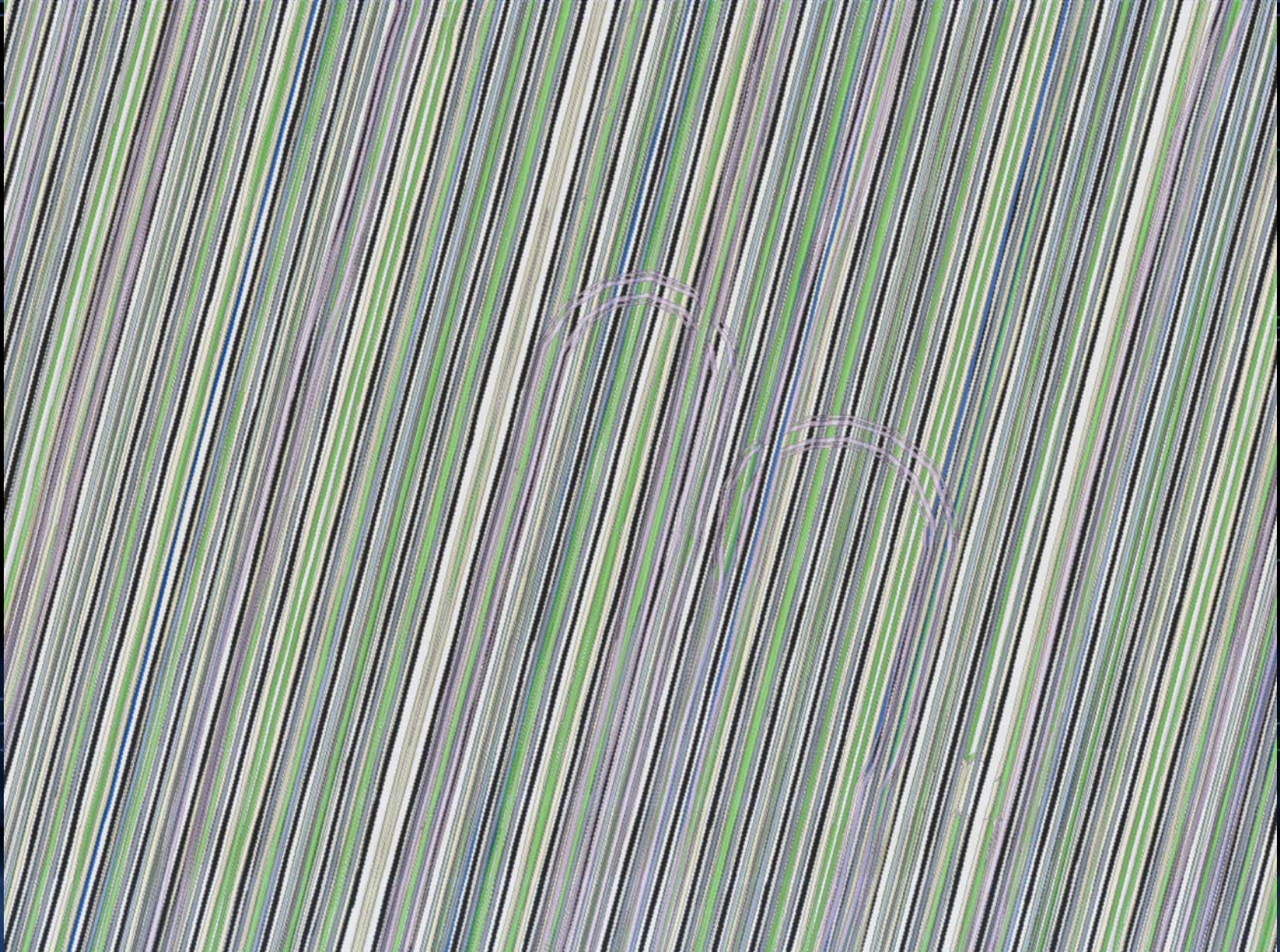
Results

P10 – Hyde County	L1 – Bertie County	L2 – Bertie County
Crop: Organic Corn	Crop: Cotton (Strip Till)	Crop: Corn (Conv. Till)
Chicken Litter Application	Strip-Till	Disk
Dynadrive	Plant	Bed
Field Cultivation	Roundup-Orthene	Plant
Plant	Herbicide (Sequence)	Nitrogen Application
Spring Tooth Harrow I	Pix Application I	Herbicide (Roundup)
Spring Tooth Harrow II	Nitrogen Application	Combine
Spring Tooth Harrow III	Pix Application II	
Danish Tyne Cultivation I	Hood Spray	
Danish Tyne Cultivation II	Defoliation	
Combine	Cotton Picker	
Auger Cart (Grain wagon)	Boll Buggy	
Total: 11 Events	Total: 11 Events	Total: 6 Events

Results

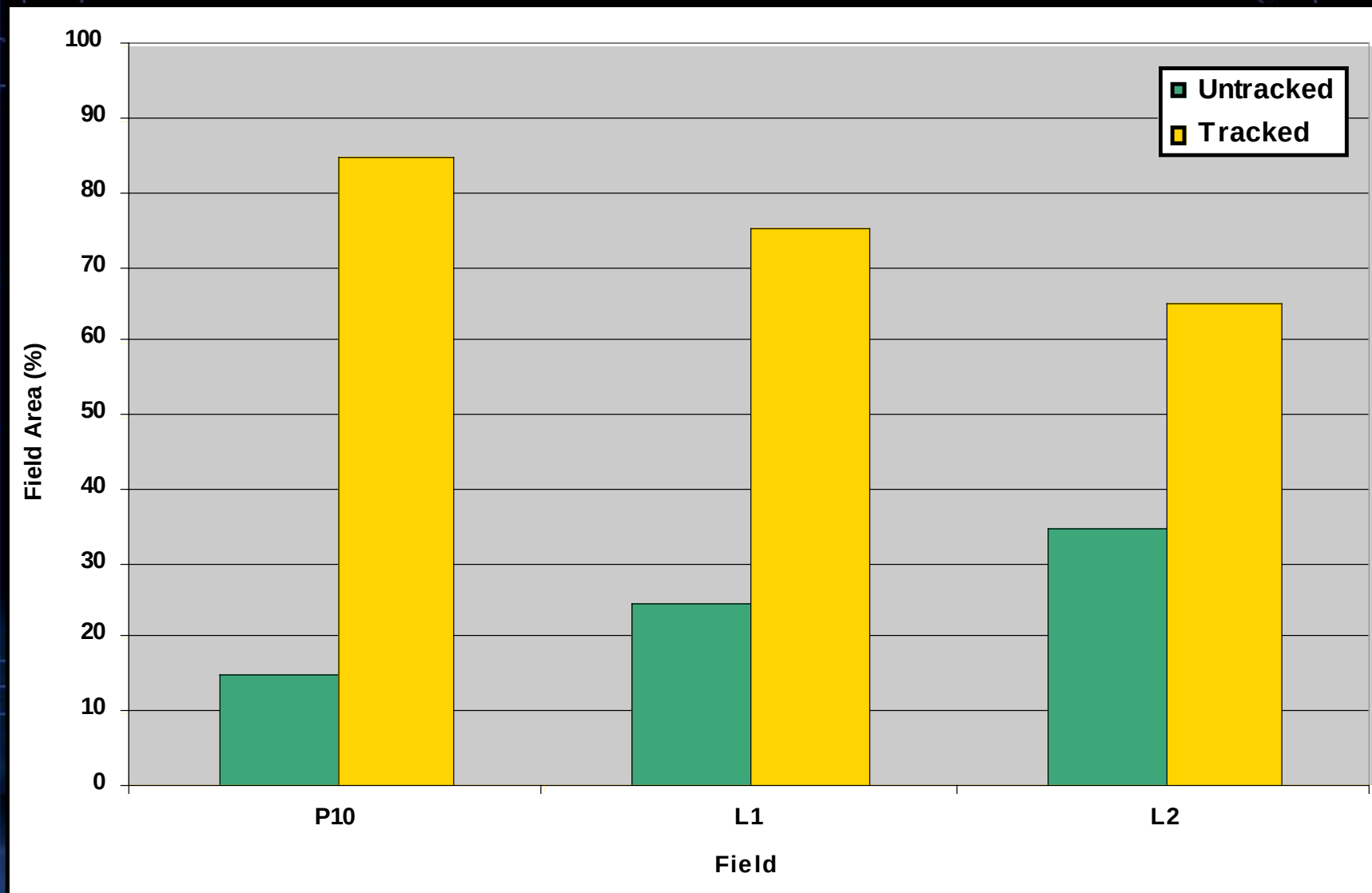
NC STATE UNIVERSITY

Accumulation of Tracks During Season



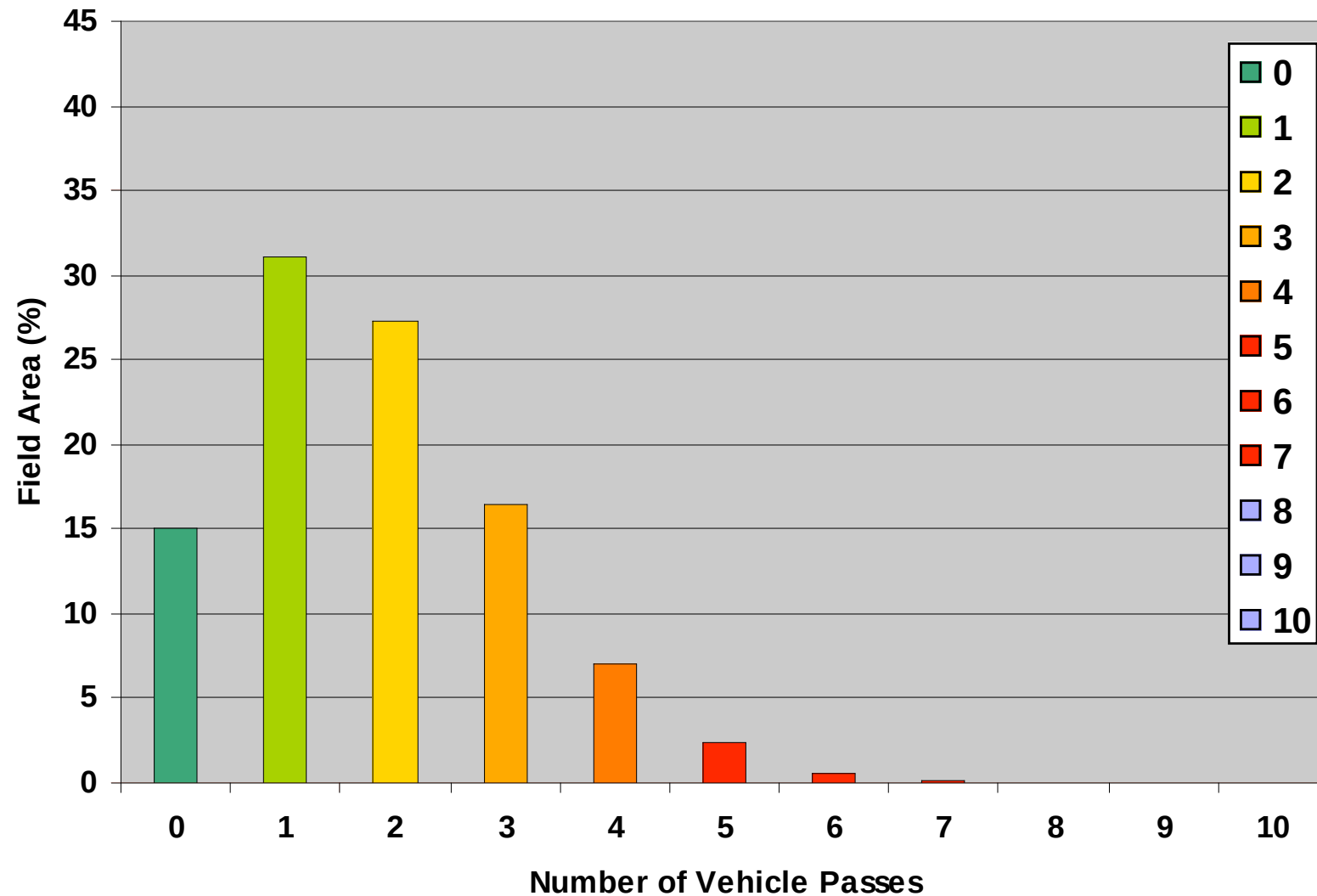
Results

Field Area Tracked vs. Untracked



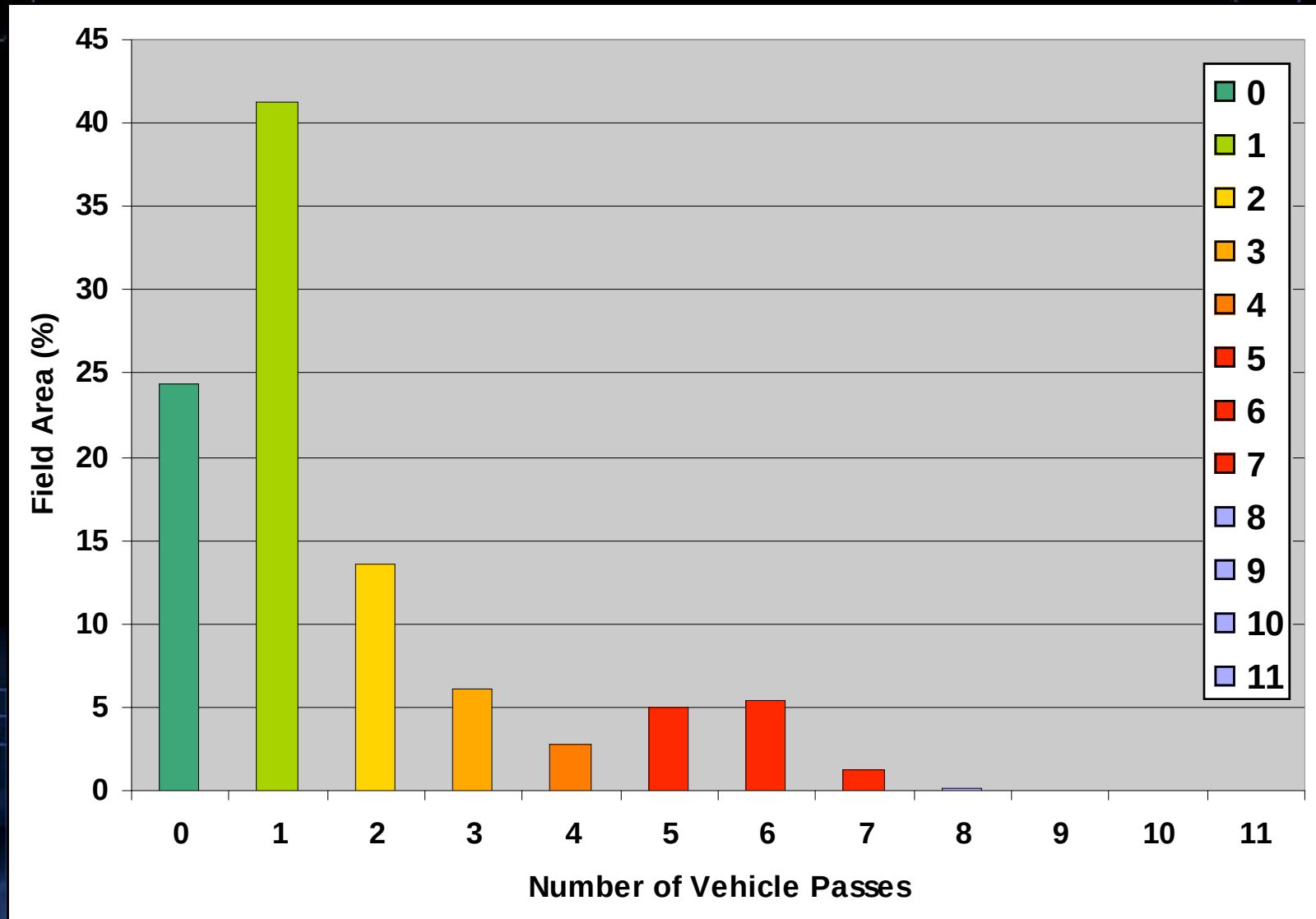
Results

Area Tracked x No. of tracks Field P10



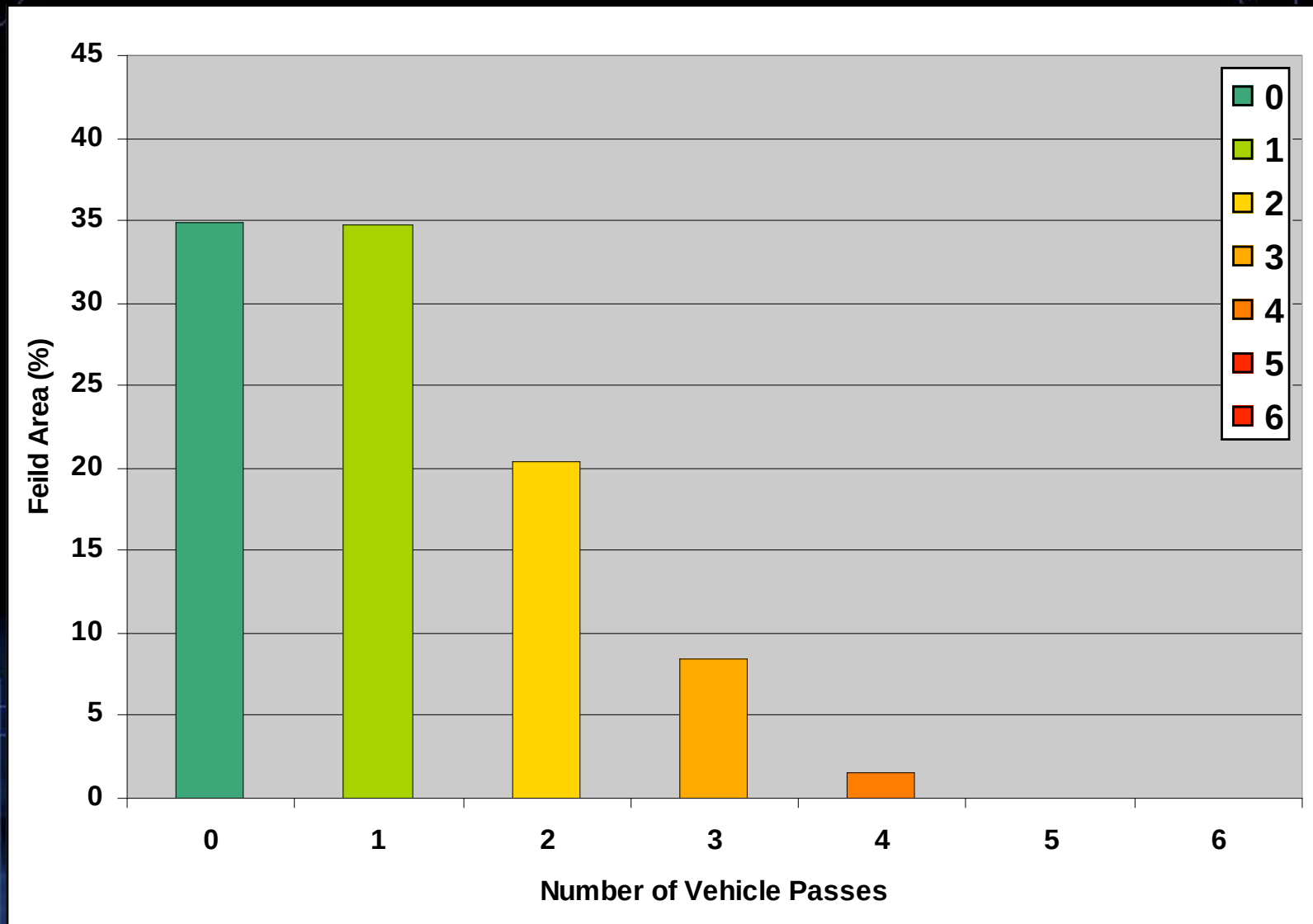
Results

Area Tracked x No. of Tracks Field L1



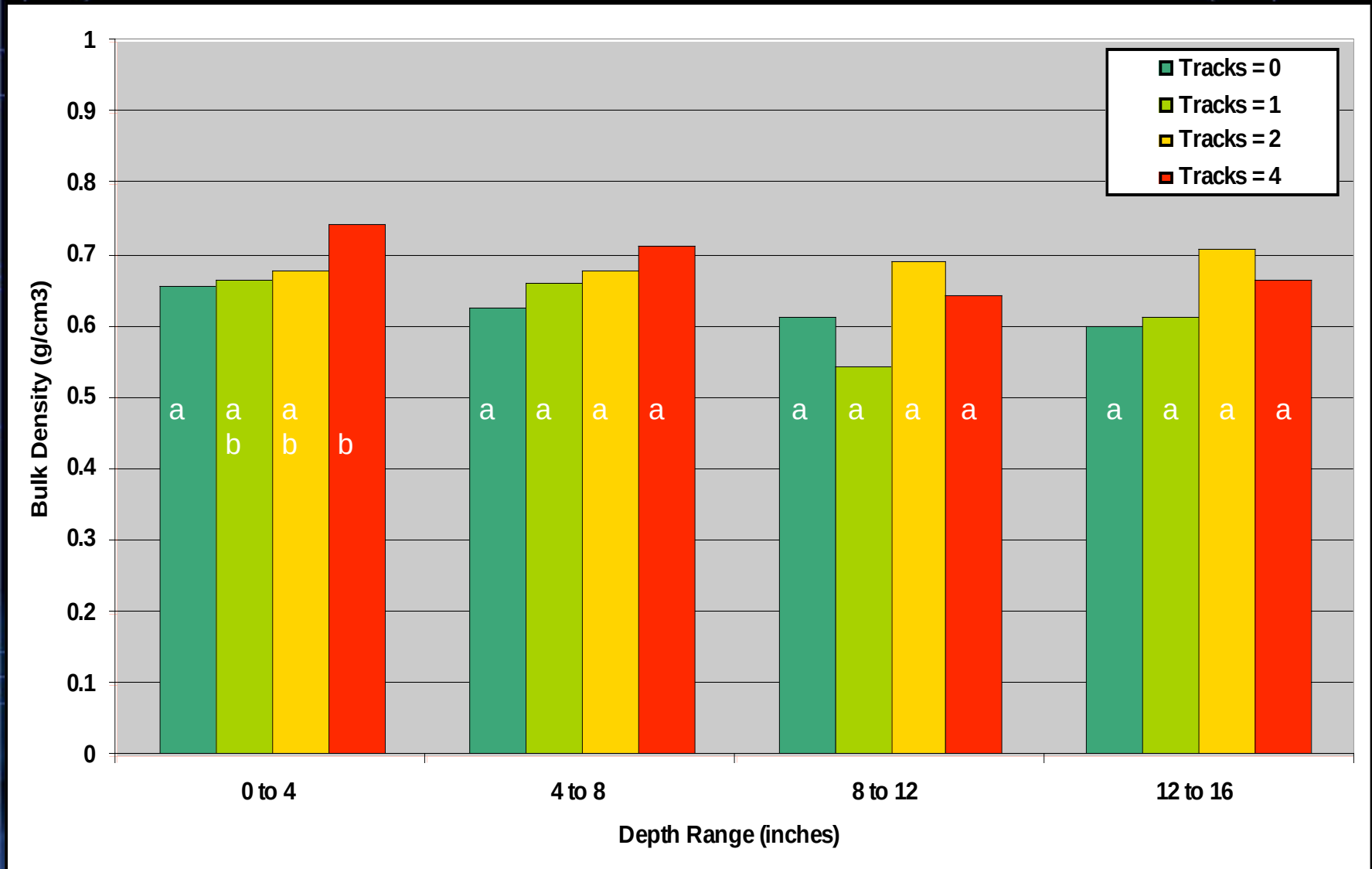
Results

Area Tracked x No. of Tracks Field L2



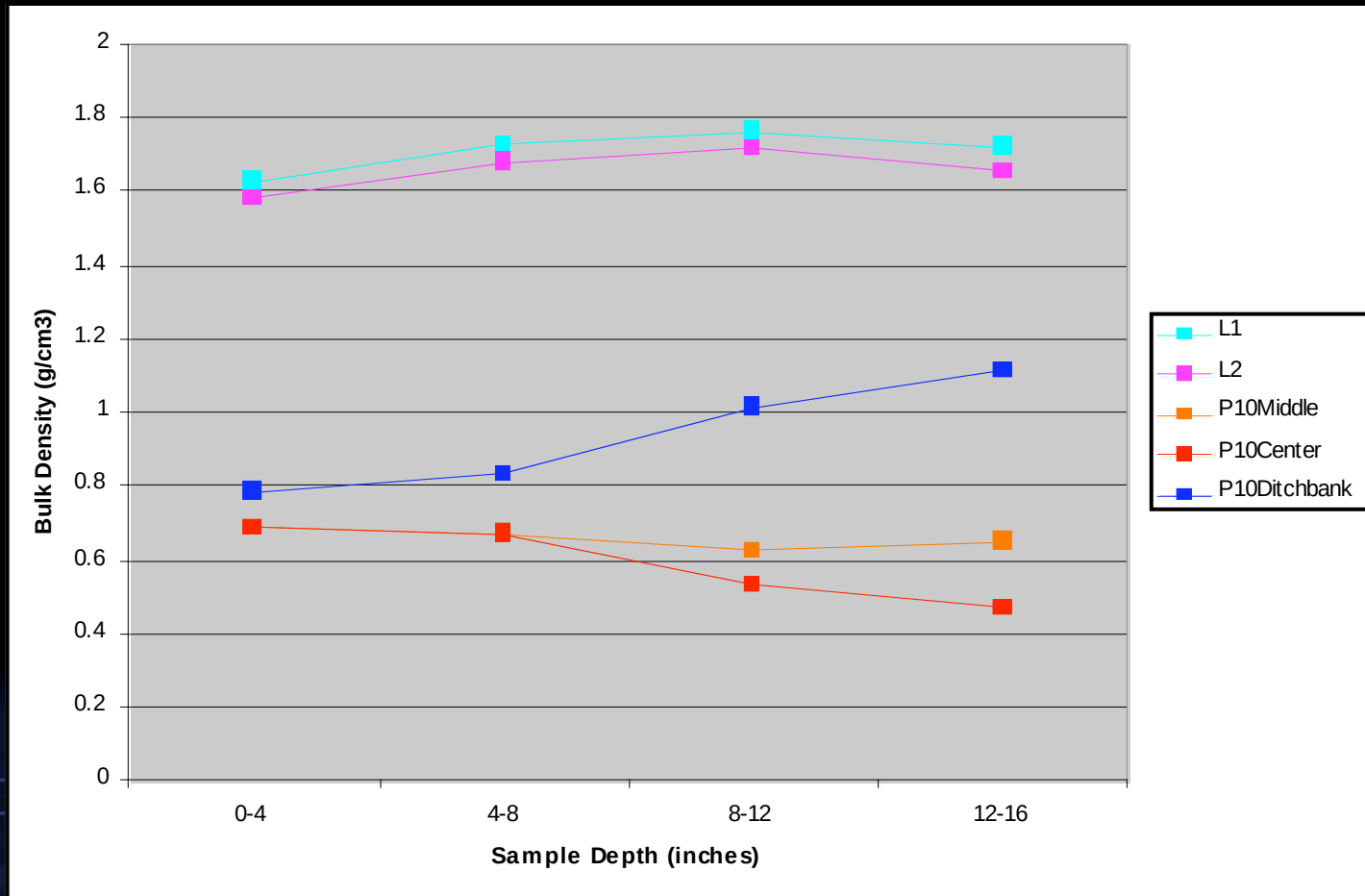
Results

Bulk density – P10 Middle



Results

Mean bulk density at depths at all locations in 2006.



Conclusions

- Bulk densities ranged from 0.4 – 1.1 g/cm³ at P10 and from 1.4 – 1.7 g/cm³ at L1 and L2.
- 65-85% of field surface area tracked.
- Bulk density increased significantly with level of traffic at P10Middle at the 0-4" depth.
- Bulk density increased significantly with level of traffic at L1 at the 0-4" depth as well.
- Bulk density was significantly different at different locations within fields at the same level of traffic.

