

The Role of Biomass in Erosional and Soil Strength Influences Under Military Land Management

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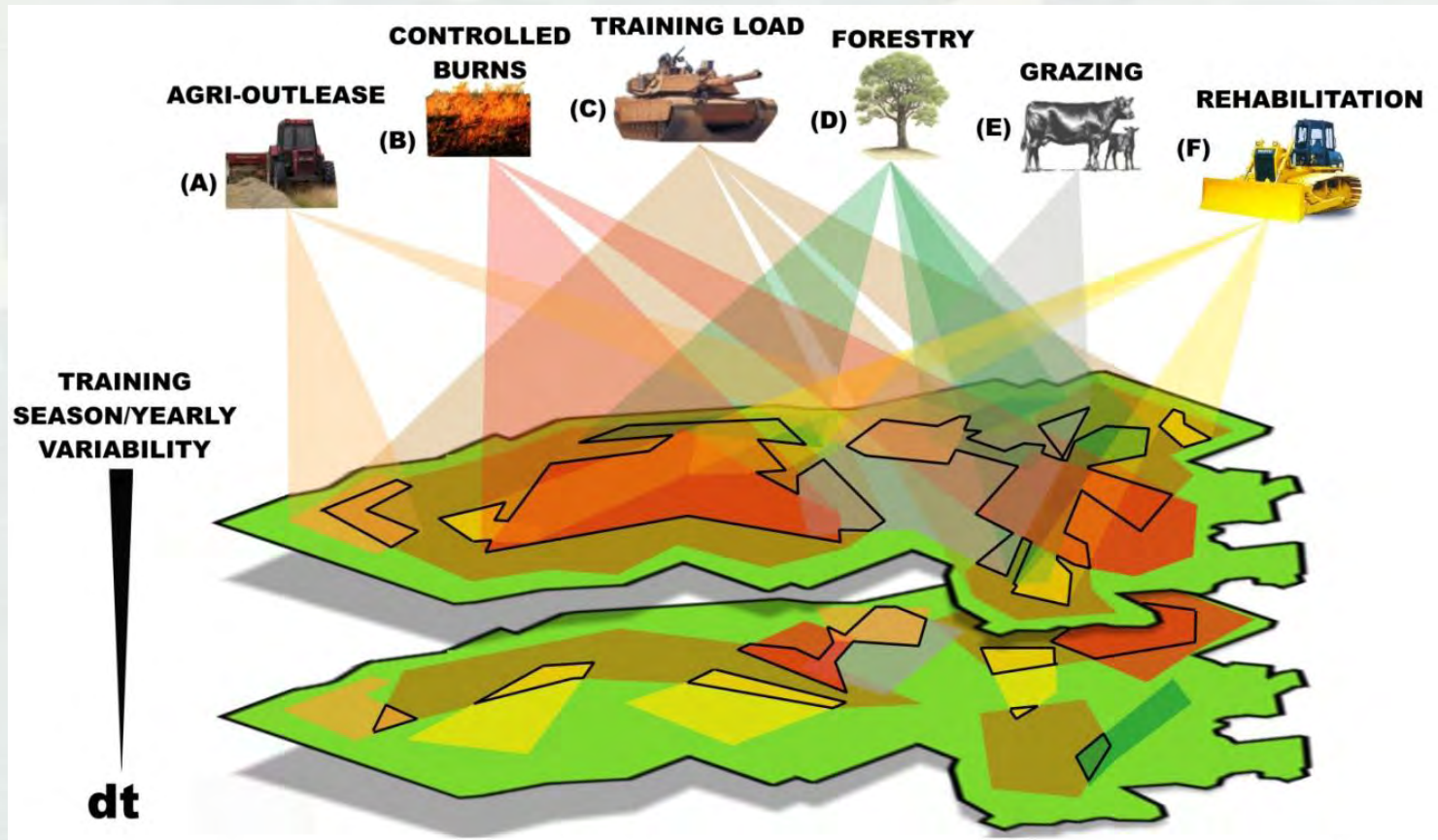


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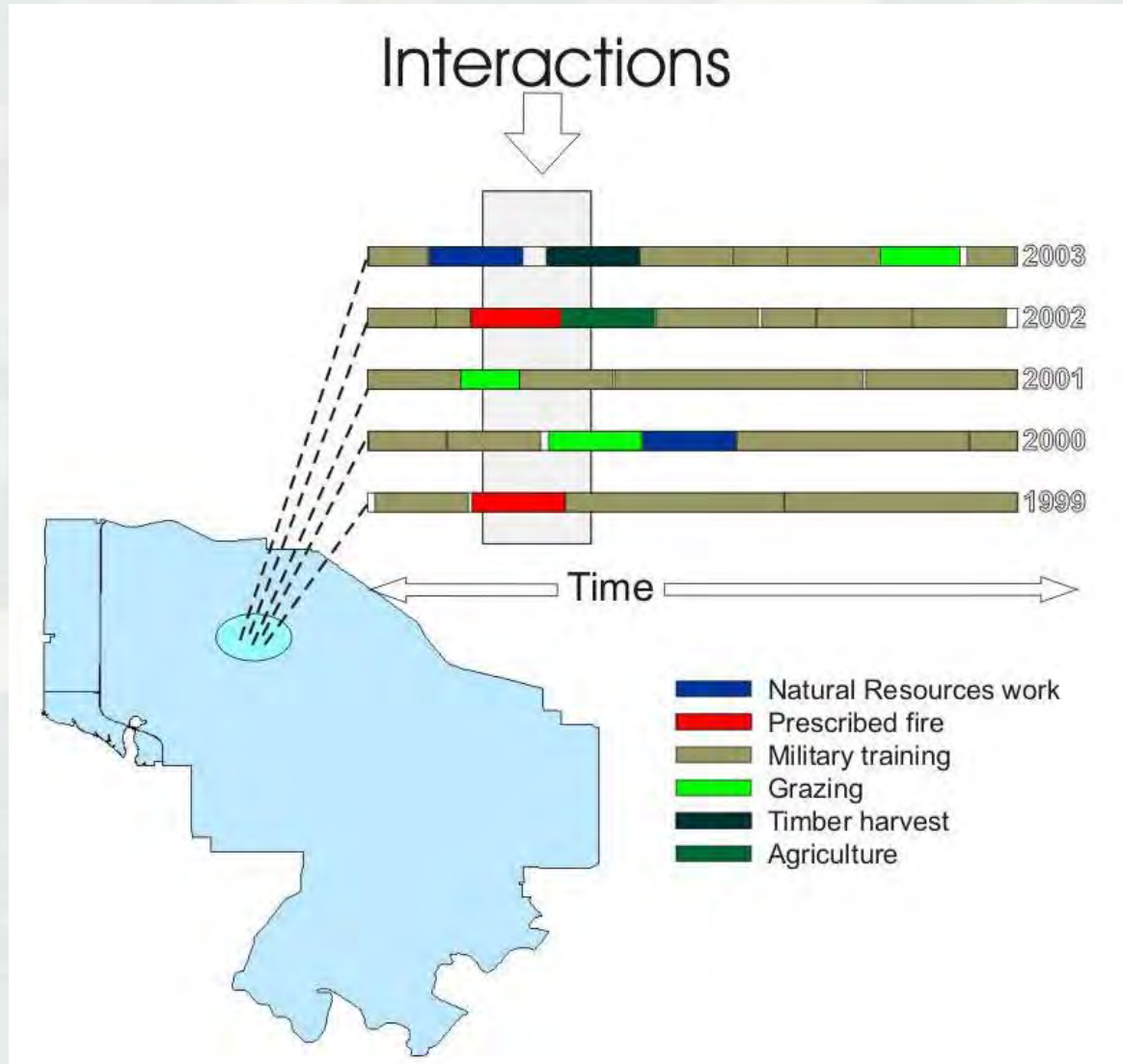
Cumulative Impacts



$$f(A, B, C, D, E, F \dots n) = \int \left(\sum_{k=A}^n \pm impact_k \dots \pm \prod_{k=A}^n impact_k^{x=(1 \dots z)} \dots \right) dt$$



How to determine Interactions



OPAL Field Study

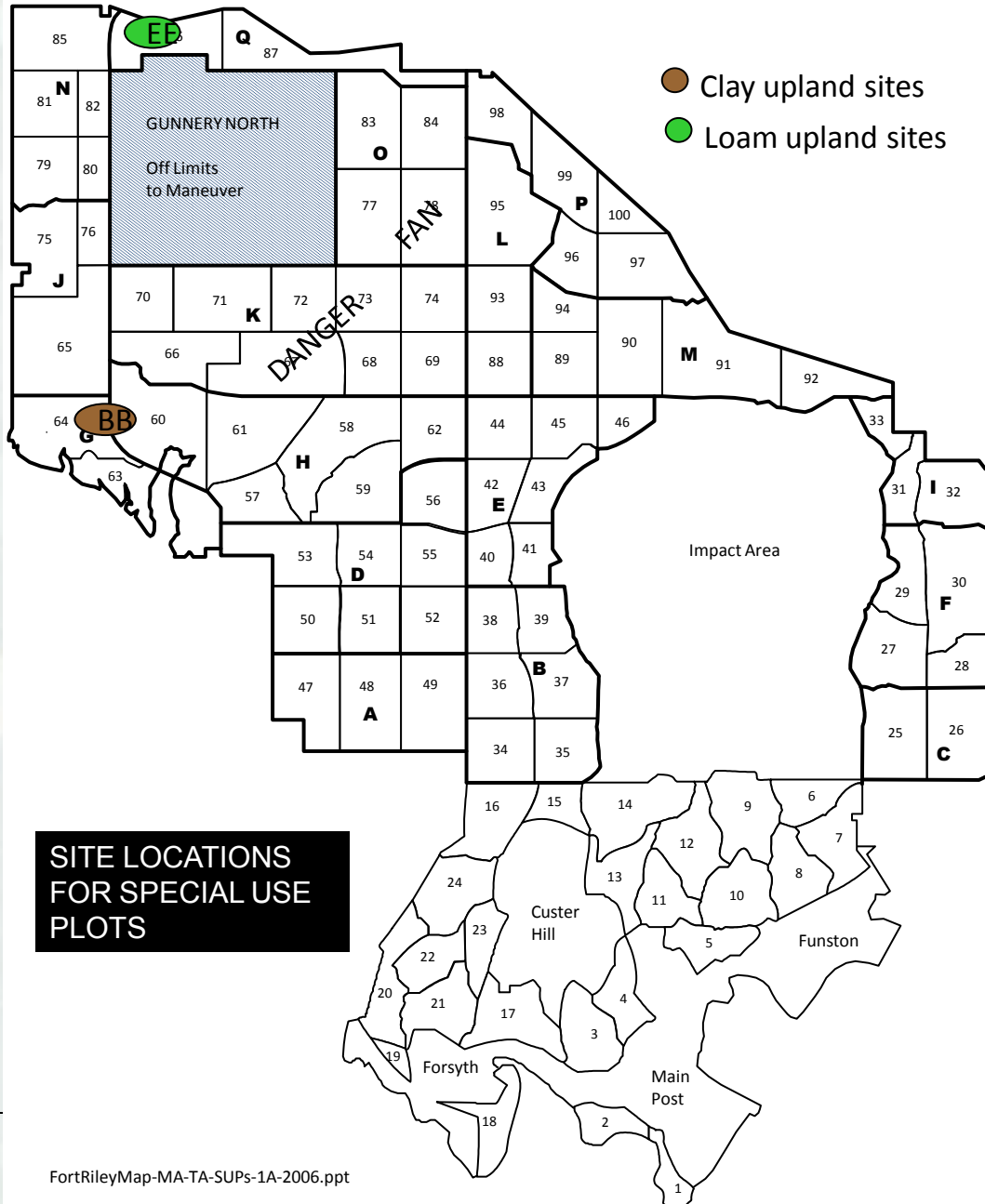
- Established plots at:
 - ▶ Fort Riley, KS
 - ▶ Camp Guernsey, WY
 - ▶ Fort Carson, CO
- Determine relationships between anthropogenic impacts:
 - ▶ Above and below ground biomass response
 - ▶ Soil dynamic responses



Fort Riley

- 100,000 Acres
 - 71,000 Acres (30ha) used for Training
- Mesic tall grass-prairie ecosystem
- Conservation:
 - Control Burn
 - Native Grass Ag Out-lease
- Additional 3 BCT by 2013
- Established long-term plots for study area





SITE LOCATIONS FOR SPECIAL USE PLOTS



**FORT RILEY
SPECIAL USE PLOTS
(loamy upland site)**



Hwy. 77



#5

#4

#3

#1

**FORT RILEY
SPECIAL USE PLOTS
(clay upland site)**



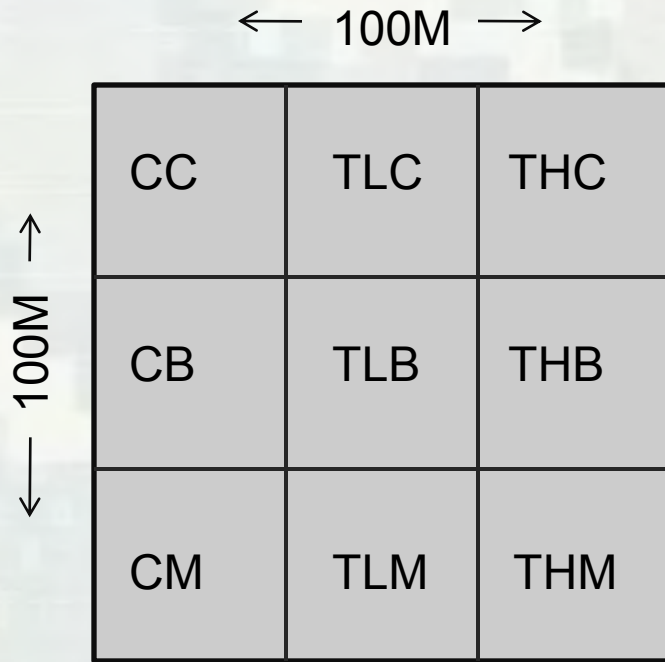
#3

#2

#1

#5

Gravel Rd



C = Control

TL = Track Light (Fall only with 2 passes)

TH = Track Heavy (Spring and Fall)

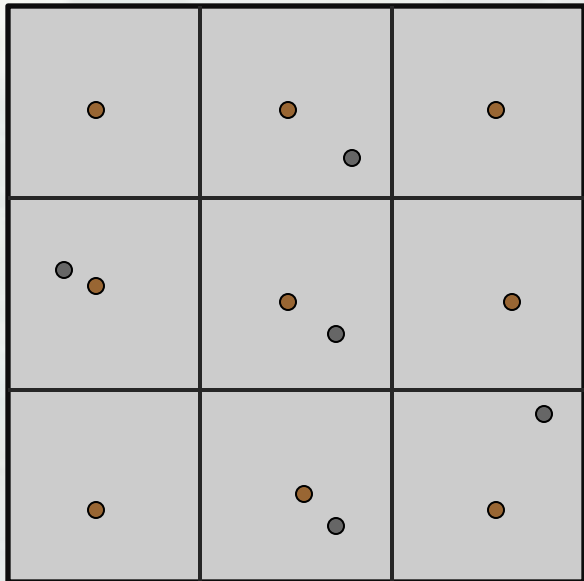
B = Control Burn – Winter burn scheduled for February

M = Mow or Hayed – Fall mowing



Soils & Vegetation

SUBPLOT SAMPLING



Within Track



Out of Track

- One sample per subplot unless randomly chosen for a within track measurement then we have 2 samples per subplot.

- Soil:
 - 1 BD
 - 1 OM/Nutrient
 - 1 Texture
 - 1 Carbon
 - 1 Nematode
 - 1 Penetrometer
 - 3 Drop Cone
 - 1 Clegg
 - 1 TDR (soil moisture)

- Vegetation:
 - 1 Above ground biomass (1/4 M Frame)
 - 1 Digital image (1/4 M Frame)
 - 1 Balloon Digital Image (Riley)
 - 1 Fall or Spring Vegetation ID / transect (Riley)

- Misc:
 - 1 surface elevation (Polaris)
 - 1 Balloon Digital Image (Riley)

Subplot Sampling

Winter

Spring

Summer

Fall



2010

**CHRONOLOGY OF ANNUAL SAMPLING
ON SPECIAL USE PLOTS**



TANK TRACKING

TANK TRACKING

**VEG
COVER
&
BG**
Blimp
Photos

VEG
Cool
season

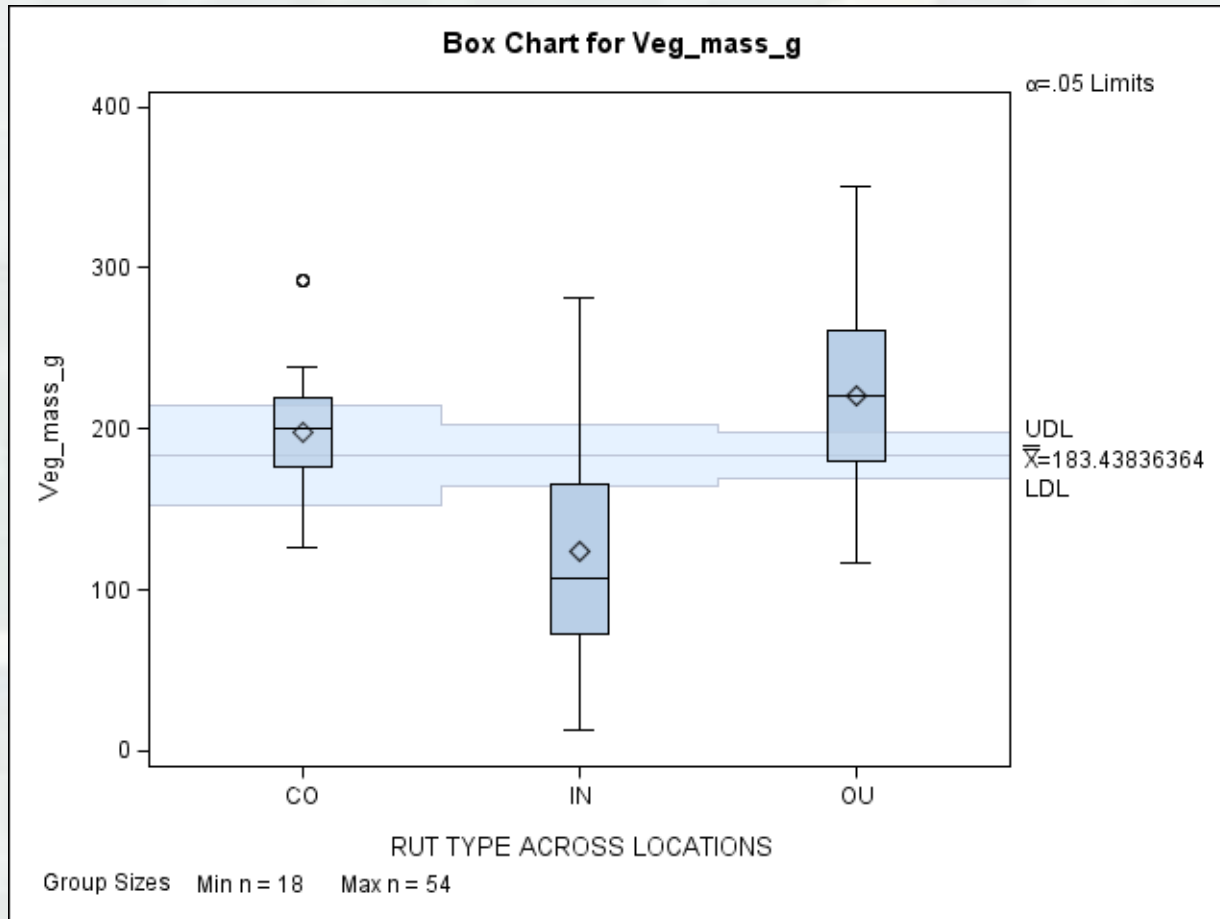
SOILS
Compaction
C & N
Nematodes

VEG
Warm
season

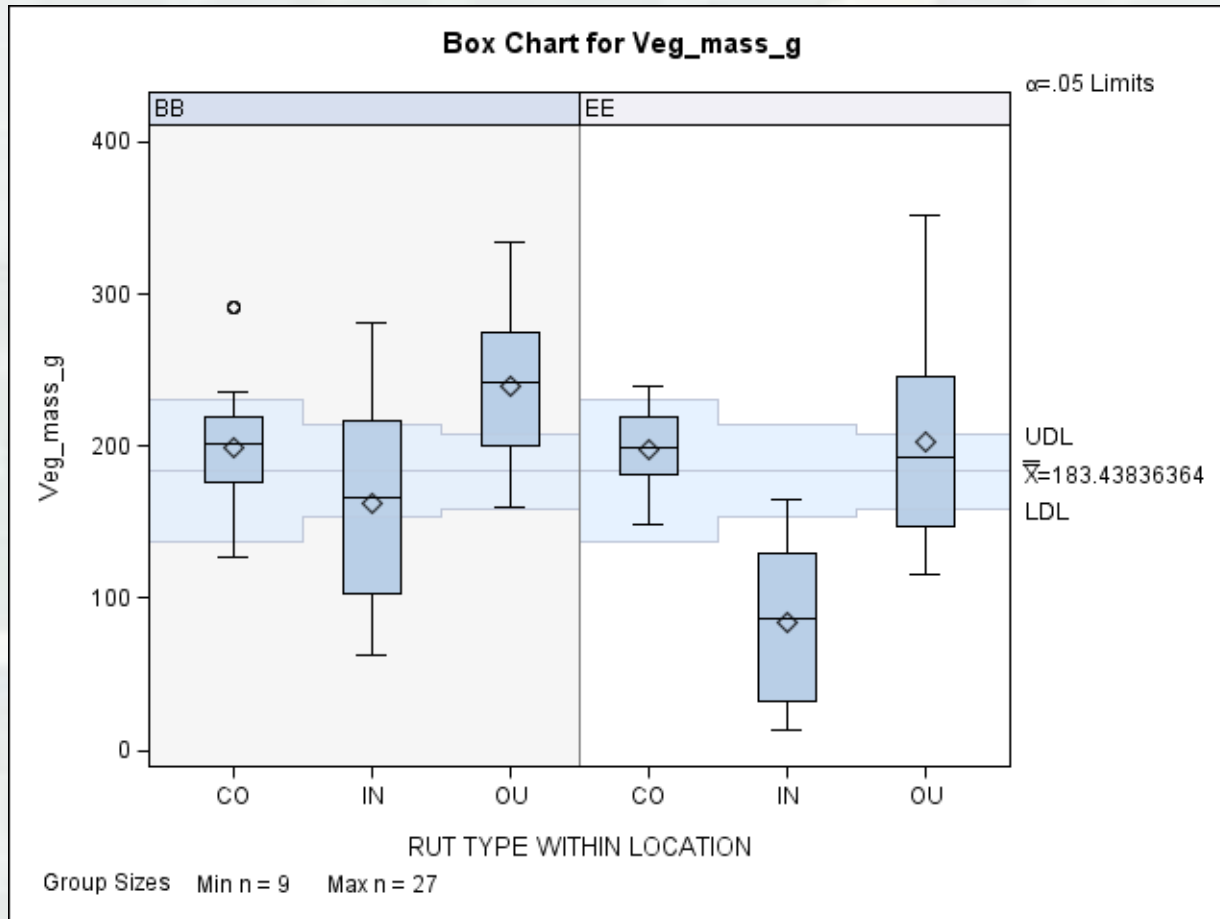
**VEG
COVER
&
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Blimp
Photos

SOILS
Compaction
C & N
Nematodes

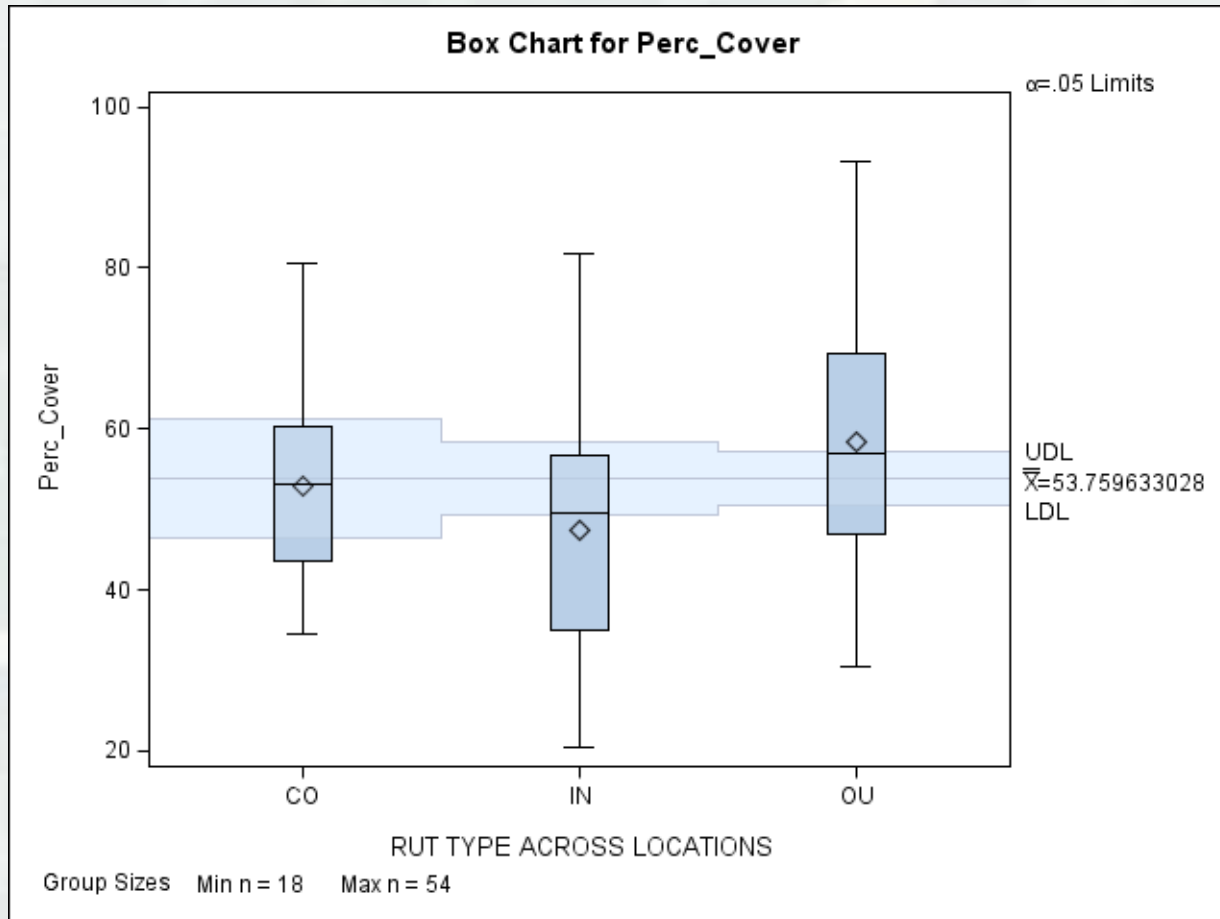
Above Ground Biomass across Locations



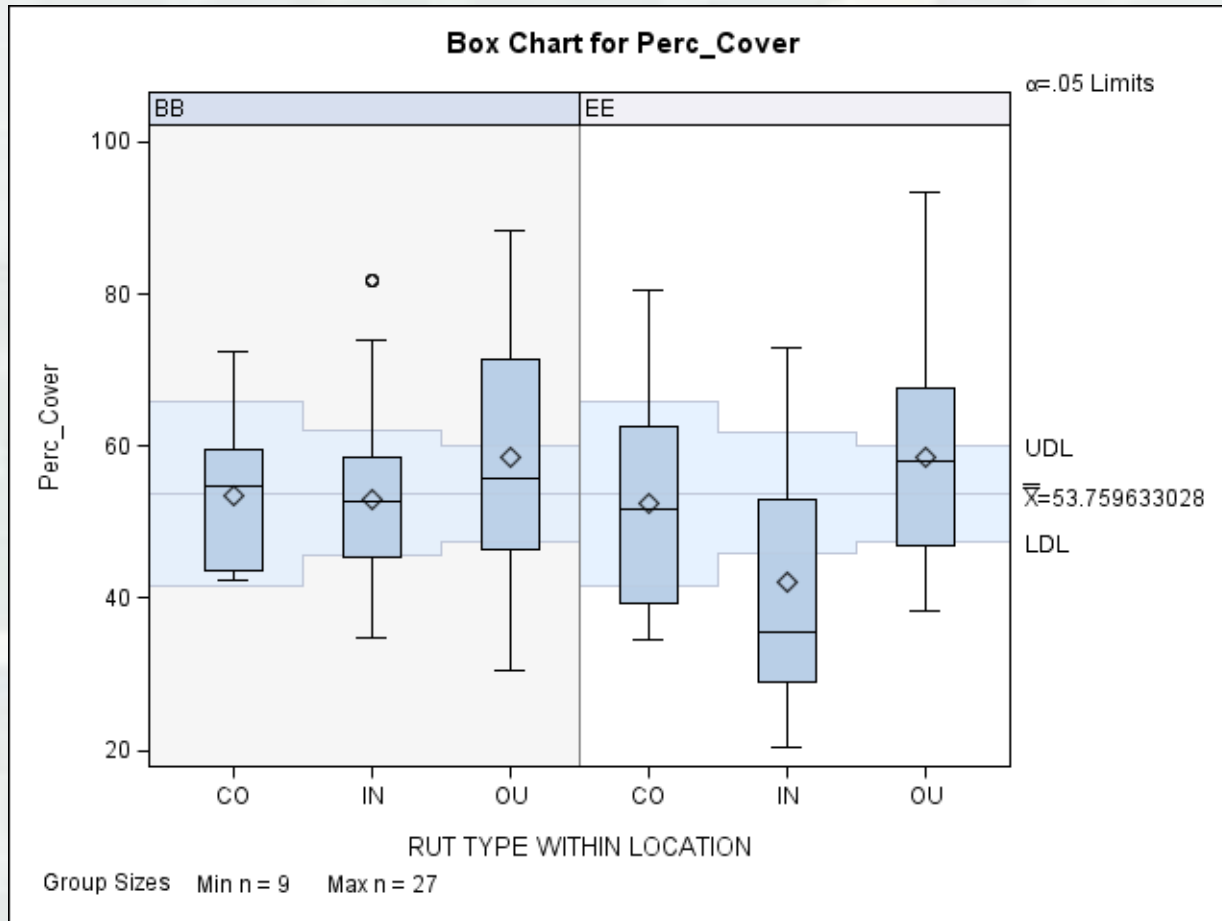
Biomass by Rut Type by Location



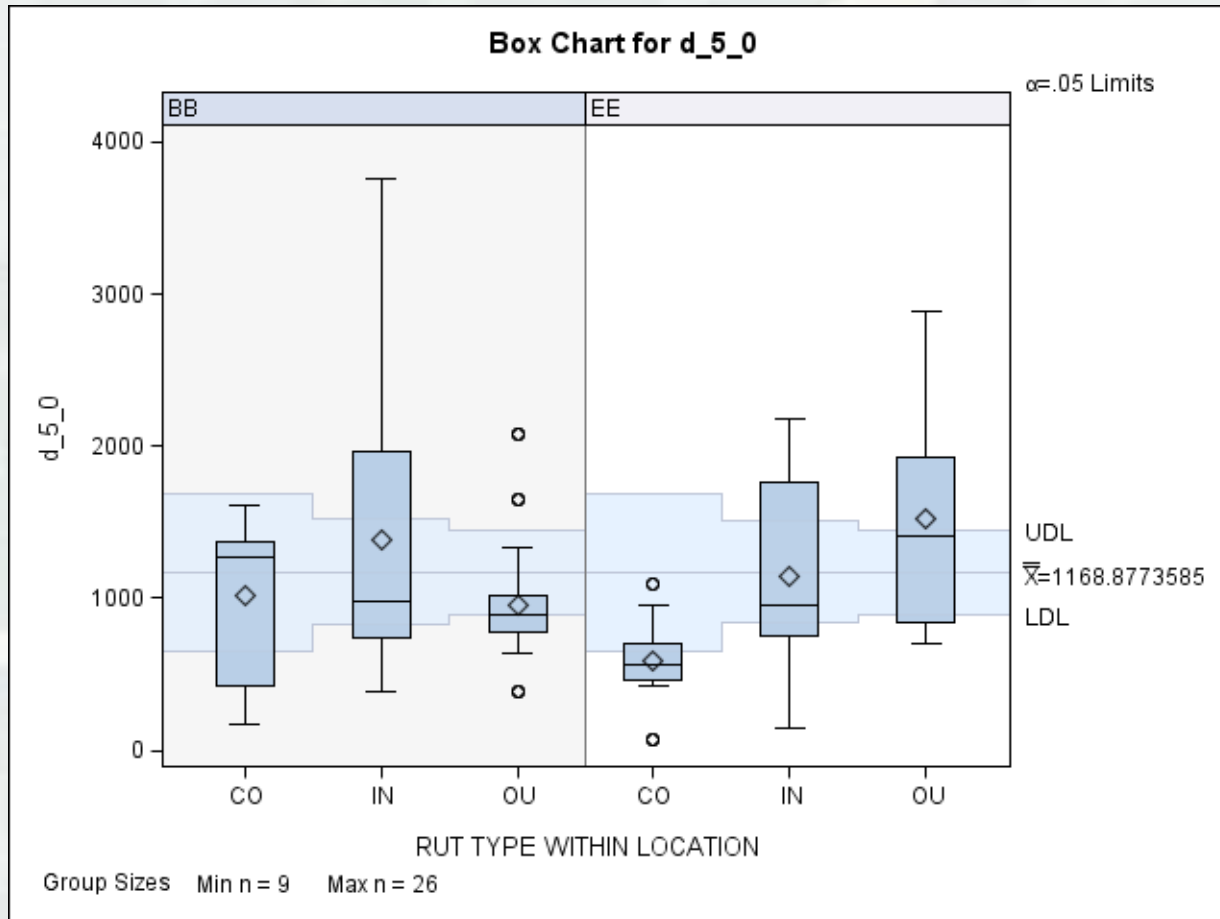
Percent Cover by Rut Type across Locations



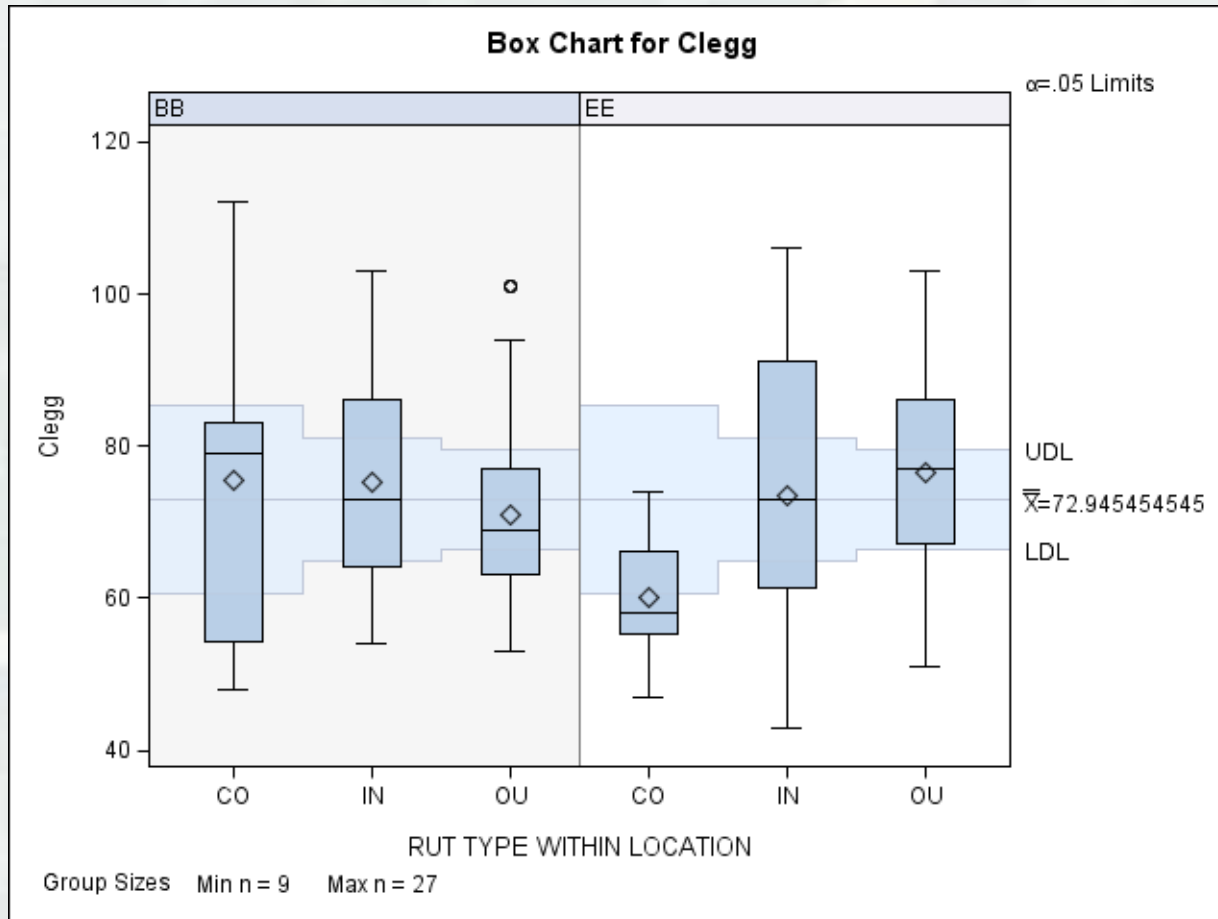
Percent Cover by Rut Type by Location



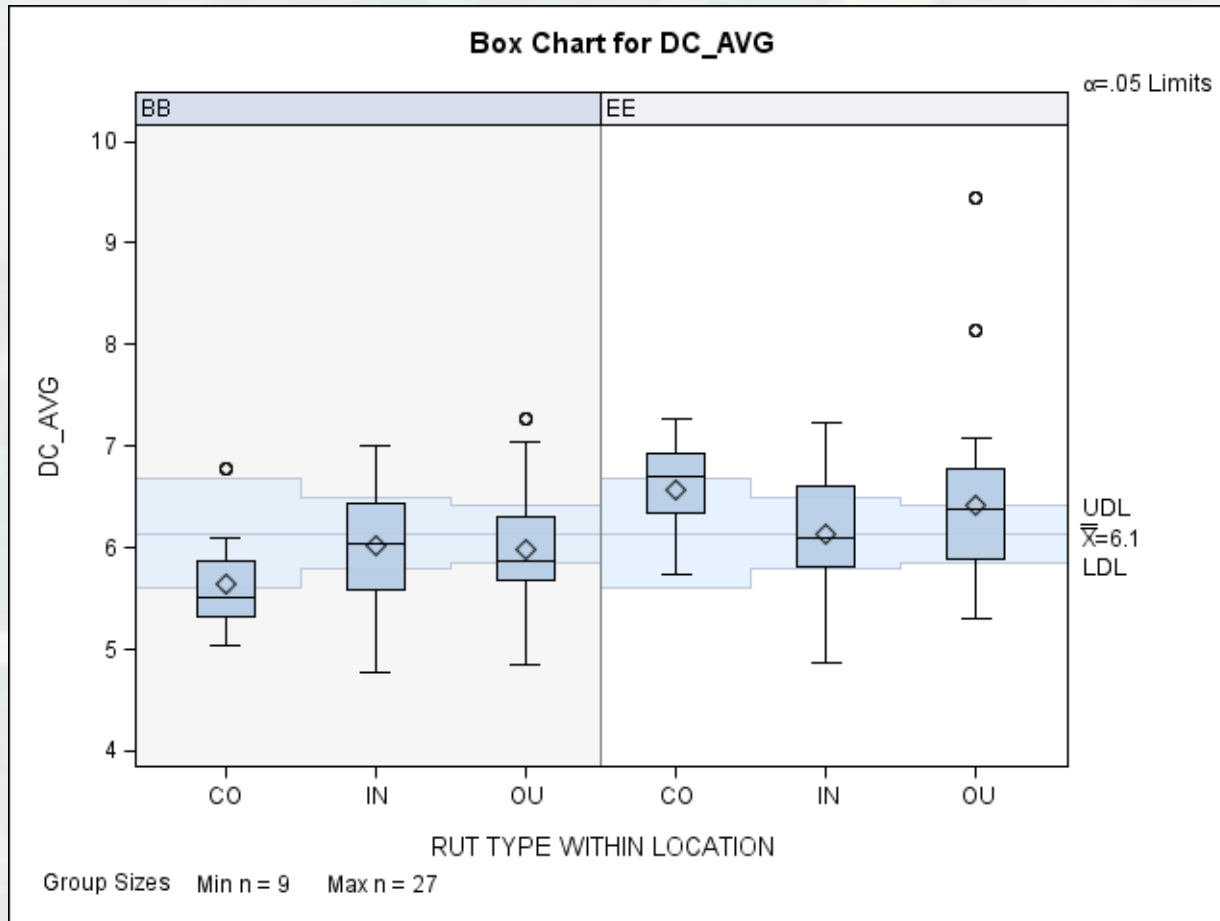
Penetrometer at 5cm by Rut Type by Location



Clegg by Rut Type by Location



Drop Cone by Rut Type by Location



Conclusions

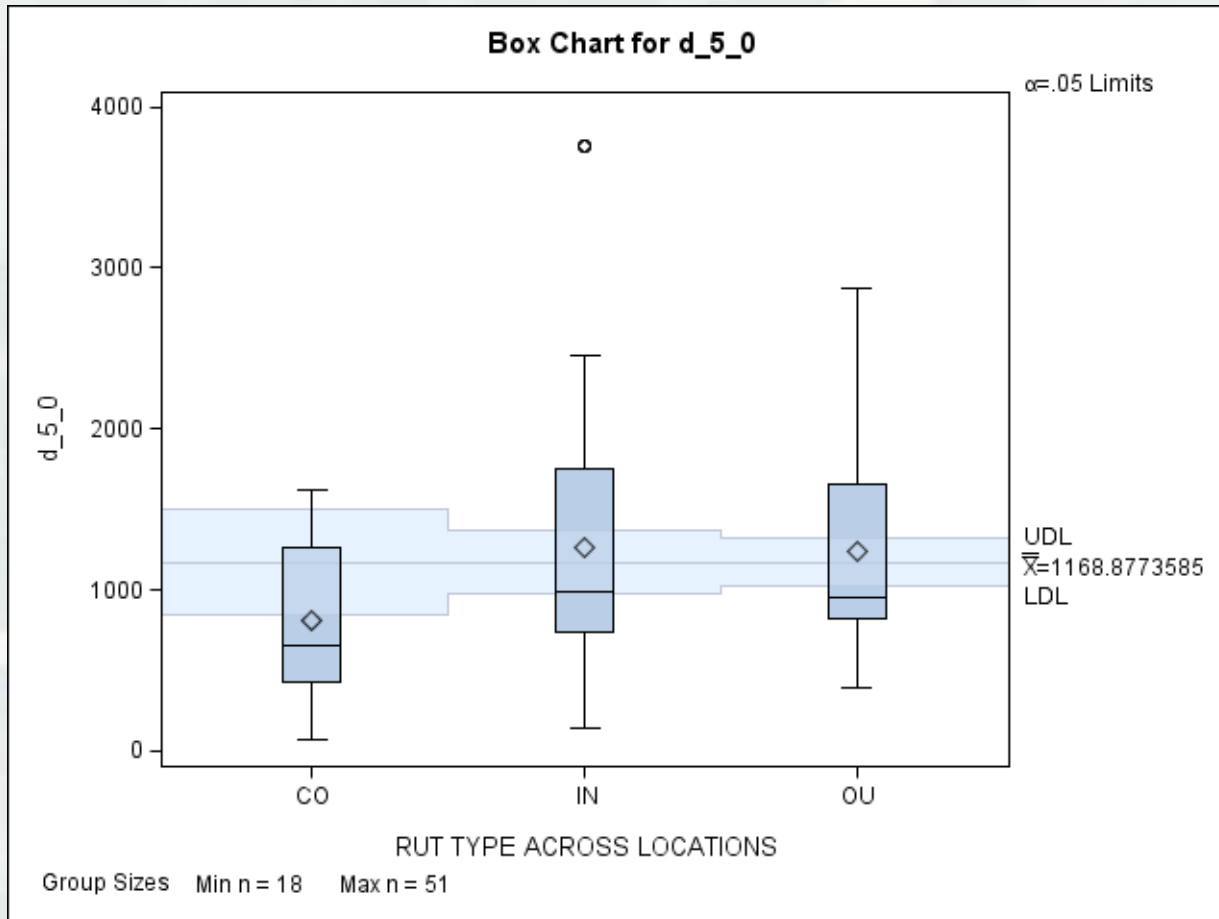
- The overall objective of this research is to quantify and develop an understanding of the interactions between land management practices and training impacts.
- Establishing a baseline understanding of current biomass and soil physical properties is critical to the future research proposed in the program.
- Significance was only found in biomass results:
 - Within track biomass was significantly less than out of track and controls.
 - No significant difference was observed for the soil strength
 - ▶ Past research indicates that soil strength does “recover” within a short timeframe after minimal vehicle impacts (Althoff 2007).
- Final results will provide algorithms to improve land management and trafficability models such as the NATO Referenced Mobility Mode (NRMM) to include vegetated soils.

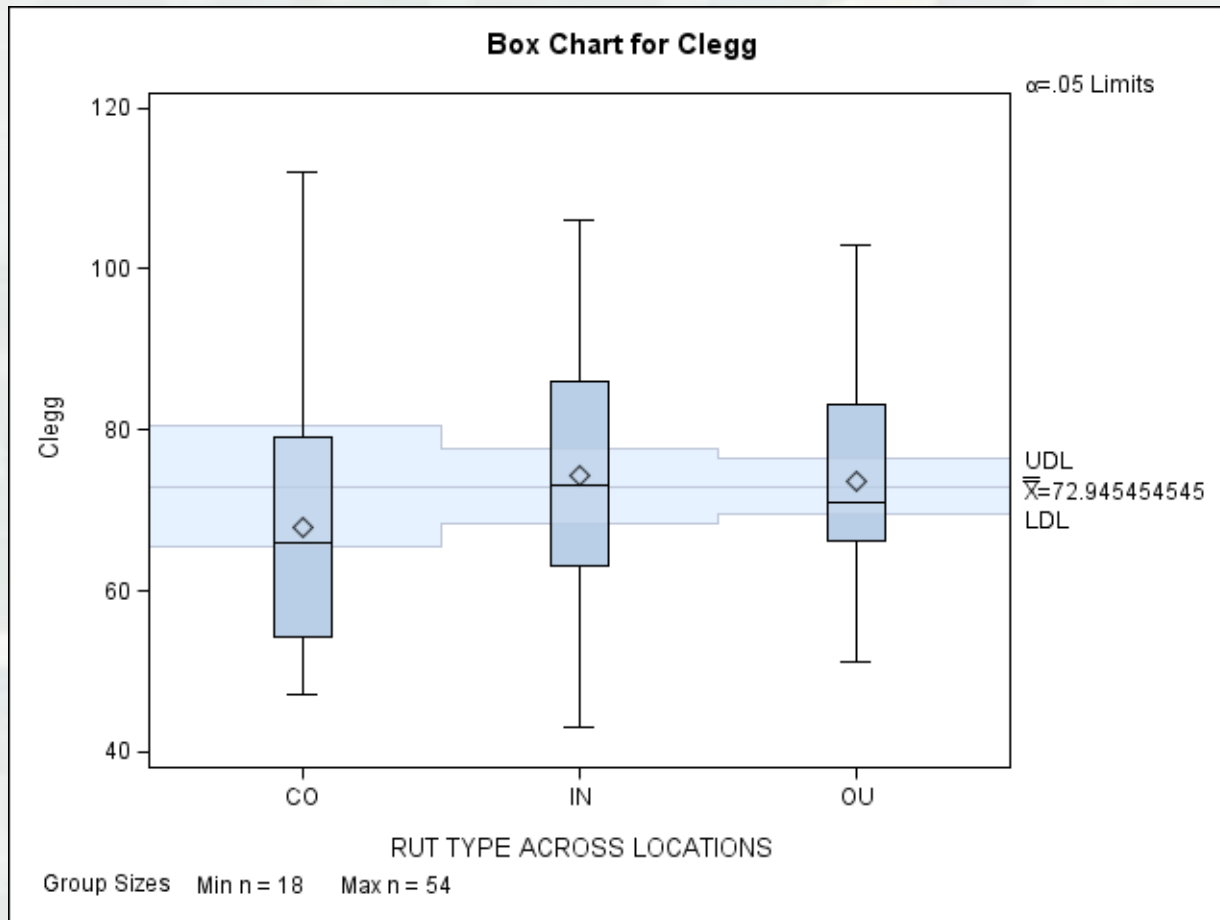


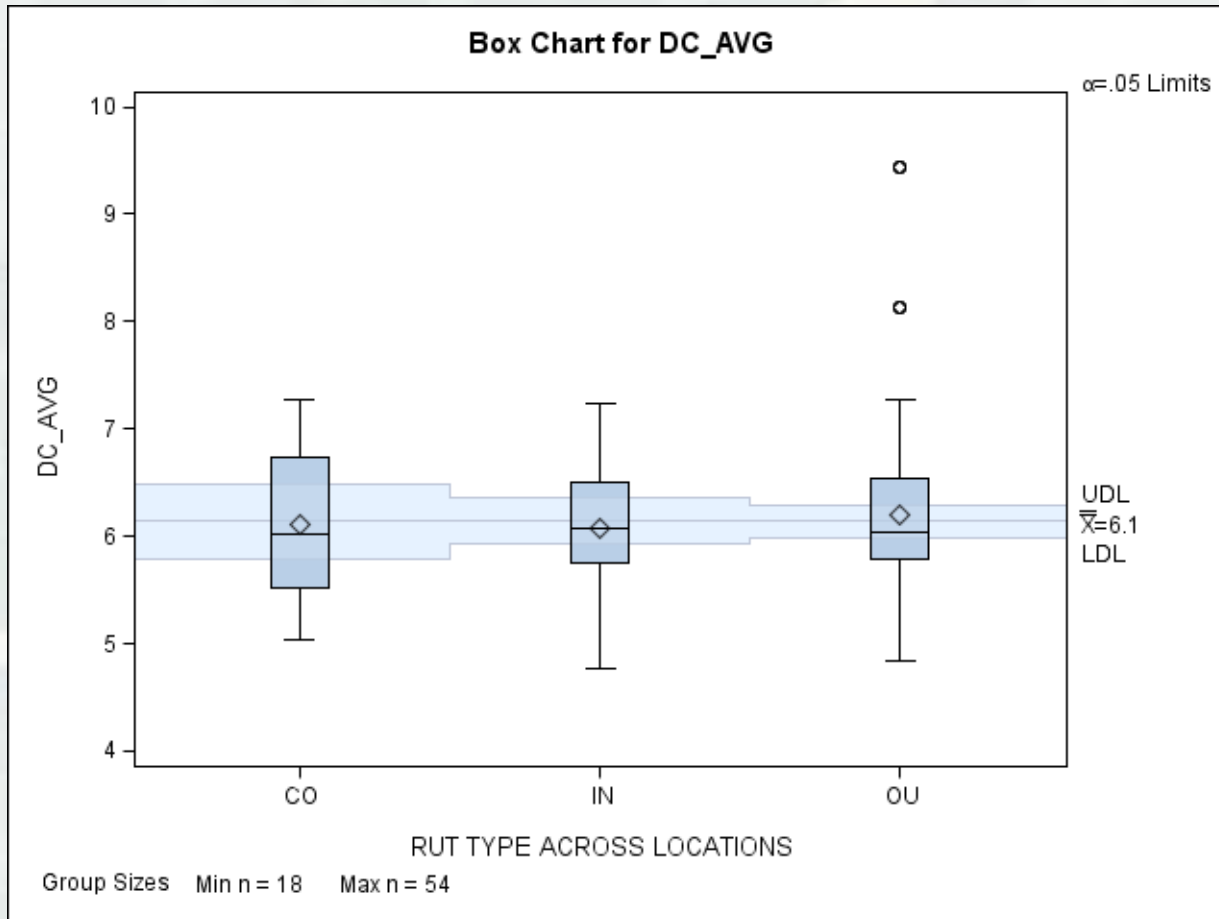
Questions?

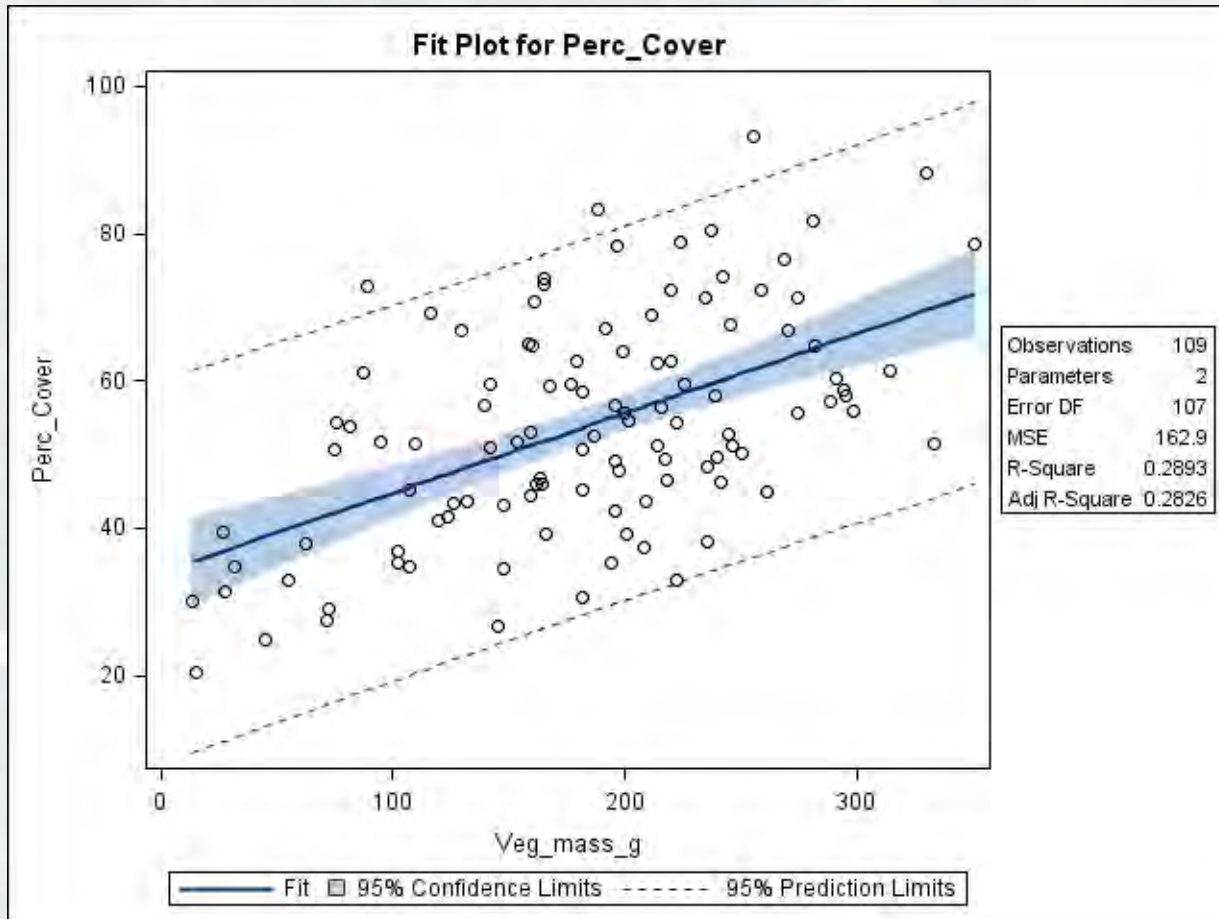
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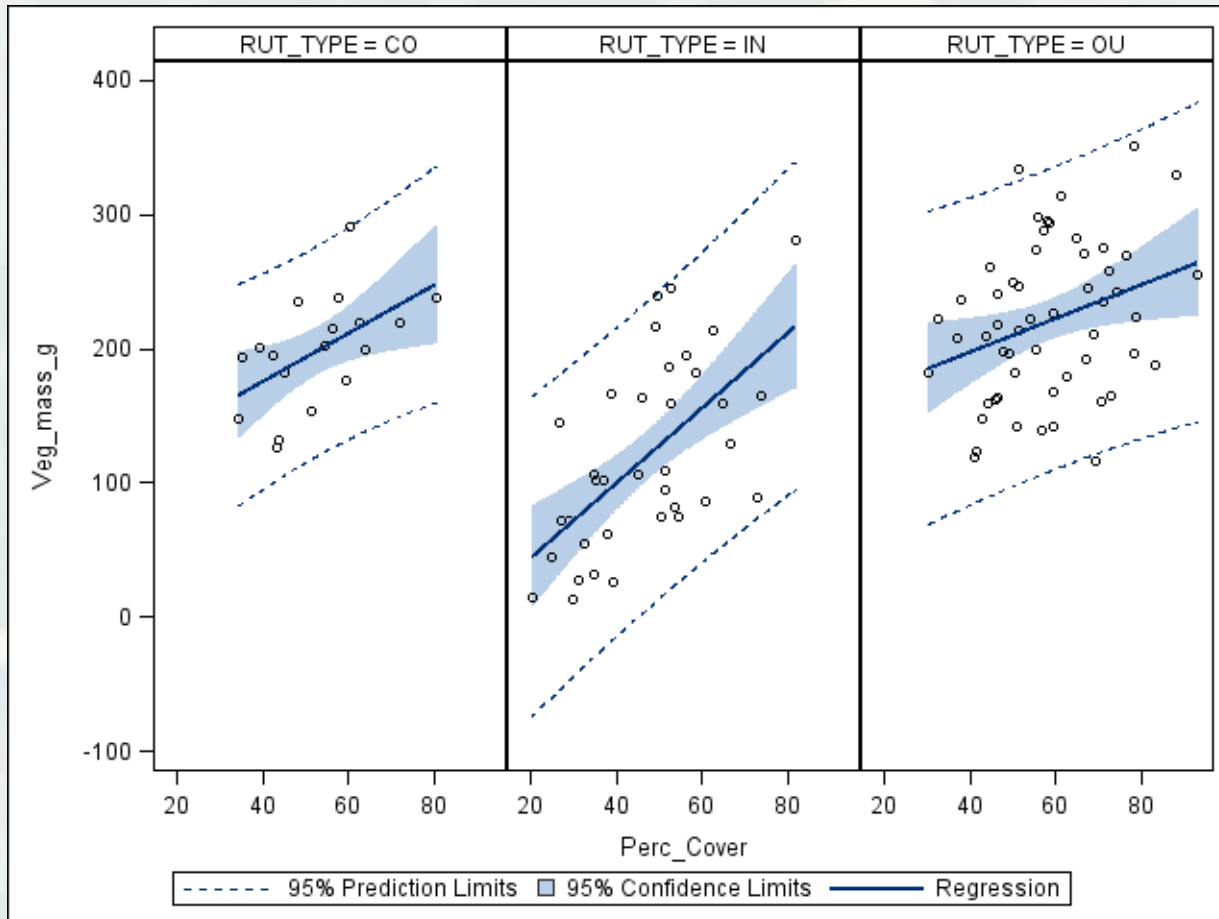
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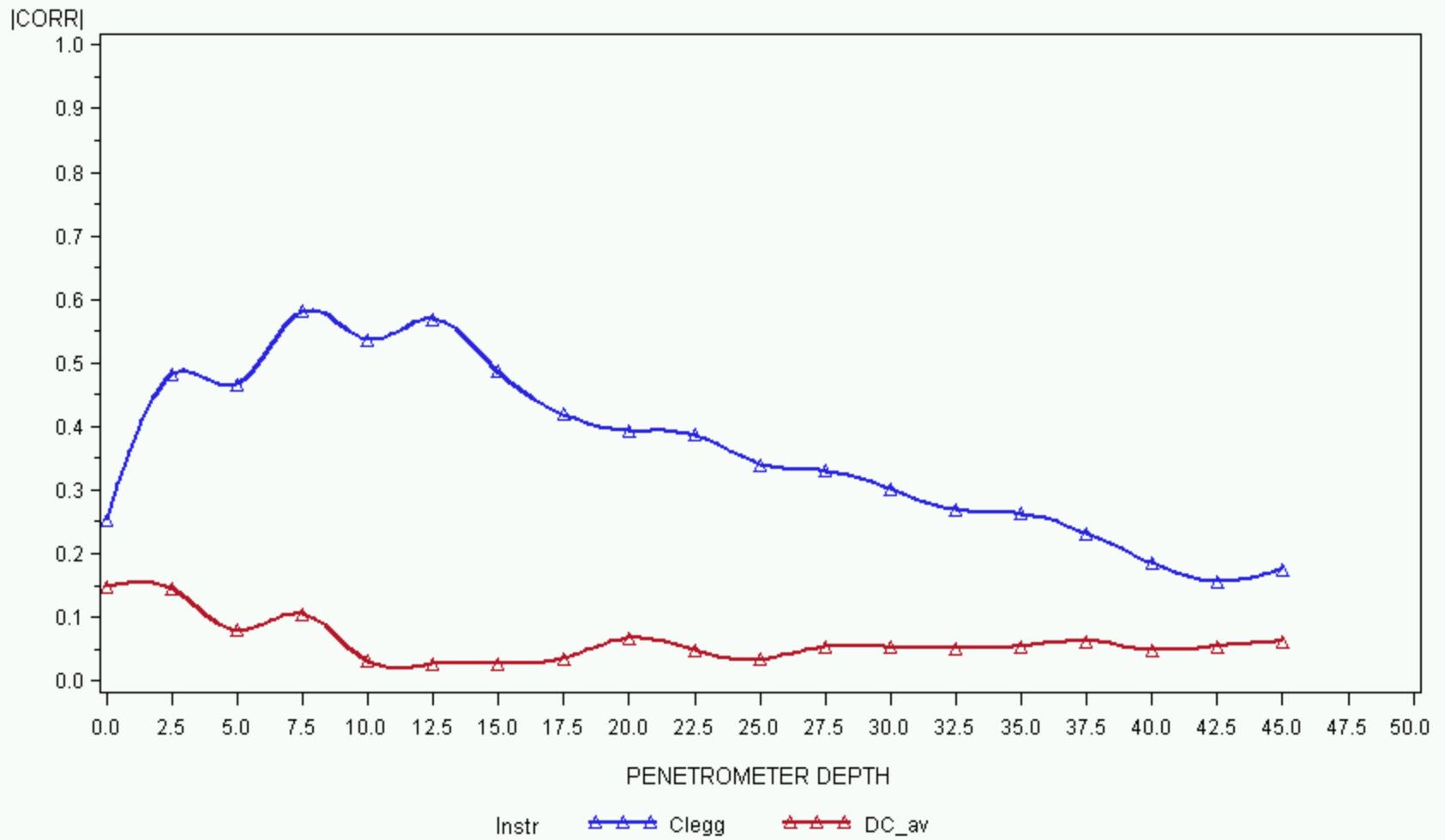




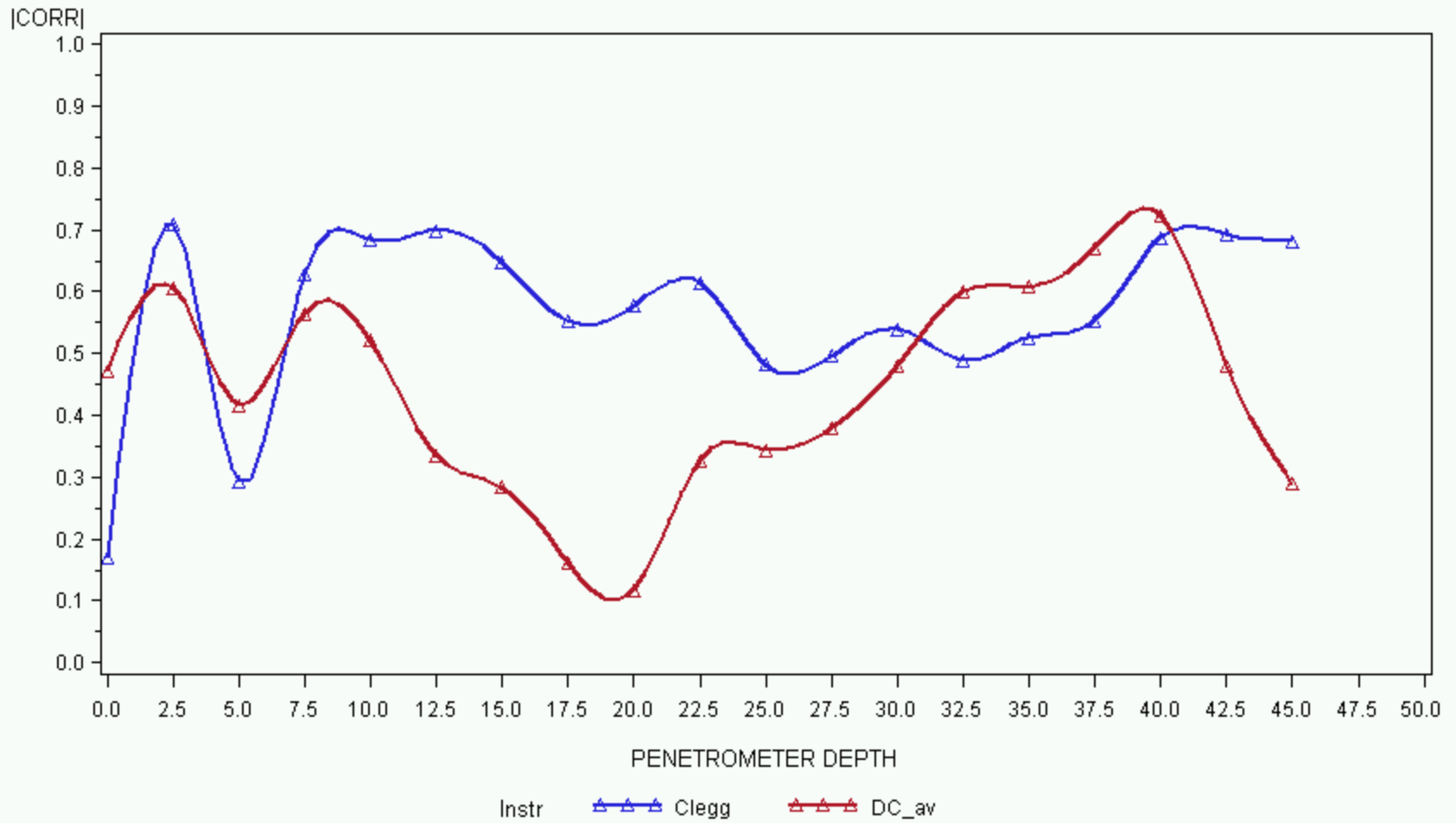




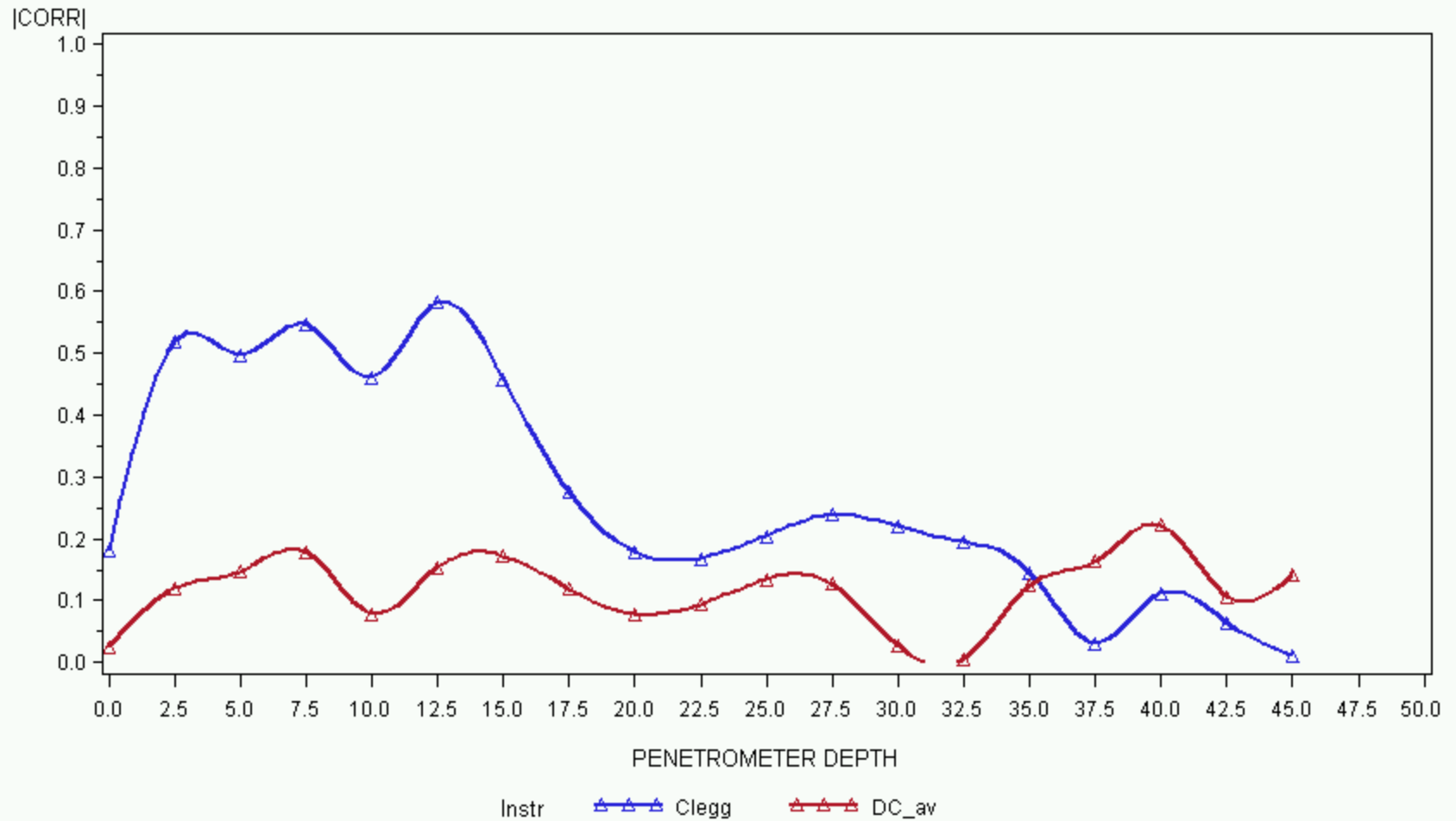




RUT_TYPE=CO



RUT_TYPE=IN



RUT_TYPE=OU

