

The logo for STRI, featuring the letters 'STRI' in white on a dark green square background with stylized grass blades.

Greens Playing Quality

STERF Seminar Copenhagen and Hoor

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Conor Nolan

STRI Turf Agronomist

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Introduction

- Performance measurement and tools
- General findings
- Sward type performance

Performance Criteria

- What do we analyse?
 - Firmness
 - Speed
 - Trueness
 - Smoothness

 - Moisture
 - Organic matter

 - Soil chemistry

Analysis of Data 2009-2014

- 5,294 measurements from 2,064 greens across UK & Ireland.
- 1,327 parkland, 436 links and 285 heathland and 16 other greens.
- Data from 404 courses.
- 1,559 measurements from 1,078 greens in 2014.
- Championship to Municipal.
- January to November each year.
- Regional analysis via postcode.

Analysis of Clients Data

- Like for like analysis
- Same courses and same greens
- Continuous data collected from 2010 to 2014

The logo for STRI, featuring the letters 'STRI' in white, bold, sans-serif font on a dark green square background. The square is positioned in the top left corner of the slide. The background of the entire slide is a blurred green field of grass.

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Measurement Tools

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Firmness

- Clegg Soil Impact Hammer
- 0.5kg rounded-head dropped from 0.5m
- Replicates golf ball hitting green
- Measures peak deceleration as it impacts on surface
- Nine readings taken from a 3x3 grid
- Mean value calculated
- Standard Error of Mean (SEM) to show variability
- SEM greater than ± 3.0 shows results are too variable

The Clegg Impact Hammer



Moisture

- Theta probe
- Measures volumetric soil water content
- Upper 60mm of soil profile measured
- Nine readings taken from a 3x3 grid
- Averaged to give general moisture content
- Level of variation (SEM) important to note for moisture

Theta Probe Soil Moisture Meter



Smoothness and Trueness

- Vertical deviation – bobble/chatter
- Horizontal deviation - snaking

Smoothness and Trueness

- STRI Trueness Meter™
- Wheel replicates movement of golf ball rolling across the green
- Measures vertical and horizontal movement
- Extremely accurate readings
- Six readings taken across the green
- Mean calculated with SEM

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STRI Trueness Meter™



Green Speed

- Stimpmeter, tape measure
- Taken in inches for ease of use in graphs/Excel
- Use flat area of green
- Three golf balls rolled from same position
- Repeated from middle ball position
- Lowest value is upslope, highest value is downslope
- Two sets of measurements per green

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The Stimpmeter



Soil Organic Matter Targets



3 - 6 % in top 20 mm

< 4 % from 20 – 80 mm

Excess organic matter leads to surface softening and increased disease pressure.

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General Findings

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2014 State of The Nation

- **1,559** measurements from **1,078** greens and **404** courses.
- **Green Speed:** 8 ft 6 in Parkland and 9 ft 2 in Links
- **Firmness:** 91 Gravities Parkland and 104 Gravities Links.
- **Organic Matter at 0-20 mm:** 8.1% Parkland and 6.7% Links.
- **Organic Matter 20-40 mm:** 4.5% Parkland and 4.7% Links.
- **Smoothness:** 24.9 mm/m Parkland and 20.4 mm/m Links.
- **Trueness:** 10.2 mm/m Parkland and 6.8 mm/m Links.

Average Surface Firmness 2009-2014

Mean Surface Firmness (and Range) for all Courses 2009-2014

Course Type	Year					
	2009	2010	2011	2012	2013	2014
Parkland (85-110 Gravities)	84 (56 to 123)	82 (58 to 110)	85 (37 to 142)	83 (43 to 124)	96 (56 to 142)	91 (53 to 133)
Links (100-140 Gravities)	101 (78 to 134)	95 (69 to 137)	97 (62 to 130)	97 (61 to 124)	107 (71 to 164)	104 (64 to 146)

2014 Organic Matter Content

Mean Soil Organic Matter Values (and Ranges) for all courses at 0-20 mm and 20-40 mm during 2014

Course Type	0-20 mm Depth	20-40 mm Depth
	OM Value (Range)	OM Value (Range)
Parkland (743 greens)	8.1 % (3.4 to 23.6)	4.5 % (0.95 to 25.7)
Links (385 greens)	6.7 % (2.8 to 14.5)	4.7 % (1.5 to 13.7)

Smoothness & Trueness 2014

Mean Smoothness & Trueness (and Ranges) and Percentage in Target for all courses during 2014

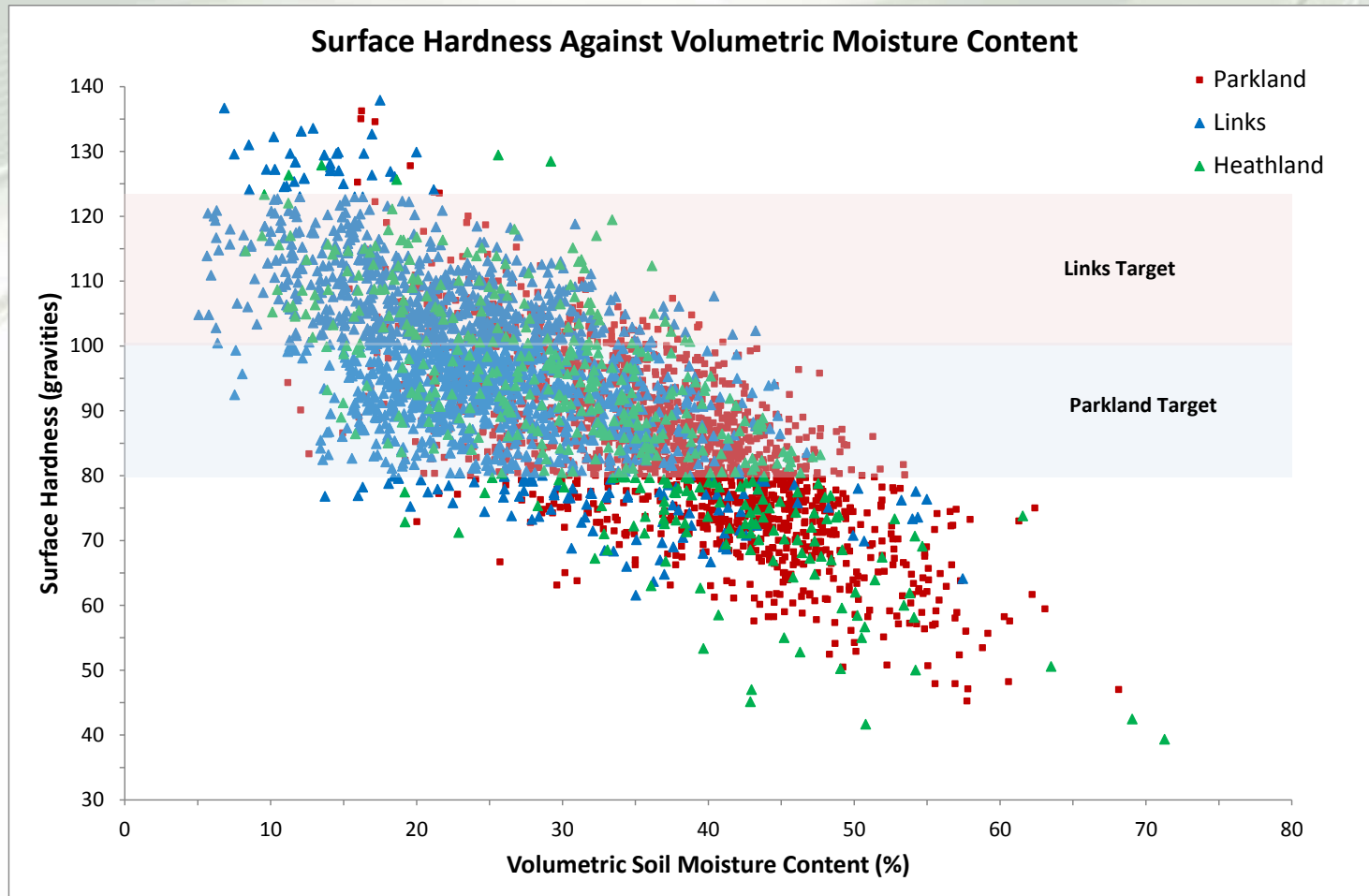
Course Type	Smoothness	Trueness
	Value (Range)	Value (Range)
Parkland (575 greens)	24.9 mm/m (12.5-44.8)	10.2 mm/m (3.0-24.9)
Links (486 greens)	20.4 mm/m (11.1 to 34.8)	6.8 mm/m (1.9 to 18.2)

Green Speed 2009-2014

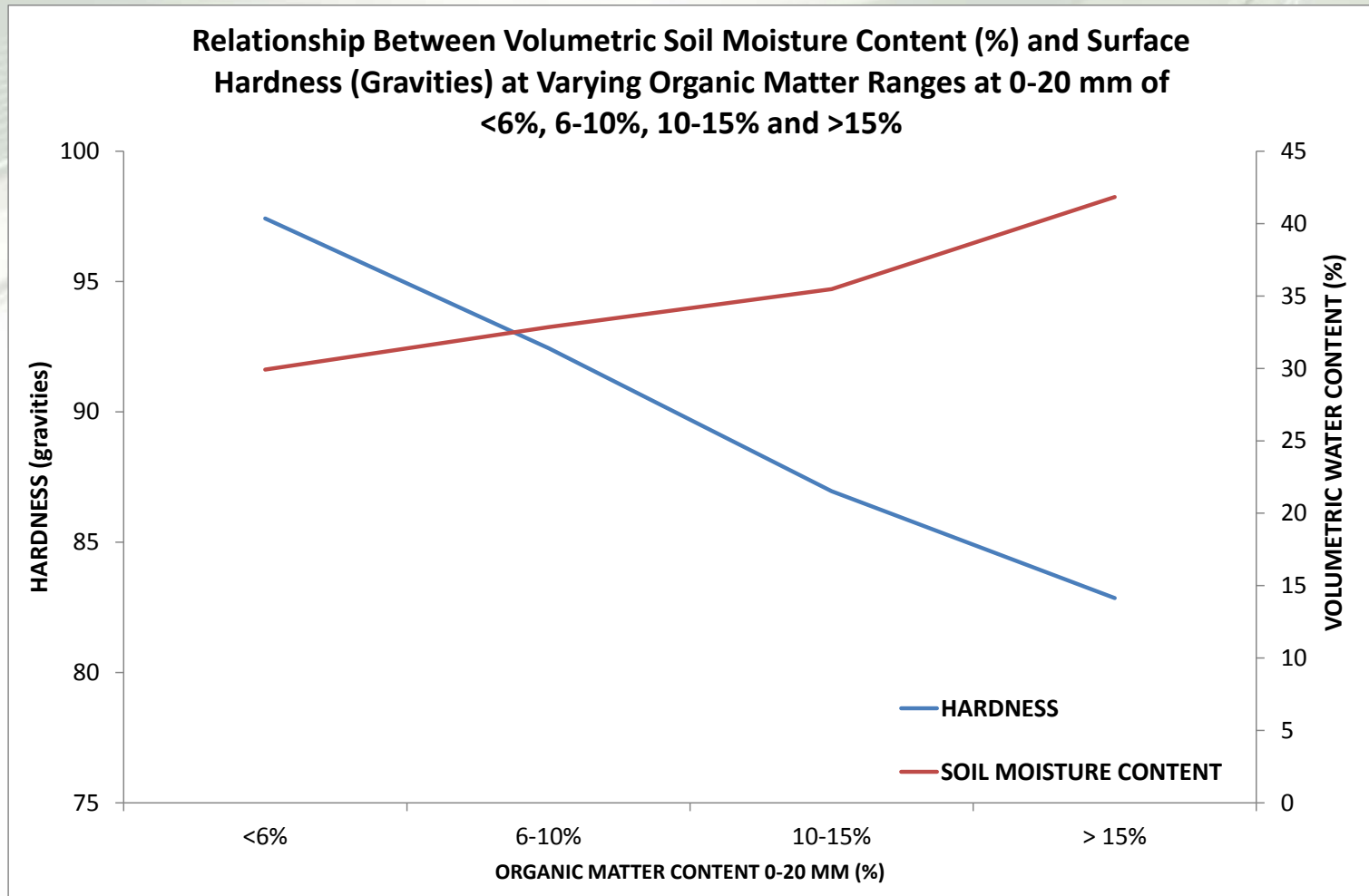
Average Green Speed by Course Type 2009-2014

Course Type	Year					
	2009	2010	2011	2012	2013	2014
Parkland (648 greens)	7 ft 9 in	8 ft 3 in	8 ft 3 in	8 ft 2 in	8 ft 7 in	8 ft 6 in
Links (531 greens)	9 ft 1 in	9 ft 1 in	9 ft 1 in	9 ft 0 in	9 ft 2 in	9 ft 2 in
Average	8 ft 4 in	8 ft 7 in	8 ft 5 in	8 ft 5 in	8 ft 9 in	8 ft 9 in

Moisture v Firmness – All



Organic Matter, Soil Moisture Content & Surface Firmness



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PERFORMANCE & SWARD SPECIES COMPOSITION

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Annual meadow-grass

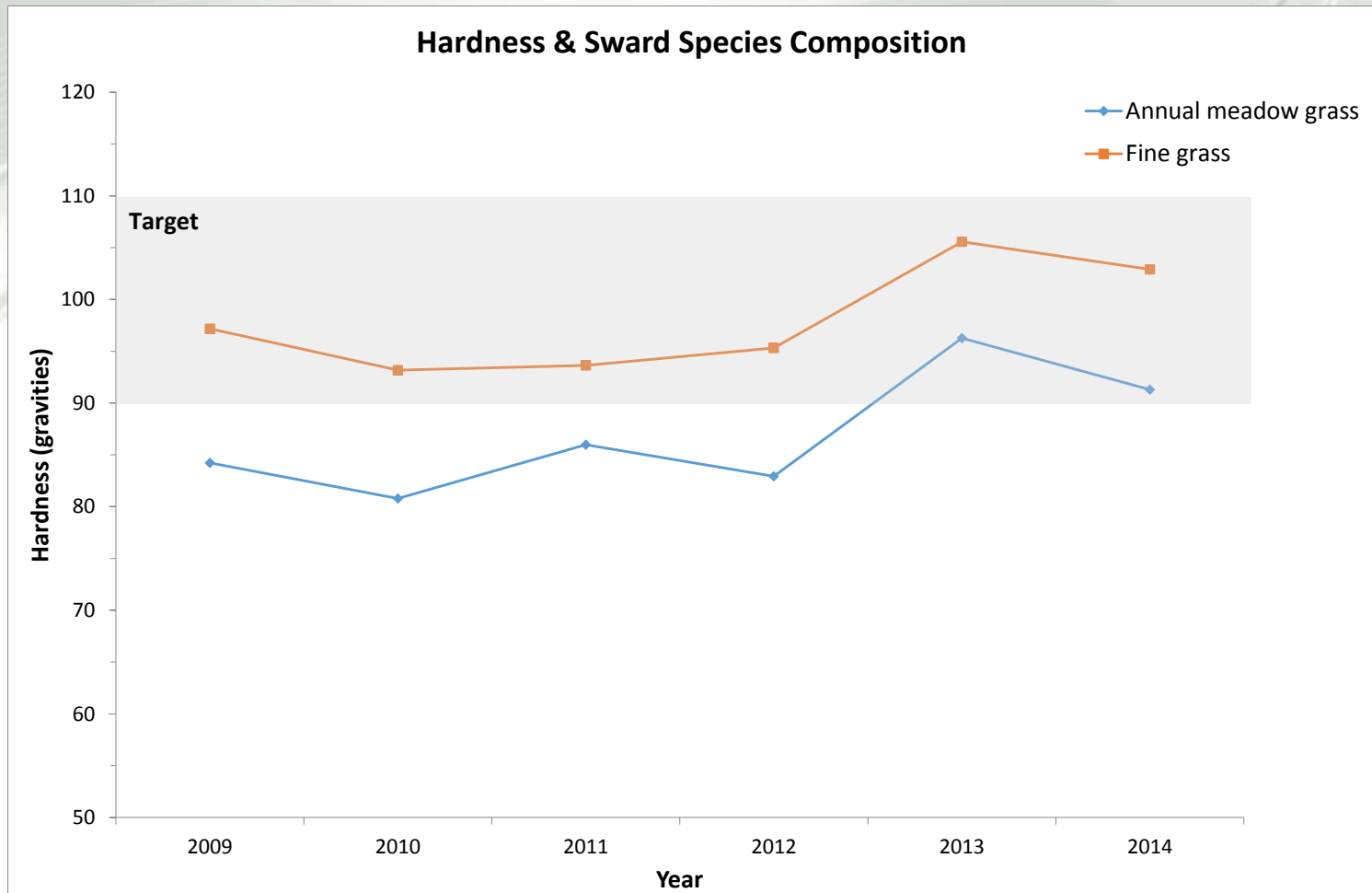


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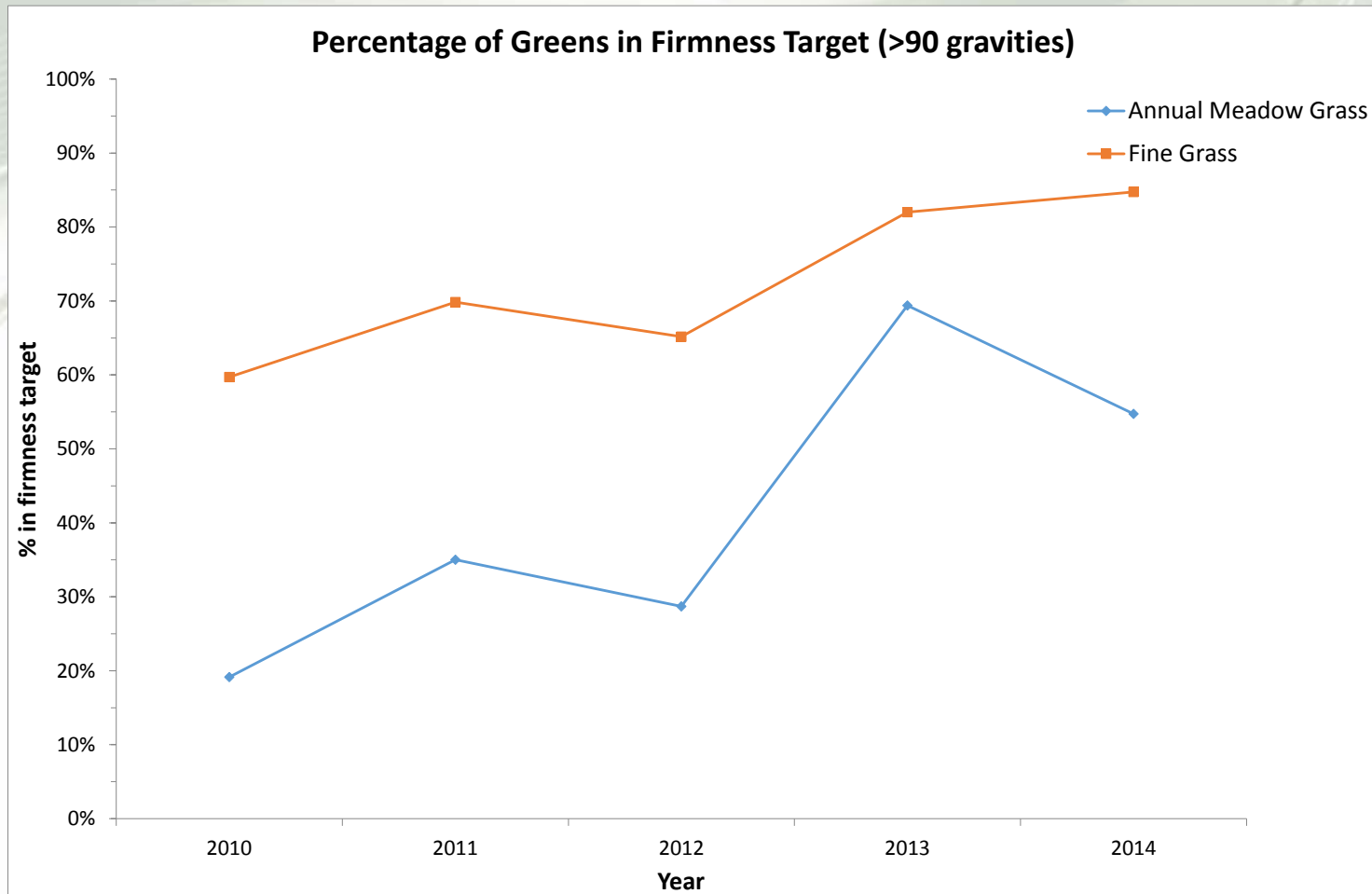
Fine grass



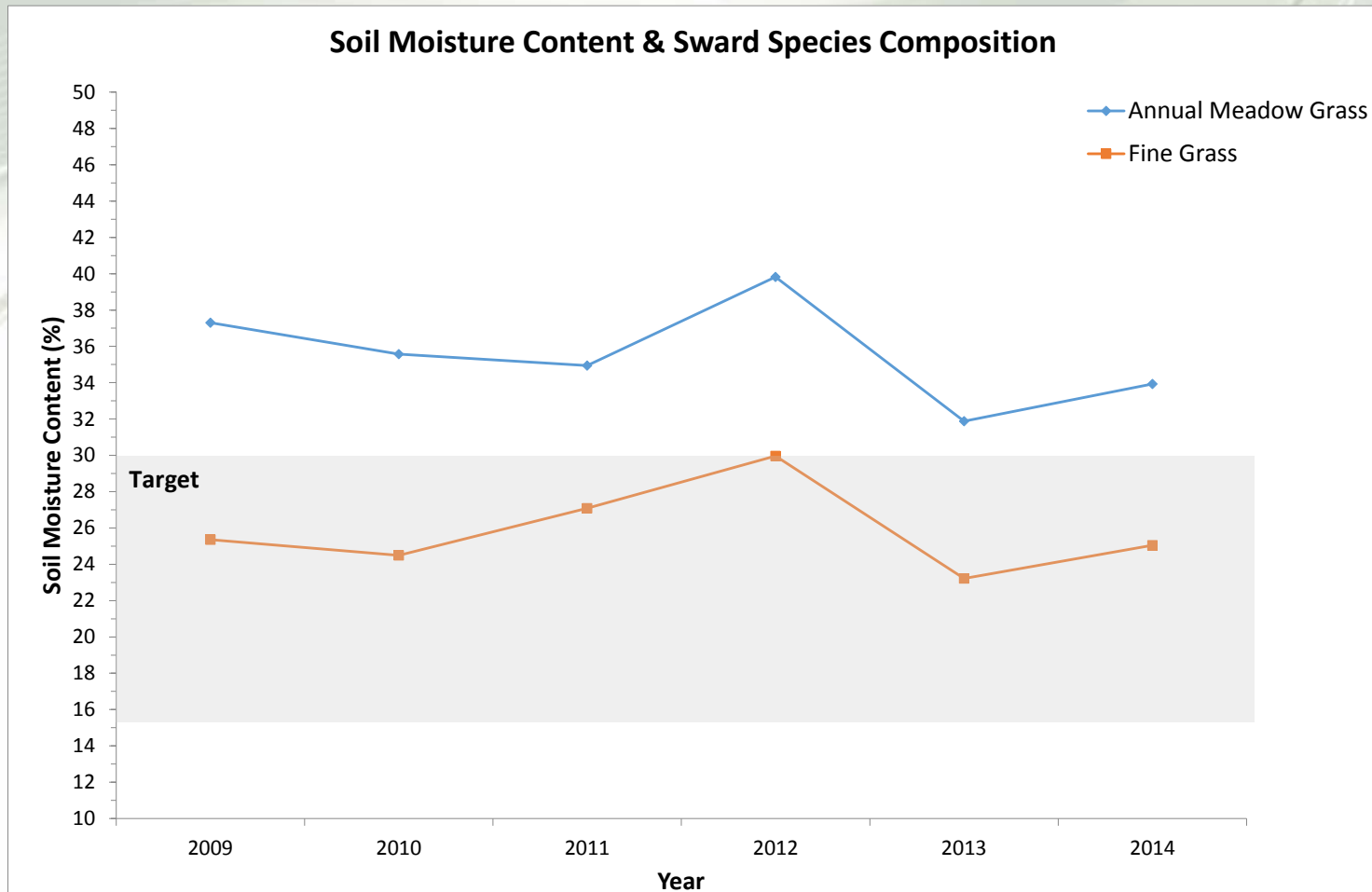
Firmness & Sward Species



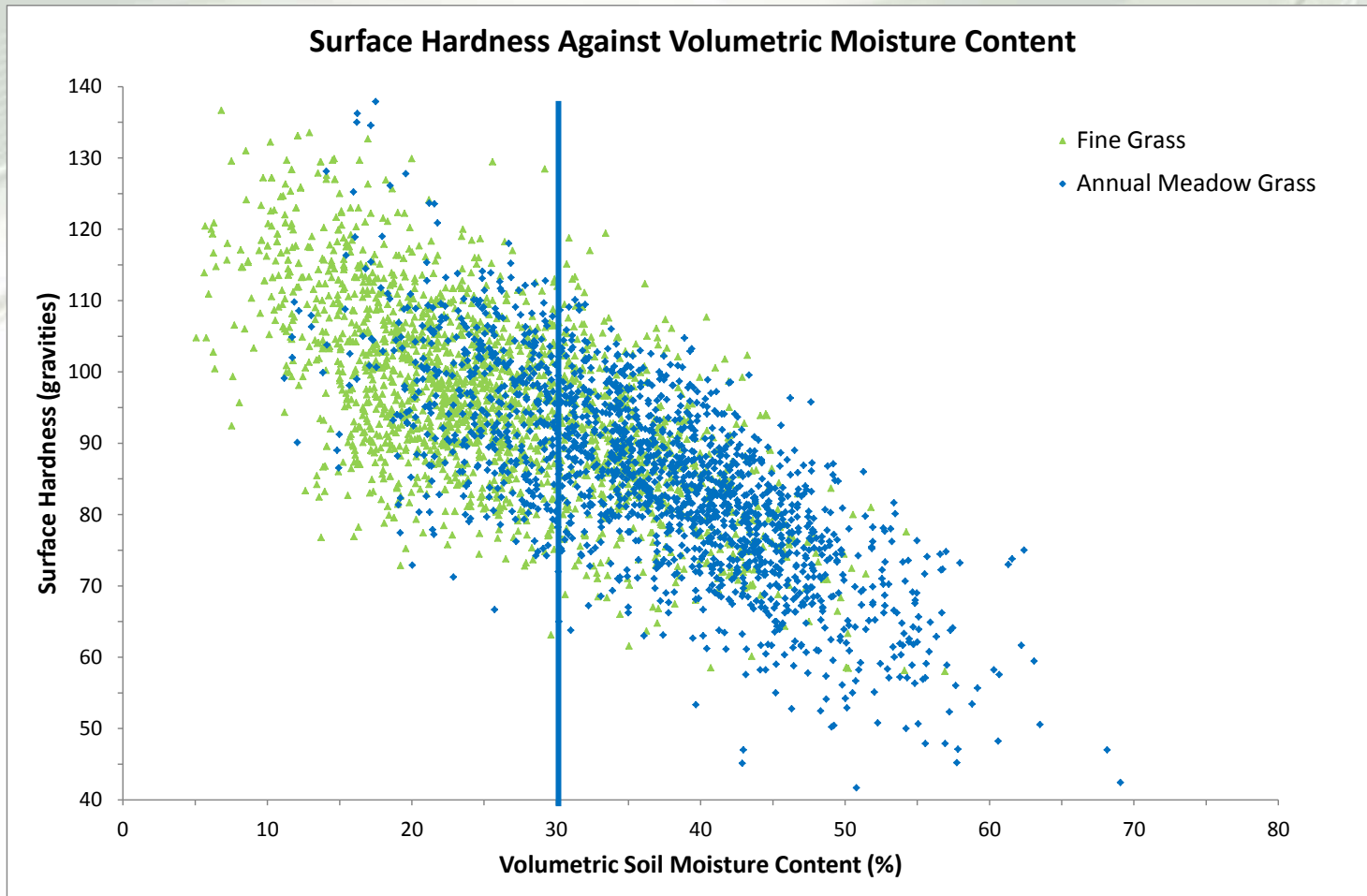
Firmness & Sward Species % in Target



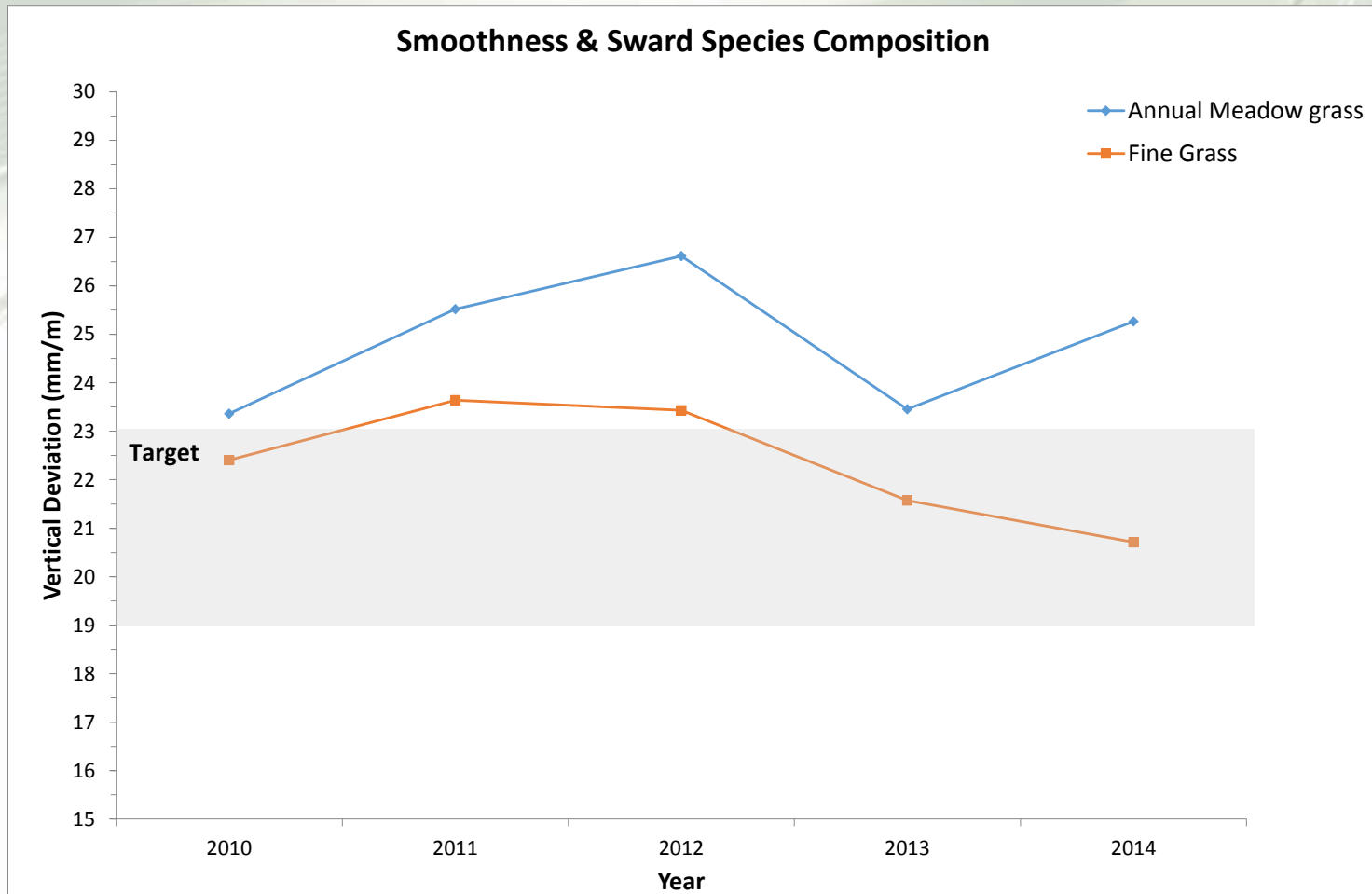
Soil Moisture & Sward Species



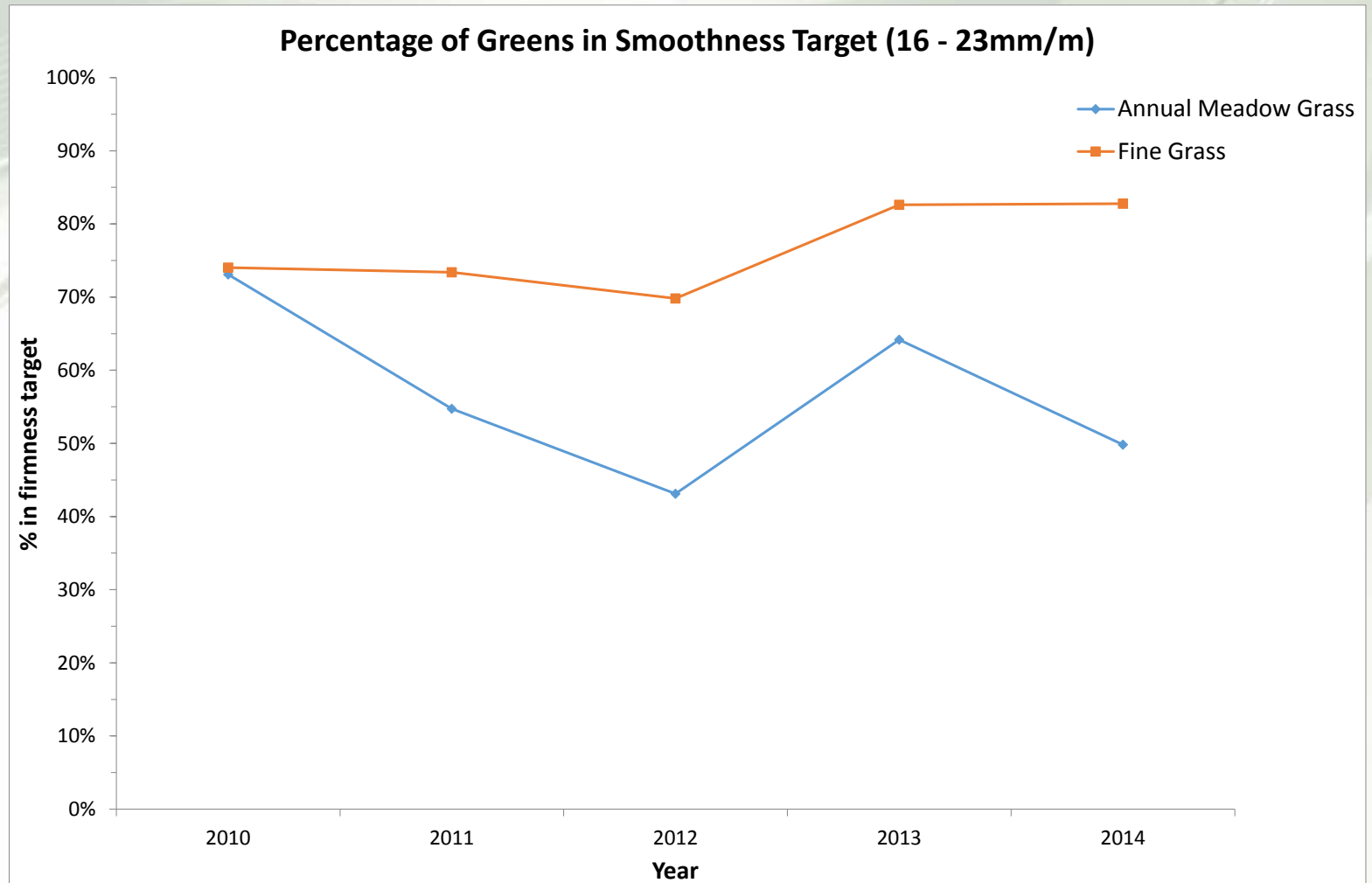
Firmness v Moisture v Sward Species



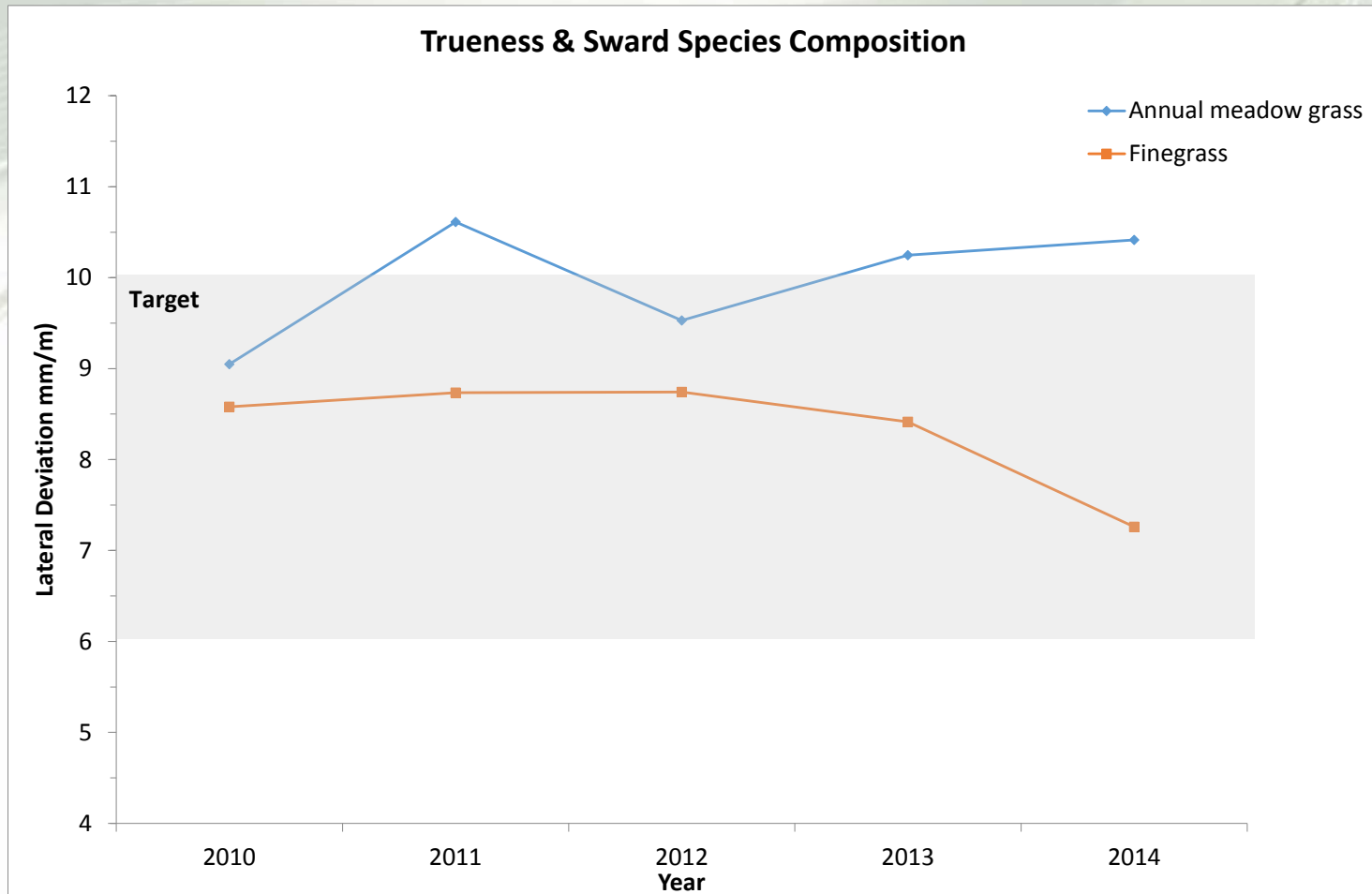
Smoothness & Sward Species



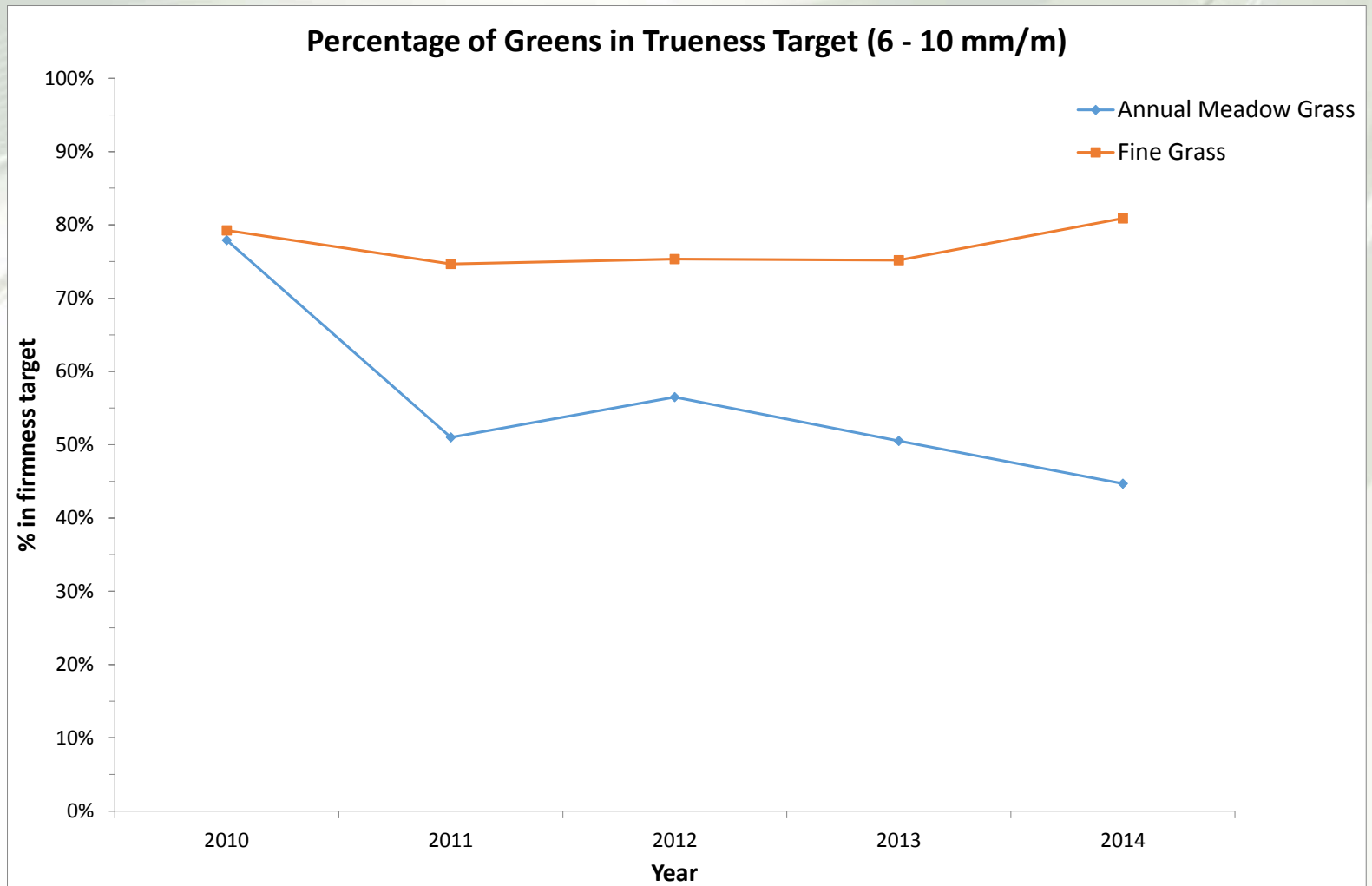
Smoothness & Sward Species % in Target



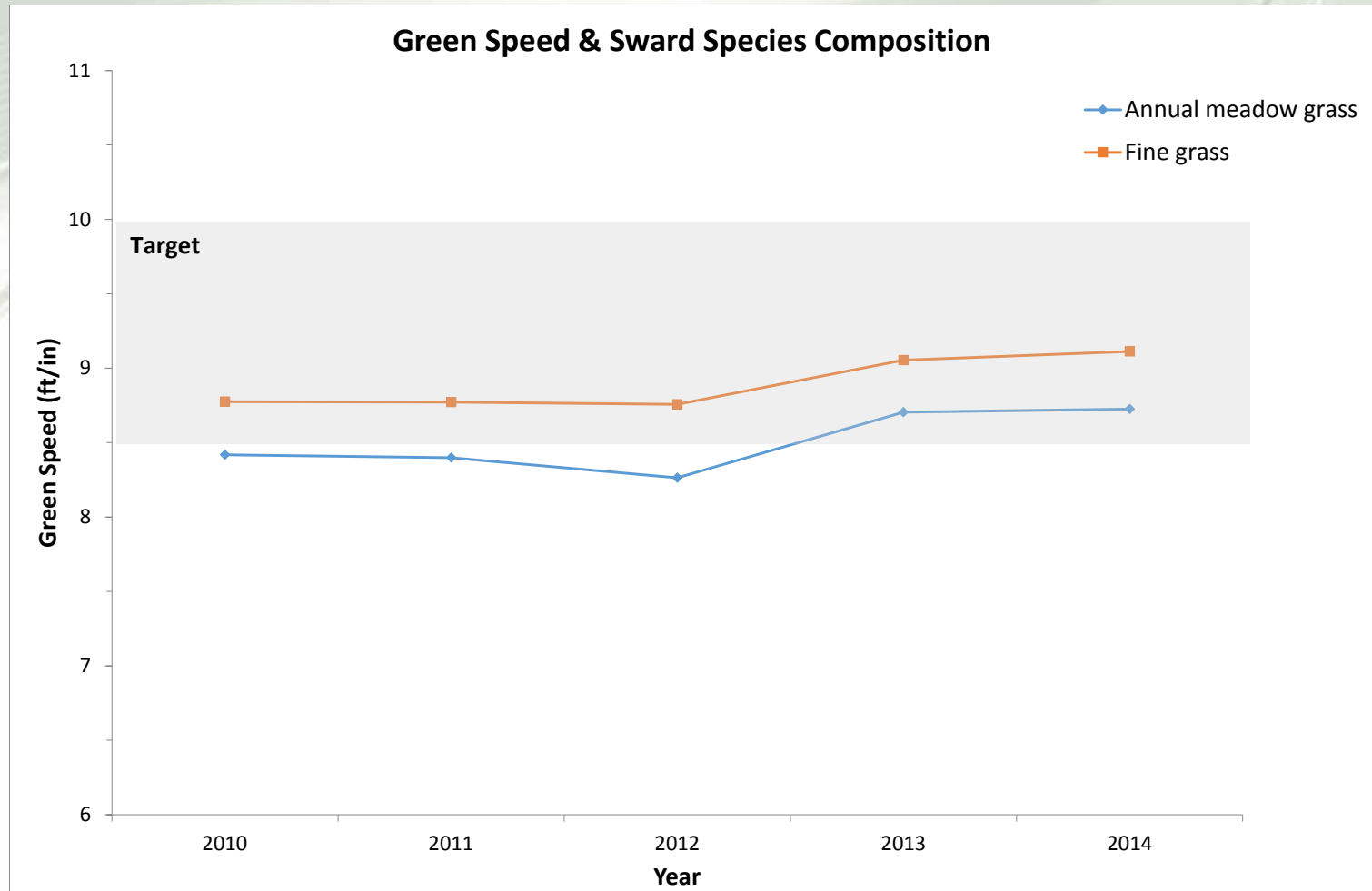
Trueness & Sward Species



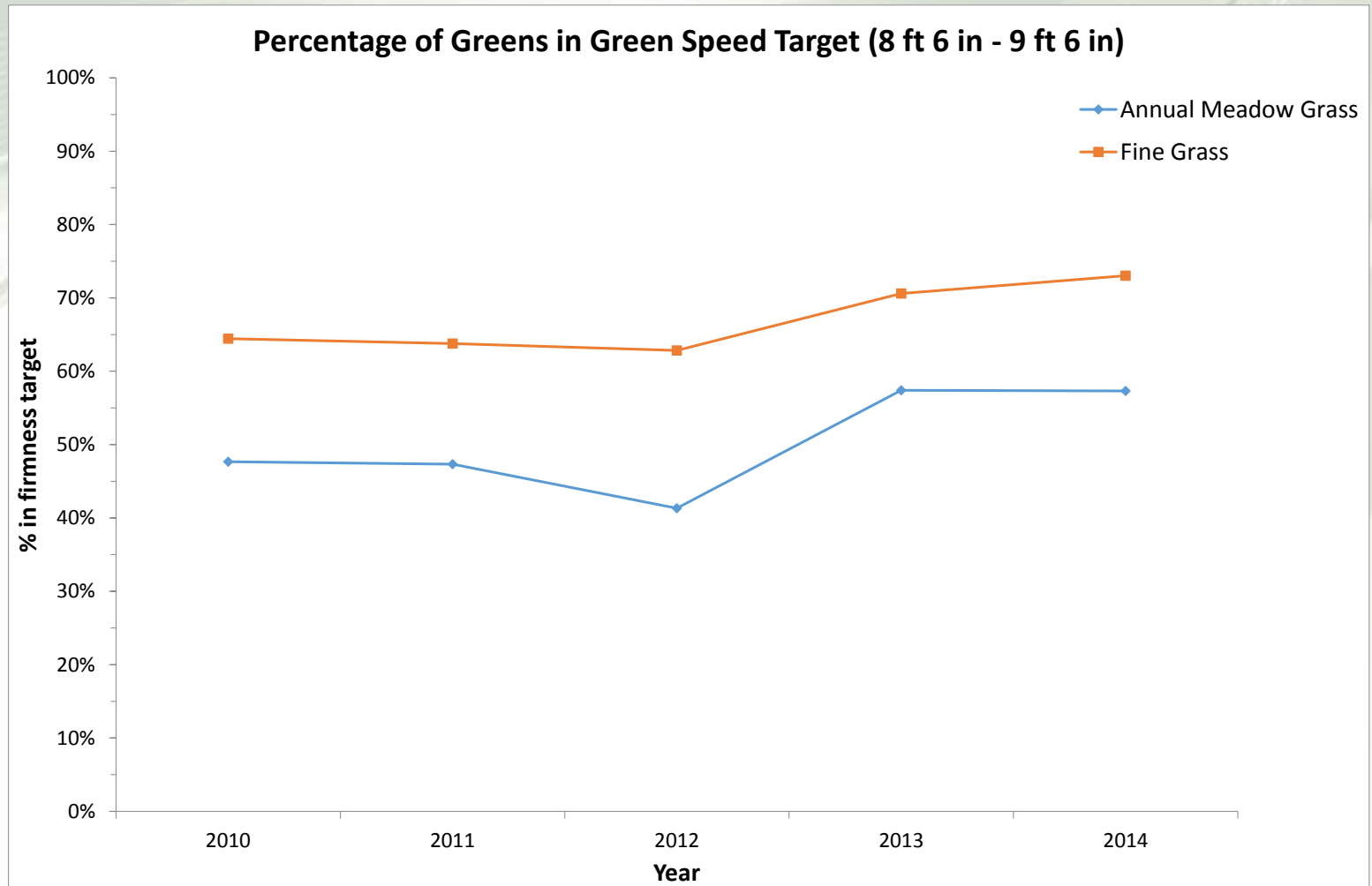
Trueness & Sward Species % in Target



Green Speed & Sward Species



Green Speed & Sward Species % in Target



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CONCLUSIONS

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2009-2014

- Fine grass swards drier, firmer, faster, smoother, truer and more consistent
- Annual meadowgrass requires higher inputs to deliver high performance
- From 2015 data collection classified by more sward types

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