

“Are we specifying grass species for the climate of the past or the climate of the future?"

.

When Our Grasslands Stop Functioning

GREEN PIGEON CONSULTING



Category	Typical Duration	Visible Effect	Potential Impact on Carbon Capture
Dry Spell	1-2 weeks	Reduced growth, slight discolouration	Minimal
Mild Drought	2-4 weeks	Growth slows, some browning on shallow soils	10-20% reduction
Moderate Drought	4-6 weeks	Significant browning, ryegrass stress evident	20-40% reduction
Severe Drought	6-8 weeks	Widespread dormancy, growth largely stopped	40-60% reduction
Extreme Drought	**>8 weeks**	**Extensive dormancy, thinning, loss of cover in places**	**60-70%+ reduction**



When Our Grasslands Stop Functioning

GREEN PIGEON CONSULTING



Scenario	Lost Carbon Capture	CO_2 Equivalent
Mild drought impact	0.1 t C/ha	0.4 t CO_2e/ha
Significant ryegrass dormancy	0.2-0.4 t C/ha	0.7-1.5 t CO_2e/ha
Severe drought & widespread dormancy	0.4-0.6 t C/ha	1.5-2.2 t CO_2e/ha



When Our Grasslands Stop Functioning

GREEN PIGEON CONSULTING



Assumed Lost Carbon Capture	Royal Parks Grassland Area	Total Potential Lost Capture	Converted to CO_2e:
0.4 t C/ha	1,400 ha	560 t C	2,055 tonnes
0.6 t C/ha	1,400 ha	840 t C	3,083 tonnes



When Our Grasslands Stop Functioning

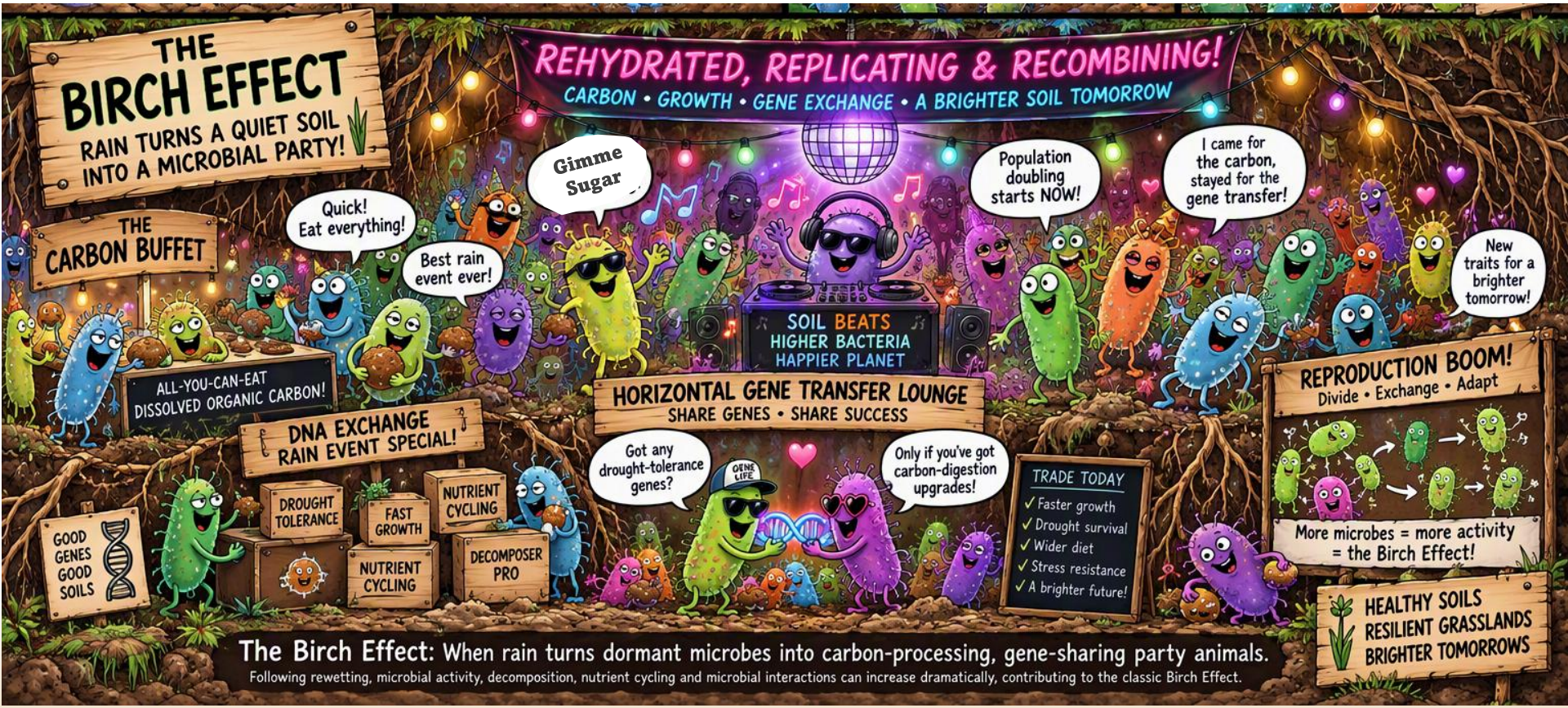
The Birch Effect!



H F Birch 1958

When Our Grasslands Stop Functioning

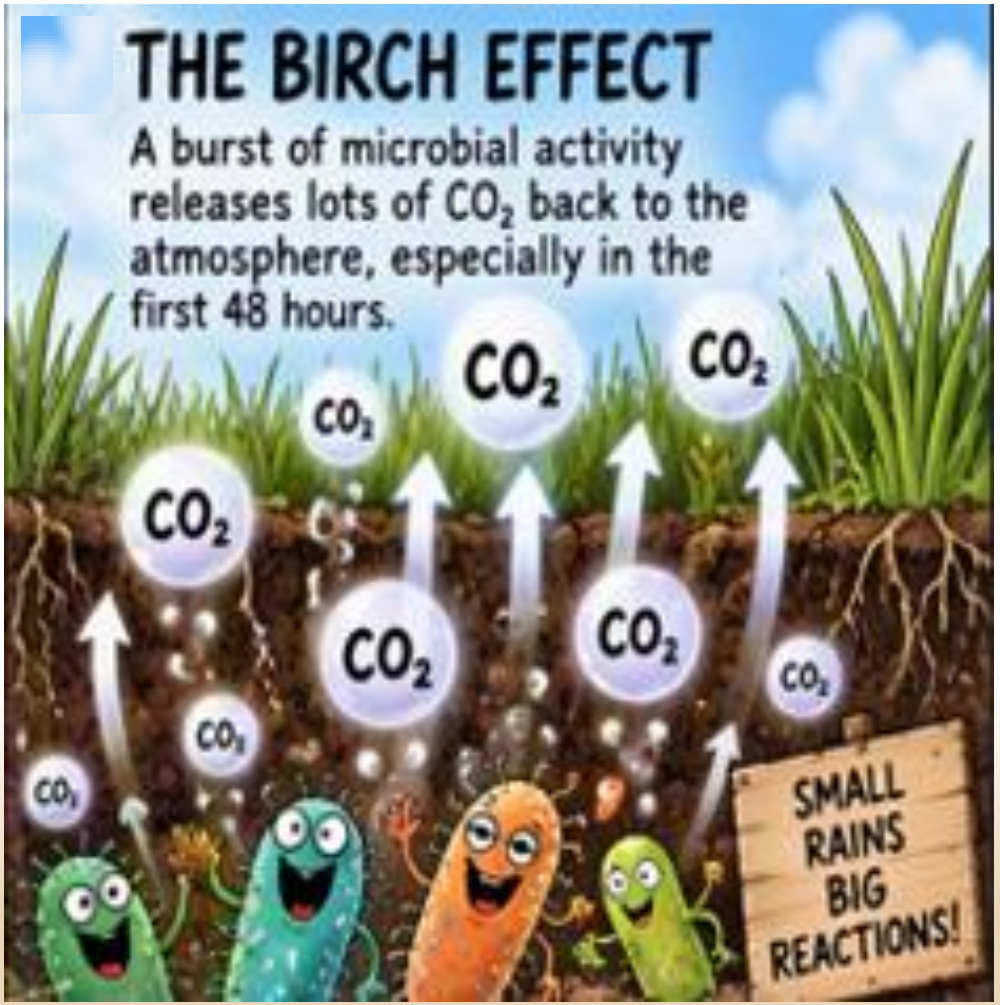
The Birch Effect!



H F Birch 1958

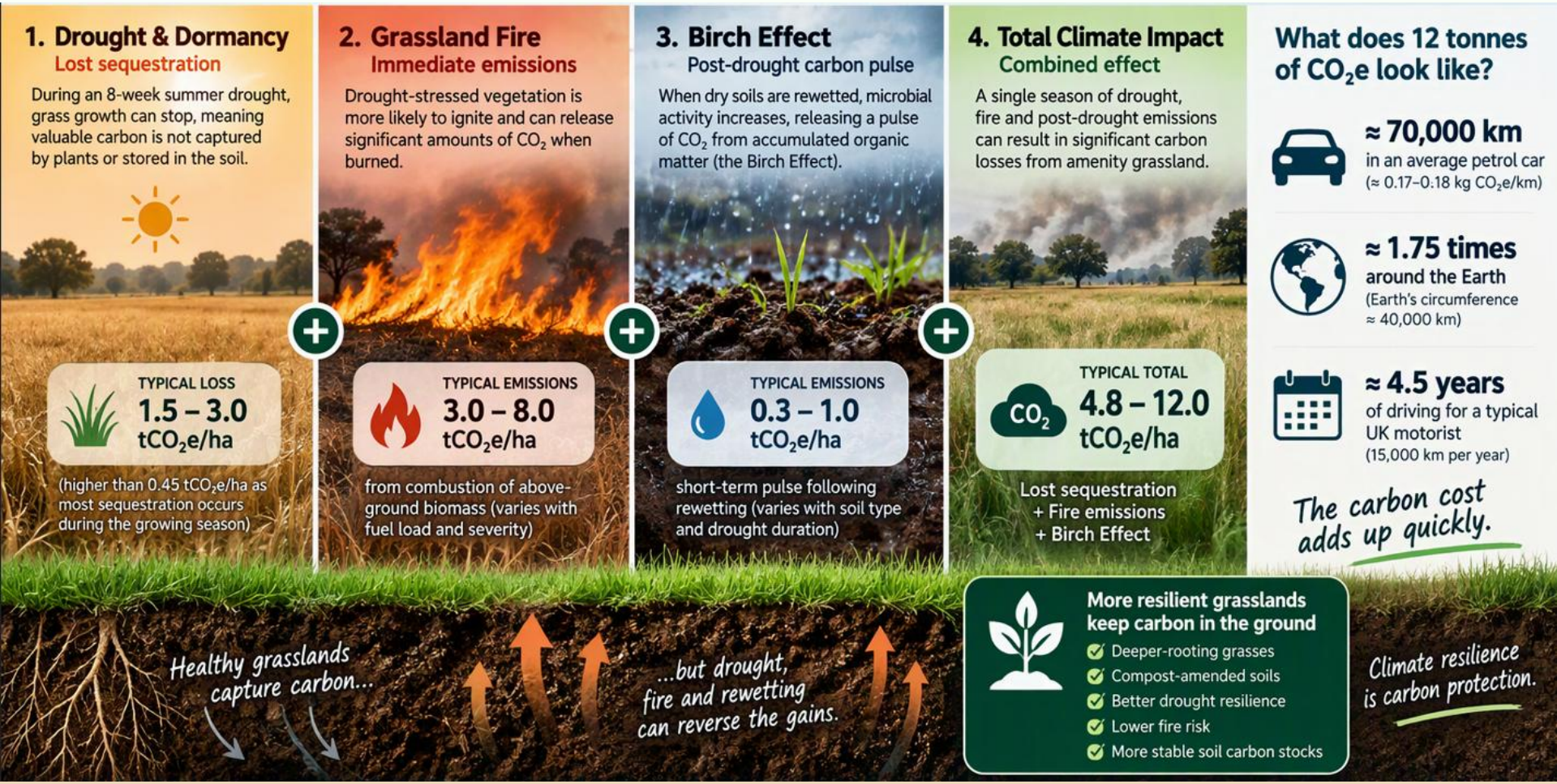
When Our Grasslands Stop Functioning

The Birch Effect!



When Our Grasslands Stop Functioning

GREEN PIGEON CONSULTING



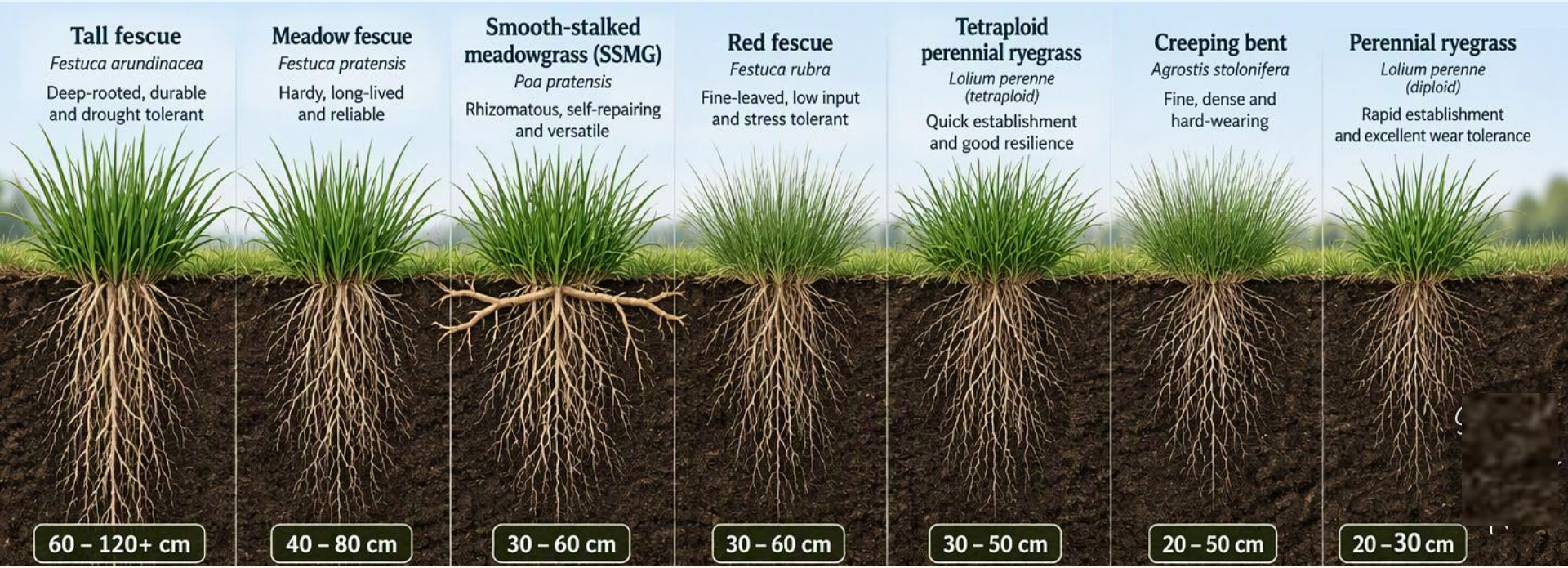
GREEN PIGEON CONSULTING

Rethinking Amenity Grassland for a Changing Climate

Carbon Grasses and / or Drought Resilience?

GREEN PIGEON CONSULTING

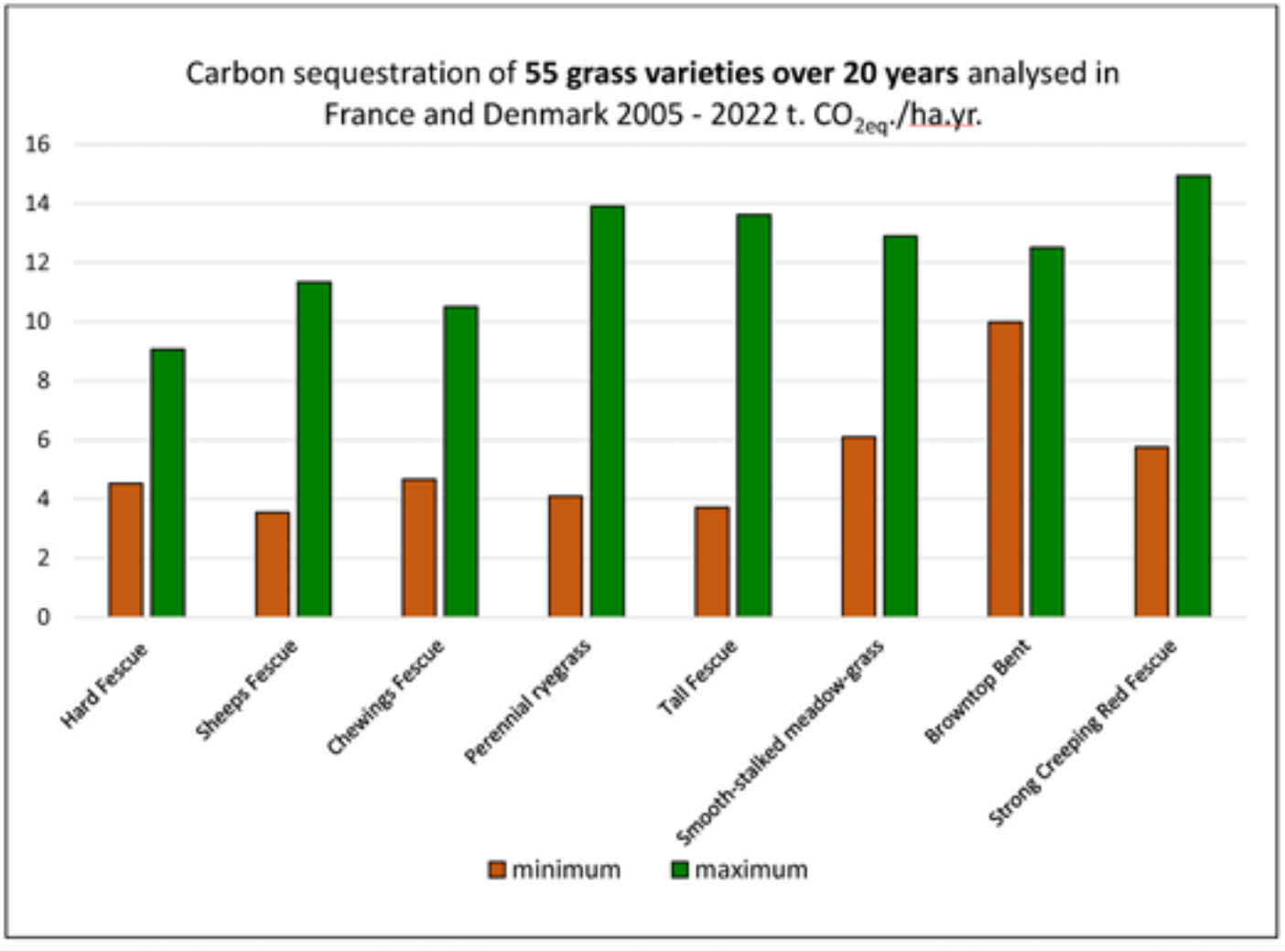
Amenity Grasses for UK Parks and Cemeteries



Carbon Grasses and / or Drought Resilience?

GREEN PIGEON CONSULTING

Carbon sequestration in turfgrass 20 years of results
Stephen Alderton, Howard Wood. Turfgrass Ecosystem Services and Biodiversity



Carbon Grasses and / or Drought Resilience?

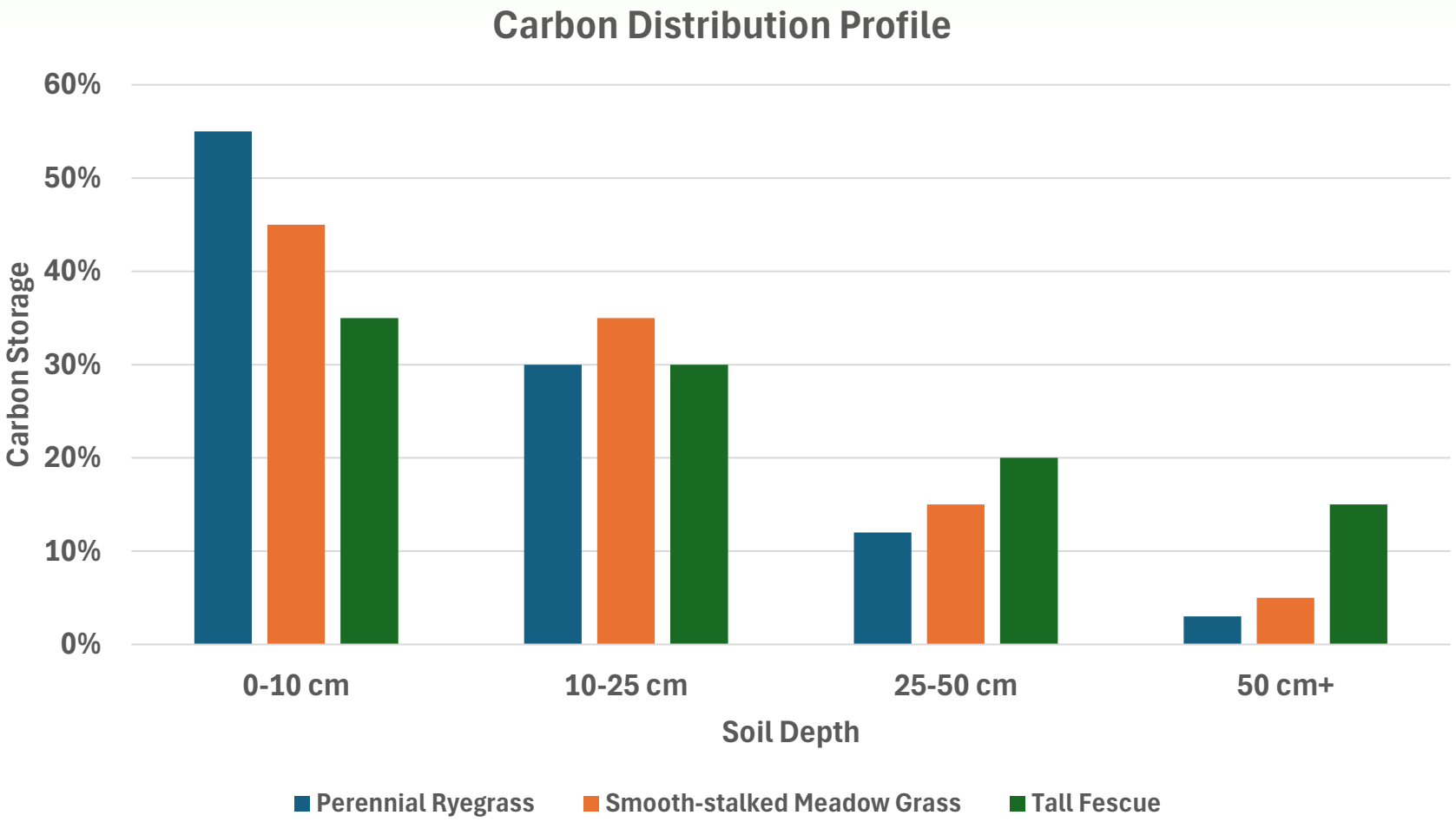
GREEN PIGEON CONSULTING

The associated Carbon4Grass methodology describes samples being divided into:

- 0-15 mm
- 16-50 mm
- 51-70 mm

Carbon Grasses and / or Drought Resilience?

GREEN PIGEON CONSULTING



Carbon Grasses and / or Drought Resilience?

GREEN PIGEON CONSULTING

Species	Annual carbon input potential	Carbon persistence potential	Long-term carbon resilience
Perennial Ryegrass	Moderate	Low	Moderate-Low
Smooth Stalked Meadow Grass	Moderate-High	Moderate-High	High
Tall fescue	High	High	Very High

Carbon Grasses and /or Drought Resilience?

GREEN PIGEON CONSULTING

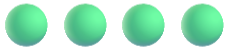
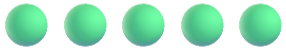
Species	Wear	Drought	Carbon
Tall Fescue	4	5	5
Cocksfoot	3	5	5
SSMG	4	4	4
Meadow Oat-grass	3	4	5
Strong Creeping Red Fescue	3	4	4
Sheep's Fescue	2	5	4
Hard Fescue	2	5	4
Tetraploid Ryegrass	4	3	3
Crested Dog's-tail	2	4	3
Perennial Ryegrass	5	2	2

If Drought Resilience Is Your Priority

GREEN PIGEON CONSULTING

Option 1: Maximum Drought and Carbon Resilience Mix
Suitable for: Parks, cemeteries, open space, road verges, climate adaptation projects.

Species	%	Primary Benefit
Tall Fescue	**45**	Deep rooting, drought resilience
Sheep's Fescue	**20**	Dry soil tolerance
Strong Creeping Red Fescue	**15**	Persistence and ground cover
Meadow Oat-grass	**10**	Deep rooting and longevity
Smooth-stalked Meadowgrass	**5**	Self-repair through rhizomes
Crested Dog's-tail	**5**	Biodiversity and low-input performance

Attribute	Performance Score
Drought Resilience	
Carbon Sequestration	
Wear Tolerance	
Biodiversity Compatibility	

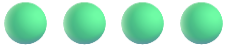
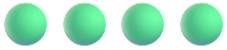
Not Every Situation Can Reduce Ryegrass

GREEN PIGEON CONSULTING

Option 2: Climate-Resilient Sports Pitch Mix

Designed to retain the wear tolerance required for sport while introducing deeper-rooting species for drought resilience.

Species	%	Purpose
Perennial Ryegrass	50	Wear tolerance and recovery
Smooth-stalked Meadowgrass	25	Rhizomes and self-repair
Tall Fescue	15	Drought resilience and deeper rooting
Tetraploid Ryegrass	10	Improved summer performance and rooting

Attribute	Rating
Wear Tolerance	
Recovery	
Drought Resilience	
Carbon Sequestration	
Climate Resilience	

What If Biodiversity Is Also a Priority?

GREEN PIGEON CONSULTING

Option 3: Carbon + Drought + Biodiversity Meadow Base
Suitable for: Species-rich meadows on alkaline sandy loam soils

Species	%	
Tall Fescue	30	75%
Sheep's Fescue	20	
Strong Creeping Red Fescue	12	
Smooth-stalked Meadowgrass	5	
Crested Dog's-tail	5	
Meadow Oat-grass	3	
Wildflower Component (general mix)	25	25%

Attribute	Rating
Drought Resilience	●●●●●
Carbon Sequestration	●●●●●
Pollinator Value	●●●●●
Species Richness	●●●●●
Long-Term Resilience	●●●●●

The Trade-Off: Cost vs Resilience

GREEN PIGEON CONSULTING

Each of these mixes there will be a trade off with:

CAPEX v OPEX v RESILIENCE

There is no single grass mixture that meets every objective.

We're not just selecting grass species. We're shaping places that influence biodiversity, climate resilience, public health and community wellbeing."

The Right Grass in the Right Place

GREEN PIGEON CONSULTING

The challenge for local authorities is not finding the perfect mix.

It is selecting the right mix for the right location and management objective.

Right Species Right Location?

GREEN PIGEON CONSULTING

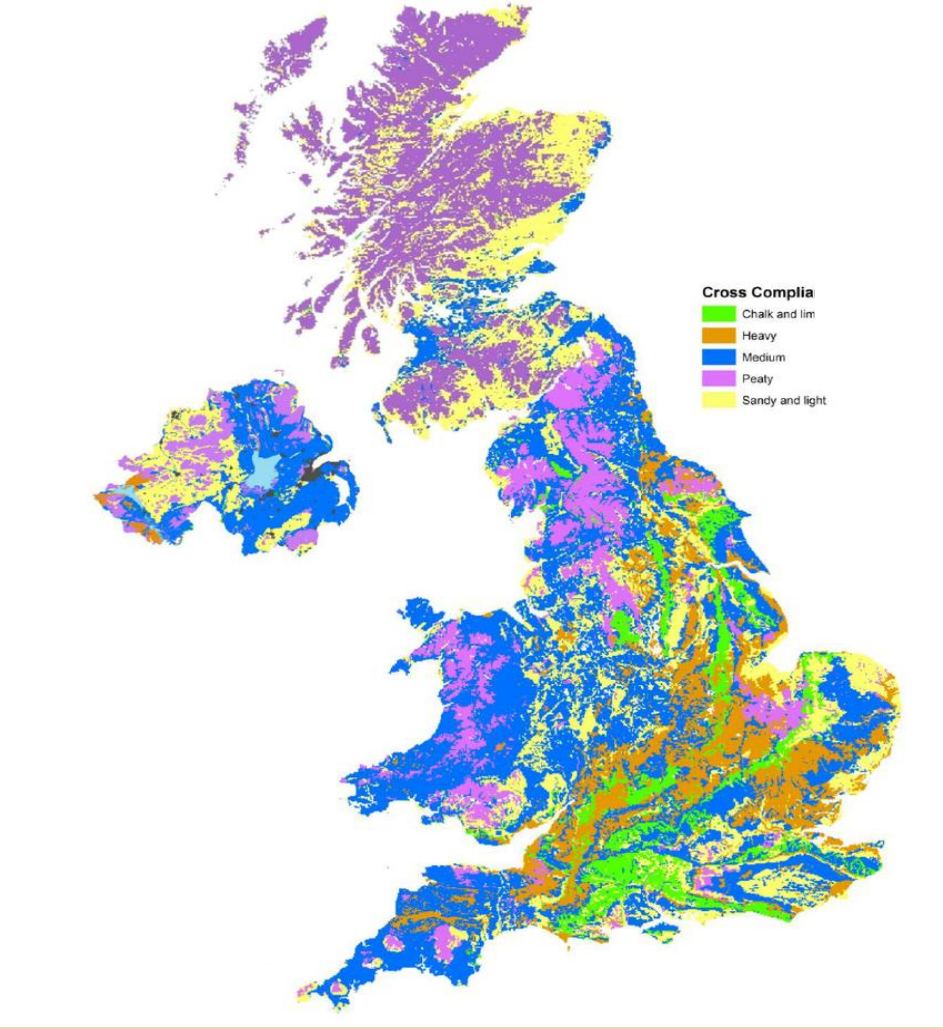
You can't manage what you don’t measure!

Without understanding soil properties, we risk mismatching grass and forbe species to soil types.

Right Species Right Location?

GREEN PIGEON CONSULTING

UK soils are multi-variable, nationally, regionally and locally.

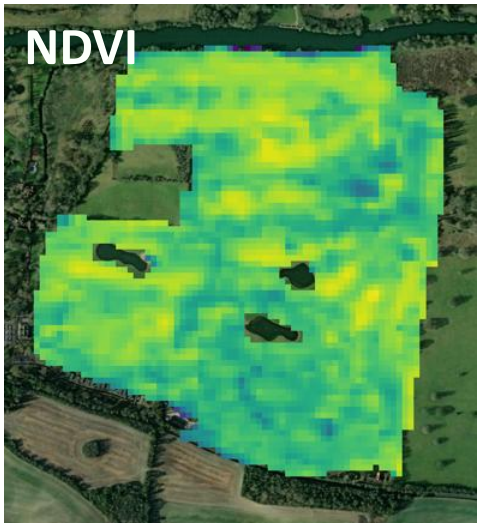


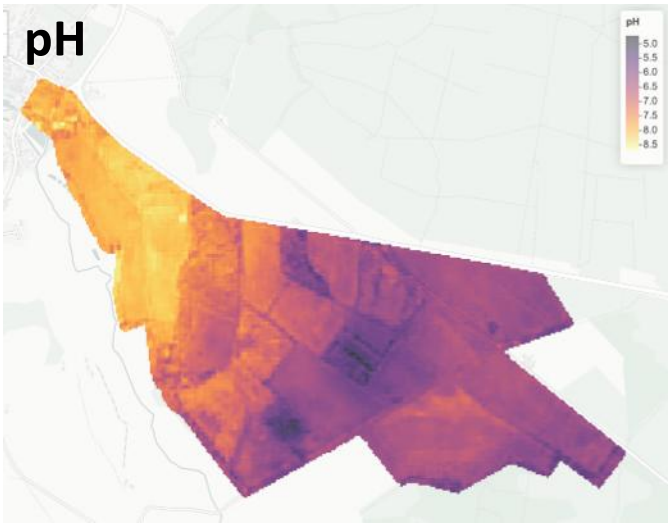
	Chalk or Limestone
	Heavy (clays)
	Medium (loams)
	Peaty
	Sandy

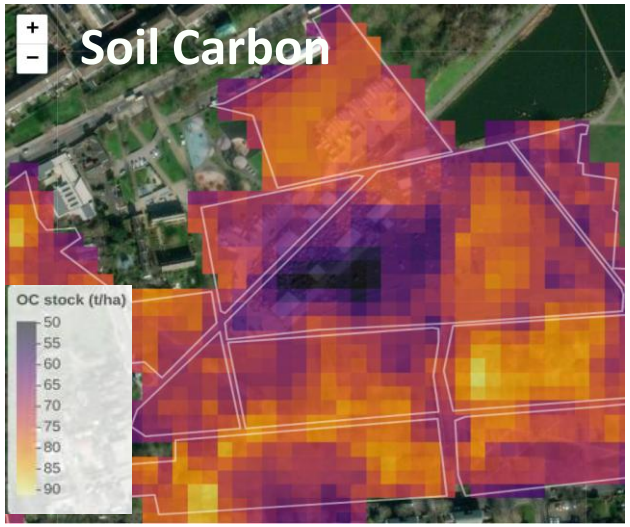
Using Soil Data to Target Species Selection

GREEN PIGEON CONSULTING

Soil physical and chemical properties vary field to field and within field







Co-Variate Mapping provides cost effective spatial information for management strategies

The Right Species for the Right Soil

GREEN PIGEON CONSULTING

Species performance varies significantly with soil texture and moisture conditions.

Species	Clay	Loam	Sandy	Wet Soils	Dry Soils
Tall Fescue	🟢	🟢	🟢	🟢	🟢
Smooth-stalked Meadowgrass	🟢	🟢	🟡	🟢	🟡
Perennial Ryegrass	🟢	🟢	🟠	🟡	🔴
Tetraploid Ryegrass	🟢	🟢	🟡	🟡	🟡
Strong Creeping Red Fescue	🟡	🟢	🟢	🟡	🟢
Slender Creeping Red Fescue	🟠	🟡	🟢	🔴	🟢
Sheep's Fescue	🔴	🟡	🟢	🔴	🟢
Hard Fescue	🟠	🟡	🟢	🔴	🟢
Crested Dog's-tail	🟠	🟢	🟢	🟡	🟡
Meadow Oat-grass	🟡	🟢	🟢	🟡	🟢
Cocksfoot	🟢	🟢	🟢	🟡	🟢

Rating: 🟢 Excellent | 🟡 Good | 🟠 Moderate | 🔴 Poor

The Right Species for the Right Soil Chemistry

GREEN PIGEON CONSULTING

Best Species by pH

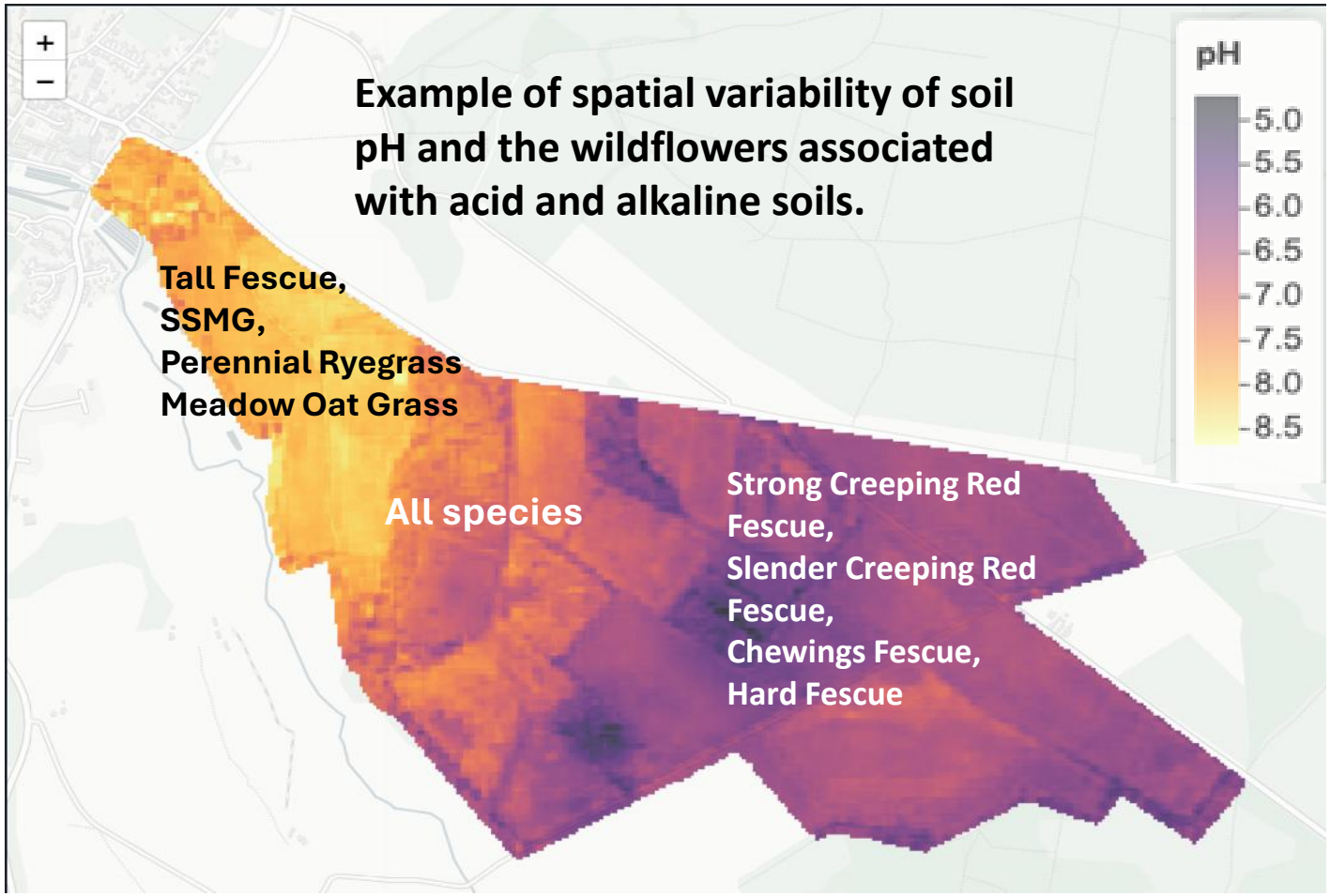
Species	Acid pH 4.5-6.0	Neutral pH 6.0-7.5	Alkaline pH 7.5-8.5
Tall Fescue	🟡	🟢	🟢
Smooth-stalked Meadowgrass	🟡	🟢	🟢
Perennial Ryegrass	🟡	🟢	🟡
Tetraploid Ryegrass	🟡	🟢	🟡
Strong Creeping Red Fescue	🟢	🟢	🟡
Slender Creeping Red Fescue	🟢	🟡	🔴
Sheep’s Fescue	🟢	🟡	🟡
Hard Fescue	🟢	🟡	🟡
Crested Dog's-tail	🟢	🟢	🔴
Meadow Oat-grass	🟡	🟢	🟢
Cocksfoot	🟡	🟢	🟢

Rating: 🟢 Excellent | 🟡 Good | 🟠 Moderate | 🔴 Poor

Right Species Right Location?

GREEN PIGEON CONSULTING

Using remote sensing helps identify soil type changes and make agronomic decisions on a defined spatial scale



Case Study – Grass Selection to Soil Type

GREEN PIGEON CONSULTING

Soil physical and chemical properties vary field to field and within field

Case Study:

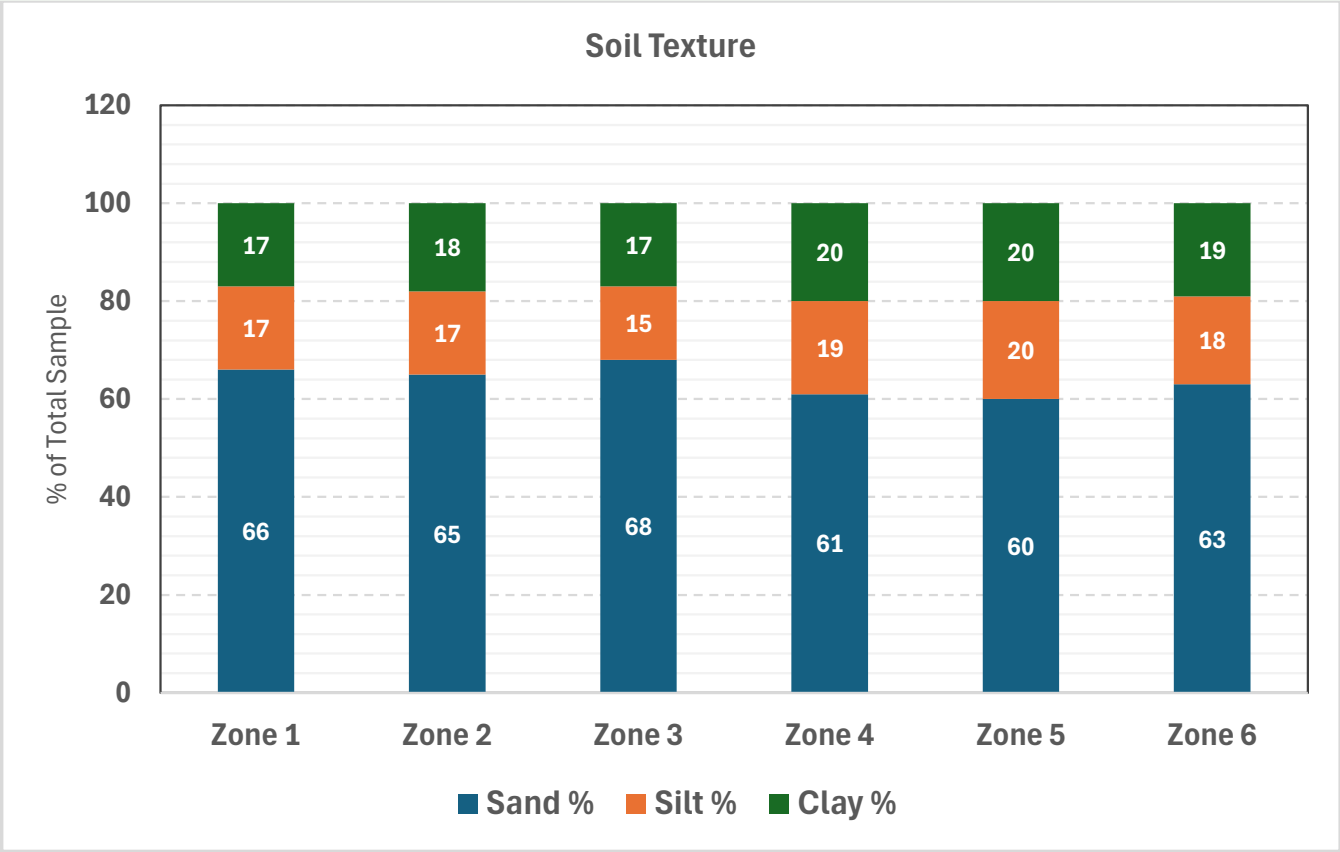
Cemetery Norfolk



Case Study – Grass Selection to Soil Type

GREEN PIGEON CONSULTING

Soil physical and chemical properties vary field to field and within field



ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6
Sandy Loam	Sandy Loam	Sandy Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam

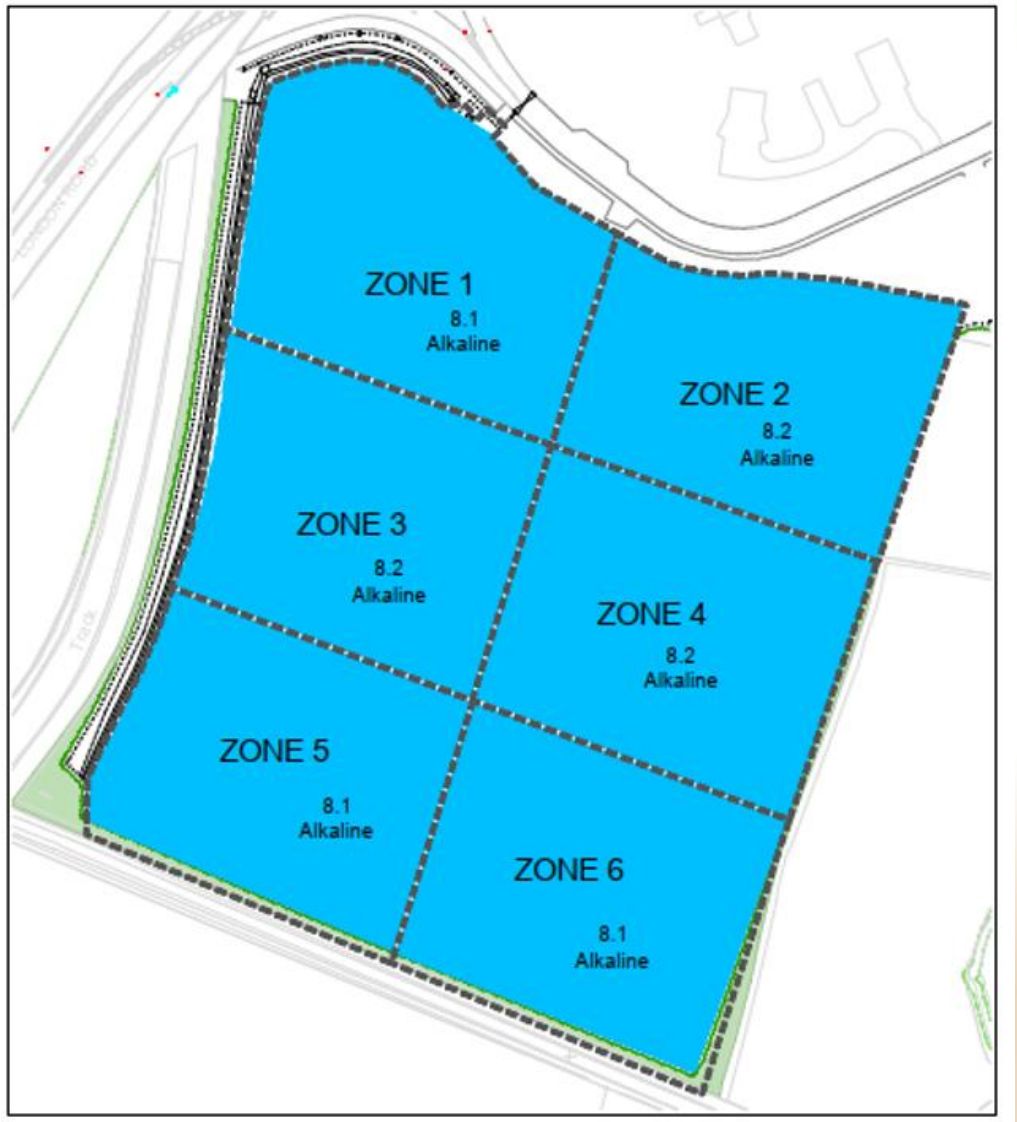
Case Study – Grass Selection to Soil Chemistry

GREEN PIGEON CONSULTING

Soil physical and chemical properties vary field to field and within field

pH

	<5.0	Strongly Acidic
	5.0-5.5	Acidic
	5.6-6.0	Moderately Acidic
	6.1-6.5	Slightly Acidic
	6.6-7.2	Neutral / Optimum
	7.3-7.8	Slightly Alkaline
	7.9-8.4	Alkaline
	8.5-9.0	Strongly Alkaline



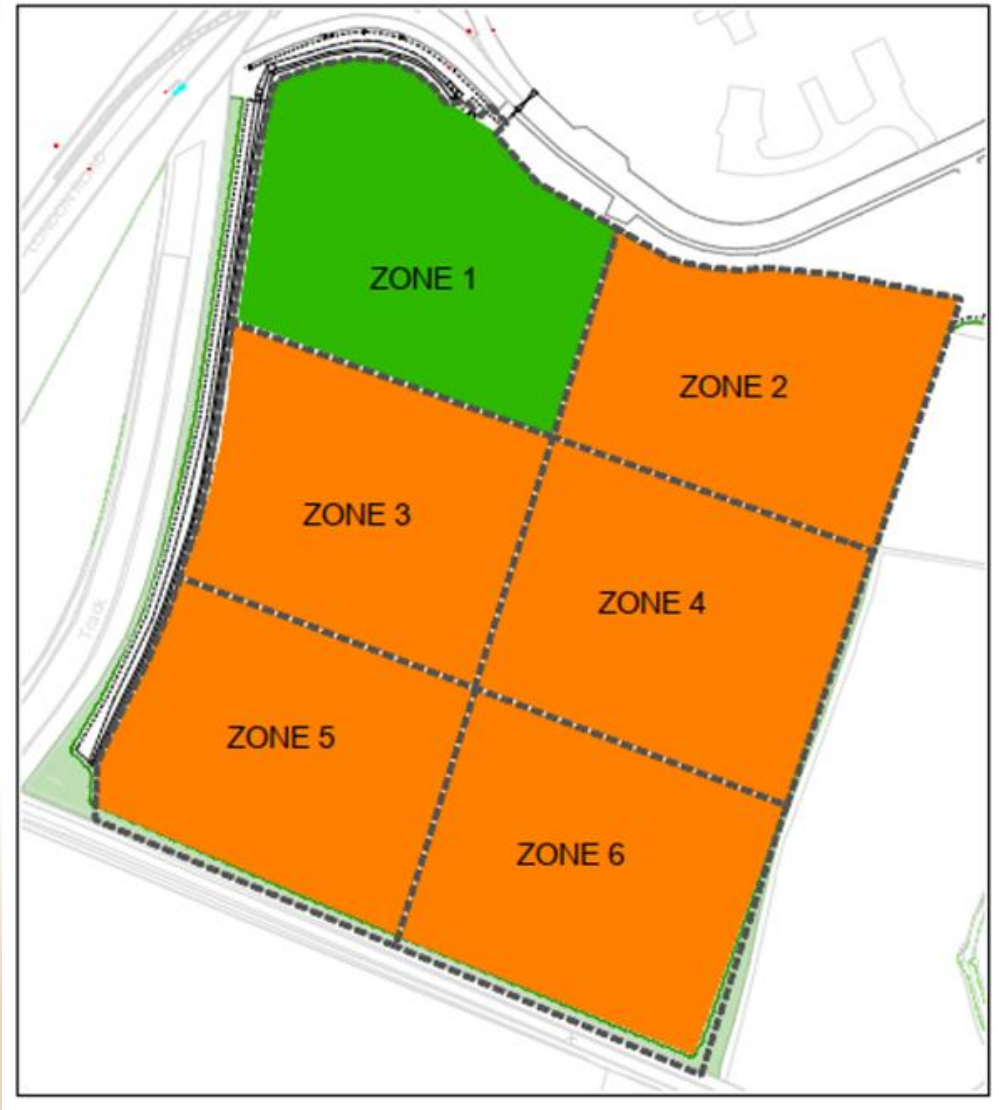
Case Study – Grass Selection to Soil Chemistry

GREEN PIGEON CONSULTING

Soil physical and chemical properties vary field to field and within field

P – Phosphorus (Phosphate) Index Map

Colour Index	Range	Description
	0	Very low, deficient
	1	Low
	2-	Below target
	2	Target index
	2+	Above target
	3	High
	4+	Very high / excessive



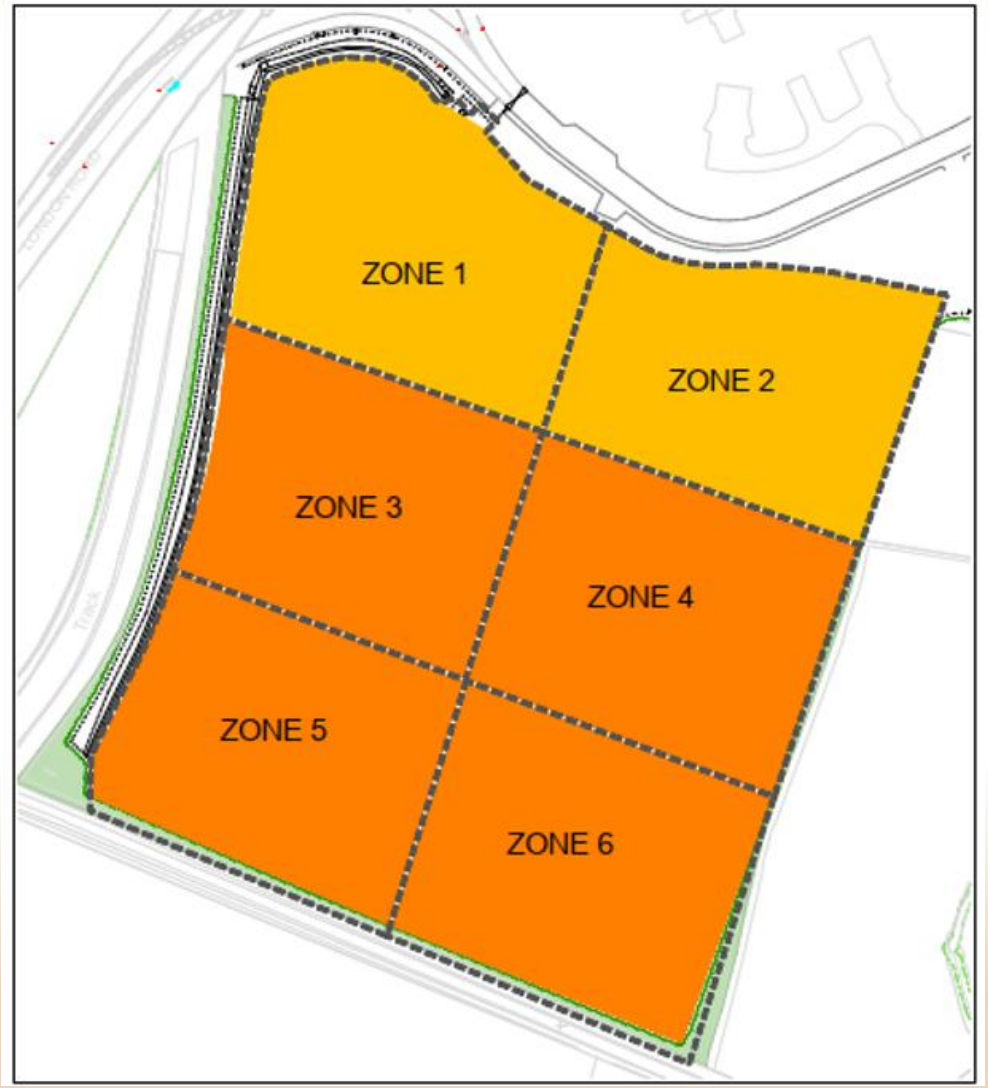
Case Study – Grass Selection to Soil Type

GREEN PIGEON CONSULTING

Soil physical and chemical properties vary field to field and within field

K – Potassium
(Potash)
Index Map

Colour Index	Range	Description
	0	Very low, deficient
	1	Low
	2-	Below target
	2	Target index
	2+	Above target
	3	High
	4+	Very high / excessive



Understanding Your Soil Before Choosing Your Grass

GREEN PIGEON CONSULTING

Soil carbon stocks can vary significantly across a single site, influencing species selection and management strategy.

Zone	SOC (%)	Bulk Density	Depth (cm)	Carbon Stock (t C/ha)
1	1.2	1.18	30	42.5
2	1.0	1.20	30	36.0
3	1.3	1.24	30	48.4
4	1.1	1.25	30	41.3
5	1.2	1.25	30	45.0
6	1.0	1.22	30	36.6
Average				**41.6 tonnes /ha**

Understanding Your Soil Before Choosing Your Grass

GREEN PIGEON CONSULTING

Soil carbon stocks can vary significantly across a single site, influencing species selection and management strategy.

Soil Condition	SOC (%)	Carbon Stock t/ha (0-30 cm)	CO_2e equivalent t/ha (0-30 cm)
Current Site	**1.0-1.3**	**36-48 t C/ha**	**132-175 t/ha**
Good Managed Grassland	2.0-2.5	65-90 t C/ha	238-329 t/ha
Long-term Species-rich Grassland	2.5-3.5	85-120 t C/ha	311-440 t/ha
Excellent Carbon-rich Grassland	3.5-4.5	120-150 t C/ha	440-550 t/ha

Illustrative target scenario based on published soil carbon recovery literature and site-specific assumptions.

Case Study – Grass Selection to Soil Type

GREEN PIGEON CONSULTING

Formal Burial Area for Immediate Use with Carbon and Resilient Grasses and Micro-clover.

- **Low fertility**
- **pH 8.2**
- **Sandy Loam**

Grasses 95%	Forbes 5%
Tall Fescue 40% Strong Creeping Red Fescue 25% Smooth-stalked Meadow Grass 15% Slender Creeping Red Fescue 10% Crested Dog's-tail 5%	Micro clover 5%

Case Study – Grass Selection to Soil Type

GREEN PIGEON CONSULTING

Long-term Species Rich Grassland for Future Burial Use

Grasses 75%	Forbes 25%
Tall Fescue – 20% Sheep's Fescue – 20% Strong Creeping Red Fescue – 20% SSMG– 5% Crested Dog's-tail – 10% Meadow Oat-grass – 5%	Carbon Building & Drought-Resilient Species (15%) Salad Burnet – 4.0% Bird's-foot Trefoil – 3.0% Ribwort Plantain – 2.5% Yarrow – 2.0% Wild Marjoram – 2.0% Kidney Vetch 1.5% Pollinator & Chalk Grassland Species (10%) Greater Knapweed – 2.0% Field Scabious – 2.0% Small Scabious – 1.5% Viper's Bugloss – 1.5% Lady's Bedstraw – 1.0% Wild Basil – 1.0% Cowslip – 0.5% Bladder Campion – 0.5%

From Evidence to Action: Building Climate-Resilient Parks and Cemeteries

Green Pigeon + CDS Group

Climate-Resilient Grassland & Soil Audit Framework.

Framework summary: from field evidence to council action



Assess

Remote Sensing Field surveys, and target sampling

Measure

Soil analysis and soil assessments from selected target sites

Score

Process and report on data. Assess management strategies and actions

Act

Implement actions and strategies and build 10-year improvement roadmap

Council value Enables councils to measure, manage and improve the climate resilience, carbon value and biodiversity of their green spaces.

Applies to: Parks • Cemeteries • Road verges • Recreation grounds • Natural burial areas • Council grasslands

The Future
Building Climate Resilient Parks

GREEN PIGEON CONSULTING

