

Historic representation of land areas

Soils: demonstration not a source



Uncertainty

- Is this used in the wrong context?

- Method development not reporting

- Consistency; GPG *neither over nor underestimate*

But more emphasis given to conservative approach

- Lack of appropriate methodology

- If scientific method used is not rigorous and associated with high uncertainty we tend use it for LULUCF

- Mapping error difficult to quantify

- Incorrect application of GIS

- Scaling errors

- Maps are representations of the real world, not one is 100% accurate

- Classification error
- Scaling error
- Mapping error
- Projection error

- LULUCF

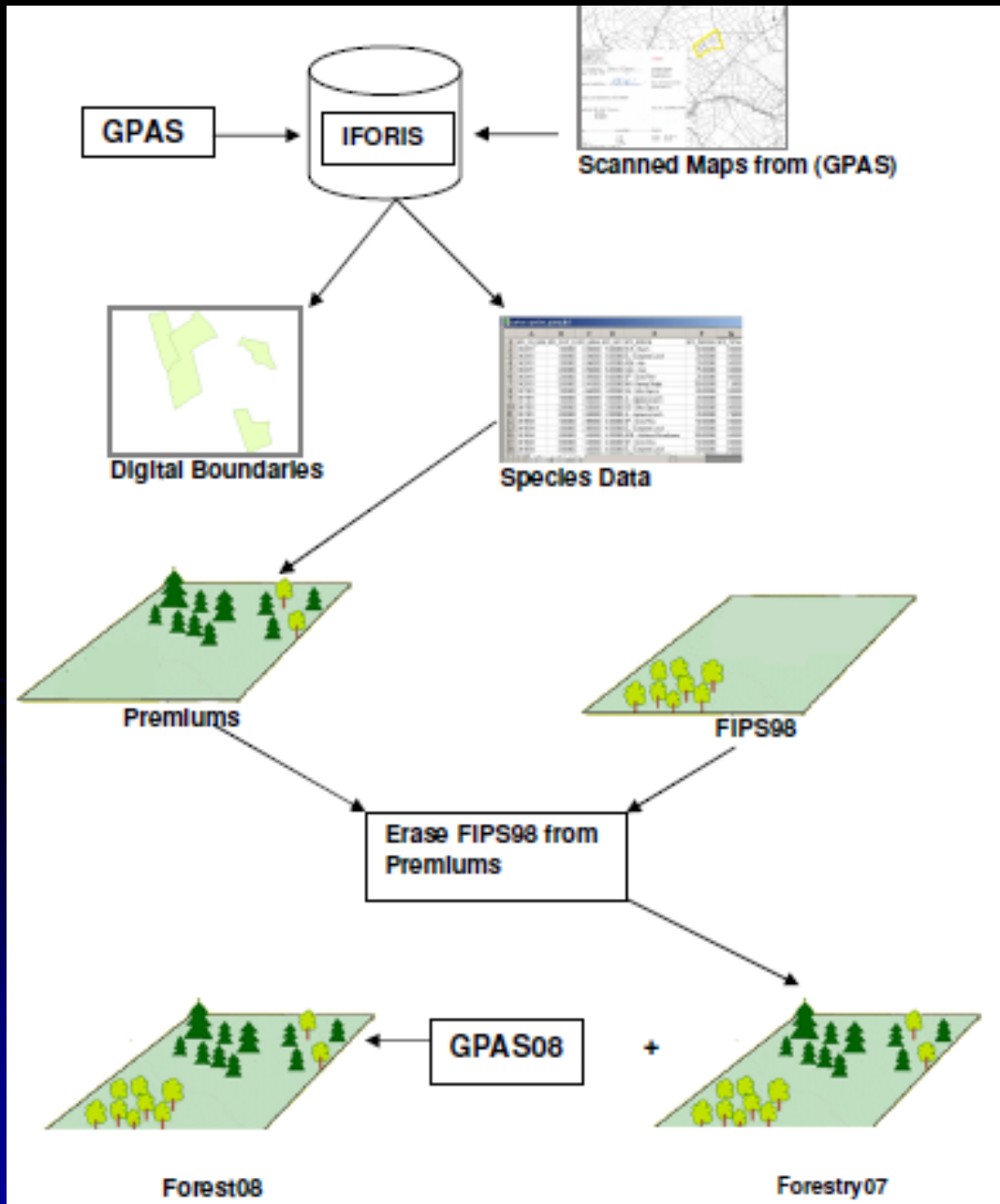
- LUC area data crucial
 - Mapping errors overlooked

- To much emphasis on activity data verification

Representation of Land Area

- What is required for KP 3.3
 - Land area consistent with forest definition
 - Knowledge of land use change (ARD) and other land
 - Knowledge of soil type and drainage to apply EF (organic soils)
- Methodological choice
 - Approach 3 (GPG Ch4, Ch2 Fig 2.3.3, mandatory)
 - Digitised maps
 - International Land cover maps
 - Stratified grid sample
 - No historic data
 - Additional surveys
 - Elected International dataset (Fig 2.3.2)
 - E.g. CORINE (GPG)

1. Digitised maps- e.g. FIPS Ireland



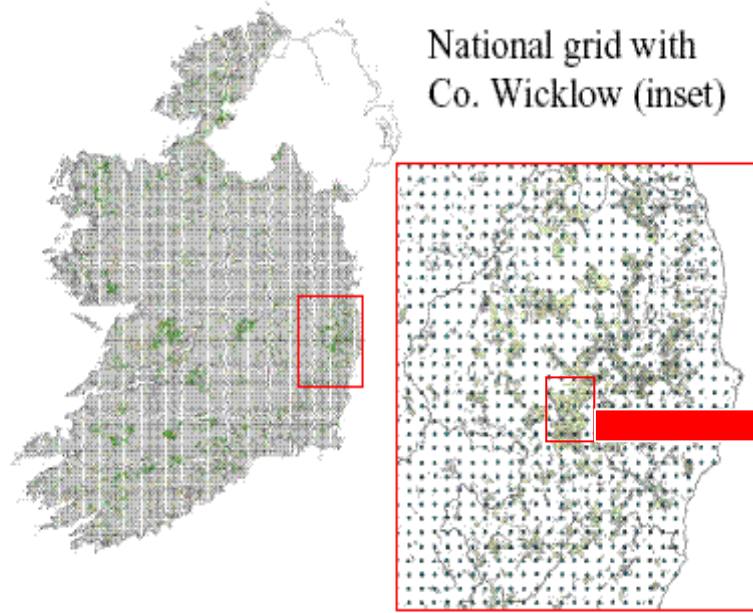
Caveats

- Polygons overlapping
- Slither polygons
- Digitisation errors
- No update (defor)
- Boundaries
- Open areas

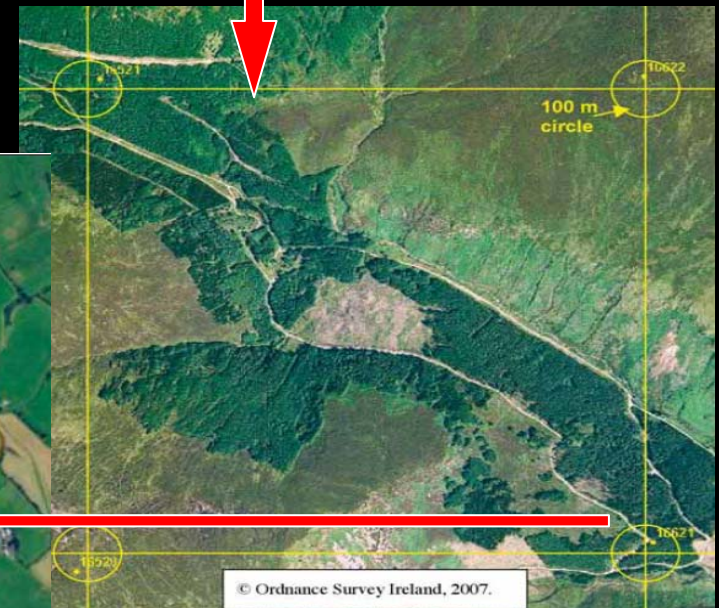
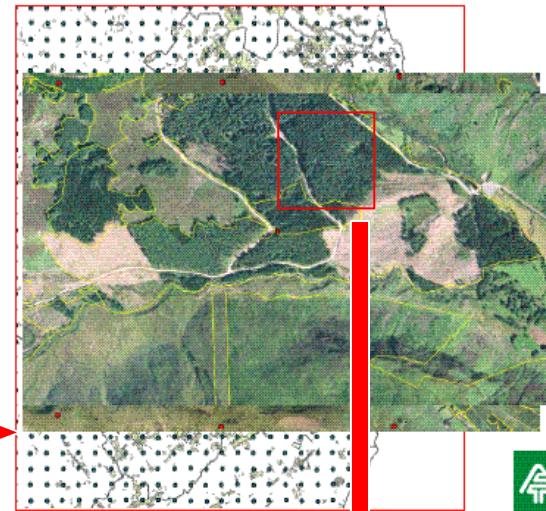
2. Stratified grid e.g. National forest inventory

PHASE 1- SAMPLE GRID – 2 x 2 km

National grid with
Co. Wicklow (inset)



Forest Identification



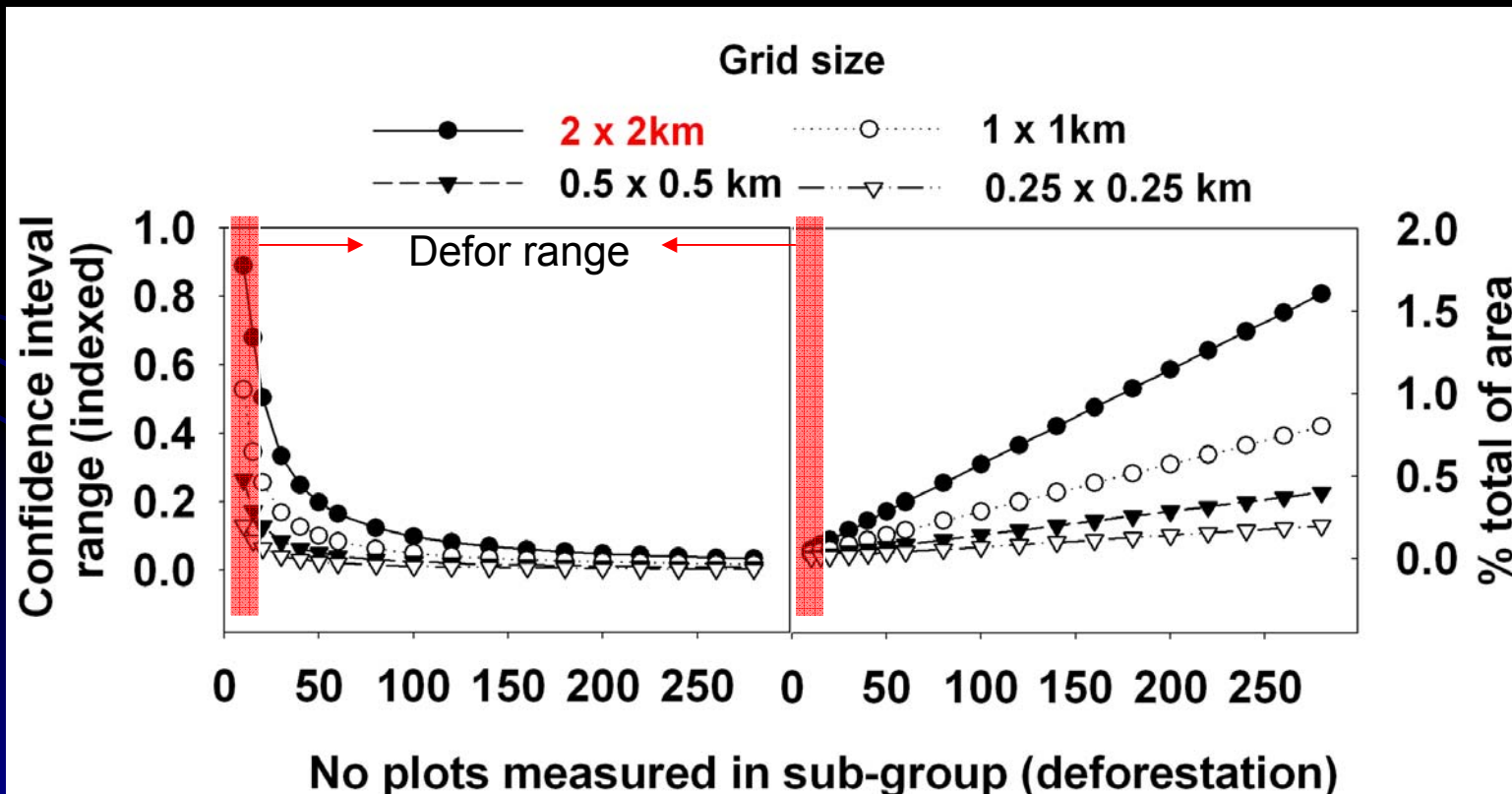
Hierarchical classification essential

Forest
Grassland
Wetland
Cropland
Settlement
Other



Stratified grid method issues

- Forest definition 0.1 ha
- 2 x 2km grid resolution 400ha
- Better reflective of sub-groups with more data
 - Deforestation small subgroup < 400 per year



Stratified grid method issues

- 2 x 2 km grid

- **Affor 2000 to 2006**

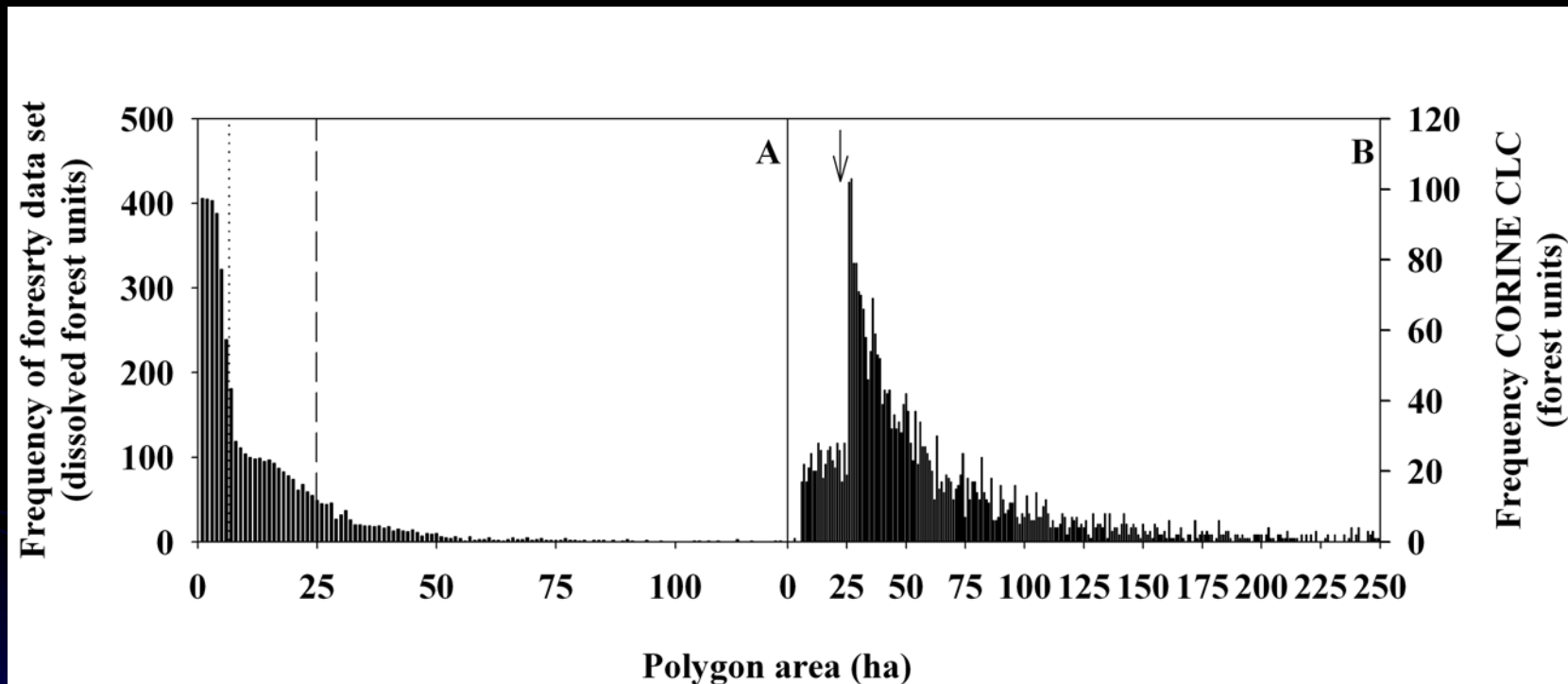
- 70 plots or 0.34 % of total area
- 28224 ha (24225-28195 ha 95 %CI)
- FIPS data suggests 28109 ha

Deforestation2000-2006

- Plots 15 or 0.08 % of total area
- Area 6048 ha (1938 to 10157 ha 95 %CI)
 - Eq 864 ha per year
- Felling licence information suggests 100 to 300ha per year

3. Use international data e.g. CORINE

- Poor resolution 25 ha and 5 ha for CLC
 - Land area not consistent with forest definition



● Classification

- Classification not representative of Irish landscape (some peatland and grassland misclassified)
- CLC324 –scrub?? a) clear and replant and b) encroachment vs clearing

A comparison of 3 methods

e.g. afforestation of peatland 1990-2000 (Black et al., 2009)

Table 2: A comparison of peatland area afforested (public and private) between 1990 and 2000 according to CORINE (EEA, 2004), the IFS soil/forest estate intersect and NFI datasets.

Dataset	Peat area afforested ha	Estimated afforested area ha	%
A) CORINE (EEA)	98,000 ^a	116,667	83.9 ^a
B) IFS soils/Forest	70,741	162,724	43.5
C) NFI ^b	72,979 (63,324 – 82,635) ^c	149,410 (136,320 – 162,500) ^c	48.8
Official total area 1990-2000		168,841	

^a Taken from EEA (2004)

- A) International data base- Landsat
- B) Digitised vector maps
- C) Stratified grid sample

Land representation

- Must apply Approach 3, but all methods have problems
- Systematic grid sample
 - Not good for small sub categories (defor??)
 - Require statistical correction using finer resolution data
 - Should grid size be in line with forest definition?
 - 0.1 ha = 31 m grid size = 70M grids
- International datasets
 - Resolution not consistent with forest definition
 - Classification not representative of national
 - Land cover \neq Land use

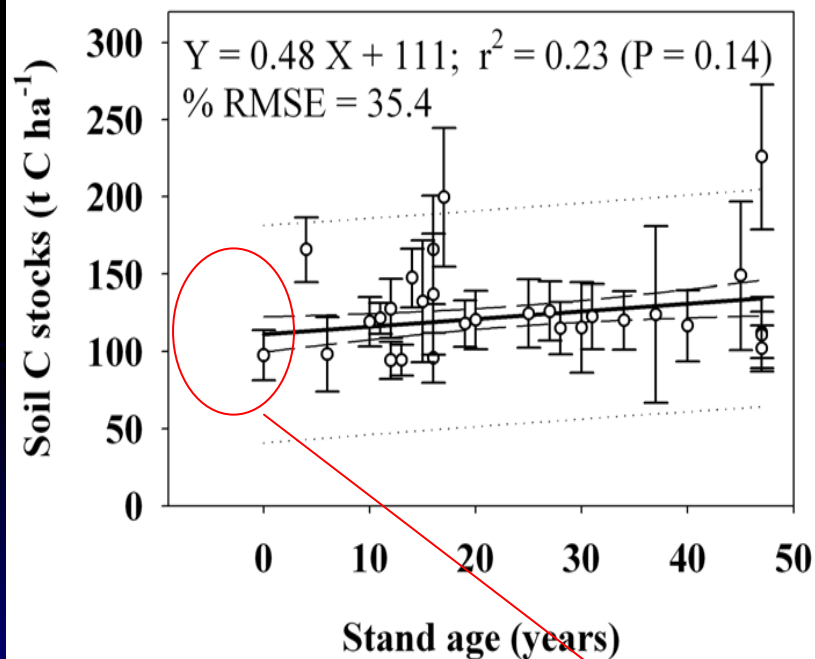
Exclusion of a pool: not a source e.g. mineral soils

- Approach

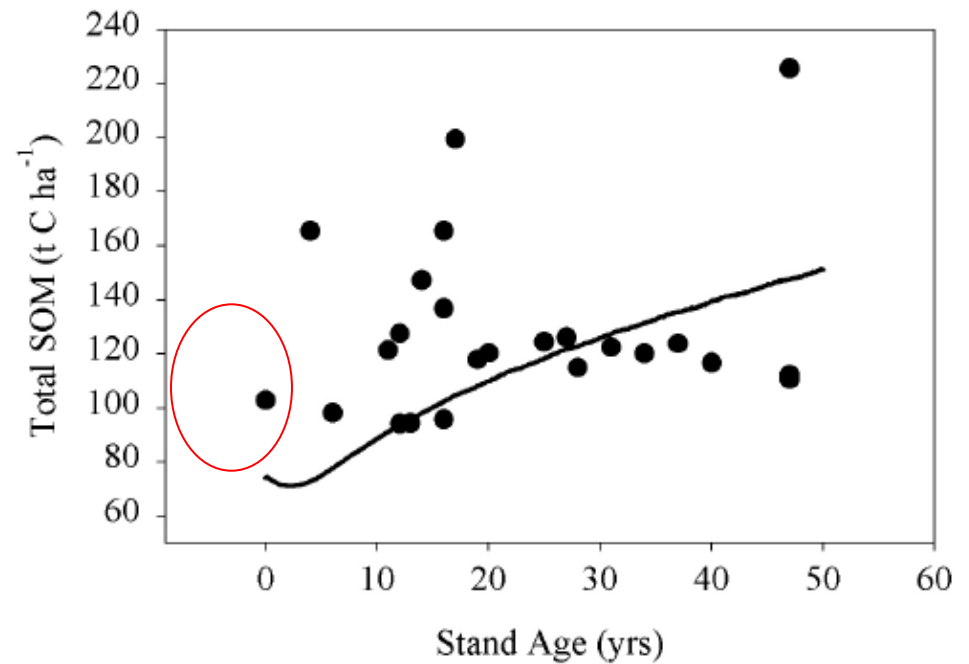
- Chronosequence data
- Soils database (available in 2010)
 - Forest and adjacent land use
 - Assume land use sample in steady state (min 20years)
 - Tested (Chronosequence work and Tate et al, 2003)
 - Difference between forest and other land use represents:
 - Soil stock change for soil type and land use
 - Includes other lands to forest and
 - Forests to other lands

Chronosequence (gley soils)

Measurements



Century v4



(n = 40 sites)

Small sample size at time zero

GIS sources

LUPS
IFORIS

Climate

Productivity
Topography

Soil type

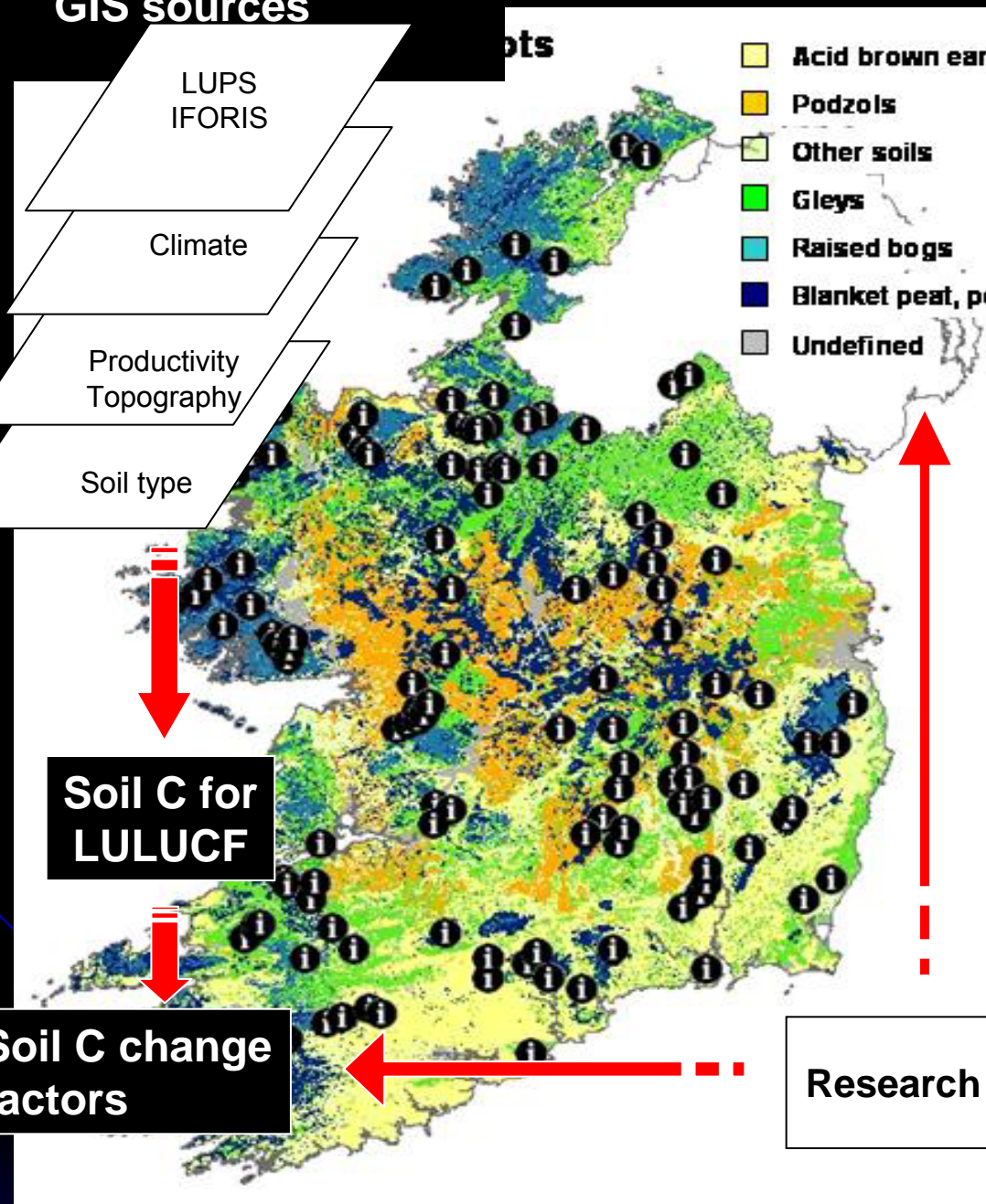
Ref C stocks for:

- Acid brown earths
- Podzols
- Other soils
- Gleys
- Raised bogs
- Blanket peat, peaty gley/podzols
- Undefined

CARBWARE

Soil C change
factors

Research



E.G Podsols (Pasture-conifer forest (50 years))



Grassland

Grassland	C%	Forest	C %
Organic		Organic	
0-10 cm	13.5	0-10 cm	28.3
10-20	11.8	10-20	30.8
Mineral		Mineral	
0-10 cm	4.5	0-10 cm	6.4
10-20	3.7	10-20	3.9
20-30	3.4	20-30	3.7

Site: Millstreet, Co. Cork



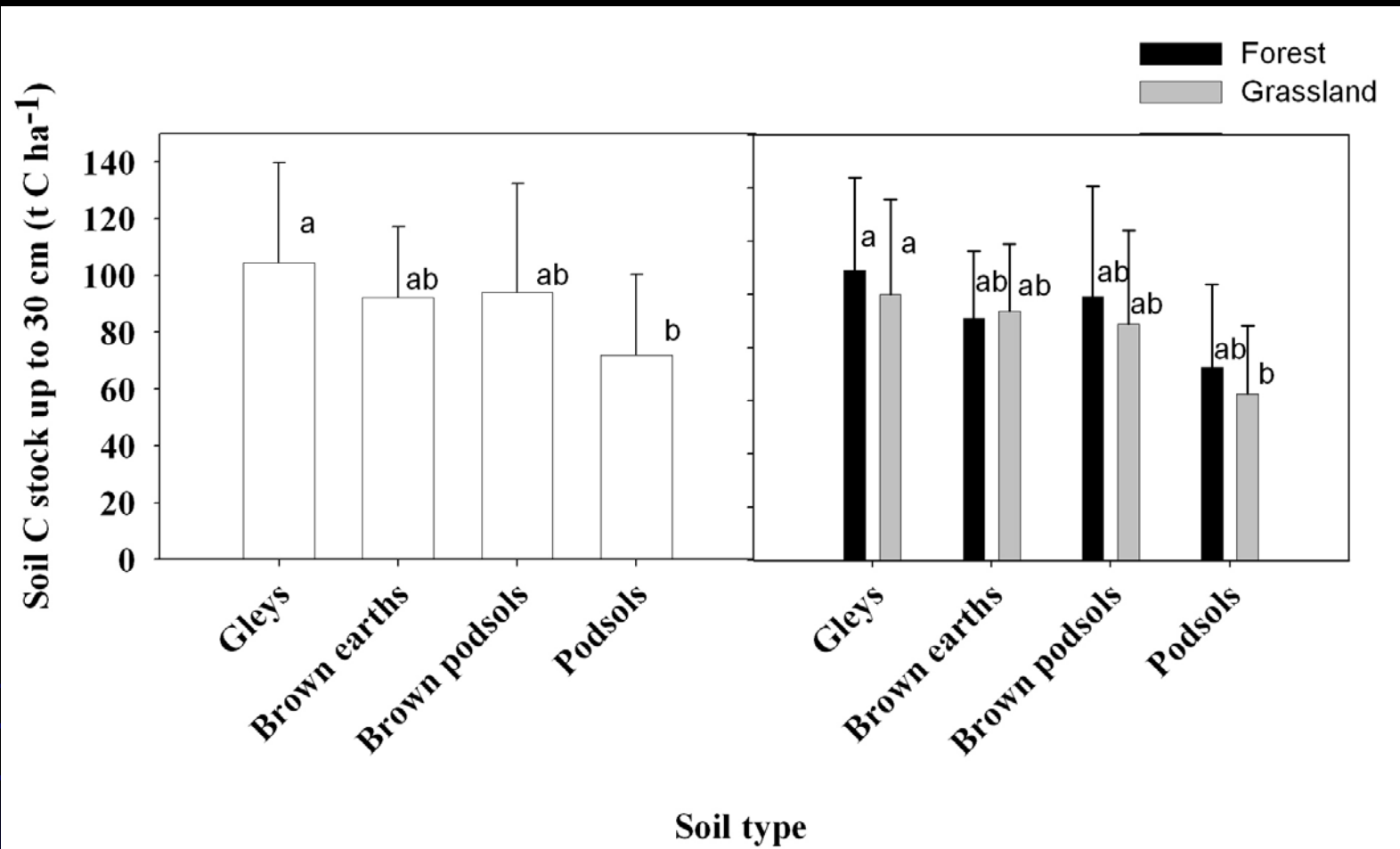
Forest

Data complete in 2010

Soil	Land use	Transition time (years)	Number of plots	Number of soil profiles
Gleys	Forest (F)	30	10	50
	Un-managed grassland (UG)	30	4	20
	Managed grassland (MG)	30	4	20
	Scrub grassland (SG)	30	2	10
Brown earths	F	35	10	50
	UG	35	6	30
	MG	35	4	20
Brown podsols	F	50	10	50
	UG	50	6	30
	MG	50	4	20
Podsols	F	39	10	50
	UG	39	5	25
	MG	39	4	20
	SG	39	1	5
Total			80	400

Results from the hierarchical analysis of variance
on soils C at a depth of 0-30cm

Source	SS	MS	F	P
Between soils	763902	24634	3.49	<0.01*
Land use within soils	29663	2963	1.24	0.34ns
Grassland types within soils	20215	4043	0.81	0.48ns



Can not use means because not significantly different
But demonstrate the pool is not a source

Table 6

Results from hierarchical analysis of variance on soil C values at the three depth increments

Source	(0–0.1 m)					(0.1–0.3 m)					(0.3–1.0 m)				
	SS	d.f.	MS	F	P value	SS	d.f.	MS	F	P value	SS	d.f.	MS	F	P value
Between soils	70,400	6	11,733	46.37	<0.001	130,353	6	21,725	36.12	<0.001	581,289	6	96,882	33.25	<0.001
Climates within soils	7116	10	712	2.81	0.01	23,825	10	2383	3.96	0.001	39,663	9	4407	1.51	0.18
Land use within soil/climate	37,568	45	835	3.30	<0.001	84,852	44	1928	3.21	<0.001	306,879	33	9299	3.19	<0.001
Residual within cells	122,472	484	253			235,791	392	602			710,999	244	2914		
Total	237,555	545				474,822	452				1,638,831	292			

Land use	Soil carbon stock (t C ha ⁻¹)
Natural forest	111.85 ± 5.24
Planted forest (pre-1990, post-1989)	104.31 ± 6.44
Annual cropland	118.27 ± 22.47
Perennial cropland	114.91 ± 13.22
High-producing grassland	114.93 ± 3.56
Low-producing grassland	117.66 ± 12.56
Grassland with woody biomass	111.57 ± 4.29
Wetlands	104.62 ± 19.92
Settlements	117.66 ± 12.56
Other land	88

n = 1789 sites

Historic factors?

- Both e.g. have history of deforestation over last 300 years
 - Non forest soils- deforested soils (still not in equilibrium)
 - Consistent with some literature and models
 - Century takes 400+ years to equilibrate

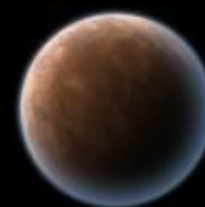
Pool is not a source

- Sample size?
- Incorrect application of data
 - If means base line soil ref values are not different, why use them
 - No guidance
 - Inconsistent review
 - Country X (120 plots, no difference, apply 1CMP16)
 - Country y (ca 2000 plots, no difference, use Tier 2 soil Ref)

WG3: Mitigation

LULUCF is not the real world!

LULUCF world



We should do better !