

Current and Future Degradation Risks to Forest Soils in Ireland

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Bilbao, 10th September 2014



UNIVERSITY of LIMERICK
OLLSCOIL LUIMNIGH

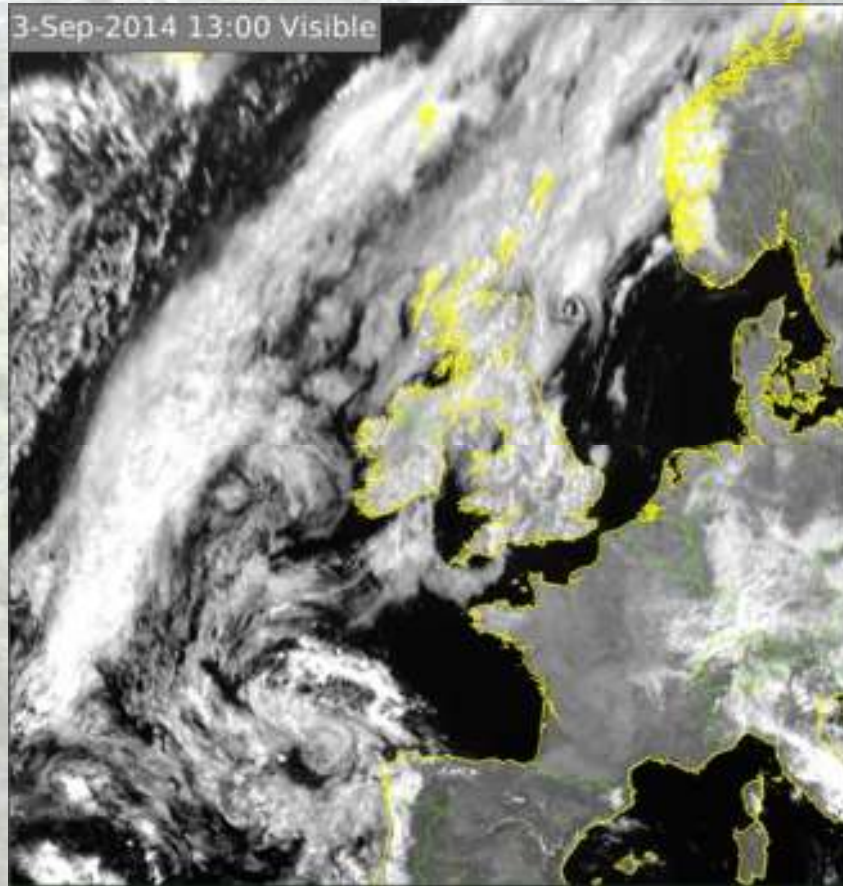


Content

- Introduction

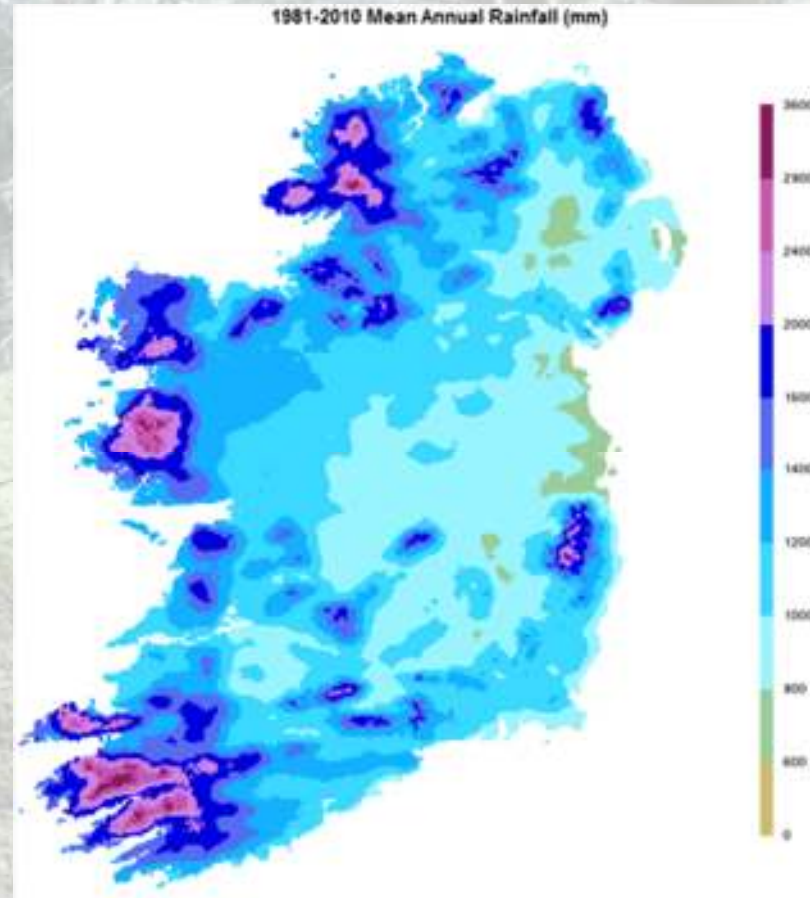
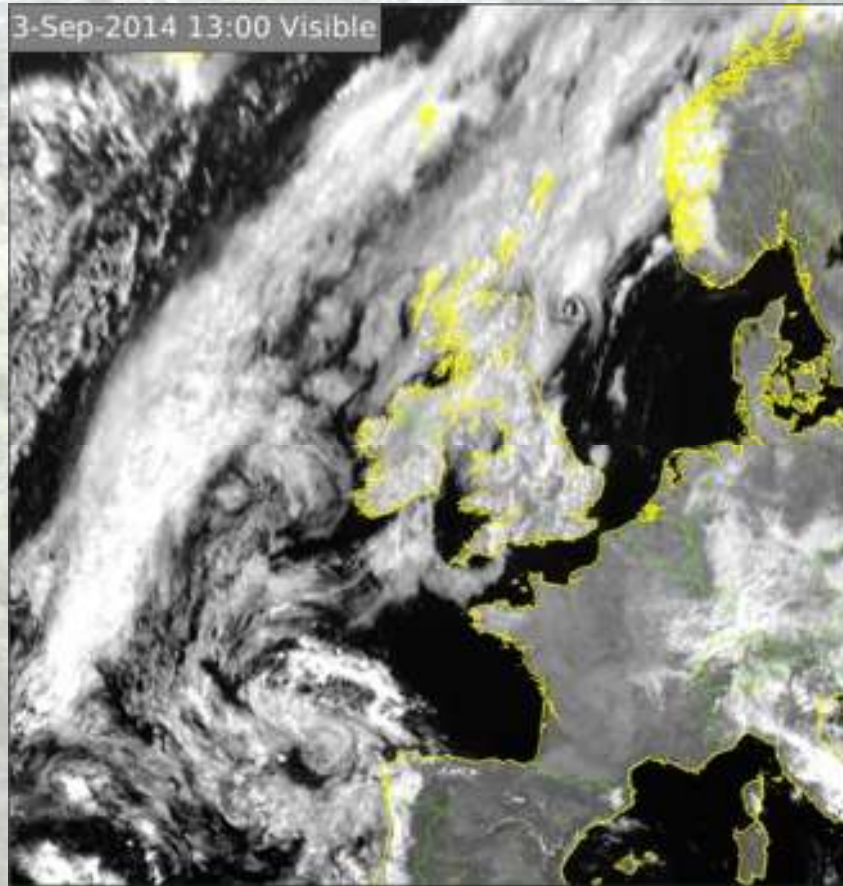
- Climate, soils and forests of Ireland
- Soil degradation

Climate of Ireland



Meteireann.ie

Climate of Ireland

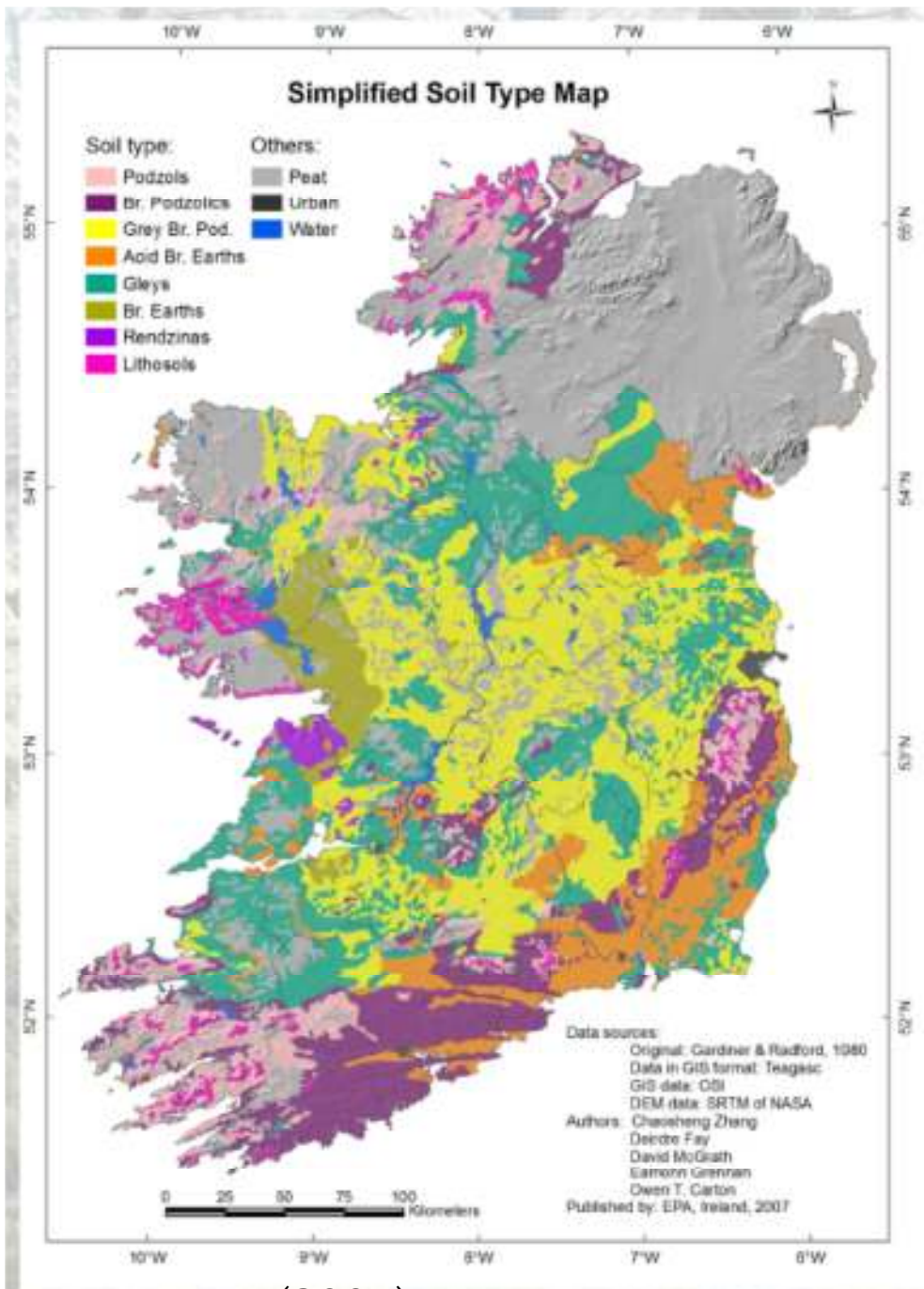


Meteireann.ie

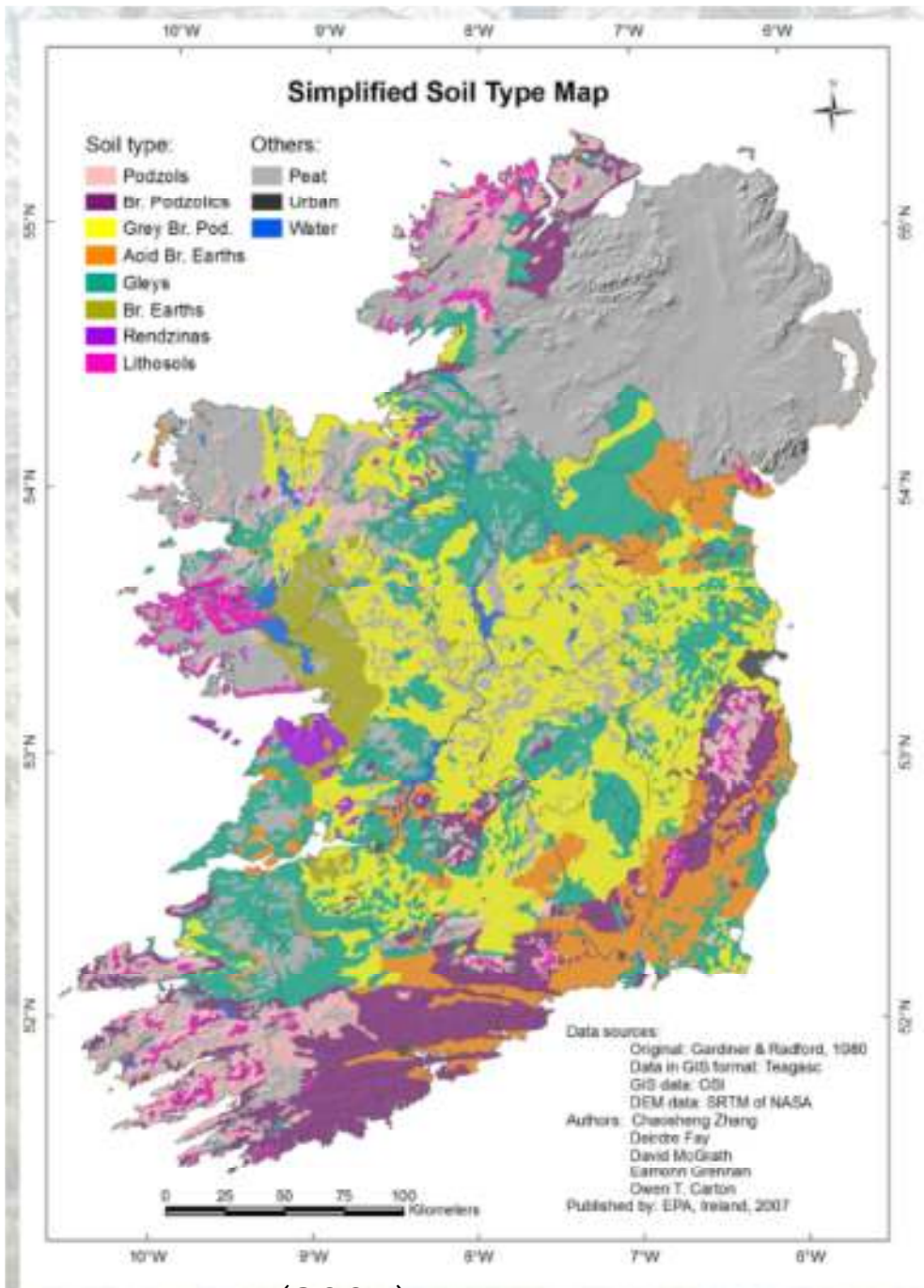
Irish Soils

- Relatively young 10,000 – 20,000 years old
- Dominant pedogenic processes:
 - Widespread acidification due to excessive leaching
 - Movement/translocation of silicate clay leading to the development of clay-rich subsurface horizons
 - Accumulation of the oxides of iron and aluminium and to a lesser extent, humus in coarse textured soils
 - A reasonably high level of soil organic matter accumulation
 - Development of conditions associated with wetness
 - Biological homogenization of soil

(Collins et al. 2004)

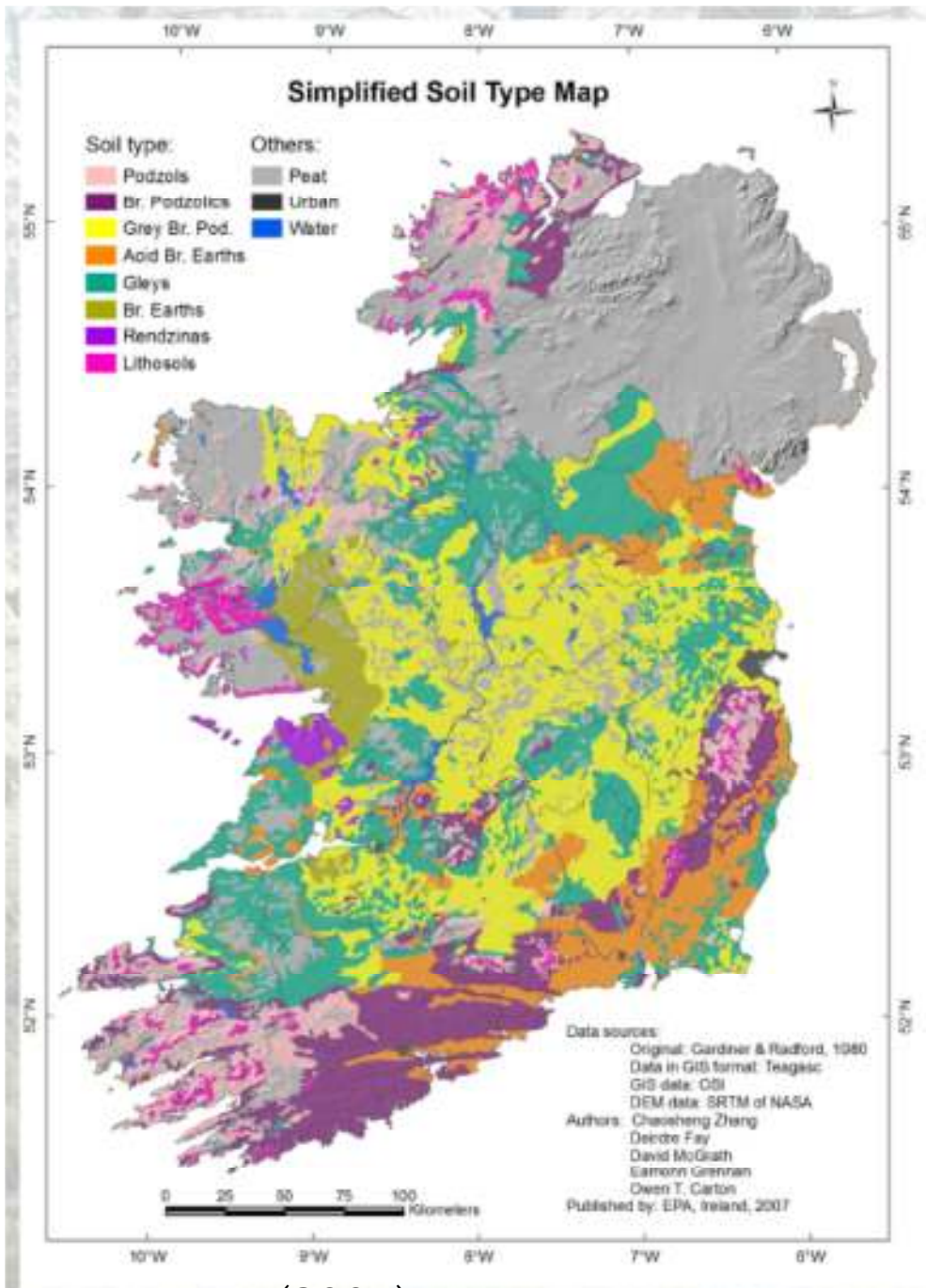


Fay et al. (2007)



Podzol

Fay et al. (2007)



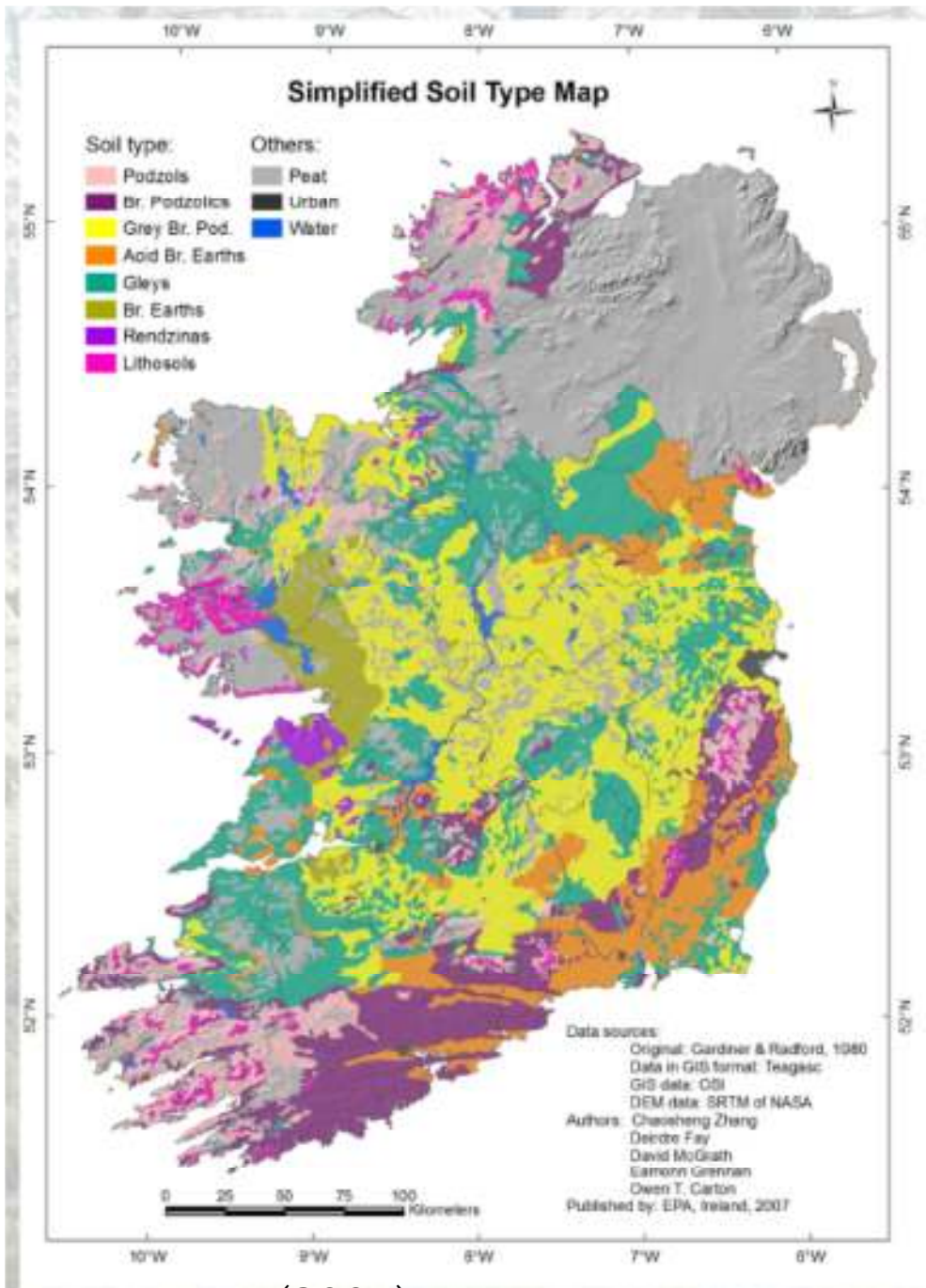
Fay et al. (2007)



Podzol



Gley



Fay et al. (2007)



Podzol

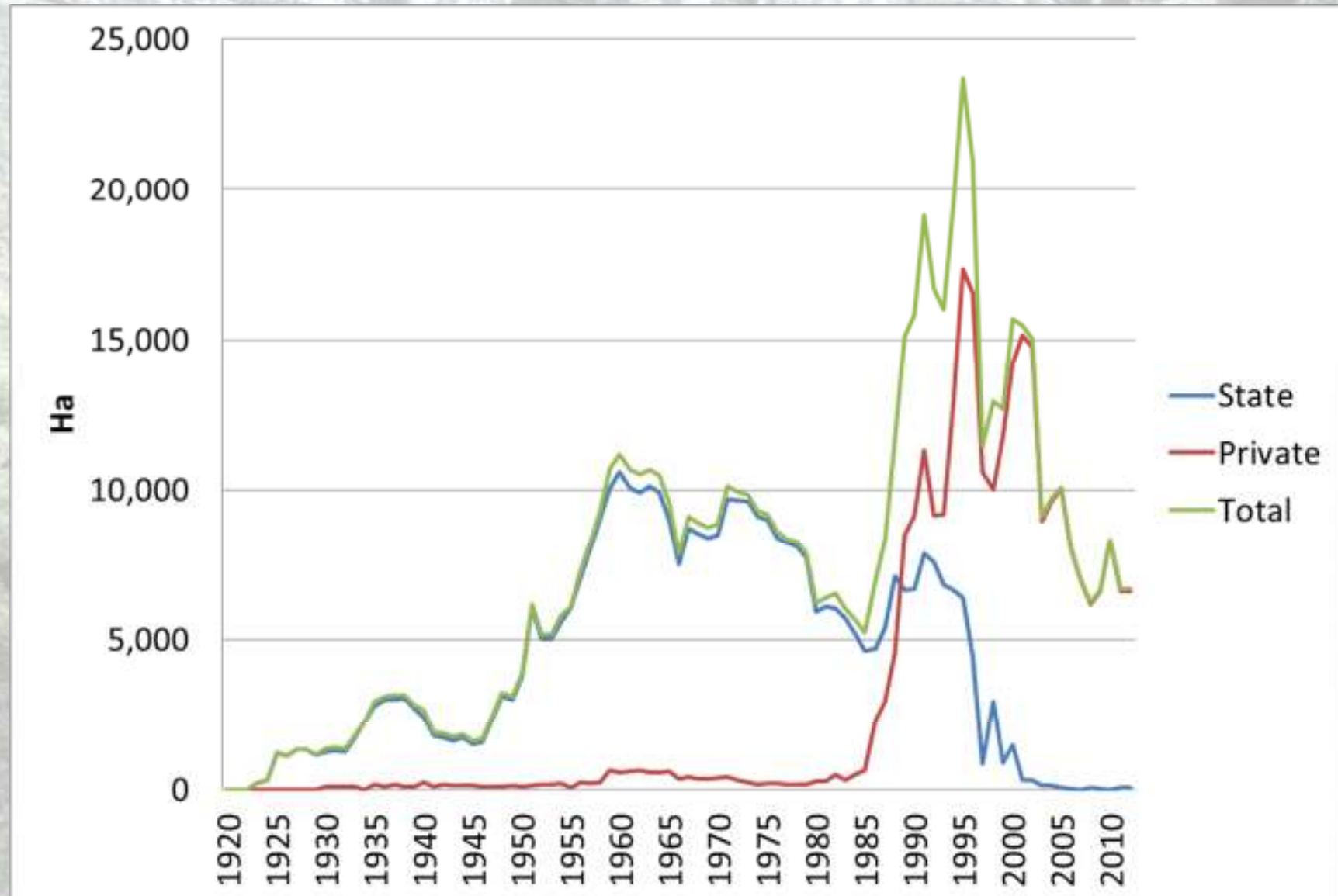


Gley



Peat

Annual rate of Afforestation 1922-2013

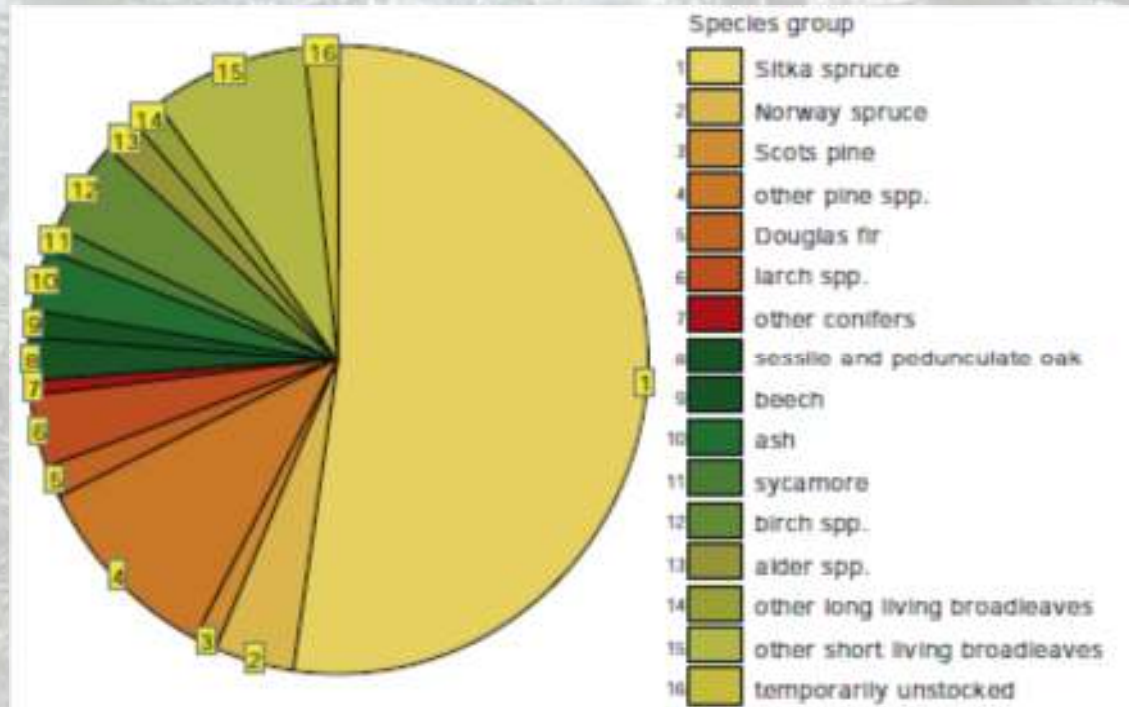


Irish Forests: Area and Composition

- Area in 2012: 731,650 ha (10.5% of land area)
- 57% publicly owned and 43% private.
- 74.2% of forests are coniferous
- 25.8% are broadleaf

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Redmond (2007)

Irish Forests: Soils

| Soil type | % of forest estate |
|--------------|--------------------|
| Blanket peat | 31.5 |
| Gley | 26.2 |
| Basin peat | 10.7 |
| Podzol | 10.6 |
| Brown earth | 8.4 |
| Other | 12.6 |



Soil Degradation Risks

- Soil erosion
- Nutrient Depletion / acidification
- Climate Change
- Loss of organic carbon

Soil erosion

Impact of harvesting on solid yield from blanket peatland forest

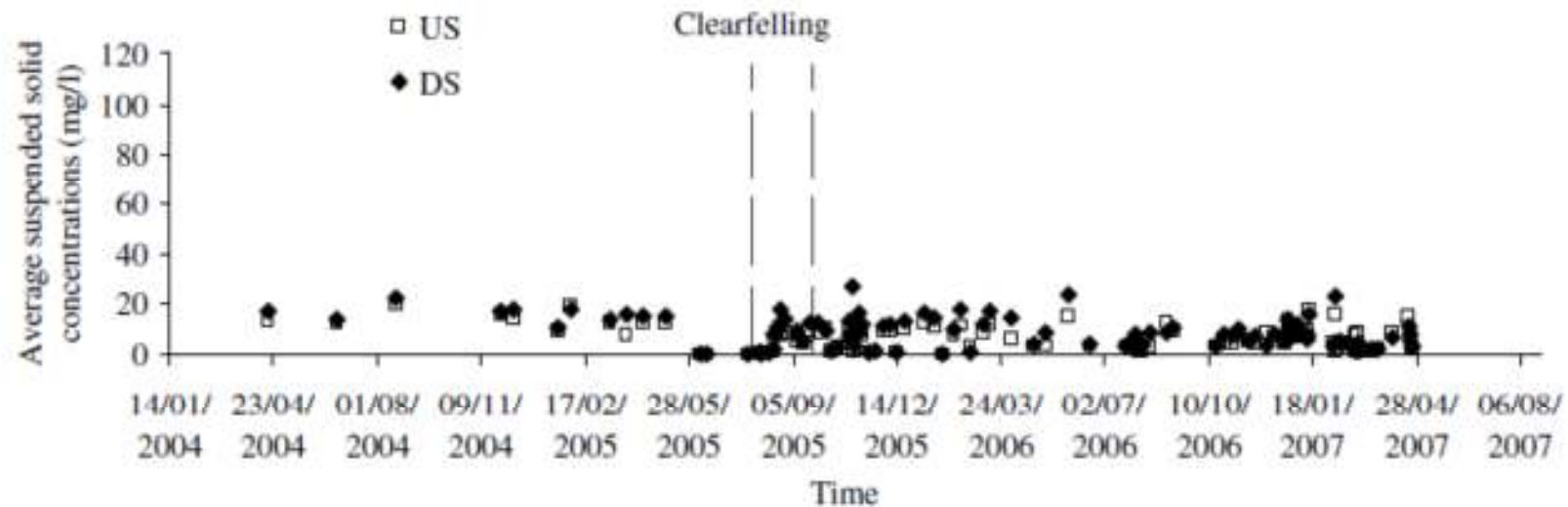


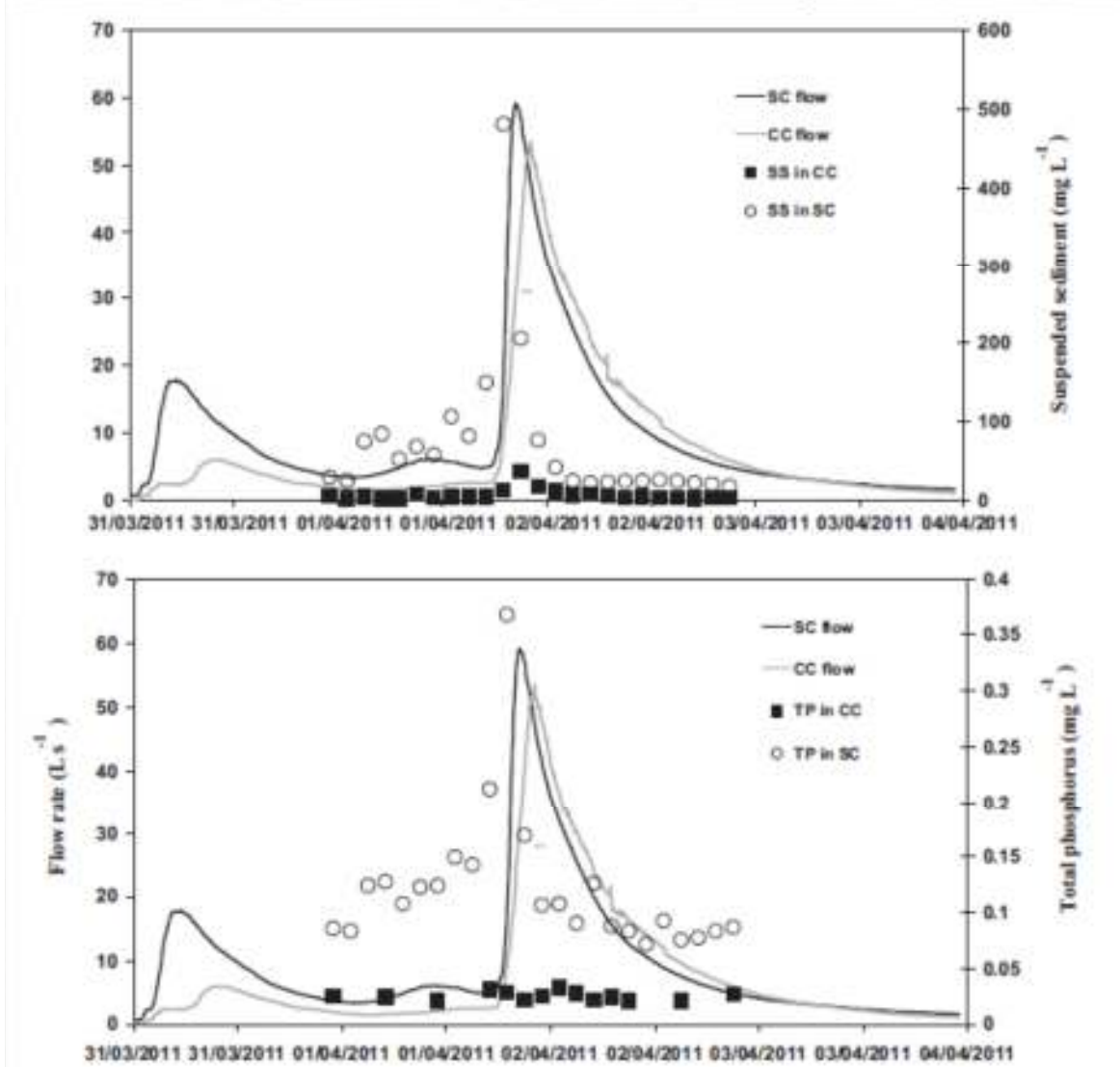
Figure (a) Daily average suspended solid concentrations at US and DS stations before and after harvesting

Solid yields slightly increased after harvesting could be due to the increase in water discharge from the experimental area.

The study indicated that it is possible to prevent the solid concentration increase after harvesting if good management practices are strictly followed. (Rogers et al. 2010)

Soil erosion

Impact of harvesting on solid yield from blanket peatland forest



- Suspended solids and total P loss in a storm during clearfelling
- SC = study catchment
- CC = control catchment
- Suspended solids returned to pre felling levels in 6 months
- P is difficult to retain, even with mitigation measures

Finnegan et al. (2014)

Loss of soil nutrients / acidification

- Assumption: conventional forestry is sustainable
- Increasing demand for forest biomass for energy
- Volume of wood from forestry thinnings and forestry residues available for bioenergy will increase from approx. 0.5 million m³ in 2011 to 1.25 m³ in 2030.
- Currently
 - 300,000 t yr⁻¹ of chipped logs
 - 25,000 t yr⁻¹ of brash bales



Loss of soil nutrients



UCD DUBLIN University College Dublin An Coláiste Ollscoile, Baile Átha Cliath

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FOR SITE

Critical Biomass Removal on Irish Forest Soils

[Atmospheric deposition](#) [Biomass nutrients](#) [Mineral weathering](#) [Soil solution, leaching & runoff](#)

Critical Biomass Removal on Irish Forest Soils

Critical Biomass Removal is the amount of long-term biomass removal below which impacts to site nutrient supply will not occur, according to current knowledge.

The ForSite project is assessing the nutrient impact of increased biomass harvesting in Irish forests, by developing databases of forest nutrient exchanges, and a tool for policymakers to assess biomass-harvesting scenarios against the new concept of critical biomass removal.

<http://www.ucd.ie/forsite/>

Loss of organic carbon

- Ireland has had an active afforestation programme for almost a century
- 299,738 ha since 1990
- Potential for soil carbon storage
- But 53% of forests are on peat.....
- 26% are on gleys, some have C rich surface horizons.....

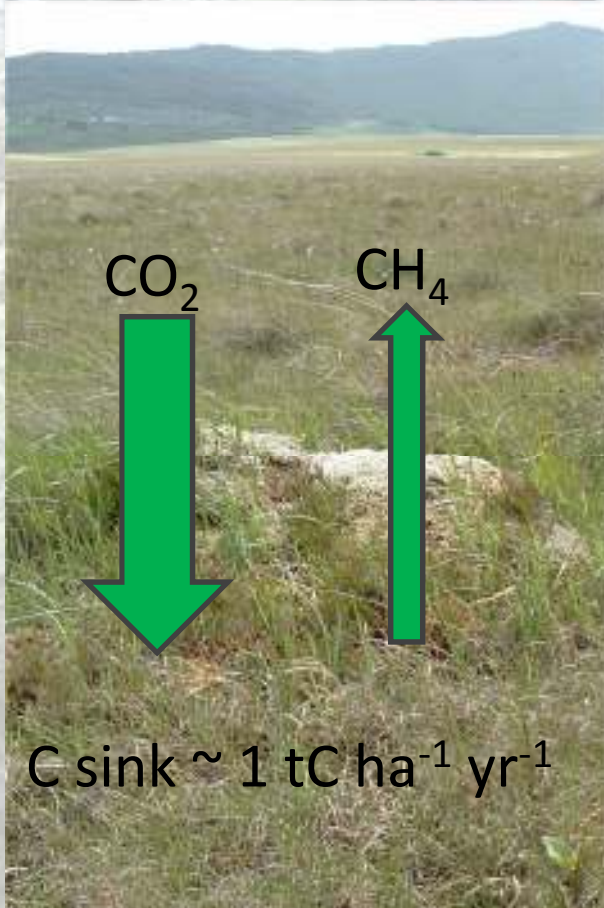
Peatland Forests



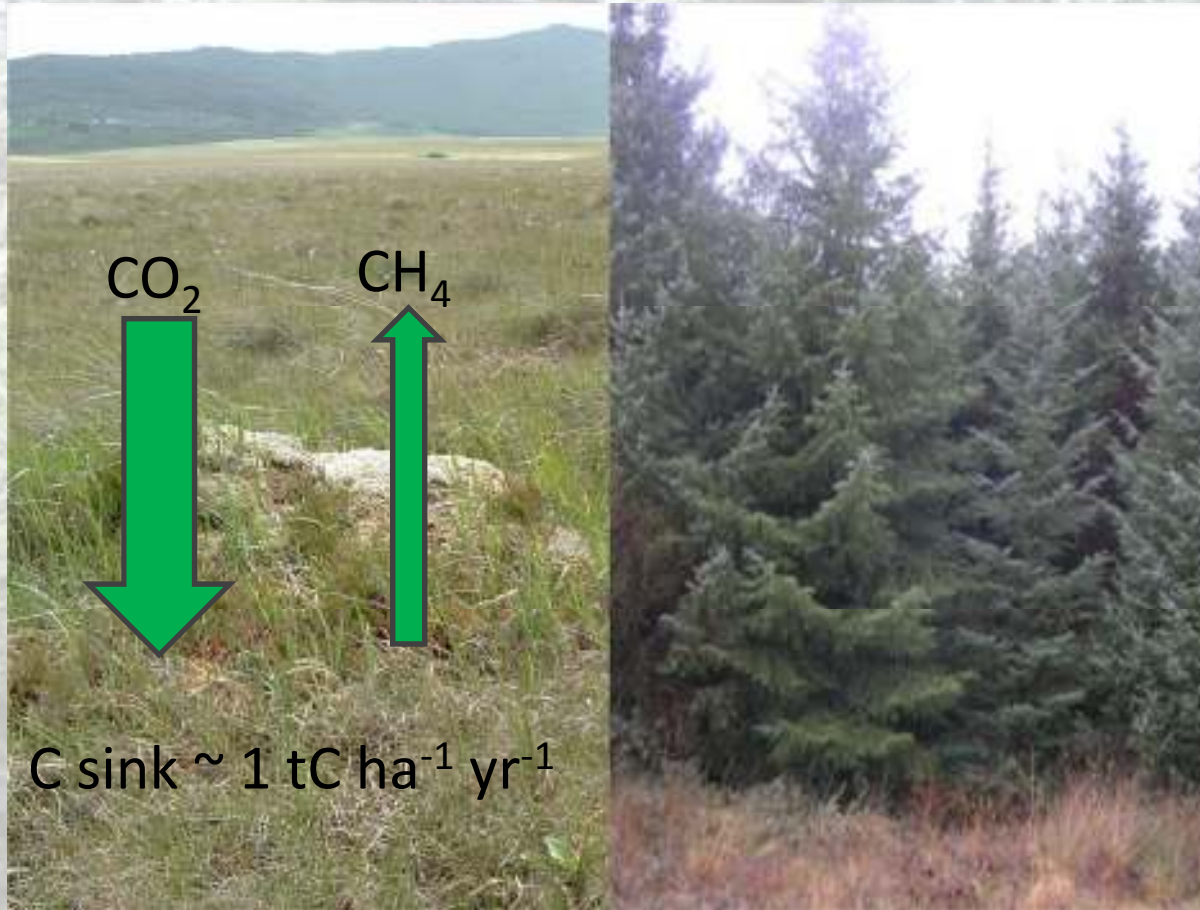
Peatland Forests



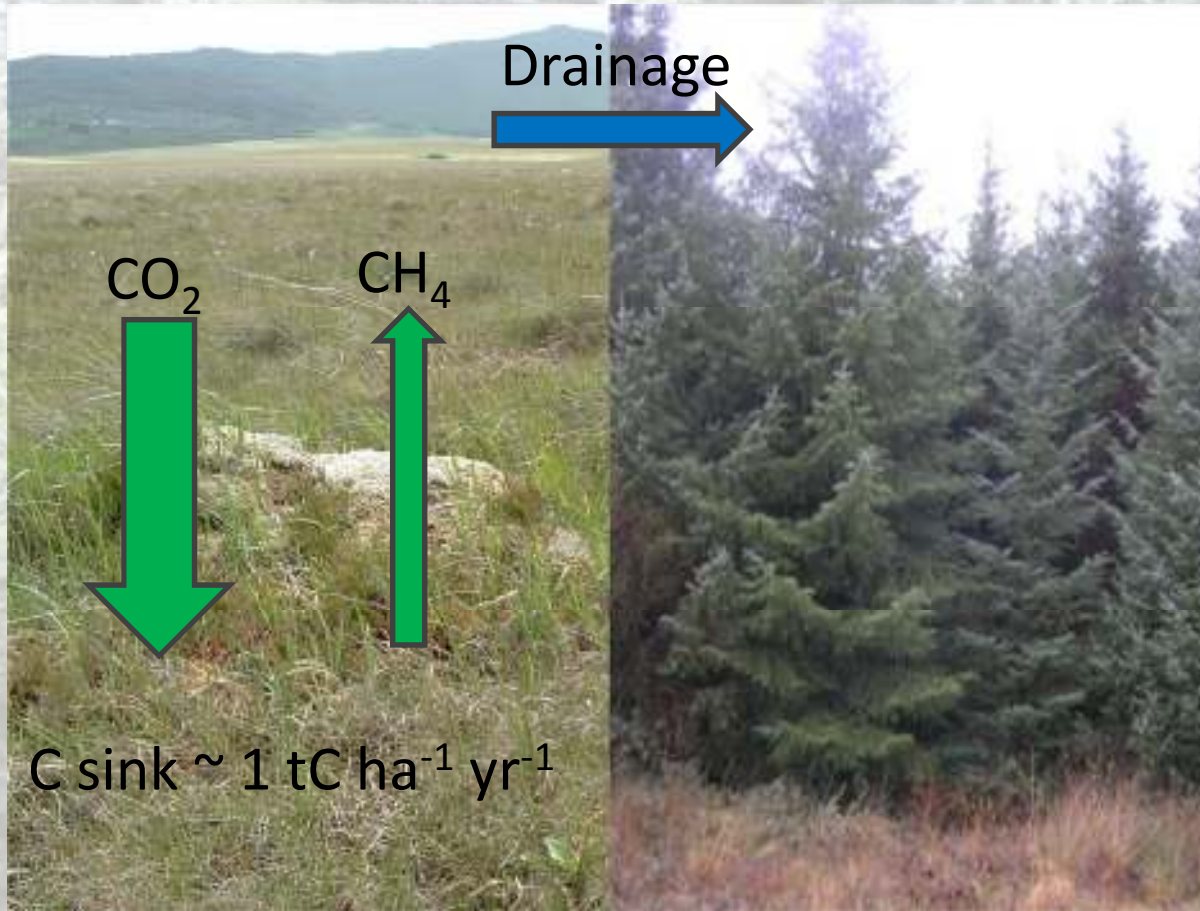
Peatland Forests



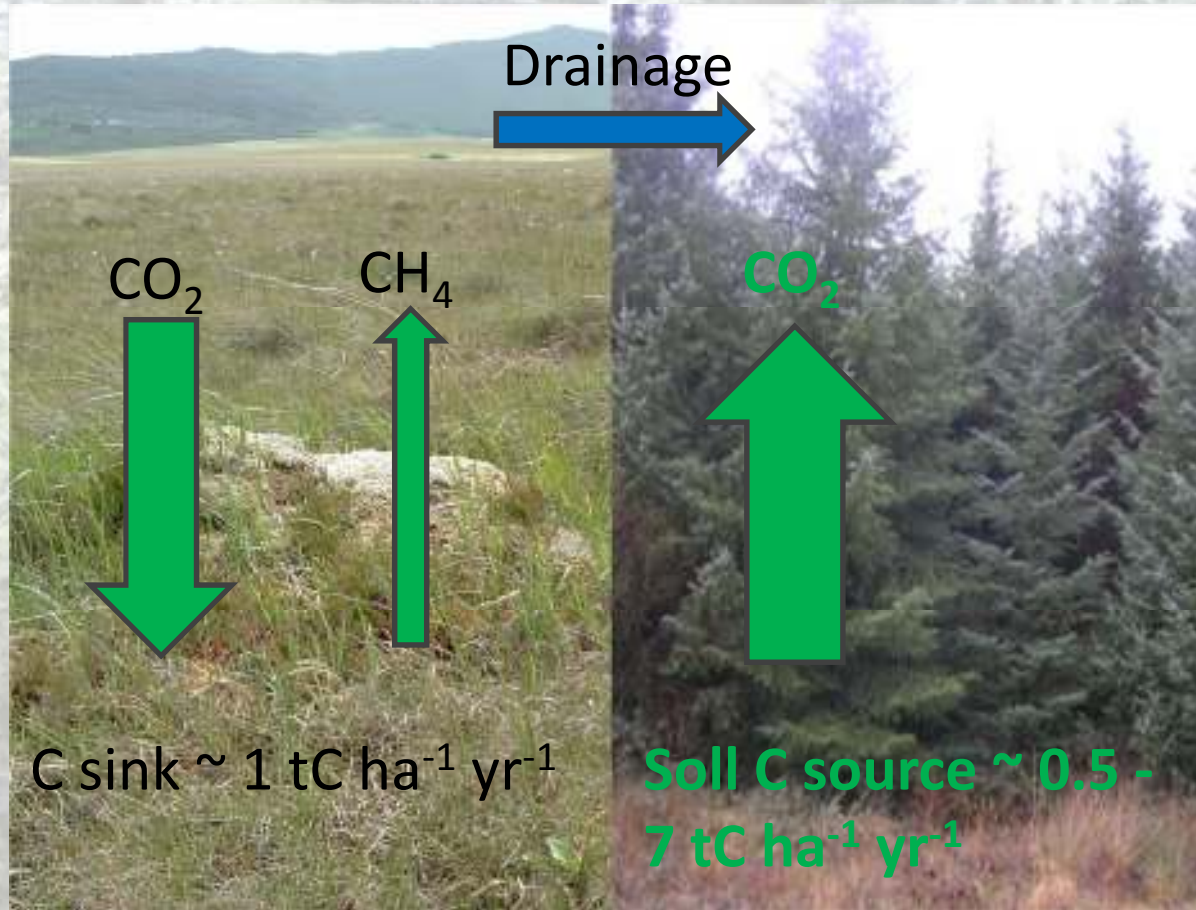
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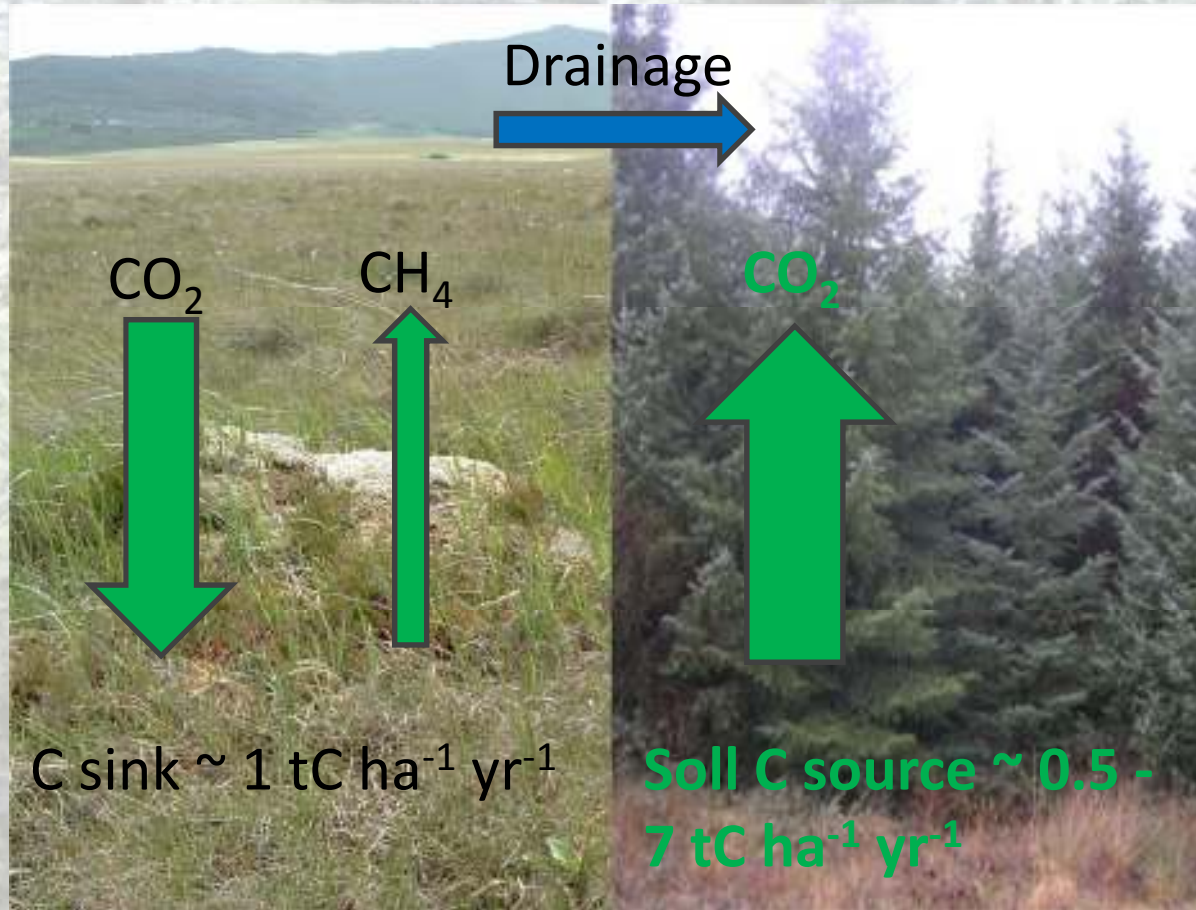
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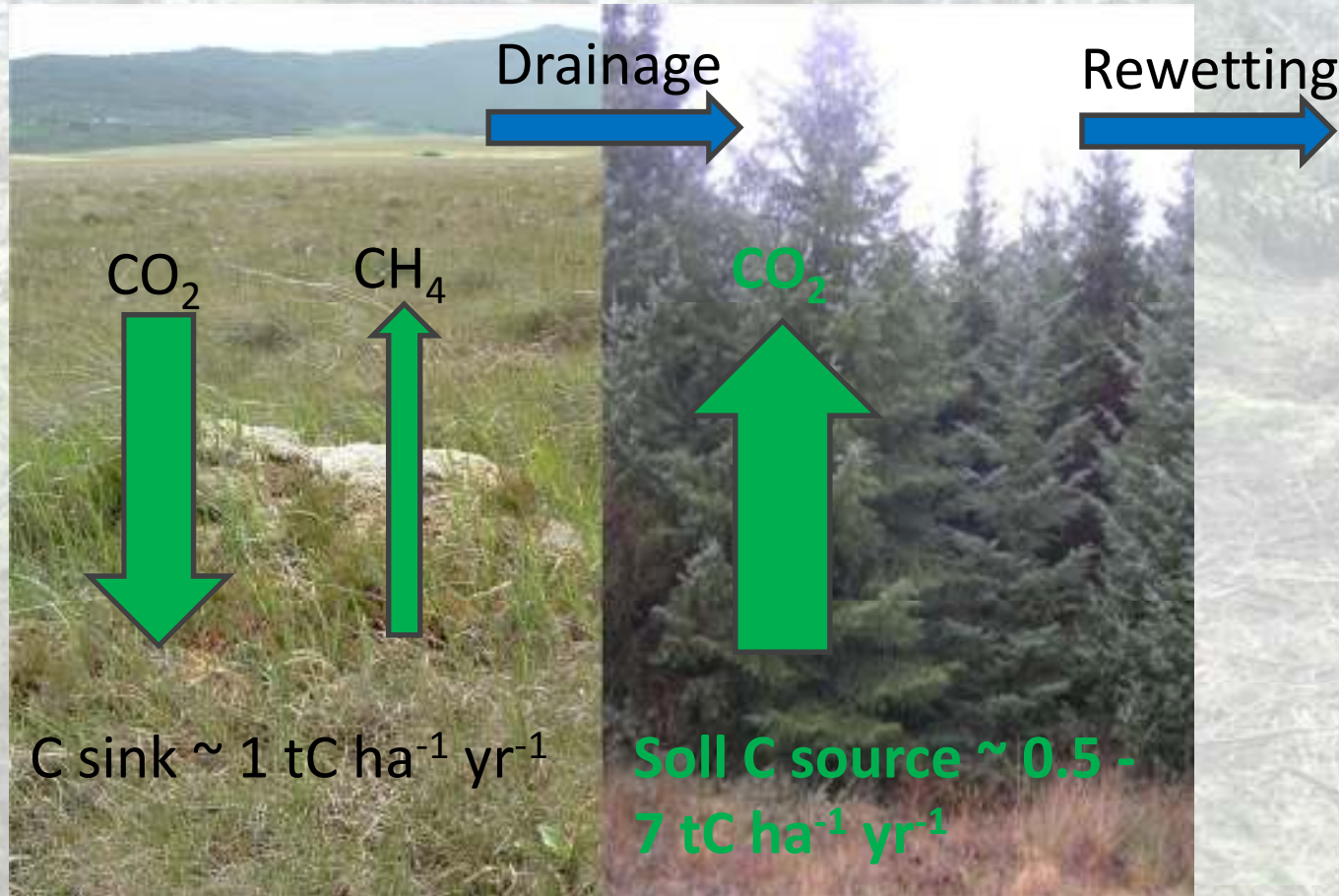


Peatland Forests



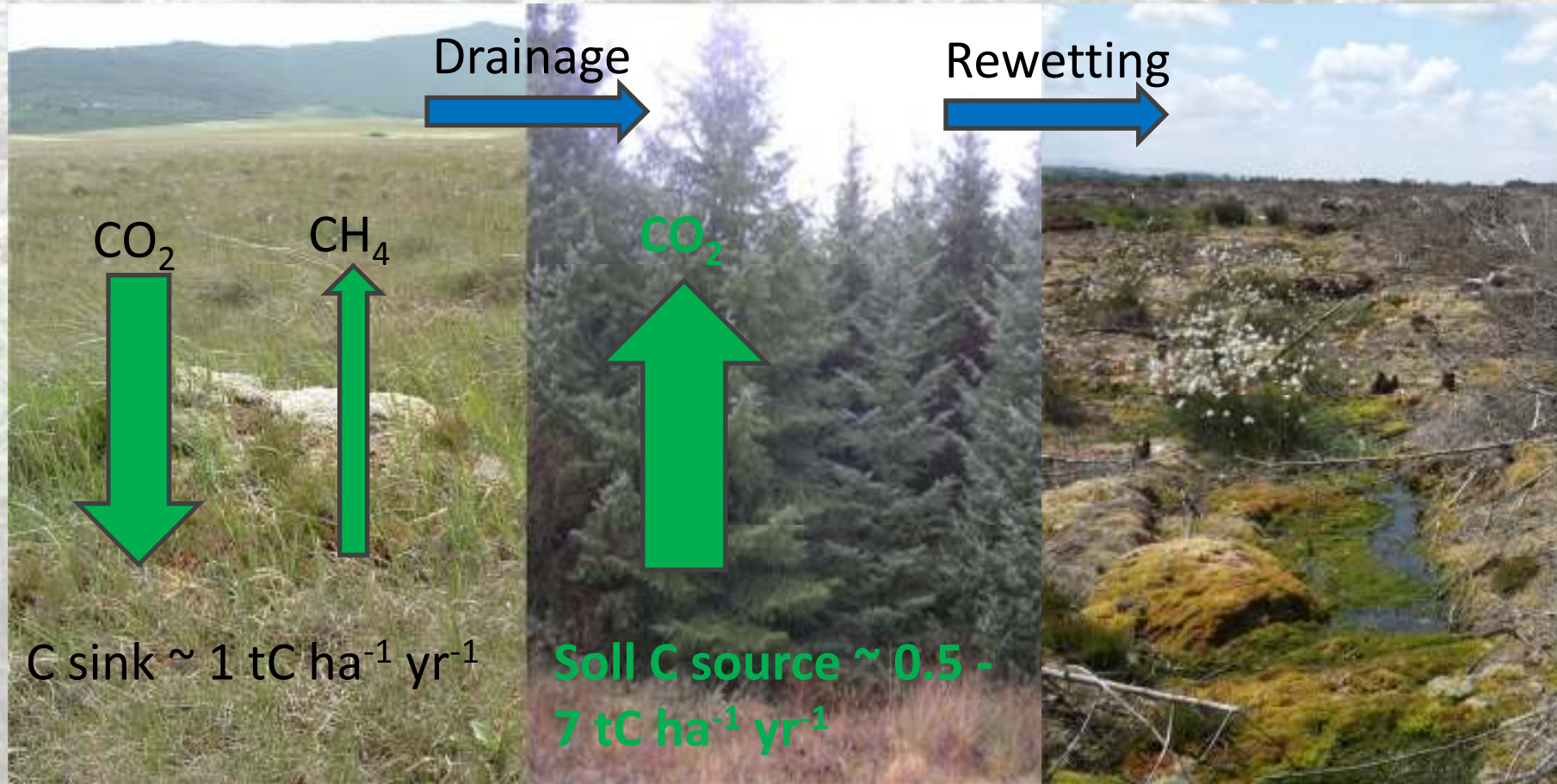
20% of peatland forests (64,548 ha) are uneconomic and unsustainable (Tiernan 2008)

Peatland Forests



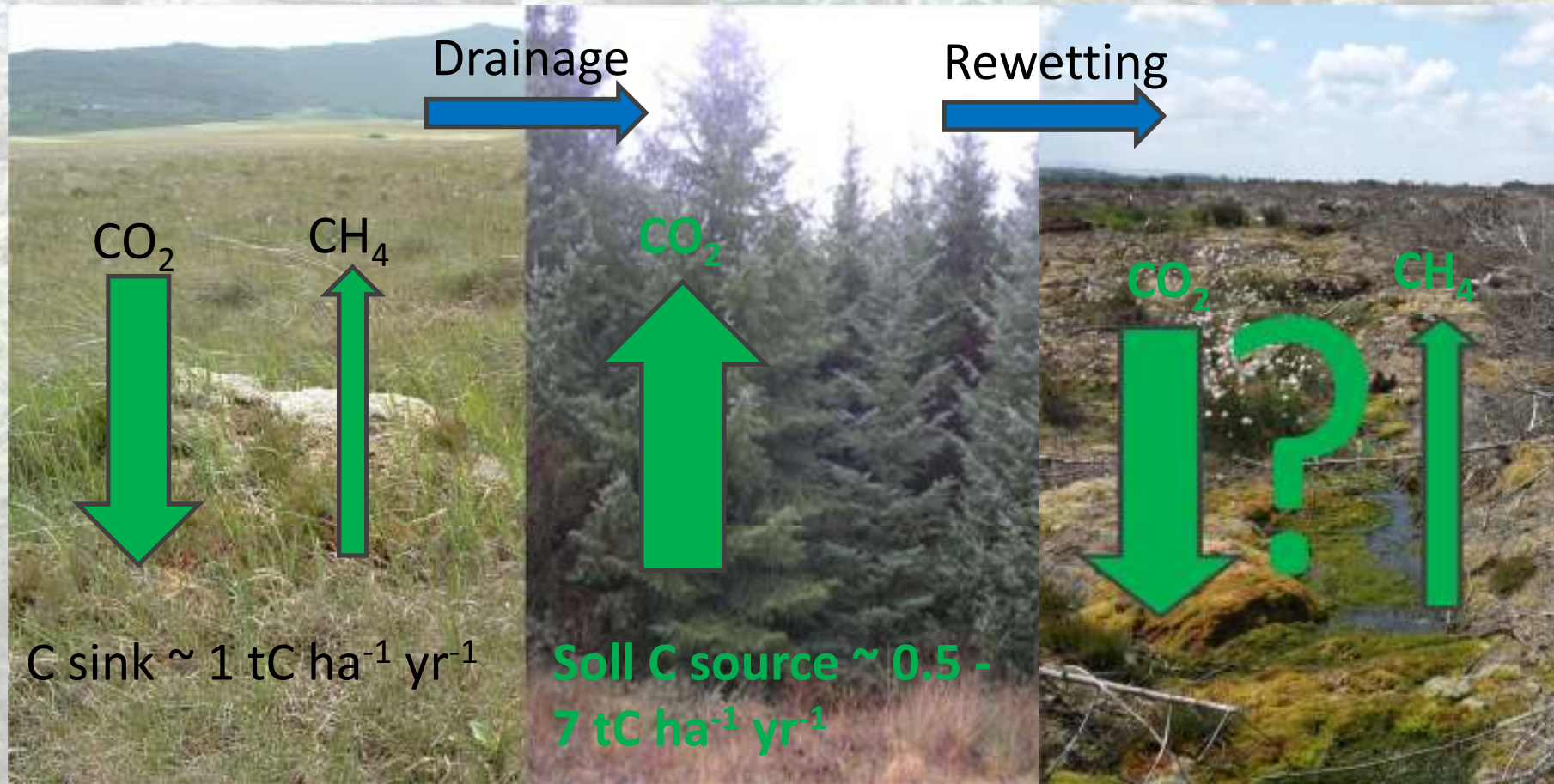
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Peatland Forests



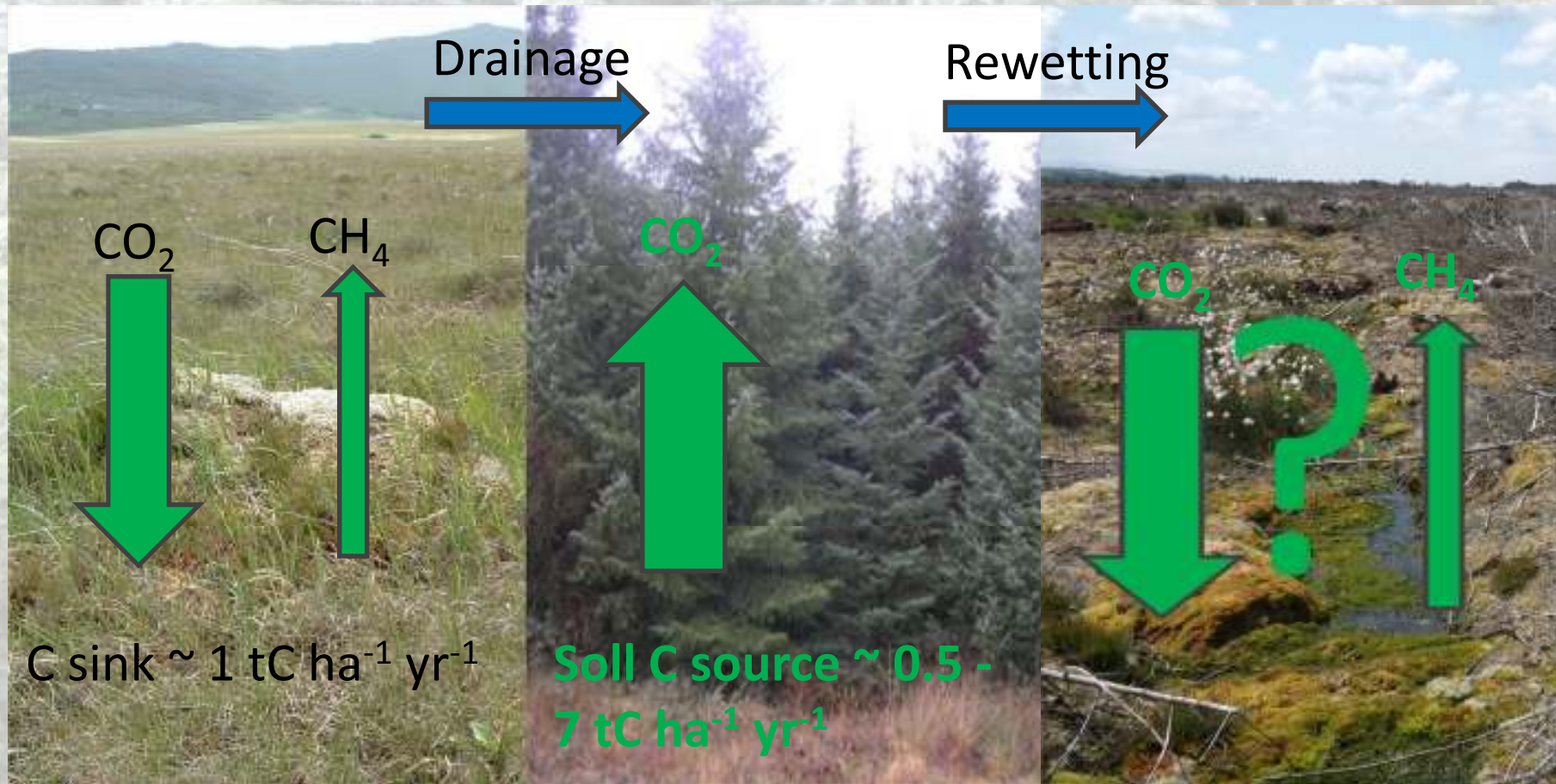
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3,100 ha rewetted to date

Climate Change

•
• **12 February 2014**

5,000 – 7,000 ha of forest blown down



Climate Change

12 February 2014

5,000 – 7,000 ha of forest blown down

CORRESPONDENCE:

Stormiest winter on record for
Ireland and UK

Matthews et al. (2014)