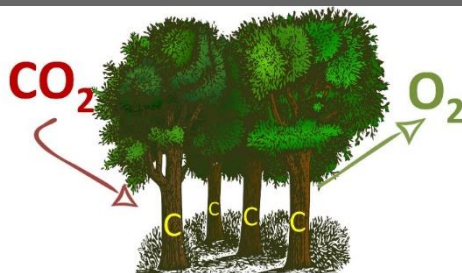


# Teagasc Signpost Webinar Series:

## The Positive Role of Farm Forests in GHG Mitigation



**Tom Houlihan**  
Teagasc Forestry Specialist

# Topics

- Overview of forest resource / planting categories
- Forest mitigation pathways
- Indicative forest sequestration
- Mitigation to 2030 and beyond
- Benefits of riparian forestry
- Towards future forest resilience
- Hedgerows
- Take home points

23,000 private owners  
83% farmers, 389,000 ha

## Ireland's forests and Forestry Programme supporting...

Forestry sector  
worth up to €2.3



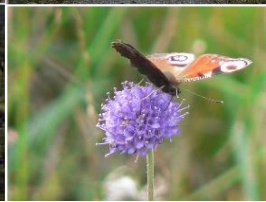
12,000 jobs (mainly



778,000 ha  
11% of land  
area

An Roinn Talmhaíochta,  
Bia agus Mara  
Department of Agriculture,  
Food and the Marine

Ecosystem services



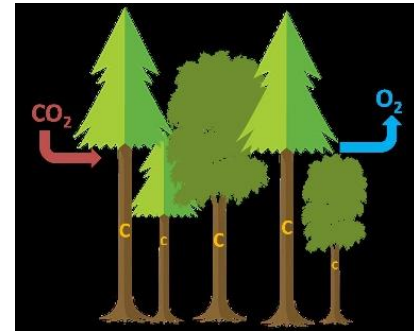
# Climate Change Mitigation - Role of forests

- Forest mitigation - not silver bullet but...

Has a highly significant role to play

- Climate mitigation is not the only reason for expanding our forest resource

Balanced approach → range of benefits





# Range of Planting Categories, some examples:

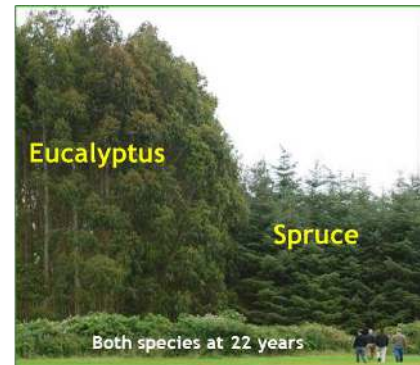
**GPC 3: 15% Diverse Conifer/Broadleaf**



**GPC 6: Pure Oak**



**GPC 12: Forestry for Fibre**



**GPC 4: Diverse Conifer**



**GPC 8: Pure Alder/Birch**



**(GPCs 9/10) Native Woodland**

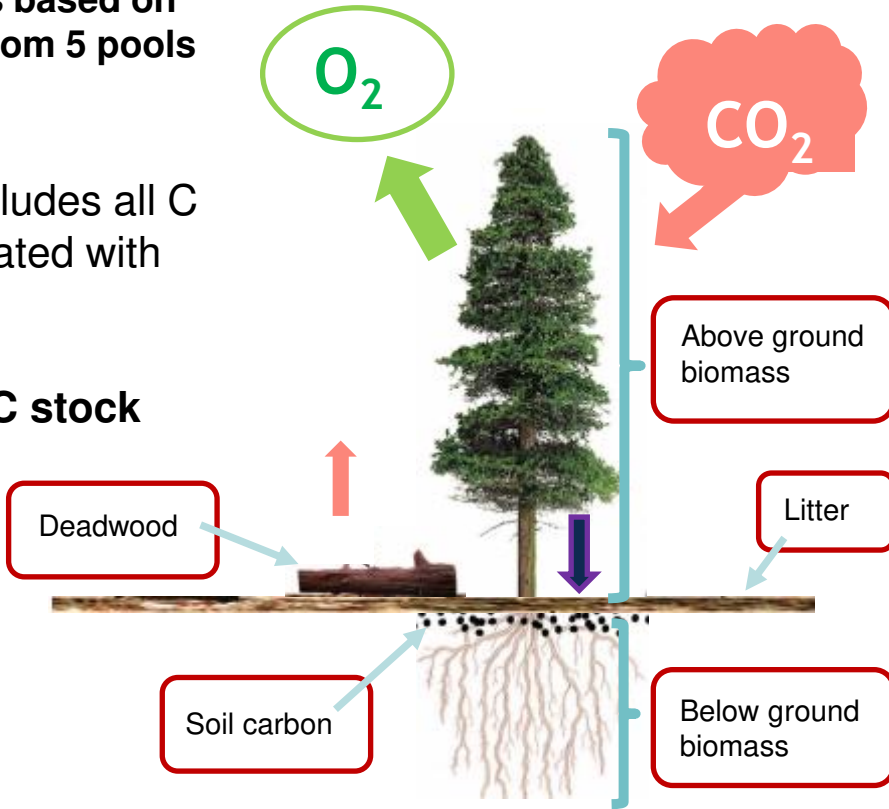


**GPC 11: Agroforestry**



# Forest Carbon (C) Pools

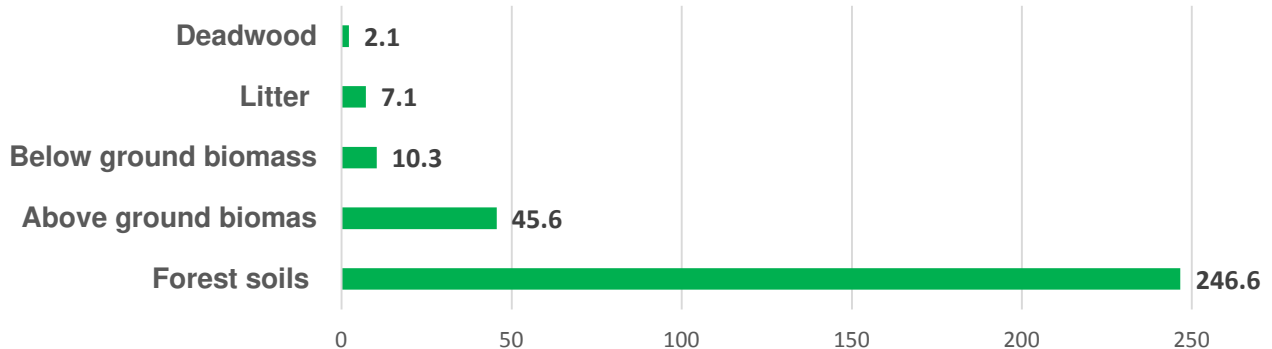
- At forest level, C balances based on net emissions/removals from 5 pools (reservoirs)
- Modelling framework includes all C transfers (fluxes) associated with these C pools
- **Final output = sum of C stock changes**



Source: Hendrick and Black, 2009 (COFORD)

# Estimating Carbon

## Forest Carbon Stock (million tonnes)



(Source: National Forest Inventory, 2017)

- **On average, 4.3 tonnes (approx.) of CO<sub>2</sub> – e /ha/year sequestered by the overall national forest resource**  
(incorporating different tree species, on varying soil types, at varying ages and with varying levels of harvest)

(Sources: NIR, 2019; DAFM 2019)

**Remember:** 1 tonne of C ~ 3.67 t CO<sub>2</sub> equivalent (CO<sub>2</sub> – e)

# Multiple Carbon Benefits

**1. C - Sequestration in growing forest** (also land substitution effect)



**2. C - Storage in harvested wood products**



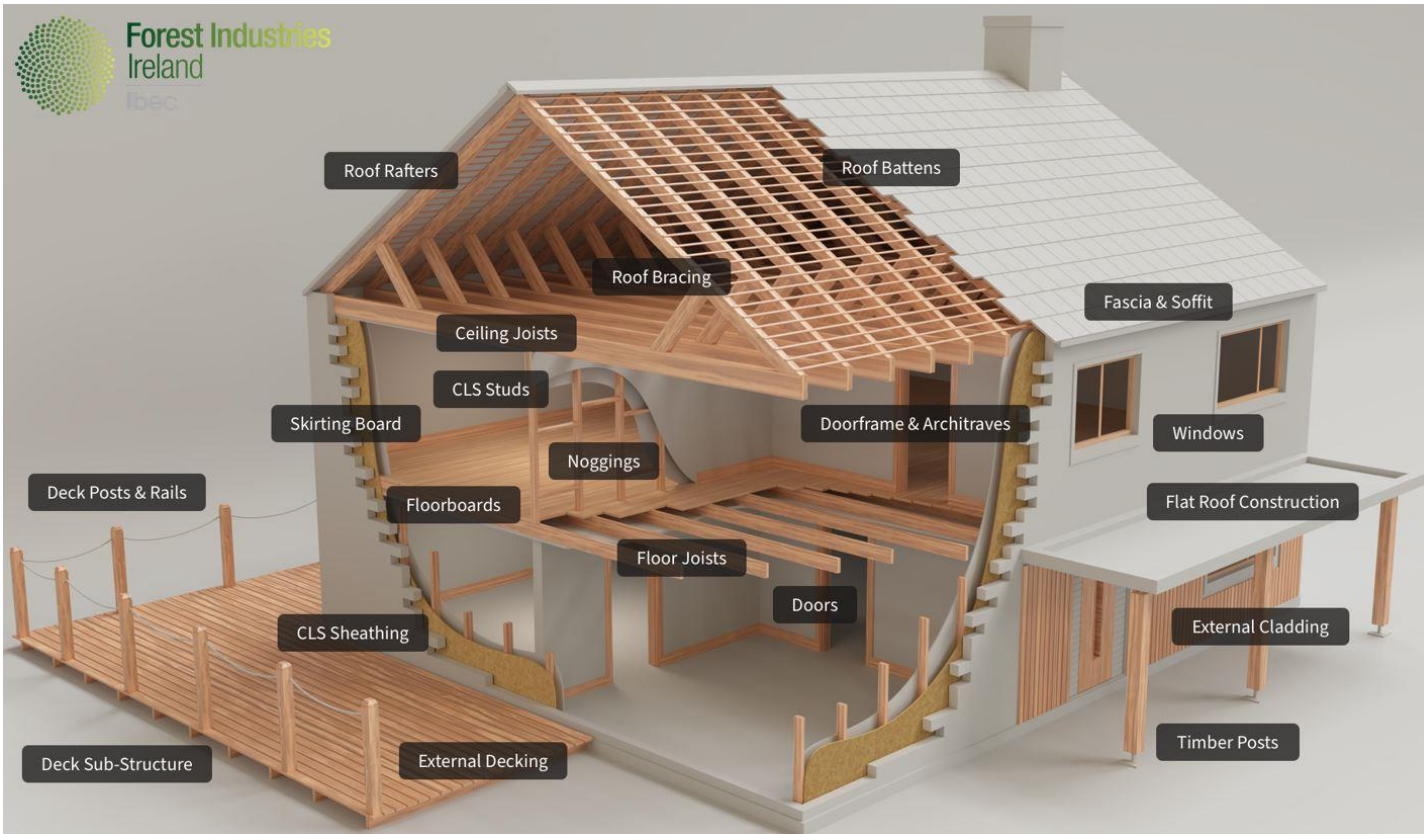
**4. Substitution of energy intensive materials**  
(not in accounting)

**3. Substitution of fossil fuels with wood energy**

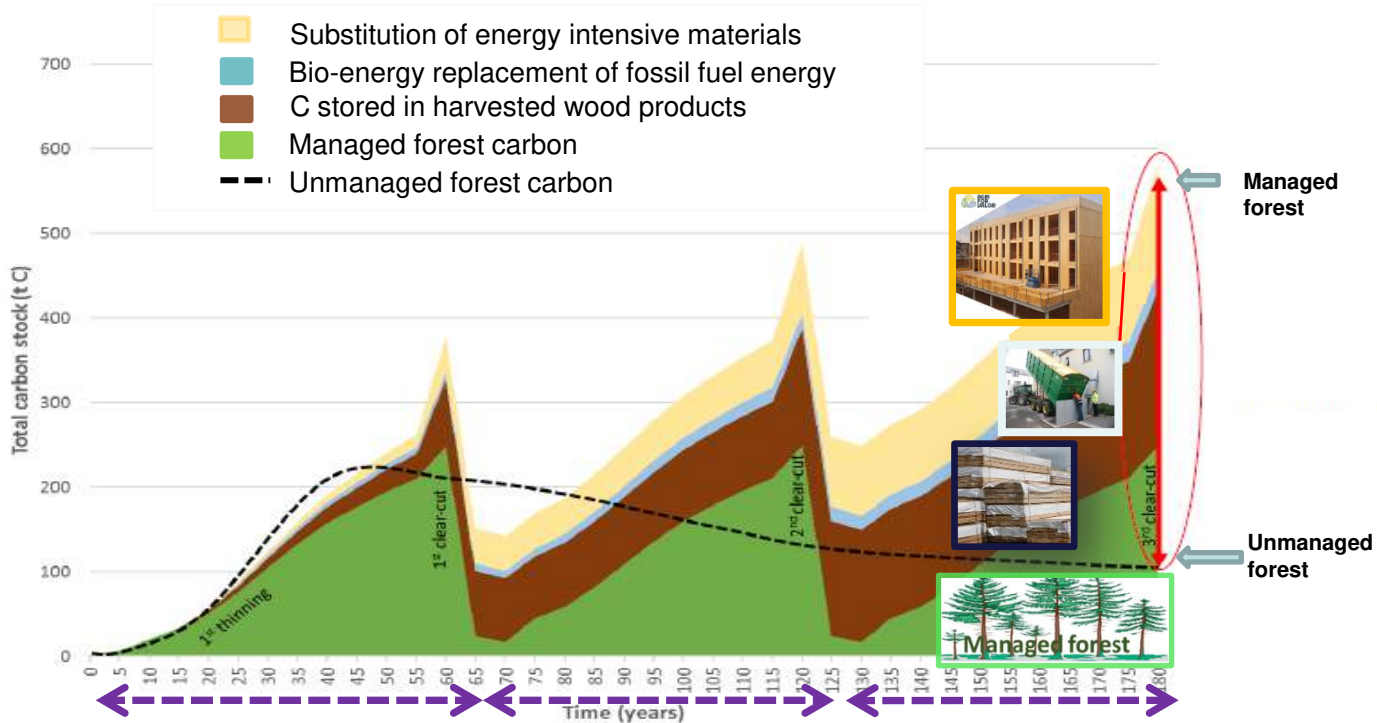




# Multiple Applications



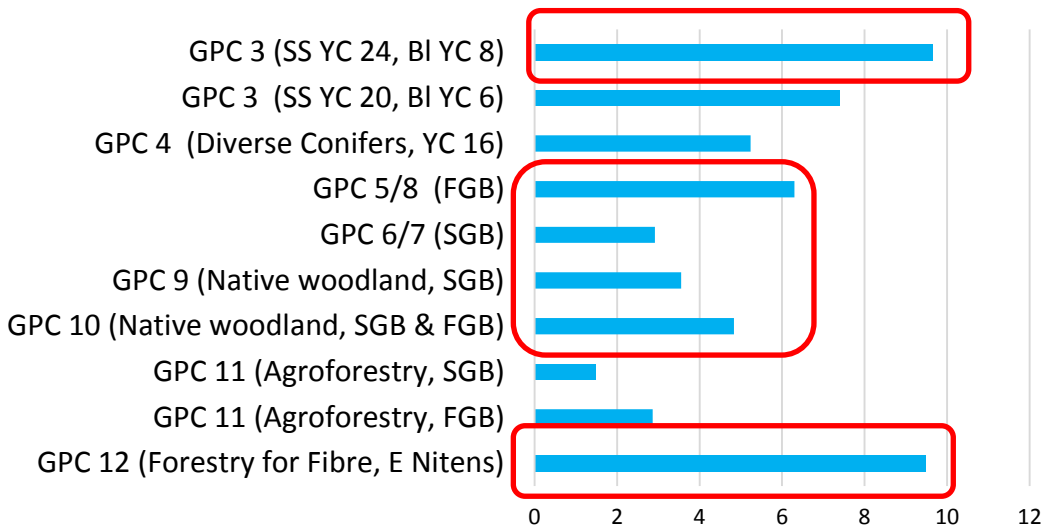
# Stand Level Processes



# Indicative Sequestration Rates

## Indicative C-Sequestration Rates\* for Grant and Premium Categories (GPCs)

tCO<sub>2</sub>/ha/year



### Key:

**GPC** – relevant forestry grant and premium category

**YC** –Yield class

**SS** –Sitka spruce

**BI** - Broadleaf element

**FGB** - Fast growing broadleaves e.g. alder.

**SGB** – Slower growing broadleaves e.g. Oak

**E Nitens** – *Eucalyptus nitens*

\***Potential** sequestration rates normalised over 2 rotations

Note: Values represented **are indicative only** and involve a **range of assumptions**

# Native Woodlands



Indicative Average Sequestration rate  
(over 100 year period):

**1.8 - 4.5 + tCO<sub>2</sub>-e/ha/yr**

Depending on many factors e.g.

- Species/mix
- Site type/productivity
- Management approach



*Sources (DAFM, 2018/2019)*



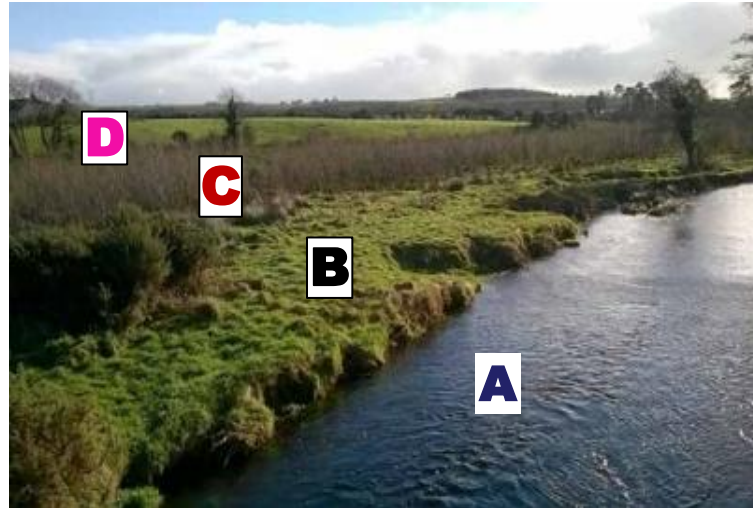
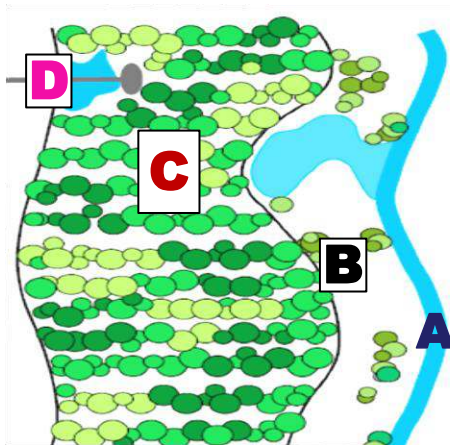
# Woodland for Water

Capacity for water protection and enhancement by combining undisturbed water setbacks and new native woodland

## Adjoining land use:

- Agriculture
- Forestry
- Built environment

## Woodland for water measure



Source: DAFM 2018





# 2021-2030

- EU Member States must account emissions and removals of greenhouse gases from the LULUCF sector during 2021 - 2030.

## LULUCF Accounting from 2020:

- Six accounting categories:

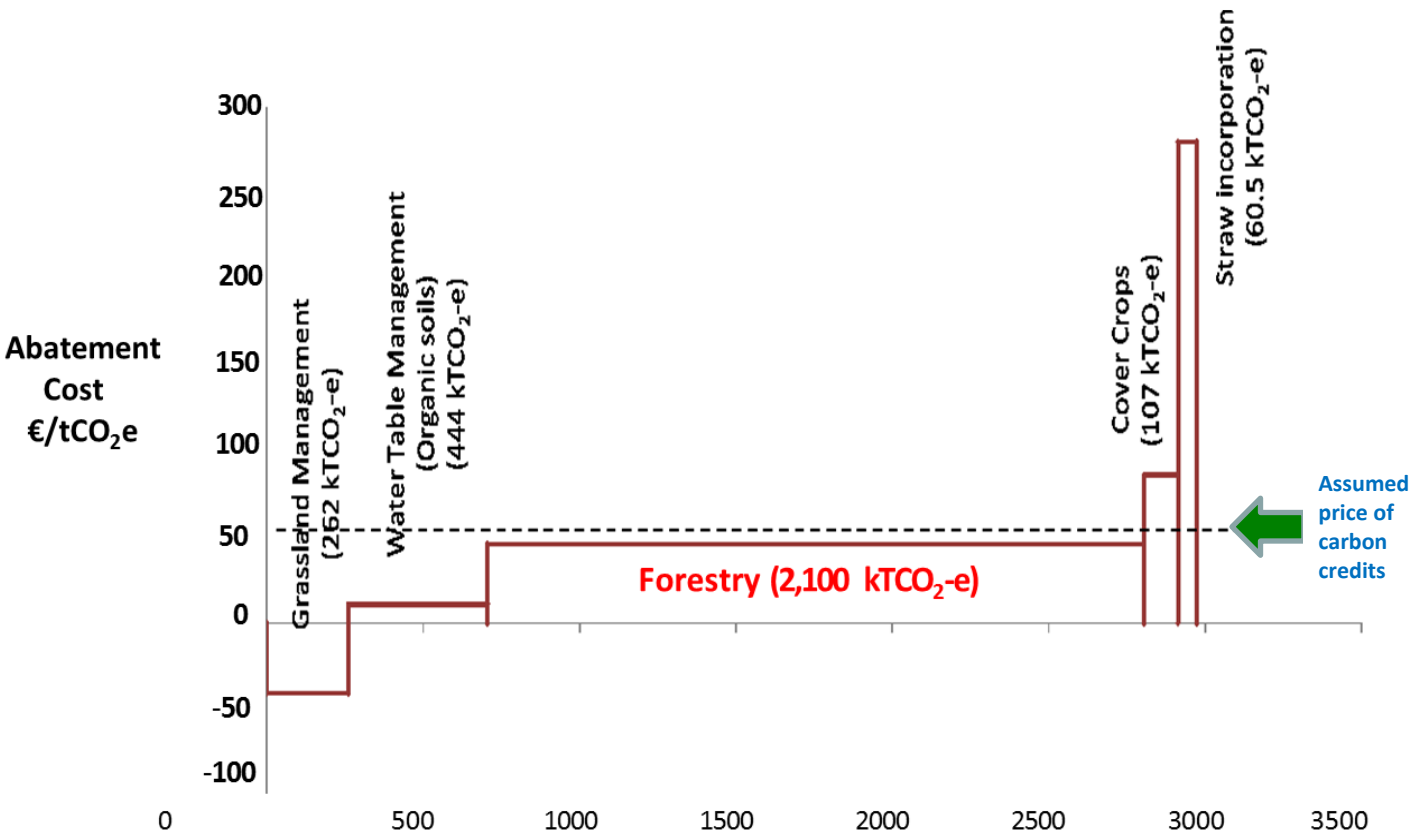
- **Afforested Land**
  - **Deforested Land**
- } Emissions/ removals are accounted **in full**

- **Managed Forest Land**
- } Emissions/removals compared to **Forest Reference Level**

- Managed Grassland
  - Managed Cropland
  - Managed wetlands (from 2026)
- } Emissions/removals compared to **base period**

# MACC Mitigation Pathway

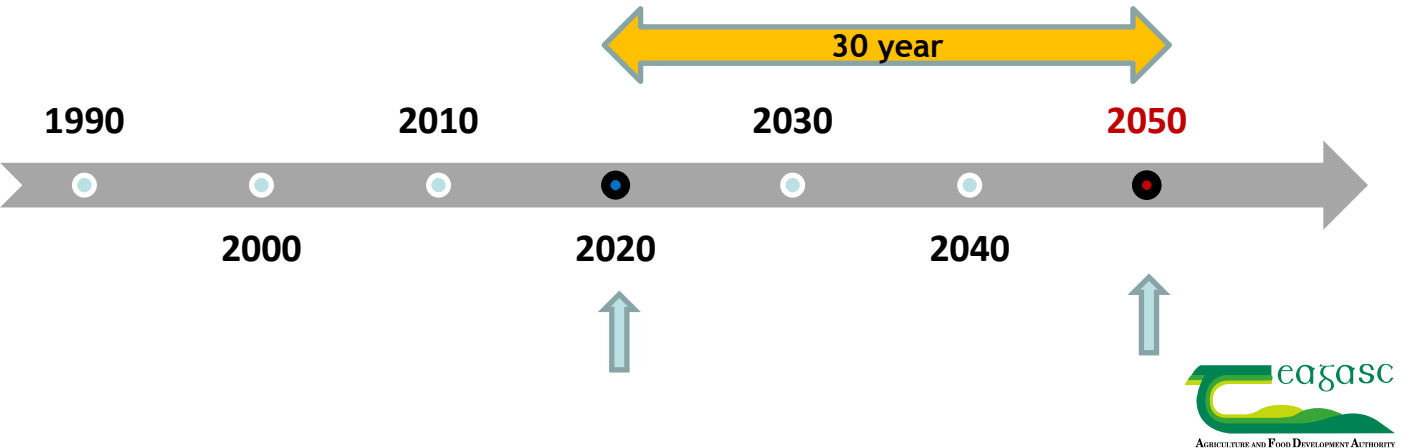
## Land Use, Land Use Change & Forestry



# Transition Period

Under LULUCF Regulation 2018/814:

- **Afforested Land** transitions to **Managed Forest Land** after 30 year period
- **Implications for future planting levels**



# Towards Future Resilience

## Tree breeding / improvement



Birch / Alder improvement

## Fit Forests Project

Response of trees to  
climate change



Developing ash genetic resources


## Forest management



**TranSSFor** 



Broadleaf silviculture / restructuring

  
PW-IPM: Towards  
Integrated Pest Management for  
Pine Weevil in Ireland

# Hedgerows

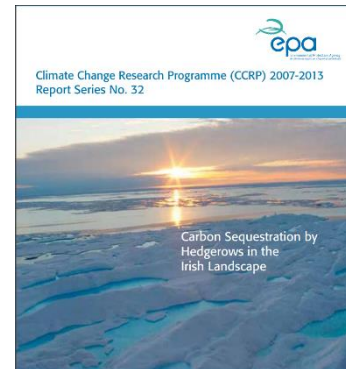
- Hedgerow emission/ removals not currently accounted
- Accounting requirements:
  - Methodology must capture the emissions or removals associated with human activity, compared with a reference/base period
- Projects completed / underway in relation to the sequestration capacity of lands, including hedgerows



# National Hedgerows & Trees Outside the Forest

## Irish Hedge Map – Version 1.0 (Teagasc, 2011)

- Based on 2005 ortho-photography
  - Digital mapping of all mature hedgerows, individual trees, non-forest woodland and scrub
  - **National cover estimate: 450,000 ha / 6.4% of the country (80% accuracy)**
- 
- **EPA Funded Project :**
  - Carbon sequestration by Hedgerows in the Irish Landscape (Black et al., 2014)
  - Estimated hedgerow sequestration capacity of 0.66 – 3.3 t CO<sub>2</sub>/ha/year

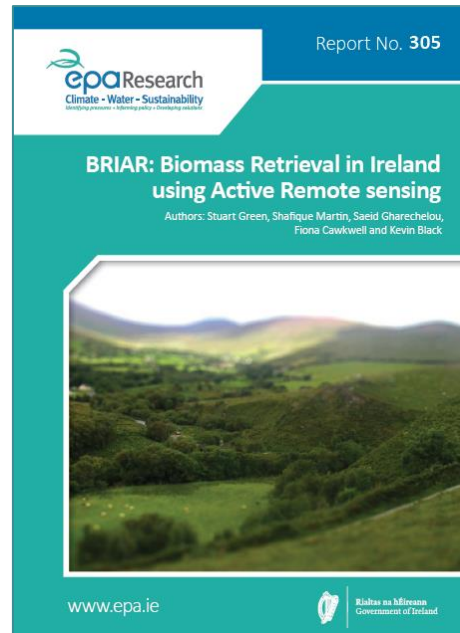


# BRIAR – Biomass Retrieval in Ireland using Active Remote Sensing (EPA, 2019)

Estimated hedgerow length of 689,000 km

## Recommendations:

- 5- year National point cloud-based inventory of hedgerows
- Study of differences between managed and unmanaged hedgerows
- Direct assessment of C stock via field measurement
- Consideration of C stored in banks on which hedgerows are planted





# Farm Carbon Project

- Direct measurement of hedge biomass (above / below ground) and soils
- Develop growth / accumulation models
- Improve understanding of carbon dynamics e.g. impact of management
- Develop / test scorecard for hedgerow assessment



# New Hedgerows

Scheme	Newly established hedgerows (km)	Newly planted trees	Newly planted orchard trees
Rural Environment Protection Scheme (REPS) 1994 - 2010	4,100	1,702,972	N/A
Agri-Environment Options Scheme (AEOS) 2010 - 2014	1,322	464,910	N/A
Green Low Carbon Agri-Environment (GLAS) 2014 - 2018	1,183	1,617,516	11,182
Total	6,605	3,785,398	11,182

*Source: Forest Statistics Ireland 2019, DAFM*

# Messages

- **Farm forests have very significant potential to help deliver climate change mitigation and many other benefits**
- **Forest mitigation pathways exist within and beyond the forest boundary but work to be done!**
- **Delivery:**
  - Increasing forest cover
  - Managing our forests sustainably
  - Minimising deforestation
  - Optimising long-lived harvested wood products
  - Appropriate use of wood to substitute for:
    - energy-intensive materials
    - fossil fuel energy





# THANK YOU

# Useful Links

- Teagasc website (forestry section) [www.teagasc.ie/forestry](http://www.teagasc.ie/forestry)
- Teagasc forestry- research page <https://www.teagasc.ie/crops/forestry/research/>
- Lanigan, G., Donnellan, T., Hanrahan, K., Carsten, P., Shaloo, L., Kroi, D., Forrestal, P., Farrelly, N., O'Brien, D., Ryan, M., Murphy, P., Caslin, B., Spink, J., Finnan, J., Upton, J., Richards, K. (2018). An Analysis of Abatement Potential of Greenhouse Gas Emissions in Irish Agriculture 2021-2030, Teagasc Greenhouse Gas Working Group. <https://www.teagasc.ie/media/website/publications/2018/An-Analysis-of-Abatement-Potential-of-Greenhouse-Gas-Emissions-in-Irish-Agriculture-2021-2030.pdf>
- Hendrick and Black (2009). Climate Change and Irish Forestry, COFORD Connect, Environment No 9. <http://www.coford.ie/media/coford/content/publications/projectreports/cofordconnects/ccn09-env09.pdf>
- DAFM (2018) Woodland Environment Fund. <https://www.agriculture.gov.ie/media/migration/forestry/grantandpremiumschemes/2018/DAFMWEFleaflet14Sept18250918.pdf>
- DAFM (2018) Woodland for Water: Creating new native woodlands to protect and enhance Ireland's waters. <https://www.agriculture.gov.ie/media/migration/forestry/grantandpremiumschemes/2018/WoodlandWaterLoRes06June18270618.pdf>

# Useful Links 1

- DAFM (2019). Forest Statistics Ireland.  
<https://www.agriculture.gov.ie/media/migration/forestry/forestservicgeneralinformation/ForestStatisticsIreland2019161219.pdf>
- DAFM (2017). Land Types for Afforestation.  
<https://www.agriculture.gov.ie/media/migration/forestry/grantandpremiumschemes/schemecirculars/2018/LandTypesForAfforestationOct17030118.pdf>
- DAFM (2017). National Forest Inventory Report.  
<https://www.agriculture.gov.ie/nfi/nfithirdcycle2017/nationalforestinventorypublications2017/>
- Green, S., Shafique, M., Gharechelou, S., Cawkwell, F., Black, K. (2019) Biomass Retrieval In Ireland Using Active Remote Sensing (BRIAR), EPA Research Programme 2014-2020.  
[http://www.epa.ie/pubs/reports/research/climate/Research\\_Report\\_305.pdf](http://www.epa.ie/pubs/reports/research/climate/Research_Report_305.pdf)
- Black, K., Green, S., Mullooley, G., Poveda, A. (2014). Carbon Sequestration by Hedgerows in the Irish Landscape: Towards a National Hedgerow Biomass Inventory for the LULUCF Sector Using LiDAR Remote Sensing, EPA Climate Change Research Programme 2007-2013.  
<https://www.epa.ie/pubs/reports/research/climate/ccrp-32-for-webFINAL.pdf>