



Woodlands for Water:

Using forests to protect & enhance water

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Teagasc Environment Training Webinar Series

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

Department of Agriculture, Food & the Marine...

Forest Sector Development; Forest Service Inspectorate; Administrative Division (Also Research, Food & Codex)

...responsible for implementing national forest policy

...regulates afforestation, forest road construction, felling & aerial fertilisation, under the Forestry Act 2014 & Forestry regulations 2017 (S.I.191 / 2017)

...regulates both Coillte & private

...responsibilities under the Water Framework Directive, Habitats Directive, EIA Directive, etc.

...other roles, e.g. National Forest Inventory, carbon accounting, forest health (Plant Health Directive), Forest Reproductive Material Directive, EUTR, FLEGT

...preparation for BREXIT

...delays with licensing dominating, due to file build-up on the 'Ecology Worklist' and in Appeals → major impact on forestry sector but resourced plan now in action

Department of Agriculture, Food & the Marine...

...promote sustainable forestry, under 2014-2020 Forestry Programme (*inter alia*):

- Afforestation Scheme (12 options, incl. agro-forestry, native woodland)
- Schemes for forest roads, tending & thinning, and continuous cover forestry
- Native Woodland Conservation Scheme
- NeighbourWood Scheme
- Just-released Woodland Creation on Public Lands Scheme

Government Policy *“to develop an internationally competitive & sustainable forest sector that provides a full range of economic, environmental & social benefits to society & which accords with the Forest Europe definition of sustainable forest management.”*

OR

‘The right tree in the right place’



Forestry in Ireland – multi-faceted...

- Stark growth advantage
- 11% of total land area, aiming for 18% by 2046
- Carbon sink, 2.8 to 4.8 million tonnes of CO₂ equivalents per year from 2006 to 2016
- Sector contributes €2.3 billion to the national gross domestic product (GDP)
- Almost half of forests (49.2%) in private ownership
- 29% broadleaves
- Growing resource, annual increment >> the amount felled
- Vibrant, export-oriented forest products sector, with over 80% of wood-based panels being exported
- Strong focus on ecosystem services – water & soil, biodiversity, landscape, amenity...

Employment & income generating, from nursery to the final crop & beyond ,into processing & end-use



Additional co-benefits...



Image: Forestry Commission



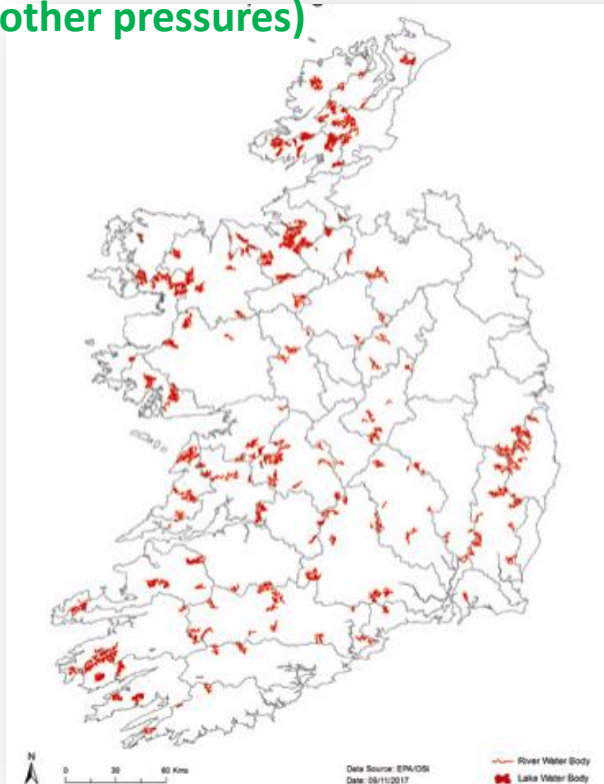
Additional co-benefits...



Image: Forestry Commission



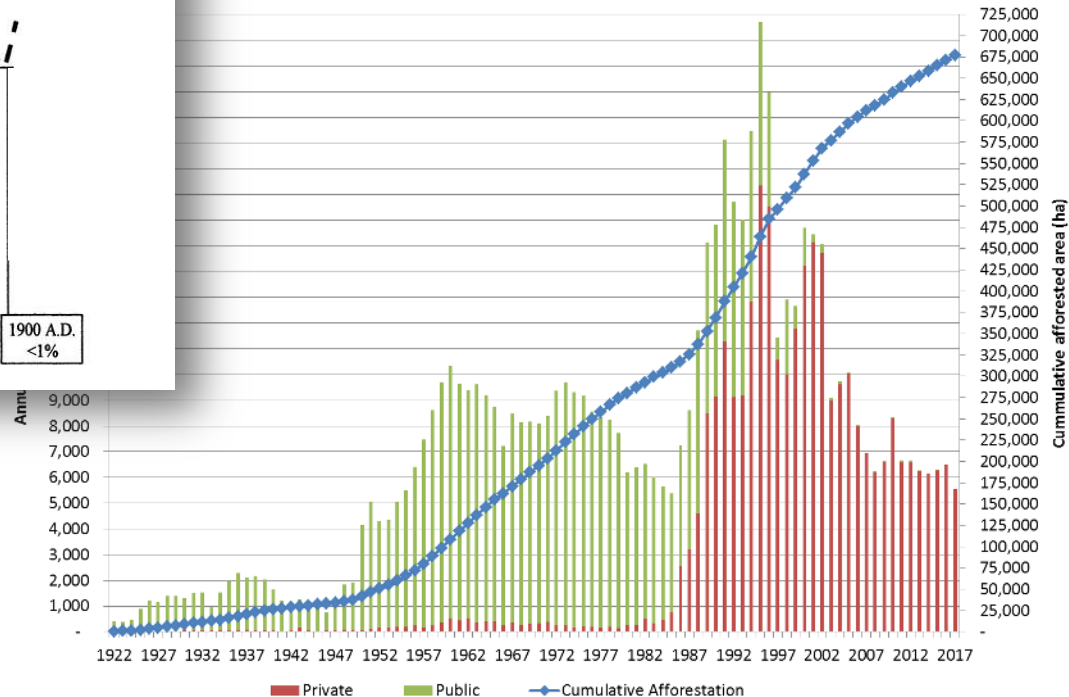
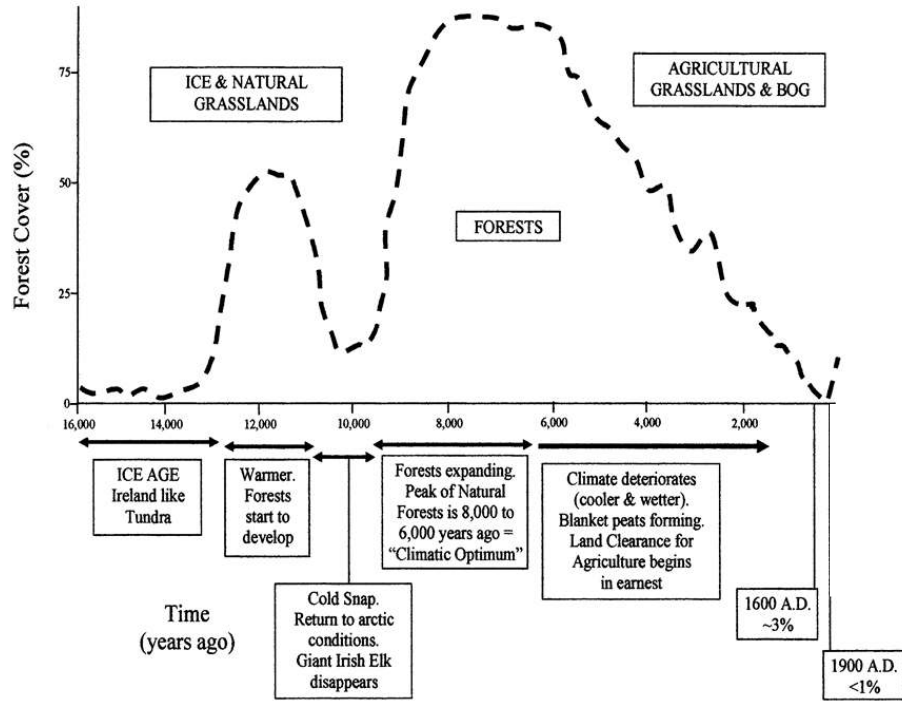
At Risk water bodies where
forestry is a significant pressure
(alone or with other pressures)



From the River Basin Management Plan for Ireland
2018-2021

Afforestation trends

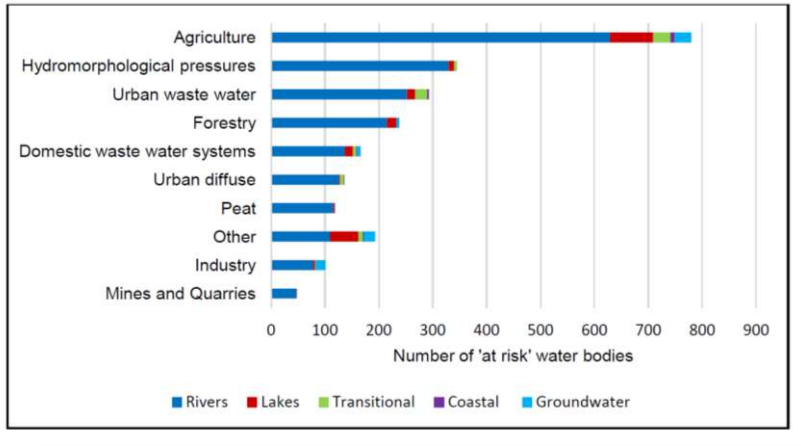
(DAFM National Forest Inventory, 2017)



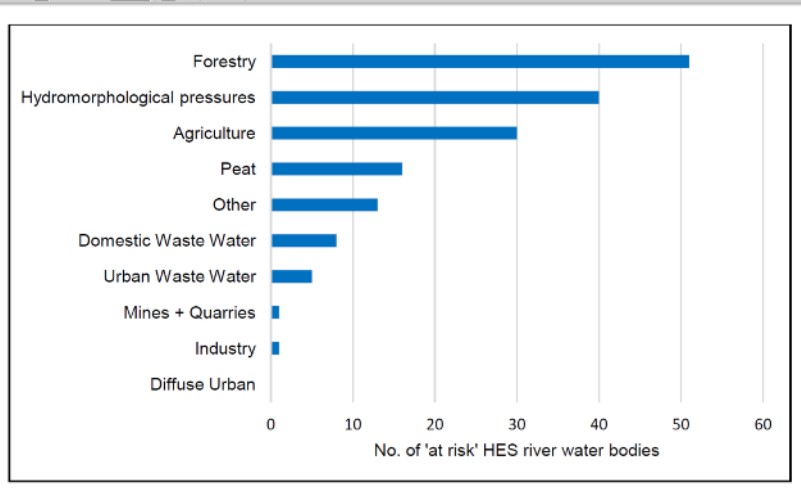
Historical perspective

Characterisation process behind 2nd cycle RBMP...

Forestry ranked the 4th most significant pressure on 'at risk' water bodies

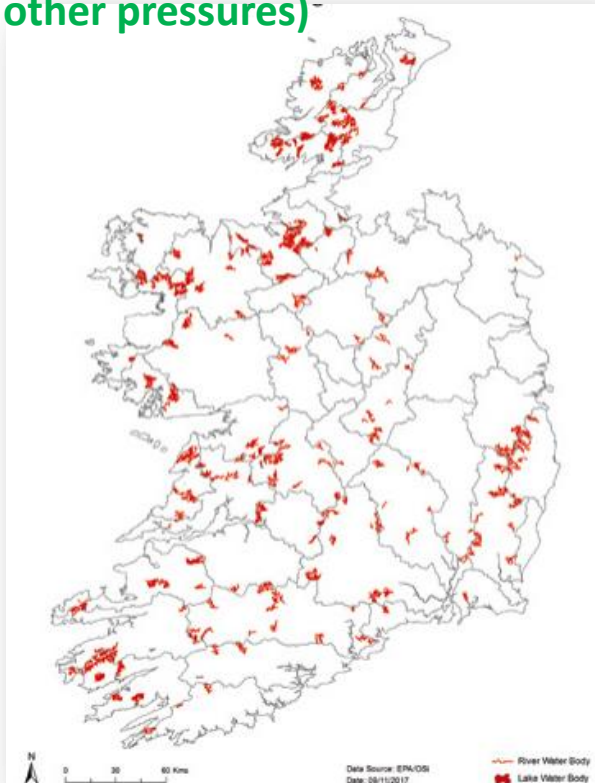


Forestry ranked the most significant pressure on high ecological status (HES) objective river water bodies deemed to be at 'at risk'...

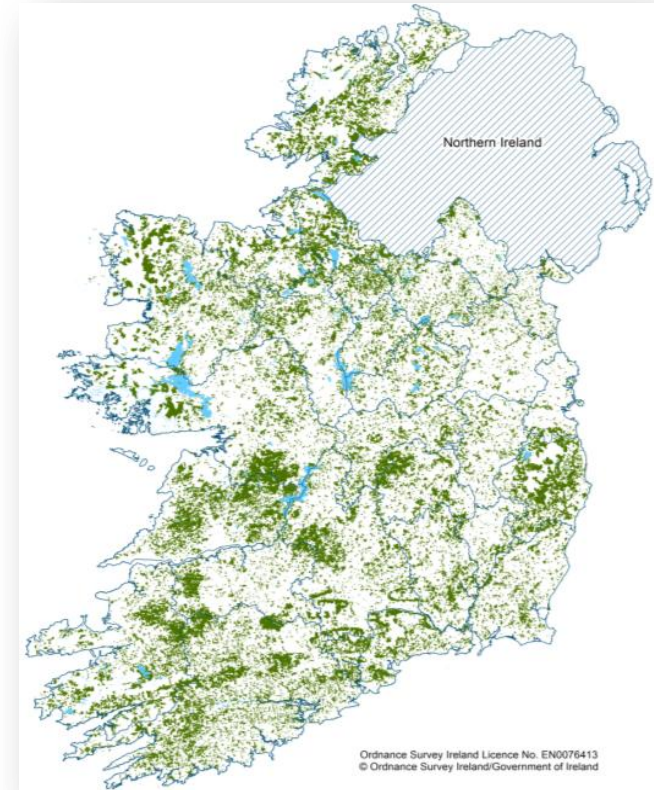


...strong overlap with 'legacy sites' approaching clearfell stage

At Risk water bodies where
forestry is a significant pressure
(alone or with other pressures)



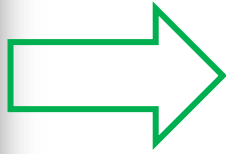
Distribution of forests in Ireland
(DAFM National Forest Inventory,
2017)



A. Poorly sited, designed & managed forests can lead to negative impacts on water

B. **However**, appropriately sited, designed & managed forests can:

- deliver key water-related ecosystem services
- play an important role in meeting WFD objectives



Therefore,
eliminate 'A' and
promote 'B'

Native Woodland Scheme Package

Supporting farmers & other landowners to conserve existing native woodlands & to establish new native woodlands, to (*inter alia*) protect & enhance water & aquatic ecosystems

Operating since early 2000s in partnership with Woodland of Ireland, NPWS, IFI, Heritage Council & others



Support for
restoring existing
native
woodlands...

... and for converting conifer stands to native woodland...





Native Woodland Establishment Scheme*

- Supports the creation of new native woodland...
- ...to expand Ireland's native woodland resource & to realise associated eco-system services
- Focused on the most appropriate native woodland type(s), minimal site inputs, & long-term management under 'continuous cover forestry'
- Application prepared by a 'NWS Forester', ecological input encouraged on sensitive sites
- Highest grant & premium rates available, up to €6,220 / ha grant (incl. fencing allowance) plus up to €680 / ha / yr premium for 15 years
- An option for farmers in highly sensitive areas, to create new woodlands as part of their farm enterprise

* 'Grant & Premium Categories' 9 & 10 under the general Afforestation Scheme







Photo John Cross



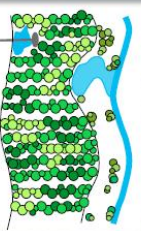


Water-related eco-system services of native woodland

- reduces sediment 'mobilisation' & runoff into watercourses
- intercepts nutrient runoff into watercourses
- stabilises banks
- inputs food ('leaf drop') into the aquatic ecosystem
- provides shading / cooling of water
- helps regulate floodwater
- restores the riparian ecosystem



Woodland for Water: Creating new native woodlands to protect and enhance Ireland's waters



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Section 4

Relevant Research & Initiatives

age of significant water-related ecosystem services can be realised by applying the land for Water measure, combining new native woodland and an undisturbed water body, particularly under the following headings:

reduction in sediment mobilisation and runoff into watercourses

interception of nutrient runoff into watercourses

bank stabilisation

load input into the aquatic ecosystem

shading / cooling

regulation of floodwater

riparian restoration

ation presents an overview of relevant research in Ireland, the UK and elsewhere, illustrating these ecosystem services. Various research titles are listed under each of the headings, together with a concise overview of the main findings of that research. Note, this is intended as a brief overview of relevant research. Full references are set for follow-up reading.

review has been compiled with input from Woodlands of Ireland within the context partnership between that organisation and DAFM in the ongoing development and refinement of the Native Woodland Scheme package.

ediment mobilisation and runoff into watercourses

te of riparian vegetation in protecting and improving chemical water quality in streams by M.G., Vidon, P., Gunwick, N.P., Allan, C.J., Duval, T.P. & Lowrance, R. 2010. *Journal of American Water Resources Association* 46(2):261-277.

ew of the research literature concludes: that riparian vegetation influences stream chemistry through diverse processes including direct chemical uptake and indirect effects such as the supply of organic matter to soils and channels, modification of waterment, and stabilization of soil. Our analysis suggests that the level and time frame of a rise to restoration depend strongly on the degree and time frame of vegetation loss. ly effects of past vegetation can continue to influence water quality for many years. ades and control the potential level and timing of water quality improvement after tion is restored. Through the collective action of many processes, vegetation exerts initial influence over the well-documented effect that riparian zones have on stream quality. However, the degree to which stream water quality can be managed through angement of riparian vegetation remains to be clarified.

Land use management effects on flood flows and sediments – guidance on prediction

McIntyre, N. & Thorne, C. (Eds.). 2013. CIRIA Report C719. CIRIA, London.

At the plot scale, experiments at the Pontbren catchment showed that tree planting can in some circumstances reduce runoff by orders of magnitude.

Interception of nutrient runoff into watercourses

The role of herbaceous woodland perennial diversity for improving nutrient uptake capacity of riparian areas

McMullen, C.M. & Thompson, J. 2006. Leopold Center Completed Grant Reports. Paper 258. Volume 15 (2006) Leopold Center Progress Report.

The principal conclusion is that perennial herbaceous species, because of the biomass they accumulate during the growing season, have the potential to improve the capacity of riparian buffers to seasonally store nutrients and prevent them from entering surface waters. Because the degraded forests in the study were lacking a group of species that have peak growth in early spring, their capacity to retain nutrients was seriously impaired in the spring, a time of high potential nutrient loss.

Design and placement of a multi-species riparian buffer strip system

Schultz, R.C., Coletti, J.P., Isenhardt, T.M., Simpkins, W.W., Mize, C.W. & Thompson, M.L. 1995. *Agroforestry Systems* 29 (3):201-226.

This suggests better soil stabilization, absorption of infiltrated water, and soil-root-microbe-NPS [non-point source] pollutant interaction characteristics within the multi-species riparian buffer strip system [MSRBS] than the cropped fields. Nitrate-nitrogen concentrations in the MSRBS never exceed 2 mg l⁻¹ whereas the levels in the adjacent agricultural fields exceed 12 mg l⁻¹. The water quality data collected suggest that the MSRBS is effective in reducing NPS pollutants in the vadose [region of aeration above the water table] and saturated zone below the system. Overall the MSRBS system seems to be functioning as expected. This MSRBS system offers farmers a way to intercept eroding soil, trap and transform NPS pollution, stabilise streambanks, provide wildlife habitat, produce biomass for on-farm use, produce high-quality hardwood in the future, and enhance the aesthetics of the agroecosystem.

Theme 2: Nitrate leaching

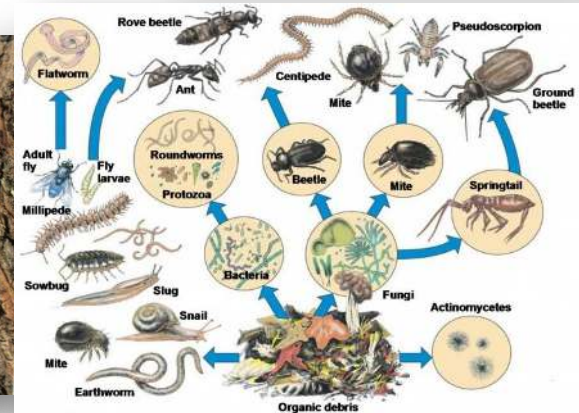
Hansen, K., Gundersen, P., Rosenqvist, L., Vestergaard, L. & van der Salm, C. 2004. In: Guidelines for planning afforestation on previously managed arable land. Edited by Hansen, K. & Vestergaard, L. Forest & Landscape, Hørsholm, 105 pp.

The nitrogen cycle in agricultural soils is an open cycle. Fertilisers (NPK) are supplied regularly in large amounts and approximately the same amount of nitrogen leaves the ecosystem by leaching or in harvested products. Leaching to seepage water and stream water is large since the soils often are 'saturated' with nitrogen and the vegetation cover is sparse during the wet season. On the contrary, old forests are characterized by a tight nitrogen cycle where losses of nitrogen are low. Water from old forests is, therefore, generally of good quality with a low concentration of dissolved nitrogen compared to other land uses. Afforestation of former farmland is seen as a strategy to improve water quality, especially with regard to nitrate leaching. In this context, the challenge is to keep nitrate leaching from the new forests at a

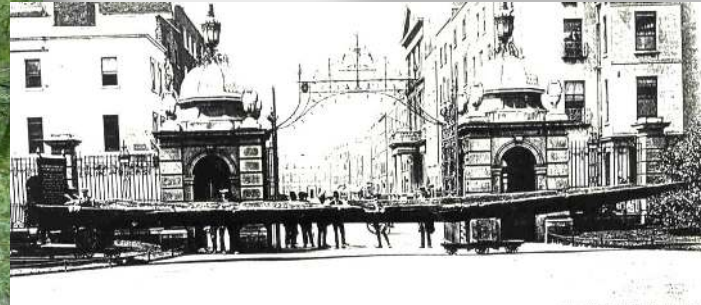
Other co-
benefits,
e.g.
wood products...



On-farm (& landscape-scale) biodiversity



**Other tangible
ecosystem services –
carbon, people, culture**





NWS package developed & implemented in partnership with Woodlands of Ireland, NPWS, Heritage Council, Inland Fisheries Ireland & other native woodland 'stakeholders'

Native woodland creation (*via* NWS Est.) trialled under the EU co-funded KerryLIFE Freshwater Pearl Mussel project



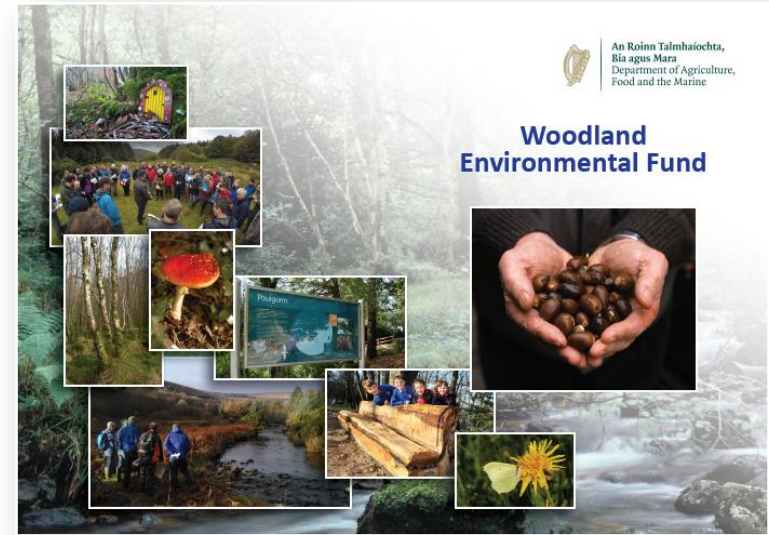


Agro-Forestry Scheme

- Another option under the Afforestation Scheme (GPC11)
- Concept well-developed throughout Europe
- Tangible benefits ref. crop & livestock production, wood products, on-farm biodiversity & soil conservation, & the **protection of water** (e.g. reduces inputs / pressure, increases infiltration)
- Scheme promotes 'silvo-pastoral' systems (grazing, fodder)
- Trees planted at wide spacing (400 / ha) & protected individually, with grazing & fodder beneath
- Grown to marketable timber
- €6,220 / ha grant to establish, plus up to €660 / ha / yr premium for 5 years
- 'Pioneer' projects, growing interest

ALSO...

- Continuous Cover Forestry Scheme
- New Woodland Creation on Public Lands Scheme
- Woodland Environmental Fund



ALSO...

- All afforestation & reforestation projects must adhere to a range of water-protection measures, including undisturbed water setbacks along aquatic zones, relevant watercourses & water-related 'hotspots'
- For details, see the *Environmental Requirements for Afforestation* & the *Interim Standards for Felling & Reforestation*



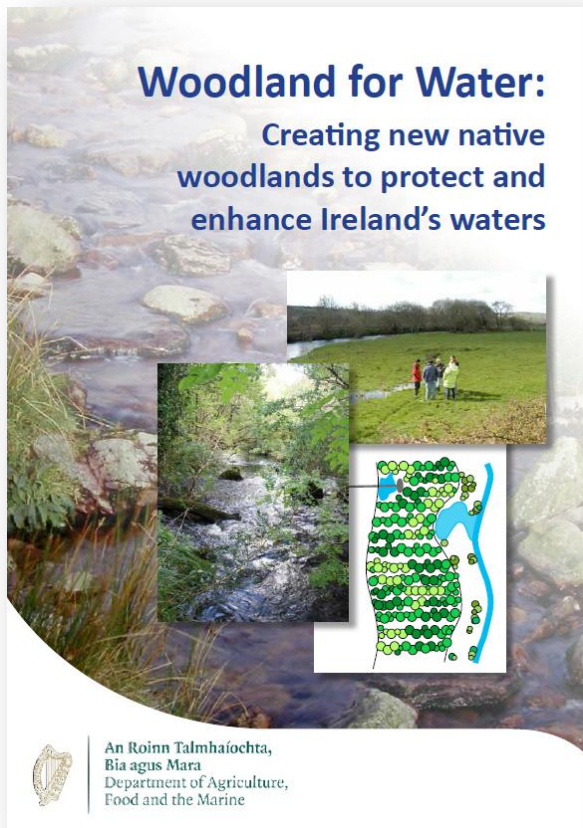
Using forests to protect water, both farm-by-farm (as part of on-farm mitigation) and at a landscape scale...

...how can we achieve the latter?

Water Catchments

WHERE WE LIVE, WORK & PLAY





Thank you!

www.agriculture.gov.ie/forestsservice/

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Also,

**Teagasc Forestry Advisors,
www.teagasc.ie/crops/forestry**

**Joe Gowran, Woodlands of Ireland,
www.woodlandsofireland.com/**