GREENING IRISH FORESTRY

Recommendations for Nature Friendly Forestry

Contents

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Introduction

In this report BirdWatch Ireland, An Taisce, the National trust for Ireland and CELT (the Centre for Environmental Living and Training) have come together to propose positive solutions to how we can transition Irish forestry to a more sustainable pathway for the benefit of wildlife, the environment and the Irish people. We want to see the development of an Irish forestry sector which has high environmental credentials and can deliver sustainable employment. Forestry must enhance the viability of rural communities and contribute positively to Ireland's rich natural and cultural heritage, while also enhancing the quality of life within communities.

How can we achieve this?

To enhance Ireland's environment our forestry sector must adopt best practice in sustainable forest management. Forestry practices must protect biodiversity, soil and water quality. We need a new model of forestry that simply put delivers:

- ✓ the right trees
- ✓ in the right places
- ✓ under the right management.

Forestry must enhance biodiversity at a community and regional level by delivering:

- New native woodland establishment while also enhancing and connecting existing woodlands.
- Ambitious targets and incentives for the planting of broadleaves.
- Setting ambitious targets to diversify the species mix within Irish forestry by capping the percentage of non-native tree species that can be planted regionally through afforestation and reforestation schemes.
- Forestry that is compatible with the delivery of ecosystem services such as carbon sequestration, flood attenuation, pollination and water quality protection.

Forestry must ensure the protection of our environment through:

- The full implementation of Irish and European environmental law.
- Working with partners such as environmental NGO's and government bodies to develop tools to ensure the conservation of habitats and species at a landscape level.
- Ensuring that the expansion of forestry in Ireland is not in conflict with the conservation of High Nature Value farmland and threatened habitats and species.
- The adoption of continuous cover forestry within environmentally sensitive sites
- Banning Sitka Spruce in acid sensitive catchments with peat soil.
- Ending the use of damaging pesticides.
- Ensuring that native woodland buffers are used where appropriate to protect water quality.
- Ensuring the proper training and safeguards are in place to protect biodiversity.

Forestry must contribute to the viability and quality of life within rural communities by:

- Funding forestry and agroforestry schemes that are complementary to farming.
- Ensuring forestry creates local employment and spin off industries.
- Ensuring that the financial incentives that are in place for forestry are not perversely conflicting with agri-environmental schemes.

- Establishing regional thresholds for forest cover where environmental and social conflicts are evident.
- Ensuring that the afforestation approvals process is transparent, unbiased and open to the public.

Chapter 1. Recommendations for Nature Friendly Forestry

by BirdWatch Ireland
Fintan Kelly, Policy Officer

Context

Under the Irish Forestry Programme 2014-2020[1] a target has been set to increase Ireland's forest cover area from its current level of 10.7% to 18% by 2046[2]. This, it is projected will require over 46,000 ha of land to be afforested by an estimated 25,000 landowners. This would be equivalent to afforesting an area half the size of Dublin. Between 1990-2015 Ireland has had the highest rate of afforestation in the EU (4.6%)[3]. This drive to afforest vast areas of farmland across the country in combination with the ongoing intensification of agricultural land[4] will result in one of the most dramatic changes in land-use on the island in centuries. Invariably the scale of the social and environmental changes will have far reaching consequences for biodiversity. Looking forward, whether forestry in Ireland will have a net positive or negative influence on biodiversity will ultimately depend on a range of factors, such as where afforestation takes place, the model of forestry used and the environmental safeguards that are implemented. According to the National Parks and Wildlife Service (NPWS) forestry is currently a significant threat and pressure on habitats and species protected under the Habitats Directive[5] and the Birds Directive[6]. While according to the Environmental Protection Agency forestry is the greatest pressure nationally on our last remaining lakes and rivers of high ecological value[7].

The indications are that unless there's a shift in government policy then the predominance of non-native plantations and the use of clear-felling within Irish forestry will continue. That is to say that plantations of non-native conifers will be planted on marginal farmland and clear-felled. The expansion of forestry will therefore exacerbate the accepted negative biodiversity and water quality impacts associated with this model of forestry on a regional and catchment scale. One of the most

[1] Forest Service (2015) Forestry Programme 2014-2020; Forest Service, Department of Agriculture, Food and the Marine Ref: IRL-DAFMFS.023 http://bit.ly/2k1nvc5
[2] Department of Agriculture, Food and the Marine (2014) Forests, products and people. Ireland's forest policy – a renewed vision. Department of Agriculture Food and the Marine, Dublin.
[3] FOREST EUROPE, 2015: State of Europe's Forests 2015.
[4] Feehan, J., 2003. Farming in Ireland: History, Hertiage and Environment. Walsh Printers, Roscrea, Co. Tipperary.
[5] NPWS, 2013. The Status of Protected EU Habitats and Species in Ireland. Overview Volume 1. Unpublished Report, National Parks & Wildlife Services.
Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. Editor: Deirdre Lynn
[6] NPWS (2014) Ireland's Summary Report for the period 2008 – 2012 under Article 12 of the Birds Directive. Dublin: National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht.
[7] Department of Housing, Planning, Community and Local Government (2017) Draft River Basin Management Plan for Ireland (2018-2021), Dublin: Department of Environment, Heritage and Local Government

pressing concerns for BirdWatch Ireland is that afforestation will be strategically targeted on marginal agricultural land, particularly in areas where low intensity land uses such as hill farming have persisted for generations[8][9]. This marginal farmland contains some of the important remaining areas for biodiversity in the country, including high-status waters bodies[10], protected semi-natural habitats and High Nature Value farmland (HNVf)[11]. Commercial forestry in its current form is not compatible with the sustainable management of many of these sites. In order to ensure that Irish forestry is sustainable moving forward we must ensure that the right trees are planted in the right places and are management appropriately.

- ✓ **Right Trees**
- ✓ **Right Place**
- ✓ **Right Management**

In order to achieve this goal, BirdWatch Ireland propose a range of changes to the current afforestation policies and forestry practices which we believe would greatly improve the sustainability of the sector moving forward.

The impact of afforestation on Irish biodiversity

Historic deforestation has transformed Ireland from a prehistoric primeval forest to one of the least forested countries in Europe[12]. However, in recent years the rate of commercial afforestation in Ireland has been the highest in the EU[13]. Today only about 10.7% of Ireland's land area is under forest cover[14]and of this only around 2% of the country is covered by what is termed native or semi-natural woodland, and much of this is highly fragmented and modified[15].

The biodiversity of our woodlands is also impoverished relative to the UK and mainland Europe. Taking woodland birds as an example, there is an East-West decline in avian-diversity across Europe with Ireland being particularly low in species[16]. This is likely the result of a combination of both historical and biogeographical factors. The historical deforestation of Ireland[2] in combination with the isolation of Ireland during and after the last glacial maximum[17] and our cool maritime climate are all contributing factors to the low levels of woodland biodiversity in Ireland[16]. The forested areas we do have are dominated by plantation forestry. Plantation forests make up 90.6% of the total forest area in Ireland[3]. 72.8% of the national forest estate is made up of non-native conifers, with 52.4% of forestry in Ireland being made up of just one species, Sitka spruce (*Picea sitchensis*)[18]. Ireland's unnatural and industrial model of forestry is very unusual in a European context (Forest Europe, 2015). For example Ireland has the third highest level of plantation forestry in Europe and the

[8] Forest Service (2016) Land Types for Afforestation; Forest Service, Department of Agriculture, Food & the Marine, Ireland, Johnstown Castle Estate, Co. Wexford
[9] COFORD (2016) Land Availability Working Group. Land Availability for Afforestation - Exploring opportunities for expanding Ireland's forest resource. COFORD, Dublin
[10]Moran, J. and Sullivan, C. (2017) Co-benefits for Water and Biodiversity from the Sustainable Management of High Nature Value Farmland.
[11] Matin, S., Sullivan, C.A., Ó hÚallacháin, D., Meredith, D., Moran, J., Finn, J.A. and Green, S (2016) Map of High Nature Value farmland in the Republic of Ireland. Journal of Maps 12: 373–376.
[12] Aalen, F.H.A., Whelan, K. and Stout, M. (Eds.). (1997) Atlas of the Irish rural landscape. Cork University Press, Cork.
[13] Forest Europe, 2015: State of Europe's Forests 2015.
[14] Forestry-Service (2014), Ireland's Forests Annual Statistics, Wexford: Department of Agriculture, Food and the Marine
[15] Perrin, P., Martin, J., Barron, S., O'Neill, F., McNutt, K. & Delaney, A. (2008) National Survey of Native Woodlands, 2003-2008. Unpublished report to the National Parks and Wildlife Service, Dublin.
[16] Fuller, R. J., Gaston, K. J., & Quine, C. P. (2007). Living on the edge: British and Irish woodland birds in a European context. Ibis, 149, 53-63.
[17] Blondel, J. (1997) Evolution and history of the European bird fauna. In Hagemeijer, W.J. & Blair, M. (eds) The EBCC Atlas of European Breeding Birds: Their Distribution and Abundance: cxxiii–vi. London: Poyser.
[18] Forestry-Service (2014), Ireland's Forests Annual Statistics, Wexford: Department of Agriculture, Food and the Marine

highest share of forest area dominated by introduced tree species. This is in stark contrast to Europe as a whole where 87% of forest area is semi-natural (Figure 1)[3].

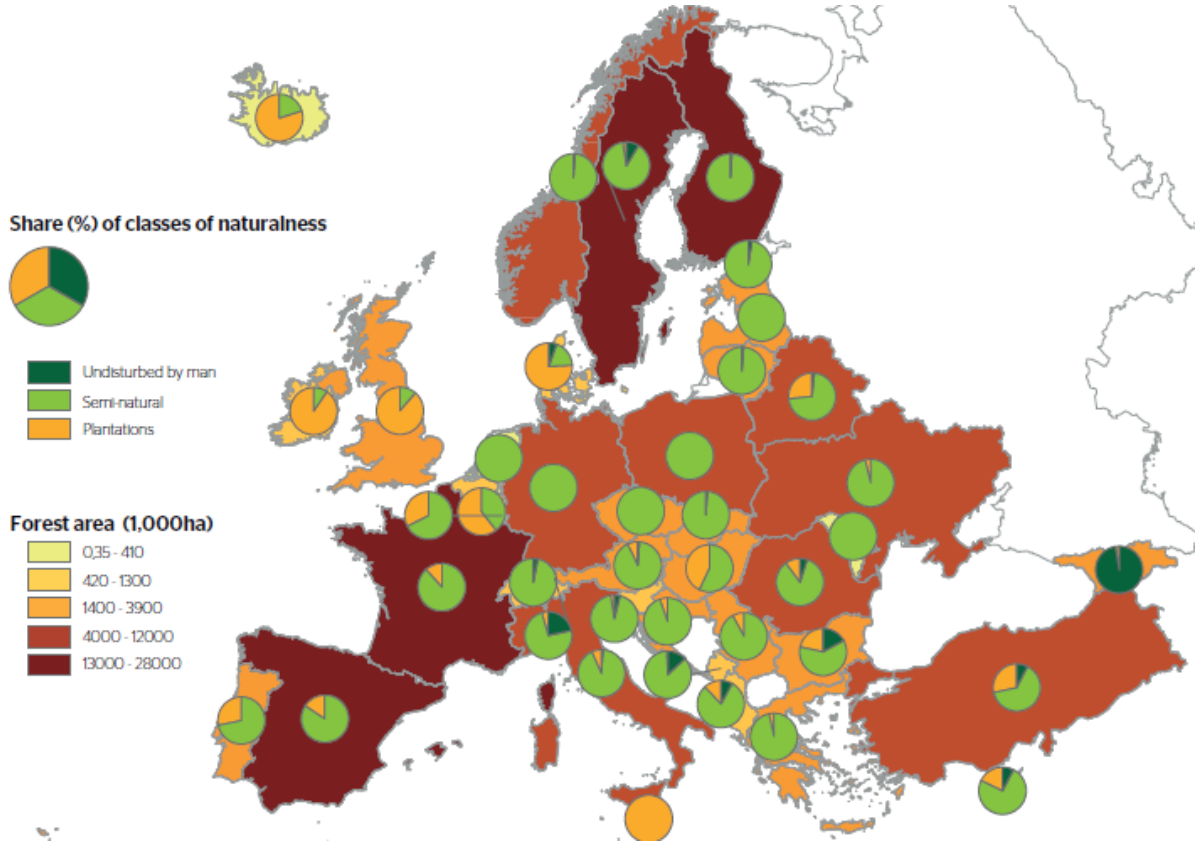

Figure 1: Share of the classes of naturalness (percent) in the forest area in Europe by country, 2015[3].

As forestry in Ireland is dominated by plantations of non-native conifer species like Sitka spruce[14] and the Native Woodland Scheme only accounts for a small proportion of afforestation[1]. When considering the environmental impacts of afforestation in Ireland we shall therefore mainly focus on the impacts of this predominant forestry model. These plantations support a lower diversity and abundance of bird species relative to native broadleaves[50] and support fewer specialist species[4946]. Internationally afforestation most negatively impacts on biodiversity when it replaces natural ecosystems, such as forests, grasslands, and shrublands, and when exotic tree species are used rather native species[46]. In Ireland afforestation has most negatively impacted on bird biodiversity when it replaces the habitat of open habitat specialists[48 51] and ground nesting birds, which in an Irish context is typically on marginal farmland in upland areas or along the Western seaboard[19]. For these open habitats specialist's afforestation results in direct habitat loss, edge effects[20] and habitat

[19] COFORD (2016) Land Availability Working Group. Land Availability for Afforestation - Exploring opportunities for expanding Ireland's forest resource. COFORD, Dublin

[20] Amar, A., Grant, M., Buchanan, G., Sim, I., Wilson, J., Pearce-Higgins, J. W. & Redpath, S. (2011) Exploring the relationships between wader declines and current land-use in the British uplands. Bird Study 58, 13-26.

fragmentation[4748][21]; in addition, these fragmented landscapes support a high abundance of predators relative to open habitats increasing the risk of predation [22][23].

Bird species in Ireland that are known to be under pressure from afforestation include Hen Harrier (*Circus cyaneus*), Merlin (*Falco columbarius*), Golden Plover (*Pluvialis apricaria*), Bewicks Swan (*Cygnus columbianus bewickii*), Greenland White-fronted Goose *(Anser albifrons flavirostris*) and Dunlin (*Calidris alpina schinzii*) [24][25]. Of these open habitat specialists' waders are the group which has been most negatively impacted on by afforestation such as Curlew (*Numenius arquata*) and Lapwing (*Vanellus vanellus*)[48][51]. In Ireland research has shown that species like Skylarks (*Alauda arvensis*) will strongly avoid forested habitats[26] while populations of Hen Harriers[27] and Merlin[28] are not be self-sustaining when levels of forest cover at a landscape level exceeds certain thresholds.

From a conservation perspective the negative impact of afforestation on open habitat specialists has been magnified by the fact that many of the species that have been worst affected are Birds of Conservation Concern in Ireland (BOCCI)[29]. Of the ten-priority species within BirdWatch Ireland's Group Action Plans for Irish Birds[30] which are being impacted by afforestation and woodland management, six are Red listed and three are Amber Listed BoCCI's. This includes species like Curlew[31][32] whose population has undergone a decline of 97% in the last 40 years and is now facing national extinction[33].

Birds are accurate indicators of biodiversity loss[34] and the declines in certain bird groups is illustrative of the broader impacts that current afforestation policies are having on biodiversity nationally. There is ample additional evidence that a range of protected habitats and species are also being negatively impacted by afforestation in Ireland. According to the NPWS forestry is a pressure or threat on almost 40% of the habitats and over 20% of species protected under the Habitats Directive. Forestry is second only to agriculture as pressure and threat on annexed habitats and species[35]. The habitats which have been most negatively impacted by forestry are peatlands, grasslands, wetlands and coastal habitats. The forestry semi-state Coillte for example owns 232,500 ha of peatlands making them the largest owner of peatland habitat in Ireland. Ten of thousands of

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[21] Pearce-Higgins, J.W., Grant, M.C., Robinson, M.C. & Haysom, S.L. 2007. The role of forest maturation in causing the decline of Black Grouse Tetrao tetrix. Ibis 149: 143–155. doi: 10.1111/j.1474-919X.2006.00623.x

[22] Ainsworth, G., et al., 2016. Understanding Predation A review bringing together natural science and local knowledge of recent wild bird population changes and their drivers in Scotland, Edinburgh: Scotlands Moorland Forum.

[23] Douglas, D J T., et al. (2014) Upland land use predicts population decline in a globally near threatened wader. Journal of Applied Ecology (2014): 194–203.

[24] NPWS (2014) Ireland's bird species' status and trends for the period 2008-2012. Dublin: National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht.

[25] NPWS (2014) Ireland's Summary Report for the period 2008 – 2012 under Article 12 of the Birds Directive. Dublin: National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht.

[26] Copland, A. S., Crowe, O., Wilson, M. W., & O'Halloran, J. (2012). Habitat associations of Eurasian Skylarks Alauda arvensis breeding on Irish farmland and implications for agri-environment planning. Bird study, 59(2), 155-165.

[27] Irwin, S., Wilson, M., O'Donoghue, B., O'Mahony, B., Kelly, T., & O'Halloran, J. (2012). Optimum scenarios for Hen Harrier conservation in Ireland. Cork: Department of Agriculture, Food and the Marine by the School of Biological, Earth and Environmental Sciences, University College Cork.

[28] Lusby, J., Corkery, I., McGuiness, S., Fernández-Bellon, D., Toal, L., Norriss, D., ... & Quinn, J. L. (2017). Breeding ecology and habitat selection of Merlin Falco columbarius in forested landscapes. Bird Study, 1-10.

[29] Colhoun K and Cummins S (2013). Birds of Conservation Concern in Ireland 2014 –2019. Irish Birds. 9: 523—544.

[30] BirdWatch Ireland (2014) BirdWatch Ireland's Group Species Action Plans for Irish Birds: Prioritisation of actions, species priorities and implementation. BirdWatch Ireland, Kilcoole, Co. Wicklow.

[31] Buscardo, E., et al. (2008) The early effects of afforestation on biodiversity of grasslands in Ireland. Biodiversity and conservation: 17(5), 1057-1072.

[32] Franks, S., et al., (2017): Environmental correlates of breeding abundance and population change of Eurasian Curlew Numenius arquata in Britain, Bird Study, DOI: 10.1080/00063657.2017.1359233

[33] Donaghy, A., (2016) Breeding Curlew Survey 2016: Results from Sligo, Leitrim, Cavan and Monaghan & East Galway, Roscommon, Offaly and Longford (Excluding the Shannon Callows). Unpublished report to National Parks and Wildlife Service. BirdWatch Ireland 2016

[34] Pereira HM, Ferrier S, Walters M et al (2013) Essential biodiversity variables. Science 339:277–278

[35] NPWS (2014) Ireland's Summary Report for the period 2008 – 2012 under Article 12 of the Birds Directive. Dublin: National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht.

hectares of rare raised bog and blanket bog habitat have been drained and afforested in past decades[36]. While the industrial scale afforestation of bogs has thankfully ceased the NPWS have identified that protected Annex I peatland habitats such as Wet Heath, Dry Heath, Alpine and Sub Alpine Heath, Rhyncosporion depressions and the priority habitat Active Blanket Bog are still being lost and degraded by forestry[37]. Annex I grasslands such as Molinia Meadows and the priority habitat Species-rich Nardus grasslands are particularly at risk from afforestation and have already been completely lost from parts of their range due to afforestation[36].

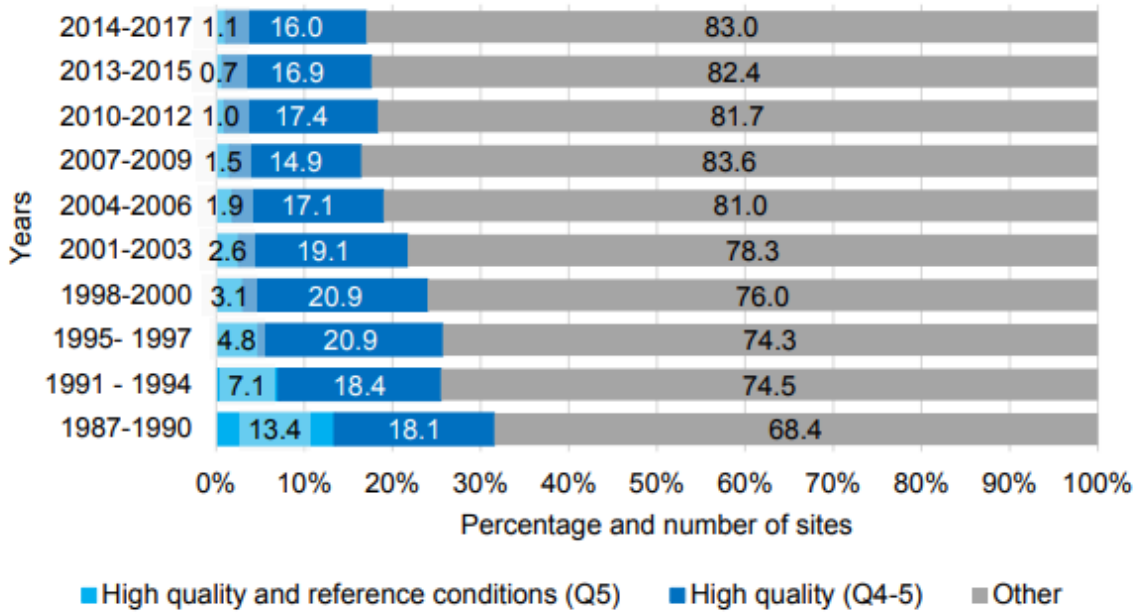

Figure 2: Trend in the percentage of high-quality river sites (Q5, Q4–5) since 1987[40]

Forestry is also negatively impacting on aquatic biodiversity and water quality. According to Ireland's Environmental Protection Agency forestry is a significant pressure on water quality and freshwater biodiversity at a national level[38]. These impacts are largely associated with the management of forestry including drainage, forestry planting and clear-felling[39]. Of the water bodies at risk of not meeting their objectives under the Water Framework Directive, forestry is the fourth most significant pressure nationally. For Ireland's most pristine rivers and lakes that are at risk of not meeting their high ecological status objective, forestry is the greatest pressure nationally impacting on these ecologically important water bodies[38]. According to the EPA the number of high-quality river sites nationally has declined from 31.6% in 1987–1990 to just 17.0% in 2014–2017. While the number of high-quality lakes has declined form 22% in 2007-2009 to 17% 2015-2017[40]. May of these high ecological status waterbodies are protected not only under the Water-Framework Directive but also under the Habitats and Birds Directives due to habitats and species that they support. The loss

[36] NPWS (2015) A National Peatlands Strategy 2015. Dublin: National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht.
[37] NPWS (2013) The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
[38] Department of Housing, Planning, Community and Local Government (2017) Draft River Basin Management Plan for Ireland (2018-2021), Dublin: Department of Environment, Heritage and Local Government
[39] EPA (2015) Water Quality in Ireland 2010-2012, Dublin: Environmental Protection Agency, PO Box 3000, Johnstown Castle, Co.Wexford, Ireland.
[40] EPA (2018) Water Quality in 2017: An Indicators Report, Dublin: Environmental Protection Agency, PO Box 3000, Johnstown Castle, Co. Wexford, Ireland.

of high ecological status is a critical conservation issue for Ireland's internationally important populations of Freshwater Pearl Mussel (*Margaritifera margaritifera*) the endemic subspecies the Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*) and the Atlantic salmon (*Salmo salar*)[36]. Despite these multiple layers of protection there has been a drastic decline in the number of high-status sites in Ireland over recent decades[40].

Prospects for biodiversity loss

Forestry in Ireland is a primary driver of biodiversity loss. Given the Government's target to increase afforestation over the coming decades these negative impacts will only intensify unless steps are taken to avoid or counter them. One of the most concerning aspects of Irish forestry policy is that afforestation will be strategically targeted on marginal agricultural land, particularly in areas with wet mineral soils and semi-natural grasslands[41] [9]. This marginal farmland overlaps with the distribution of some of the most important areas for biodiversity in the country, including high-status waters bodies[42], protected semi-natural habitats and High Nature Value farmland (HNVf)[43]. HNVf is the term used to describe farmland which is associated with either a high species and habitat diversity, or the presence of species of European, and/or national, and/or regional conservation concern, or both[44]. Effectively many important cultural landscapes which support habitats and species that are incompatible with Ireland's predominant forestry model are being earmarked for afforestation. In the case of Birds of Conservation Concern in Ireland (BoCCI) recent research has identified a strong overlap between newly afforested areas and threatened bird species[45]. Worryingly a high percentage of the 10 x 10km squares which had recently had some afforestation contained BoCCI which are known to be negatively impacted by afforestation, including Curlew (84%), Skylark (76%), Lapwing (75%), Redshank (72%) and Golden Plover (33%)[45].

Tools to Green Irish Forestry

As we have already argued under a business as usual scenario forestry expansion in Ireland will take place on marginal agricultural land with wet mineral soils which are likely to support semi-natural grasslands and rushy fields[9]. This will result in the afforestation of marginal farmland of high importance for biodiversity. To avoid any conflict between the Government's afforestation targets and the conservation of legally protected habitats and species it is necessary that appropriate safeguards are in place. Forestry in Ireland is mainly driven by the private sector with the expansion of the national forest estate occurring on an ad hoc basis through the afforestation of private landholdings. It is therefore difficult to predict where afforestation will take place and assess what the direct and cumulative impacts are likely to be. By improving upon the existing the environmental safeguards that are in place, as well as the quality of ecological assessment and the tools that are available to identify potential conflicts then the sustainability of Ireland's forest sector can be greatly

[41] Forest Service (2016) Land Types for Afforestation; Forest Service, Department of Agriculture, Food & the Marine, Ireland, Johnstown Castle Estate, Co. Wexford

[42]Moran, J. and Sullivan, C. (2017) Co-benefits for Water and Biodiversity from the Sustainable Management of High Nature Value Farmland.

[43] Matin, S., Sullivan, C.A., Ó hÚallacháin, D., Meredith, D., Moran, J., Finn, J.A. and Green, S (2016) Map of High Nature Value farmland in the Republic of Ireland. Journal of Maps 12: 373–376.

[44] Cooper, T, et al. 2007 HNV Indicators for Evaluation, Final report for DG Agriculture. Brussels: European Commission, Institute for European, Environmental Policy

[45] Corkery, I, et al. (2015) Overlap of afforestation and birds of conservation concern on farmland habitat. Teagasc Biodiversity Conference 2015. Ed. D Ó hUallacháin and J Finn. Wexford: Teagasc, 2015. 74-75.

improved. In this context BirdWatch Ireland would like to suggest a range of options which would improve the environmental sustainability of Irish forestry.

Plant the right trees

It is known that the impact of afforestation on biodiversity will vary across different species and habitats and will be influenced by a range of factors including, the selection of tree species, management intensity, site location and the preceding land-use type/intensity[46][47][48]. The impact of afforestation in Ireland has been positive for some bird species such as conifer specialists like Crossbill (*Loxia curvirostra*) and Siskin (*Carduelis spinus*)[49][50] The impact of afforestation will be most positive where afforestation replaces high-intensity land use types such as improved grasslands, typically in low-altitude areas[51]. The scale of this positive impact of afforestation will increase depending on the proportion of native broadleaves, the diversity of tree species and the diversity of age-classes[51]. Where these conditions are met the positive impact on woodland bird biodiversity will be further enhanced when native woodland cover and connectivity with woodland fragments and Ireland's hedgerow network are increased[51][52]. Adopting a more continental approach to forestry where forestry consists of semi-natural woodlands made up of native broadleaves or a native / non-native mixes would improve the biodiversity value of Irish forestry[53][54][55][56]. There are a range of afforestation options within the current Forest Programme including schemes facilitating the establishment of native woodland for conservation, native broadleaves and agroforestry[1]. Many of the schemes depending on how and where they are implemented have the potential to positively impact upon biodiversity. In order to change the face of forestry in Ireland steps will have to be taken to increase the take up of these options. As a semi-state body Coillte should lead the way by converting their existing forest estate to semi-natural woodland.

- ✓ **Plant more native tree species and more native broadleaves**
- ✓ **Convert plantations to semi-natural woodlands of broadleaves or native / non-native intermixes**

[46] Bremer, L. L. & Farley, K.A. (2010) Does plantation forestry restore biodiversity or create green deserts? A synthesis of the effects of land-use transitions on plant species richness. Biodiversity Conservation 19, 893–3915. Doi:10.1007/s10531-010-9936-4.
[47] Buscardo, E, et al. (2008) The early effects of afforestation on biodiversity of grasslands in Ireland. Biodiversity and conservation: 17(5), 1057-1072.
[48] Graham, C T, et al. (2015) Implications of afforestation for bird communities: the importance of preceding land-use type. Biodiversity and Conservation: 1-21.
[49] Balmer, D et al. (2013) Bird Atlas 2007-11: The Breeding and Wintering Birds of Britain and Ireland
[50] Iremonger et l. (2006) Investigation of experimental methods to enhance biodiversity in plantation forests. BIOFOREST PROJECT 3.1.3 FINAL REPORT
[51] Walsh, P., O'Halloran, J., Kelly, T. & Giller, P. 2000. Assessing and optimizing the influence of plantation forestry on bird diversity in Ireland. Irish Forest. 57: 2–10.
[52] Sweeney, O F M, Wilson, M W, Irwin, S, Kelly, T C, & O'Halloran, J (2010). Are bird density, species richness and community structure similar between native woodlands and non-native plantations in an area with a generalist bird fauna?. Biodiversity and Conservation, 19(8), 2329-2342.
[53] Coote, L., French, L. J., Moore, K. M., Mitchell, F. J. G., & Kelly, D. L. (2012). Can plantation forests support plant species and communities of semi-natural woodland?. Forest Ecology and Management, 283, 86-95.
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[55] Økland, B. (1994). Mycetophilidae (Diptera), an insect group vulnerable to forestry practices? A comparison of clearcut, managed and semi-natural spruce forests in southern Norway. Biodiversity & Conservation, 3(1), 68-85.
[56] Gustafsson, L., Fiskesjö, A., Hallingbäck, T., Ingelög, T., & Pettersson, B. (1992). Semi-natural deciduous broadleaved woods in southern Sweden—habitat factors of importance to some bryophyte species. Biological conservation, 59(2-3), 175-181.

In Ireland clear-felling is the dominant method used to harvest wood[57]. The environmental impacts of clear-felling are dramatic, turning forested environments that may have been developing for decades into open environments. The physical activity of harvesting and sudden changes in factors such as temperature regime and shading can result in impacts on soil and water quality[57]. The sudden loss of habitat can also negatively impact on arboreal species[58]. For these reasons and impacts on landscape, amenity and recreation continuous cover forestry is replacing clear-fell forestry in many parts of Europe. In continuous cover forestry there is an uneven-aged stand structure and a continuously maintained forest cover, which does not follow the cyclic harvest-and-regeneration pattern found in clear fell forestry[59]. Selective logging where individual trees are harvested is required by legislation in Switzerland while in other parts of Europe retaining mature trees and allowing natural regeneration of forest cover is gaining popularity[60]. The enhanced structural diversity associated with continuous cover forestry can improve the capacity of a forested landscape to support a greater diversity of bird species[61]. To improve biodiversity value of forestry, management should also seek to maintain critical structural elements, such as dead and decaying wood, economically unimportant but ecologically valuable tree species, and large trees[59]. Retaining large trees provides habitat for species that depend on large living trees or large stems of deadwood[59]. Continuous cover forestry can also improve carbon sequestration in forestry by minimizing disturbances in the stand structure and soil, thereby reducing the risk of unintended C losses. By establishing mixed species forests the stability of the forest can also be increased helping to reduce the risk of high rates of soil carbon loss[62].

- ✓ **Replace clear-fell harvesting with continuous cover forestry**
- ✓ **Retaining large trees within forestry plots to provide habitat for species that depend on large living trees and deadwood**

[57] Gallagher, M. B., Johnson, M., O'Gorman, K., O'Halloran, J., Giller, P., & Clenaghan, C. (2000). The impact of clearfelling operations on physico-chemical parameters of aquatic ecosystems in southwest Ireland. Internationale Vereinigung für theoretische und angewandte Limnologie: Verhandlungen, 27(2), 1108-1115.

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[60] Hart, C. (1995). Alternative silvicultural systems to clear cutting in Britain: a review. HMSO Publications Centre.

[61] Calladine, J., Bray, J., Broome, A., & Fuller, R. J. (2015). Comparison of breeding bird assemblages in conifer plantations managed by continuous cover forestry and clearfelling. Forest Ecology and Management, 344, 20-29.

[62] Jandl, R., Lindner, M., Vesterdal, L., Bauwens, B., Baritz, R., Hagedorn, F., ... & Byrne, K. A. (2007). How strongly can forest management influence soil carbon sequestration?. Geoderma, 137(3-4), 253-268.

Figure 3: This image shows an 85-year-old stand of Douglas fir in the Lake District, Cumbria, England, in the process of transformation to a continuous cover forest. Small gaps created in the canopy are enabling a wide variety of species to regeneration and develop in the understorey. A continual cycle of interventions is leading to a progressively more irregular structure, through time.

The need to implement environmental safeguards

Based on the available evidence afforestation and silviculture as funded under past and present forestry programmes is having a significant negative impact on biodiversity both inside and outside of protected areas and across both terrestrial and freshwater environments. These negative impacts conflict with international obligations such as the EU's Biodiversity Strategy[63] and the United Nations sustainability development goals[64]. The implementation of the Forestry Programme 2014-2020[1] is resulting in breaches of Irish and EU environmental law, including the Birds Directive (Directive 2009/147/EC), the Habitats Directive (Directive 92 /43 /EEC), the Water Framework Directive (2000/60/EC) and the EU's Rural Development Regulations relating to the protection of High Nature Value farmland.

As the consenting authority for afforestation, the Forest Service of the Department of Agriculture, Food & the Marine must ensure that afforestation and the management of the national forest estate is compliant with the EU's policy framework including the state aid decision and national and European environmental legislation. The Forest Service endeavour to avoid environmental impacts using their Code of Best Forest Practice – Ireland and by adhering to the principles of Sustainable Forest Management (SFM). A framework of environmental guidelines is provided by the Forestry

[63] European Union (2011) The EU Biodiversity Strategy to 2020, European Commission, Brussels, Belgium
[64] United Nations (2018) Sustainable Development Goals https://bit.ly/2jHjQmD

Standards Manual (2015)[65], Environmental Requirements for Afforestation (2016)[66] and the Land Types for Afforestation Document (2016)[67]. These guidelines intend to provide direction for the foresters and the forest service staff to meet the minimum environmental standards. It is clear however that despite the existing safeguards that afforestation and forestry management is having a significant negative impact on habitats and species both within and outside of protected areas. In some instances, the failure of personnel to properly implement the existing procedures may be the root cause of some environmental impacts. There are also gaps in the existing procedures which are resulting in the forestry sector being non-compliant with key environmental laws and regulations. Common failures and the corresponding breaches of environmental legislation are summarised in Table 1.

Failure	Environmental Legislation
The failure to protect Annexed birds and habitats within Natura 2000 sites from the negative impacts of afforestation and silviculture.	Birds Directive: Article 2, Article 4 (1), Article 4 (2), Article 5
	Habitats Directive: Article 6(3) and Article 6(4) of the Habitats Directive.
The failure to protect birds and their habitats within the wider countryside from the negative impacts of afforestation and silviculture	Birds Directive: Article 1, Article 2, Article 3, Article 4(4),
	Habitats Directive: Article 3(3) and Article 10
The failure to protect the water quality and ecological status of water bodies from the negative impacts of afforestation and silviculture	Article 4 of the Water Framework Directive
	Article 6(3) and Article 6 (4) of the Habitats Directive
The failure to protect High Nature Value farmland from the negative impacts of afforestation and silviculture	Article 6 of the supplementing regulations of the Rural Development Regulations (No. 1305/2013)
The failure to protect Flora from the negative impacts of afforestation and silviculture	Section 21 of the Wildlife Act, 1976

Table 1: The compliance of the Forestry Programme 2014-2020 with EU Environmental legislation

Ireland has a poor record when it comes to implementing EU environmental law, as evidenced by the number of high-profile cases taken against Ireland[6869] by the European Court of Justice. Ensuring that Ireland addresses any outstanding compliance issues with the implementation of the Forestry Programme would also be judicious considering that the State Aid Decision which underpins the funding of the programme requires compliance with national and EU legislation, with specific

[65] Forest Service (2015) Forest Standards Manual; Forest Service, Department of Agriculture, Food & the Marine, Ireland; Department of Agriculture, Food & the Marine Johnstown Castle Estate Co. Wexford http://bit.ly/2BQj2kL

[66] Forest Service (2016) Environmental Requirements for Afforestation, Forest Service, Department of Agriculture, Food & the Marine, Ireland, Johnstown Castle Estate, Co. Wexford http://bit.ly/2j0SSa9

[67] Forest Service (2016) Land Types for Afforestation; Forest Service, Department of Agriculture, Food & the Marine, Ireland, Johnstown Castle Estate, Co. Wexford http://bit.ly/2B4Gpdb

[68] European Communities, 2006 nature And Biodiversity Cases – Ruling of the European Court of Justice

[69] Ruling of the Court of Justice of the European Union in Case C-418/04 Commission v Ireland 'The Birds Case,' https://bit.ly/2oLK1so

reference to afforestation within Natura 2000 sites and High Nature Value farmland.

Protect birds and biodiversity

Ensuring full compliance with the Birds Directive (Directive 2009/147/EC) and the Habitats Directive (Directive 92 /43 /EEC) must be a priority for both the current and future Forestry Programmes. The current Forestry Programmes own Strategic Environmental Assessment (SEA)[70] and Natura Impact Statement (NIS)[71] identified that mitigation measures would be necessary in order to prevent significant adverse or residual impacts on the environment. Unfortunately, many of the mitigation measures which were developed to prevent negative impacts on Natura 2000 sites and Annex species have never been implemented. Following the reasoning of the Forestry Programmes own SEA[70] and NIS[71] it must be concluded that significant impacts on protected habitats and species will continue unless mitigation measures are fully implemented. BirdWatch Ireland believe that the following mitigation measures identified in the Forestry Programmes SEA[70] and NIS[71] were sensible and should be fully implemented:

- ✓ **Establish a monitoring system to ensure that the Forestry Programme is not negatively impacting on biodiversity.**
- ✓ **Complete site-by-site ecological assessments of the impact of forestry on all qualifying interests of all Natura 2000 sites.**
- ✓ **Complete site-by-site ecological assessment where Annex I habitats or the habitat of Annex I birds or Annex II species occur or are likely to occur.**
- ✓ **Avoid sites with breeding Annex I bird species within Natura sites.**

Figure 4: A female Hen harrier (*Circus cyaneus*) in flight. Commercial forestry is one of the greatest threats to this Amber listed bird of prey[72]

[70] Davie, H & Michael, I (2014) Ireland's Forestry Programme 2014-2020 Strategic Environmental Statement (SEA); ADAS UK Ltd, 4205 Park Approach, Thorpe Park, Leeds LS15 8GB http://bit.ly/2iv14vE

[71] Davies, H (2014) Ireland's Forestry Programme 2014-2020, Appropriate Assessment (AA), Natura Impact Statement ADAS UK Ltd 11D Milton Park Milton Abingdon Oxfordshire OX14 4RS http://bit.ly/2AAWDr6

Establish a system to monitor the impact of forestry on biodiversity

Establishing a monitoring system to ensure that the Forestry Programme is not negatively impacting on biodiversity would help to identify existing and emerging conservation conflicts. There is a currently a lack of detailed information on the negative impacts of forestry on specific habitats and species throughout the country. The high-level assessments produced by the NPWS of the conservation status of habitats and species protected by the Birds and Habitats Directives do identify whether forestry is a high-ranking threat or pressure on protected wildlife, but the report does not offer the kind of detailed observations or recommendations which would inform the development of conservation measures. The establishment of a monitoring system of the impact of the Forestry Programme on biodiversity would be useful in quantifying the scale of the threat posed by forestry and the system should be designed to alert the Forest Service where conservation conflicts need to be addressed in collaboration with relevant bodies such as the NPWS. While extensive research has been carried out into the relationship between forestry and some species like Hen harrier[72], this work was only initiated following the long-term decline of the species population nationally. An appropriate monitoring system should be designed in collaboration with relevant government departments and relevant NGO's which can identify where significant conflicts are emerging rather than waiting until serious negative impacts have already occurred. The sooner issues are identified the better placed the sector will be to address them before they escalate. Having a system of monitoring in place would provide added reassurance that best practice is being followed and would help to avoid the costs associated with restoration measures.

✓ **Establish a monitoring system to ensure that the Forestry Programme is not negatively impacting on biodiversity.**

Carry out ecological assessments

The Forestry Programmes SEA[70] and NIS[71] highlight the need for a high-level ecological assessment of the compatibility of different types of afforestation and management measures with the conservation requirements of the qualifying interests of all Natura 2000 sites. The need to ensure that forestry is not negatively impacting on the qualifying interests of Natura 2000 sites is legally required by both the Birds Directive (Article 2, Article 4 (1), Article 4 (2), Article 5) and the Habitats Directive (Article 6(3) and Article 6(4)). High-level assessments of potential conflicts between forestry with the legal protection afforded to Natura 2000 sites would aid the Forest Service in managing existing forestry within Natura 2000 sites and would help to inform ecological assessments including Appropriate Assessments and Environmental Impact Assessment.

✓ **Complete site-by-site ecological assessments of the impact of forestry on all qualifying interests of all Natura 2000 sites.**

BirdWatch Ireland have in the past highlighted that there are inadequate safeguards and training in place to ensure that afforestation does not negatively impact on Natura 2000 sites[73]. Aside from certain species like Hen Harrier there are no other species-specific measures in place to protect Annex I birds or listed Birds of Conservation Concern in Ireland within the forestry consent processes. The requirement to assess the ecological impacts of a plan or project on Natura 2000 sites are laid down by Article 6(3) and 6(4) of the Habitats Directive. While the Forest Service do

[72] NPWS (2015) Hen Harrier Conservation and the Forestry Sector in Ireland. Dublin: National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht.

[73] BirdWatch Ireland (2016) Submission on Forest Service 'Environmental Requirements for Afforestation' https://bit.ly/2Mg9jcX

have an Appropriate Assessment Procedure to implement these requirements there are ongoing issues with their implementation resulting in applications being inappropriately exempted from Appropriate Assessment. It is unclear whether the ongoing failure to carry out Appropriate Assessment in sensitive sites is part of a sectoral bias in favour of afforestation or whether it is the result of the need for more ecologists in the field and better training. We believe that foresters and forestry inspectors would benefit from better guidance, including guidance on what the direct, indirect and cumulative impacts of afforestation are on specific species and habitats. No guidance exists on what habitats or landscape features are important for specific protected birds or what specific thresholds of forest cover negatively impact on individual species. Without adequate guidance, it is impossible for an inspector to carry out an Appropriate Assessment screening or a screening for an Environmental Impact Assessment. Steps to improve the quality of ecological assessments would include:

- ✓ **Training for foresters and forestry inspectors on the identification of Annex I habitats and species.**
- ✓ **Employing regional ecologists to carry out site by site ecological assessments**
- ✓ **Ensuring that the NPWS are sufficiently resourced to allow them to fulfil their role as statutory consultees.**

BirdWatch Ireland had previously called for improved ecological assessments in our submission on the Forest Service 'Environmental Requirements for Afforestation' consultation[73]. We supported our concerns with reference to the Bioforest Project[50]. The Bioforest Project was a collaborative multidisciplinary study which was carried out between the EPA, COFORD, and several Irish Universities. It remains one of the most thorough studies to have been carried out on biodiversity in Irish plantation forests. The study identified deficiencies in the afforestation consent procedure and found that the "*lack of adequate strategic assessment, failure of regulations to require biodiversity assessment for the vast majority of afforestation proposals, and serious deficiencies in those biodiversity assessments that are carried out mean that sites of high biodiversity importance are currently at risk of being damaged by afforestation*". A review of forestry Environmental Impact Statements (EIS) found that the personnel carrying out the biodiversity assessment had not received adequate training or guidance. The report conclude that more guidance and training were necessary. Recurring deficiencies in the analysed ecological assessments included insufficient scoping, non-standardised habitat/vegetation classifications, reliance on incomplete lists of species with little or no information on abundance or distribution within the site, and little or no evaluation of the conservation importance of the site. Despite these deficiencies two thirds of afforestation projects for which an EIS was submitted were approved. These are ongoing issues that threaten biodiversity in both designated and undesignated sites. The Bioforest project made a number of recommendations on the need for on-site ecological assessments:

- ✓ **All afforestation sites should be surveyed for the presence of semi-natural and species rich grassland before consent is granted for afforestation**
- ✓ **Pre-afforestation site surveys should map habitats using a standard classification and note the presence of indicators and other biodiversity features**
- ✓ **Foresters submitting grant applications should have completed accredited ecological training courses or employ qualified ecologists**

Use forestry sensitivity mapping

A landscape-based approach to afforestation using spatial planning is one approach which could allow planners and stakeholders to foresee and manage potential conflicts with conservation objectives. Sensitivity mapping is being used internationally to identify potential conflicts with conservation or ecosystem management and alter developments or land use strategies accordingly[74]. The distribution of activities or developments can then be planned in a way that avoids, reduces or offsets the identified negative impacts on wildlife or ecosystem functioning. This approach can allow decision makers to avoid unnecessary litigation and reputation damage and ensure that their operations are managed in a sustainable way. The application of sensitivity mapping has been used across a broad range of sectors including resource assessments, recreational planning, biodiversity conservation and environmental impact assessments.

At an EU level the European Commission recommended back in 2010 that wildlife sensitivity maps be used in order to avoid potential conflicts between development and the protected species of EU importance throughout their entire natural range[75]. In an Irish context the ruling of the Court of Justice of the European Union (CJEU) on the fifth complaint in Case C 418/04 Commission v Ireland 'The Birds Case,' found that Ireland had in numerous ways failed to protect wild birds and the habitats. This case precipitated the production of by BirdWatch Ireland of 10 Group Species Action Plans[76] for Ireland's 'priority, migratory and dispersed' birds based on their habitat requirements. A key recommendation of these reports was the necessity for better land-use planning using spatial tools.

Birds are good indicators of biodiversity at a landscape level[34]. They are also well studied relative to other groups and enjoy a high level of protection through international legislation such as the Birds Directive (Directive 2009/147/EC). It is therefore not surprising that bird distribution has been used internationally to underpin sensitivity mapping tools. Bird sensitivity maps have proven themselves to be a useful planning tool, which can be used in the pre-planning, screening, planning or assessment processes. They aim to identify potential sensitivities using existing bird data or proxies such as designated areas[7778]. To date bird sensitivity maps have been most commonly used in the wind energy sector, with tools having been developed at a national level in Germany[79], Scotland (Bright et al., 2006), England[80] and Lesotho[81] and regionally for the Middle East and North East Africa[82]. In Ireland a bird sensitivity mapping tool for wind energy developments and associated infrastructure was developed by BirdWatch Ireland, in close collaboration with a range of partners from the scientific, industry and government sectors[77].

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[74] Gökmen, E. Y., & Gülersoy, N. Z. (2018). Spatial Planning as a Tool for Effective Nature Conservation: A Conceptual Framework for Turkey's Spatial Planning System. Journal of Landscape Ecology, 11(1), 73-98.

[75] European Commission, 2010. Wind energy developments and Natura 2000: EU guidance on wind energy development in accordance with the EU nature legislation. Publication Office of the European Union, Luxembourg.

[76] BirdWatch Ireland (2011) BirdWatch Ireland's Group Action Plans for Irish Birds. BirdWatch Ireland, Kilcoole, Co. Wicklow https://bit.ly/2DETSau

[77] McGuinness, S., Muldoon, C., Tierney, N., Cummins, S., Murray, A., Egan, S., & Crowe, O. (2015). Bird sensitivity mapping for wind energy developments and associated infrastructure in the Republic of Ireland. BirdWatch Ireland, Kilcoole, Wicklow.

[78] Bright, J. A., Langston, R. H. W., Bullman, R., Evans, R. J., Gardner, S., Pearce-Higgins, J., & Wilson, E. (2006). Bird Sensitivity Map to provide locational guidance for onshore wind farms in Scotland. Royal society for the protection of birds research report, (20).

[79] Garthe, S. & Hüppop, O. (2004). Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index. Journal of Applied Ecology, 41(4), pp.724–734.

[80] Bright, J. A., Langston, R., & Anthony, S. (2009). Mapped and written guidance in relation to birds and onshore wind energy development in England. RSPB.

[81] Sands, D. (2015). Mapping the sensitivity of Lesotho's avifauna to wind farm developments (Doctoral dissertation, University of Cape Town).

[82] Allinson, T. (2017). Introducing a new avian sensitivity mapping tool to support the siting of wind farms and power lines in the Middle East and northeast Africa. In Wind Energy and Wildlife Interactions (pp. 207-218). Springer, Cham.

Bird sensitivity mapping for forestry is a tool which would provide the necessary guidance for the assessment of new forestry in Ireland. BirdWatch Ireland believe that such a planning tool is needed to underpin future sustainable expansion of forestry. The Forest Service of the Department of Agriculture, Food and the Marine must look to such innovative solutions in order to ensure that Ireland continues to improve standards and avoids adverse impacts not only on biodiversity within designated sites but also in the wider countryside. This is an objective which is a requirement of Sustainable Forest Management (SFM). The Forest Service have themselves within the 'Forest Biodiversity Guidelines'[83] advocated for "*the incorporation of biodiversity considerations (in map and descriptive format, as appropriate) into the initial site development plan*" and "*focus on how best to conserve and enhance biodiversity in Irish forests, through appropriate planning, conservation and management*."

In 2018 BirdWatch Ireland authored a scoping report on the development of a bird sensitivity mapping tool for forestry in Ireland[84]. The outputs of the report 'Bird Sensitivity Mapping for Forestry - a tool and guidance for strategic planning of new forestry in Ireland' included:

• To devise a methodology for species selection i.e. assess aspects of the ecology of species most likely to be affected by new planting so as to identify relevant parameters for inclusion in a sensitivity scoring model;

• To produce a list of species for inclusion, based on the above exercise, and through consultation with in-house and key external species experts;

• To identify the scope of the mapping exercise i.e. whether it would address new forestry alone, or also include existing forestry and forestry management activities;

• To identify complimentary mapping layers (existing forest cover, peatland cover, alien invasive plant species for example) that can be accessed/published alongside any online Forestry Sensitivity Mapping tool;

• To encourage stakeholder engagement in the development of a mapping tool, its associated guidance, and application for the end-user.

This study informed the creation of a Species Sensitivity Index (SSI) which was based on 12 factors:

• Conservation status (based on five criteria of population status and two additional factors (range size and endemic status), and;

• Vulnerability (five factors based on aspects of a species' ecology that makes them vulnerable to the effects of afforestation.

The scoping report lays the foundation for the development of what we believe will be an essential tool in the evolution of sustainable forestry management in Ireland. The scoping report has established a Species Sensitivity Index for afforestation in Ireland. This index is not static and can be reviewed and updated as further research and data becomes available. The next logical step is to move forward to phase 2 and the development of a consolidated bird sensitivity map for afforestation in Ireland. The consolidated map should be based on the known distribution of already identified vulnerable species as well as their habitats. These eventual species-habitat layers may then be combined to generate a sensitivity map.

[83] DAFM (2000) Forest Biodiversity Guidelines, Dept. of Agriculture, Food and the Marine.

[84] Lewis, L., Cummins, S., Crowe, O., Duggan, O., & Lusby, J. (2018) Bird Sensitivity Mapping for Forestry - a tool and guidance for strategic planning of new forestry in Ireland - Phase 1 – Scoping. BirdWatch Ireland, Kilcoole, Wicklow.

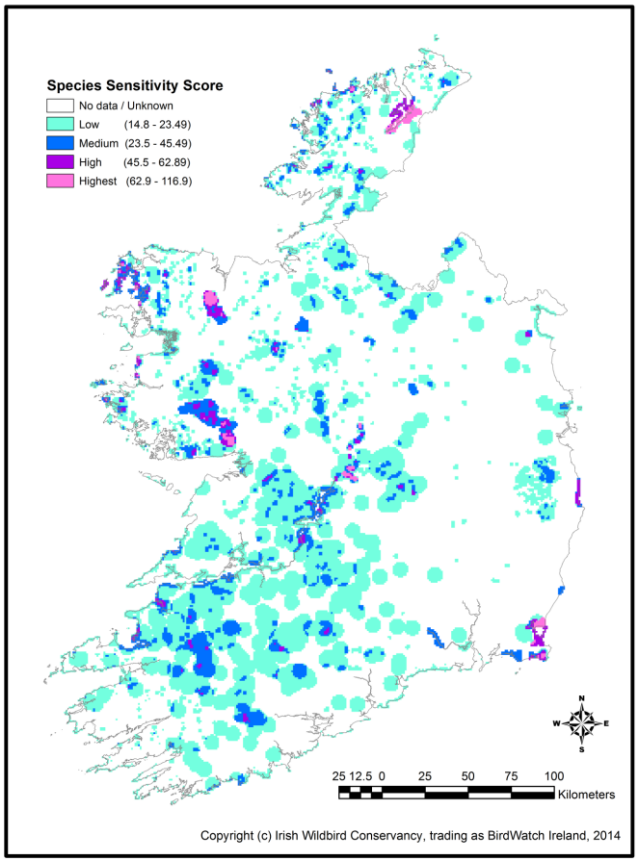

Figure 5: Composite Sensitivity Map of mainland Republic of Ireland, following mapping and assessment of 22 key species of birds in relation to the risk posed by wind energy development. The maps do not aim to identify 'no-go' areas for afforestation, nor do they aim to provide a 'green light' to afforestation; they simply provide a platform where practitioners can access existing information and guidance.

Once complete the sensitivity map would be GIS based and freely available through an online public GIS platform. It would be accompanied by written guidance which would outline for practitioners the ecological requirements of the species grouped in each layer, such as site selection, breeding habitat preferences and site specific and land use factors. This will support consultants, developers and regulatory authorities to interpret the information available through the sensitivity map in combination with finer assessments carried out by foresters and inspectors. As with all tool's sensitivity mapping is not a panacea and it comes with its own limitations. Sensitivity maps are intended for guidance purposes only. The maps do not aim to identify 'no-go' areas for afforestation, nor do they aim to provide a 'green light' to afforestation; they simply provide a platform where practitioners can access existing information and guidance. Sensitivity maps do not replace the need for site-based assessments of the impacts of afforestation on biodiversity. Additional ecological assessment may still be necessary. However, what the tool will do is help to streamline the decision-making process and allow for limited resources to be targeted towards the cases where applications have the highest risk of negatively impacting on biodiversity. Avoiding unnecessary conflicts between our national afforestation and biodiversity targets will ultimately be beneficial for the forest sector.

- ✓ **Develop and implement a 'Bird Sensitivity Mapping Tool for Forestry' which will help to inform the future sustainable expansion of forestry in Ireland.**

Protect High Nature Value farmland

Both within Ireland and across the EU the loss of farmland biodiversity has been severe over recent decades. Recent research from Germany has demonstrated a 75 % decline in total flying insect biomass in protected areas over the last 27 years[85] while populations of European farmland birds have declined by as much as 50% since 1980[86]. In Ireland the situation is little different with many of our Red Listed birds of conservation concern being heavily dependent on farmland[87]. In Ireland within the space of four decades farmland birds like Corncrake (*Crex crex*), Twite (*Carduelis flavirostris*), Whinchat (*Saxicola rubetra*), Grey partridge (*Perdix perdix*) and Yellowhammer (*Emberiza citronella*) have undergone dramatic declines in their distribution while Corn Bunting have disappeared completely as a breeding species[88]. The loss of farmland biodiversity is an important contributor to biodiversity loss in Europe. Over 50% of Europe's most highly valued biotopes occur on low-intensity farmland[89]. Of Europe's most threatened habitats and species, 57 types of habitat and 257 species depend on or are associated with farming. Worryingly over 75% of these habitats and at least 70% of the species are in unfavourable conservation status[90]. The conservation of biodiversity on European farmland agricultural land is accepted at an EU level as being critical to the successful implementation of the Pan-European Biodiversity and Landscape Strategy (PEBLDS), the Bern Convention, the European Landscape Convention, the Birds and Habitats Directives, and Rural Development policy (Community Strategic Guidelines for Rural Development)[91].

The concept of High Nature Value Farmland (HNVf) has been around since the early 1990's[92]. High Nature Value farmland has most commonly been defined as "*those areas in Europe where agriculture is a major (usually the dominant) land use and where that agriculture supports or is associated with either a high species and habitat diversity, or the presence of species of European, and/or national, and/or regional conservation concern, or both*[93]." Indeed "*the highest grade of HNV farmland is that which supports the presence of species of European conservation concern*[94]." In the EU the need to identify and protect HNVf is part of an integrated approach to rural and environmental policy which see's farming as being about more than just food production. It is recognised that HNVf is an important reservoir for biodiversity, ecosystem services and cultural heritage which are dependent on farming[95].

In many parts of Europe including Ireland, the farming systems that are of most value for biodiversity conservation are low-intensity raising of livestock on unimproved vegetation that is

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[85] Hallmann CA, Sorg M, Jongejans E, Siepel H, Hofland N, Schwan H, et al. (2017) More than 75 percent decline over 27 years in total flying insect biomass in protected areas. PLoS ONE 12 (10): e0185809. https://doi.org/10.1371/journal. pone.0185809

[86] Brambilla, M.; Casale, F.; Bergero, V.; Bogliani, G.; Crovetto, M.; Falco, R.; Roati, M.; Negri, I. Glorious past, uncertain present, bad future? Assessing effects of land-use changes on habitat suitability for a threatened farmland bird species. Biol. Conserv. 2010, 143, 2770–2778.

[87] Colhoun K and Cummins S (2013). Birds of Conservation Concern in Ireland 2014 –2019. Irish Birds. 9: 523—544.

[88] Balmer, D.E.; Gillings, S.; Caffrey, B.J.; Swann, R.L.; Downie, I.S.; Fuller, R.J. Bird Atlas 2007–2011: The Breeding and Wintering Birds of Britain and Ireland; BTO Books: Thetford, UK, 2013.

[89] Bignal, E M and McCracken, D I (2016) Low-intensity farming systems in the conservation of the countryside. Journal of Applied Ecology: 413-424.

[90] Keenleyside, C, et al. High Nature Value farming throughout EU-27 and its financial support under the CAP. London: DG Environment, Contract No ENV B.1/ETU/2012/0035, Institute for European Environmental Policy, 2014.

[91] Paracchini, M. L., Petersen, J. E., Hoogeveen, Y., Bamps, C., Burfield, I., & van Swaay, C. (2008). High nature value farmland in Europe. An estimate of the distribution patterns on the basis of land cover and biodiversity data. EUR, 23480.

[92] Baldock,D., Beaufoy,G., Bennett,G., and Clark,J.(1993). Nature Conservation and New Directions in the Common Agricultural Policy. London: Institute for European Environmental Policy.

[93] Andersen,E.,Baldock,D.,Bennett,H.,Beaufoy,G.,Bignal,E., Brouwer,F.,et al. (2003). Developing a High Nature Value Indicator. Report for the European Environment Agency, Copenhagen.

[94] Cooper, T, et al. 2007 HNV Indicators for Evaluation, Final report for DG Agriculture. Brussels: European Commission, Institute for European, Environmental Policy

[95] Pointereau, P., Paracchini, M. L., Terres, J. M., Jiguet, F., Bas, Y., & Biala, K. (2007). Identification of High Nature Value farmland in France through statistical information and farm practice surveys. JRC Scientific and Technical Reports. EUR, 22786, 76.

grazed, browsed, or cut for hay[96]. Although more intensively managed farmland can be considered HNVf due to the presence of populations of species of European conservation concern[97]. In general, HNVf systems are associated with low intensity land management, high levels of semi-natural land cover and habitats and species of conservation interest[93]. The association of HNVf with low agricultural production and marginal rural areas has meant that due to a range of socio-economic pressures HNVf is being lost due to land abandonment, afforestation and agricultural intensification[97].

According to the Forest Service's Land Types for Afforestation Document[9], the SEA[70] of the current Forestry Programme and Council for Forest Research and Development (COFORD)[98] the expansion of forestry in Ireland will occur on marginal agricultural land. This same marginal farmland is strongly associated with the occurrence of HNVf[97]. Because of this relationship there is a direct overlap between land which is being earmarked for afforestation[99] and HNVf[97]. Teagasc research has demonstrated this overlap in Figure 6[100] (Land available for afforestation (left) and HNV farmland[97] (right)). The map on the left highlights in orange the areas which are affected by National and EU environmental designations and in light green land which is classified as marginal agricultural land. Both areas overlap with the predicted distribution of HNV farmland on the right. An overlap between newly planted forests and HNVf which is associated with has already been established for Birds of Conservation Concern in Ireland (BoCCI)[100]. Recent forest planting has overlapped with 78% of the 10 x 10km squares occupied by birds of conservation concern, with 11% of these squares being planted with 100ha or more. The overlap between recent forest planting with species such as Barn Owl (*Tyto alba*) was as high as 93%. There observation led the authors of the study to conclude that "*afforestation may represent a threat at a regional and national scales to some of these bird species in the near future. At least for the already threatened species, which depend on grassland areas for foraging, plantation forests may already be having a negative impact*."

[96] Bignal, E.M. and McCracken, D.I., 1996. Low-intensity Farming Systems in the Conservation of the Countryside. Journal of Applied Ecology, 33, 413-424.
[97] European Communities (2009). Guidance document. "The application of the High Nature Value Impact indicator. Programming period 2007-2003
https://bit.ly/2DG1Zo5
[98] COFORD (2016) Land Availability Working Group. Land Availability for Afforestation - Exploring opportunities for expanding Ireland's forest resource. COFORD, Dublin: http://bit.ly/2AAGcx1
[99] Farrelly & Gallagher (2016) Potential availability of land for forestry, TResearch Volume 11: Number 1. Spring 2016, ISSN 1649-8917 http://bit.ly/2ABMsVA
[100] Corkery, I, et al. (2015) Overlap of afforestation and birds of conservation concern on farmland habitat. Teagasc Biodiversity Conference 2015. Ed. D Ó hUallacháin and J Finn. Wexford: Teagasc, 2015. 74-75.

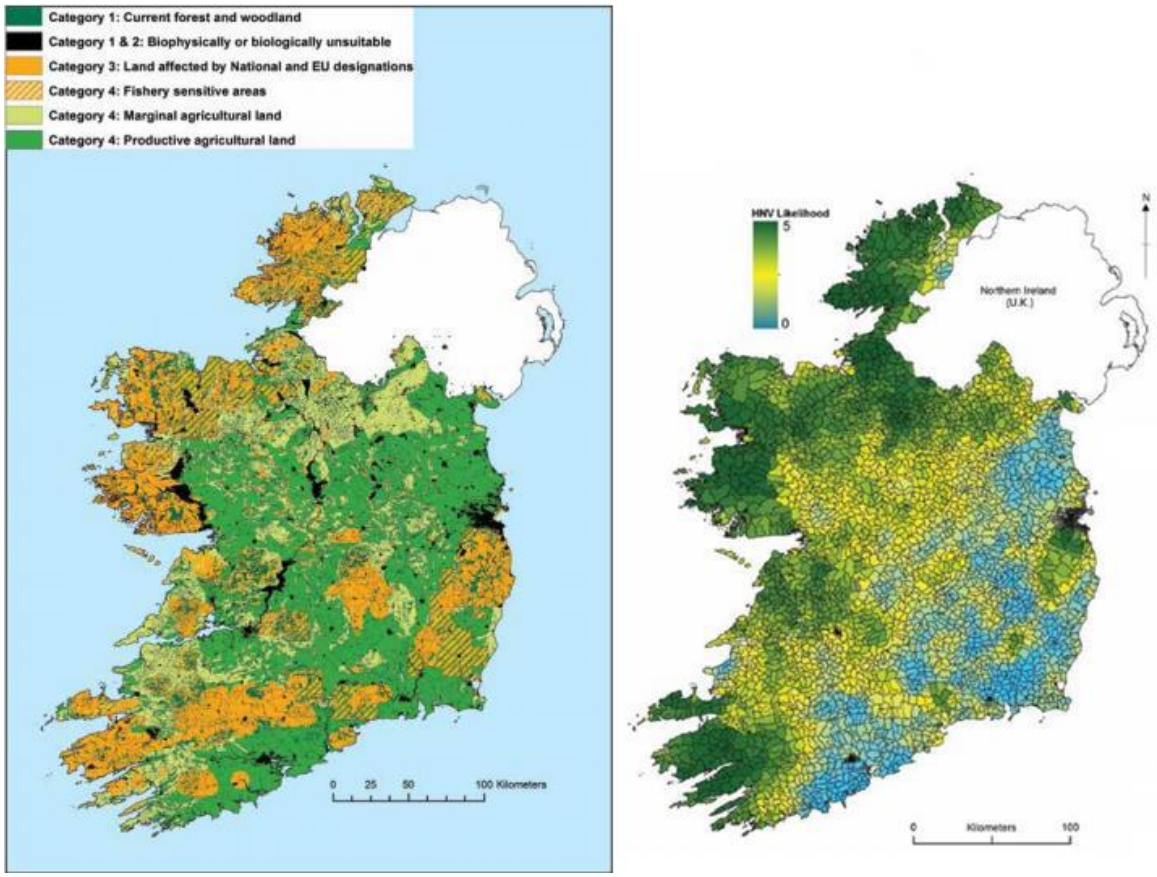

Figure 6: Left[99] - Classification of Ireland's land area in relation to the availability of land for afforestation and the area of productive and marginal agricultural land with most potential for forestry expansion. Areas with solid orange colouring denote land with National and EU designation. Hatched orange areas denote land which are fisheries sensitive. Light green areas denote marginal agricultural land with no designation. Right[11] - Predicted distribution of HNV farmland in the Republic of Ireland. The overlap between HNV farmland and areas deemed suitable for afforestation by Teagasc highlights the threat posed by the forestry programme and the lack of consideration given to biodiversity conservation within Ireland's forestry strategy.

The need to protect HNVf has been recognised within the EU's Common Agricultural Policy the Rural Development Policy[95]. Aside from the protection afforded to habitats and species associated with HNVf through EU and Irish legislation HNVf itself is also afforded protection from afforestation through Article 6 of the supplementing regulations of the Rural Development Regulations (No. 1305/2013)[101] (emphasis added):

"*Minimum environmental requirements with which the afforestation of agricultural land must comply should be laid down ensuring that* ***no inappropriate afforestation of sensitive habitats including areas under high natural value farming takes place*** *and that the need for resilience to climate change is taken into account. On sites designated as Natura 2000, afforestation should be consistent with the management objectives of the sites concerned. Special attention should be paid to specific environmental needs for particular sites such as the prevention of soil erosion. More stringent rules should be provided for afforestation operations leading to the creation of larger forests in order to take into account the impact of scale of those operations on the ecosystems and to*

[101] European Commission delegated regulation No 807/2014 supplementing regulation (EU) No 1305/2013 http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014R0807&from=en

ensure that they comply with the objectives of the Green Infrastructure Strategy (1) and new EU Forest Strategy (2)."

These obligations are acknowledged within the current Forestry Programme[1]. The need to protect HNVf is mentioned in Priority 4 (a) of the programme: in order to preserve restore and enhance "*biodiversity, including in Natura 2000 areas and high nature value farming, and the state of European landscapes*." Unfortunately, there are no corresponding objectives or actions under priority 4 which mention HNV farmland. The obligation to protect HNV farmland is referenced later in the Forestry Programme where it states, "*the inappropriate afforestation of sensitive habitats such as peatlands and wetlands will be avoided, as well as the negative effects on areas of high ecological value including areas under high natural value farming*." This statement obliges the Forest Service to ensure that safeguards are put in place to protect HNVf. Despite the Forest Service's acceptance that HNVf should be protected there are currently no guidelines or recommendations within the afforestation approvals process to implement these obligations.

By way of explanation for this omission the Forestry Programme states that "*the concept of High Nature Value land is not yet fully established in Ireland and HNV land has not been specifically designated or mapped*." There has been an obligation on Member States to use HNVf as an indicator since 2005[102]. There is a common definition of HNVf but the European Commission have imposed no common methodology for the identification of HNVf in order to allow Member States to tailor their approaches to their own regional conditions and their available data[102]. The European Commission have also provided guidance on the identification and monitoring of HNVf since 2009[103]. Member States like Ireland have had ample time to ensure that HNVf is mapped and protected. The Forest Service have a responsibility to ensure that they have the appropriate measures in place to identify and protect HNVf from afforestation.

In relation to agri-environmental schemes Ireland is at the forefront in Europe when it comes to identifying HNVf systems and protecting them through the implementation of results-based schemes[104]. Progress has been made in mapping the predicted distribution nationally of HNVf[105] and there is existing data on the distribution of many semi-natural habitats[106][107] and species of European conservation concern[108]. However, the predicted distribution map of HNVf occurrence which has been produced has its limitations. As a predictive map it has not been ground truthed and cannot be used to identify the presence of HNVf at field level. The map is based on the land cover approach to HNVf mapping which is based on criteria relating to vegetation types and landscape structure. This approach has its limitations in that unless it is accompanied by an analysis of biodiversity, it risks excluding HNVf which should be protected due to high levels of biodiversity or due to the presence of species of conservation interest. Unless land cover approaches to HNVf mapping are accompanied by objective biodiversity data then they may fail to indicate HNVf extent or quality[109].

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[102] European Commission (2016) Directorate-General for Agriculture and Rural Development – Unit E.4 (2016): Report. Preparing the assessment of HNV Farming in RDPs 2014-2020: practices and solutions. Good Practice Workshop, Bonn 7-8 June 2016. Brussels.
[103] IEEP, 2007. Guidance Document to the Member States on the Application of the High Nature Value Indicator. Report for DG Agriculture. Contract Notice 2006-G4-04.
[104] Ó hUallacháin, D and J A Finn (2015) Farmland Conservation with 2020 Vision. xx-xx. ISBN 978-1-84170-620-7. Wexford: Teagasc.
[105] Matin, S., Sullivan, C.A., Ó hÚallacháin, D., Meredith, D., Moran, J., Finn, J.A. and Green, S., 2016. Map of High Nature Value farmland in the Republic of Ireland. Journal of Maps 12: 373–376.
[106] O'Neill, F.H., Martin, J.R., Devaney, F.M. & Perrin, P.M. (2013) The Irish semi-natural grasslands survey 2007-2012. Irish Wildlife Manuals, No. 78. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Ireland.
[107] Perrin, P.M., Roche, J.R., Barron, S.J., Daly, O.H., Hodd, R.L., & Devaney, F.M. (2014). National Survey of Upland Habitats (Phase 4, 2013-2014), Site Report No. 16: Caha Mountains cSAC (000093), Cos. Cork and Kerry. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
[108] Balmer, D.E., Gillings, S., Caffrey, B., Swann, R.L., Downie, I.S. and Fuller, R.J., 2013. Bird Atlas 2007-11: the breeding and wintering birds of Britain and Ireland. Thetford: BTO.
[109] Campedelli T, Calvi G, Rossi P, Trisorio A, Tellini Florenzano, G, The role of biodiversity data in High Nature Value Farmland areas identification process: a case study in Mediterranean agrosystems, Journal for Nature Conservation (2018)

Including biodiversity data as HNVf indicators allows for identification of farmlands of highest natural value which other approaches may might fail to identify. Research in Italy[110] has shown that the failure to consider biodiversity as a HNVf indicator resulted in some of the most important areas for biodiversity being excluded. Landcover based approaches to HNVf identification can be biased towards identifying heterogeneous landscapes excluding agricultural landscapes which many be less diverse, but which are still HNVf due to the presence of birds of conservation interest[109] [111] [112].

Denmark as an example have a strong species focus to their approach to HNVf mapping[102]. They have included a broad range of biodiversity including data from national authorities and citizen science. By using a number of biodiversity proxies their approach to HNVf mapping is cost-effective and reduces the risk of missing important areas for biodiversity due to gaps in individual data sets[102]. Denmark's biodiversity mapping approach includes 'red list of species' and all species on Annex II and IV of the Habitats Directive. The European Commission recommend that the more precise, frequent and widespread the monitoring of the abundance of the selected taxa the better the biodiversity indicators will be[113]. Birds are one of the most commonly used biodiversity indicators in HNVf mapping due to the availability of high-quality data, with good spatial coverage and standardized monitoring programmes in nearly all Member States[109]. Birds are also known to be good indicators of HNVf with positive correlations having been observed between population trends for farmland birds (Farmland Bird Index, FBI) - including both generalist and specialist species - and the extent of HNVf[114] [115].

BirdWatch Ireland believe that the development of a bird sensitivity mapping tool in tandem with other existing biodiversity data sets and existing landcover based approaches to HNVf identification would support the Forest Service in preventing HNVf form being afforested. Using bird data will help to avoid afforesting agricultural land which is considered HNVf due to "*the presence of species of European, and/or national, and/or regional conservation concern, or both."* Habitat based approaches to HNVf on their own may fail to detect non-annexed habitat which is HNVf due to the presence of Annex I bird species and Birds of Conservation Concern in Ireland. Using European designations as the sole qualification for whether a habitat or a species is of conservation concern will fail to protect biodiversity of national and/or regional conservation concern.

- ✓ **Develop a HNVf mapping tool using existing bird, biodiversity and landcover data to prevent the inappropriate afforestation of HNVf.**

A HNVf mapping tool will come with its own limitations and cannot replace the need for site-based ecological assessments. What HNVf can do is provide practitioners with the best available data in a format that will enhance their ability to make good planning decisions and reduce the risk of non-compliance with the Irish and EU legislation. Avoiding unnecessary conflicts will ultimately be beneficial for the forest sector.

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[110] Forconi, V., Mandrone, S., Vicini, C. (Eds.). (2010). Aree agricole ad alto valore naturale: dall'individuazione alle gestione. Manuali e linee guida. ISPRA, Roma.

[111] Morelli, F., & Girardello, M. (2013). Buntings (Emberizidae) as indicators of HNV of farmlands: a case of study in Central Italy. Ethology Ecology & Evolution, (ahead-of-print), 1–8.

[112] Morelli, F., Jerzak, L., & Tryjanowski, P. (2014). Birds as useful indicators of high nature value (HNV) farmland in Central Italy. Ecological Indicators, 38, 236–242.

[113] European Communities (2009). Guidance document. "The application of the High Nature Value Impact indicator. Programming period 2007-2003

[114] Doxa, A., Bas, Y., Paracchini, M. L., Pointereau, P., Terres, J.-M., & Jiguet, F. (2010). Low-intensity agriculture increases farmland bird abundances in France. Journal of Applied Ecology, 47(6), 1348– 1356.

[115] Doxa, A., Paracchini, M. L., Pointereau, P., Devictor, V., & F, J. (2012). Preventing biotic homogenization of farmland bird communities: the role of High Nature Value farmland. Agriculture, Ecosystems & Environment, 148, 83–88.

Protect Flora Protection Order species

There are over a thousand vascular plants known to be native to Ireland. 106 (8.8%) of these have been assigned an IUCN Red List threat category: 20 (1.7%) are Critically Endangered, 25 (2.1%) are Endangered and 61 (5.0%) are Vulnerable; these comprise Ireland's Red-listed taxa. 15 taxa (1.2%) are Regionally Extinct, 98 (8.1%) are Near Threatened, 887 (73.2%) are Least Concern and 105 (8.7%) are awaiting assessment[116]. Three vascular plants and several bryophytes are protected under the Habitats Directive. Sixty-eight vascular plant taxa are protected by Section 21 of the Wildlife Act, 1976, as amended by the Wildlife (Amendment) Act, 2000, and are set out in the Flora (Protection) Order, 2015[117]. Except under licence none of the taxa listed on the Flora (Protection) Order may be taken, damaged, kept, bought, sold or their habitat/environment wilfully altered, damaged, destroyed or otherwise interfered with. The high level of protection afforded to these plants is not reflected in the Environmental Requirements for Afforestation. Under the relevant guideline's forester are not obliged to carry out an ecological report but "*may*" do so. There is no training or guidance given to foresters to identify FPO species. Forestry inspectors have data on a limited number of small white orchid (*Pseudorchis albida*) populations. These are the only populations of FPO species which are mapped. In the absence of training, ecological expertise and a lack of tools to help foresters identify FPO species the requirements of the Wildlife Act cannot be properly implemented.

Therefore, foresters need to be trained in the identification of FPO species and in the identification of suitable habitat. In order to ensure that the required level of protection is afforded to FPO species the Forest Service's environmental guidelines should be updated so that ecological reports are required from qualified ecologist for any site which is likely to support FPO species. The Forest Service should avail of existing data on the distribution of FPO species and the distribution of associated habitats to identify sites which are likely to support FPO plant communities. Data sets like the NPWS's map of the distribution of FPO bryophytes[118] are already publicly available and could easily be used in the afforestation approvals process.

- ✓ **Ensure foresters are trained in the identification of FPO Species and in the identification of habitats that are likely to support FPO species.**
- ✓ **Update the Environmental Requirements for Afforestation guidelines so that ecological reports are required from qualified ecologist for any site which is likely to support FPO species.**
- ✓ **Ensure that the Forest Service use sensitivity mapping layer that includes the most up to date NPWS data on the distribution of FPO species when assessing applications.**

[116] Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016) Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

[117] S.I. No. 356/2015 - Flora (Protection) Order, 2015 https://bit.ly/2HhaNVh

[118] NPWS (2015) Flora Protection Order Map Viewer – Bryophytes https://bit.ly/2GcQwLj

Figure 7: A small white orchid (*Pseudorchis albida*). One of many FPO species which are threatened by commercial forestry.

Review existing thresholds for EIA

Under the current Forest Consent and Assessment Regulations[119] all afforestation projects, whether grant-aided or not, must be assessed for their potential environment effects to determine whether an Environmental Impact Assessment (EIA) is required. The regulations lay down thresholds over which an EIA is triggered during the afforestation approvals process. District inspectors are required to have received training in the identification of EIA thresholds and in carrying out sub-threshold EIA screenings. The Forest Service have a sub-threshold EIA process to guide forestry inspectors. In practice however EIA's are rarely carried out in Ireland despite afforestation often taking place on sites which have environmental sensitivities. Under the current Forestry Regulations 2017 (SI No 191 of 2017) an EIA is only required for afforestation if the project exceeds 50 hectares or (ii) the project is less than 50 ha but is likely to have a significant effect on the environment. BirdWatch Ireland believe the 50ha threshold for a mandatory EIA is far too high to allow meaningful environmental protection in an Irish context. For example, the national average enclosed field size is 2.5 ha[120] and the average Irish farm is 32.5 ha[121]; while the average size of private grant-aided afforestation since 1980 to 2016 was 8.8 ha[122]. Even ignoring the potential for applications being designed to avoid the EIA thresholds, having a 50ha threshold is still too high to ensure that the vast majority of applications will be subject to EIA. In contrast in England, Wales and Scotland the respective Forestry

[119] S.I. No. 558/2010 - European Communities (Forest Consent and Assessment) Regulations 2010 http://www.irishstatutebook.ie/eli/2010/si/558/made/en/print

[120] Teagasc (2012) Average size of enclosed agricultural fields by townland in the Republic of Ireland https://bit.ly/2DfjqeZ

[121] Central Statistics Office (2013) Farm Structure Survey 2013 https://bit.ly/2SYrJS3

[122] DAFM (2018) Forests Statistics – Ireland 2017 is an annual compilation of statistics on the forest estate and the forest industry in Ireland https://bit.ly/2TUk0o3

Commissions require that all afforestation applications within designated sites such as Sites of Special Scientific Interest (SSSI) and Natura 2000 sites must undergo mandatory EIA screening[123]. There is no such guidance from the Forest Service in Ireland. Given the established impacts of forestry operation on the environment sensitive sites such as Natural Heritage Areas and Natura 2000 sites should automatically be subject to a screening for EIA. The 50ha threshold for a mandatory EIA should be revised and scientifically justified thresholds should be adopted for sites which are environmentally sensitive (such as Natura 2000 sites) or are of high scenic amenity.

- ✓ **The 50ha threshold for a mandatory EIA should be revised and replaced with scientifically justified thresholds for both environmentally sensitive sites.**

Conclusion

Ireland currently has one of the highest rates of afforestation in the EU[1 3] and according to government policy this is set to continue as an ambitious target of increasing forest cover from 10.7% to 18% by 2046. Under a business as usual scenario if the type of trees being planted and the way they are being harvested does not change then there will be an increase in water quality issues in many catchments. Likewise, if the expansion of forestry is disproportionately targeted towards marginal agricultural land then the observed negative impacts on both freshwater and terrestrial biodiversity will continue. Given the that many of the species and habitats which are being worst affected by afforestation are already threatened in Ireland further declines in their conservation status and distribution will have catastrophic consequences for Irish biodiversity. This prediction however need not come to fruition. Ireland has one of the lowest levels of forest cover in the EU and there is potential to sustainably increase the level of forest cover in Ireland without negatively impacting on biodiversity. Rather than merely seeking to ensure that Irish forestry is compliant with national and European environmental legislation Ireland could strive to be a world leader in sustainable forest management. Whether forestry in Ireland will have a net positive or negative influence on biodiversity will ultimately depend on a range of factors, such as where afforestation takes place, the model of forestry used and the environmental safeguards that are implemented.

By implementing the suggestions outlined in this report and ensuring that the right tree, is planted in the right place and is under the right management then Irish forestry could be actually enhance regional and national biodiversity:

BirdWatch Ireland's Recommendations to Green Irish Forestry
✓ **Plant more native tree species and more native broadleaves**
✓ **Convert plantations to semi-natural woodlands of broadleaves or native / non-native intermixes** ✓ **Replace clear-fell harvesting with continuous cover forestry**
✓ **Retaining large trees within forestry plots to provide habitat for species that depend on large living trees and deadwood**
✓ **Establish a monitoring system to ensure that the Forestry Programme is not negatively impacting on biodiversity.**
✓ **Complete site-by-site ecological assessments of the impact of forestry on all qualifying interests of all Natura 2000 sites.**
✓ **Complete site-by-site ecological assessment where Annex I habitats or the habitat of Annex I birds or Annex II species occur or are likely to occur.**

[123] Forestry Commission England (2017) EIA Screening Guidance https://bit.ly/2HgAvJL

✓ **Avoid sites with breeding Annex I bird species within Natura sites.**
✓ **Training for foresters and forestry inspectors on the identification of Annex I habitats and species.**
✓ **Employing regional ecologists to carry out site by site ecological assessments**
✓ **Ensuring that the NPWS are sufficiently resourced to allow them to fulfil their role as statutory consultees.**
✓ **All afforestation sites should be surveyed for the presence of semi-natural and species rich grassland before consent is granted for afforestation**
✓ **Pre-afforestation site surveys should map habitats using a standard classification and note the presence of indicators and other biodiversity features**
✓ **Foresters submitting grant applications should have completed accredited ecological training courses or employ qualified ecologist.**
✓ **Develop and implement a 'Bird Sensitivity Mapping Tool for Forestry' which will help to inform the future sustainable expansion of forestry in Ireland.**
✓ **Ensure foresters are trained in the identification of FPO Species and in the identification of habitats that are likely to support FPO species.**
✓ **Update the Environmental Requirements for Afforestation guidelines so that ecological reports are required from qualified ecologist for any site which is likely to support FPO species.**
✓ **Ensure that the Forest Service use sensitivity mapping layer that includes the most up to date NPWS data on the distribution of FPO species when assessing applications.**
✓ **The 50ha threshold for a mandatory EIA should be revised and replaced with scientifically justified thresholds for both environmentally sensitive sites.**

Chapter 2. Forestry and Water

by An Taisce the National Trust for Ireland
Elaine McGoff, Natural Environment Officer

Threats posed by forestry

It has been repeatedly shown that forestry can pose a significant pressure to freshwater quality and biodiversity, and was identified as a significant pressure in the 2018-2021 River Basin Management Plan[124]. Commercial forestry has the potential to impact on water quality, especially when planted in upland areas, which are often prone to soil erosion, and have a low capacity to buffer against acidification (Allott et al., 1997[125]; Kelly-Quinn et al., 1997[126]).

In the RBMP (2018-2021) forestry was listed as a significant pressure in 238 (16%) water bodies identified as At Risk. This equates to 215 rivers, 18 lakes, and 5 groundwater bodies. The pressure is largely as a result of sediment from clear felling, drainage, and planting and establishment, and the threat is predominantly located in catchment headwaters.

This does not only threaten Ireland's ability to uphold our Water Framework Directive (WFD) objectives, it also has implications for our obligations under the Habitats Directives. In the latest Article 17 report to the Commission, only 11% of our water-dependent habitats, and 50% of our water dependent species, were deemed to be at Favourable Conservations Status[127]

The main issues arise owing to the choice of tree, conifers (predominantly Sitka spruce) and the location of these. There is a multitude of legacy plantations which are posing a significant risk to waterways, both if left alone because of windblown trees releasing sediment, and due to planned felling, which would also release sediment. **[all of the issues outlined in your previous report- I won't rehash them here]**

[124] https://www.housing.gov.ie/water/water-quality/river-basin-management-plans/river-basin-management-plan-2018-2021

[125] Allott, N., Brennan, M., Cooke, D., Reynolds, J.D. and Simon, N., 1997. A study on the effects of stream hydrology and water quality in forested catchments on fish and invertebrates. Volume 4: Stream Chemistry, Hydrology and Biota, Galway–Mayo Region. AQUAFOR report. EOLAS Contract HEIC/91/304/A, COFORD, Dublin, Ireland

[126] Kelly-Quinn, M., Tierney, D., Coyle, S. and Bracken, J.J., 1997. A Study of the Effects of Stream Hydrology and Water Quality in Forested Catchments on Fish and Invertebrates. Stream Chemistry, Hydrology and Biota, Wicklow Region. AQUAFOR Report. EOLAS Contract HEIC/91/304/A, Volume 3. UCD, Dublin, Ireland.

[127] NPWS (2013). The Status of Protected EU Habitats and Species in Ireland. Overview Volume 1. Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland

Native Woodland Establishment and Woodland for Water

While the negative impacts of forestry on water have been extensively catalogued, the potential positives have not received so much attention. The forest service are making strides in this regard, with the promotion of native woodland for the protection of biodiversity. In particular, they are working towards improving the relationship between afforestation and water quality, with the introduction of the Woodland for Water initiative. This scheme is based on the Native Woodland Establishment Scheme (NWS establishment), which provides funding for establishing new native woodland on open, greenfield sites[128]. These new afforestation projects must reflect the most appropriate native woodland type for the site, and must be deemed capable of supporting the vigorous growth and sustainable long term development of this woodland, without the need for fertiliser input.

There has been an increase in the uptake for planting of native trees, with the Forest Service reporting a 50% increase in this type of planting in 2018, with 403 ha planted. However, it could be argued that the totals for the amount of native woodland which has been planted is still disappointingly low, with broadleaved species accounted for only 28.7% of the forest stock in 2017[129].

The Woodlands of Ireland's Strategy for Native Woodlands in Ireland 2016-2020[130] underpins the premise of the Woodland for Water document. It provides support for the establishment of native woodlands, particularly in regard to water quality, with one of the elements of the Woodlands of Ireland strategy document being:

> *'To promote the strategic creation of protective native woodlands on sites adjoining watercourses, in order to maintain and improve water quality and to contribute towards the mitigation of increased flooding predicted as a result of climate change.'*

Over the lifetime of the strategy, it seeks to establish the planting of 1000 hectares of new native woodland focused on water quality.

The Forest Service Woodlands for Water measure builds on the Woodlands of Ireland strategy, using the incentive of the Native Woodland Establishment funding, to support the implementation of this initiative. It is primarily a tool to highlight the potential for the Native Woodland Establishment scheme to relevant bodies as a means to protect water. The problems surrounding clear-felling are alleviated as any grant aided native woodland cannot be clear-felled and replaced, but must be indefinitely retained as permanent native woodland and managed using Continuous Cover Forestry (CCF). A CCF forest is sustainably managed for continuous canopy cover whereby forest stands are maintained in a permanently irregular structure, which is created and sustained through the selection and harvesting of individual trees. As such the soil never exposed and the forest canopy is maintained at one or more levels without clear-felling[131]. Research into the value of CCF in minimising impacts on water quality is encouraging (Reynolds, 2004[132]), and there is ongoing research in to the benefits of this method in

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[128] https://www.greenbelt.ie/sites/default/files/nativewoodlandestablishmentscheme.pdf

[129] https://www.agriculture.gov.ie/nfi/nfithirdcycle2017/nationalforestinventorypublications2017/

[130] Woodlands of Ireland (2016) A Strategy for Native Woodlands in Ireland 2016-2020

[131] http://www.coford.ie/media/coford/content/publications/projectreports/cofordconnects/CCF.pdf

[132] Reynolds, B., 2004. Continuous cover forestry: possible implications for surface water acidification in the UK uplands. Hydrology and Earth System Sciences 8: 306–313

Wales[133]. This approach could prove valuable given the state's ambition to increase the percentage of woodland in Ireland in the coming years, and may offset the risks posed by clear-felling.

Potential risks of this approach

Despite the apparent benefits of this approach, it comes with some caveats. There is currently no strategic plan for forestry within catchments, which means that cumulative impact cannot be assessed. This is extremely pertinent for all forestry proposals in ecologically sensitive areas. In order to address this, there should be a strategic catchment wide approach, with the assessment for adverse environmental effects at a catchment level including cumulative effects, and the consideration of catchment level mitigation and monitoring measures. The current granting of forestry at a site level does not account for this. While the NW establishment scheme is likely to be of great benefit in many areas, and far preferable to monoculture spruce and pine plantations, the cumulative impact should be assessed in order to ensure the naturalness of the catchment is retained. For example in upland areas which comprise peatlands. These areas should be maintained in this condition, as the high status low nutrient waters may be dependent on that open, low nutrient system. Excessive plantation, even of native woodlands, may, in some cases, increase the organic input to the river, or alter the natural morphology, thereby altering the natural physiochemistry. Native woodland plantation with CCF management is not a panacea for all the environmental ills posed by afforestation.

In addition, there should be a WFD specific assessment at site level for any forestry plantations within the zone of impact for water bodies, particularly for those at high status. There currently is no WFD specific assessment for any projects in Ireland. High status sites, a key habitat for freshwater biodiversity, are in dramatic decline in Ireland, and can be impacted by the smallest pressure. Small increases in nutrients, changes in acidity, and increased siltation, hydromorphological pressures and priority substances will have a disproportionate impact on a high status system relative to the impact of the same input to an already degraded system. There has been a substantial loss in the highest quality river sites. According to the EPA's 2016 report, Ireland's Environment – An Assessment[134], in the most recent monitoring period (2013-2015) only 21 sites were classified as the highest quality river sites (0.7% of sites) compared with 575 between 1987 and 1990 and 82 between 2001 and 2003.

The legal ramifications and requirements for the WFD are starkly outlined in the recent ECJ ruling on Case C-461/13[1][135] on the dredging for navigation of the river Weser in Germany found that:

> "*Article 4(1)(a)(i) to (iii) of [the WFD] must be interpreted as meaning that the Member States are required — unless a derogation is granted — to refuse authorisation for an individual project where it may cause a deterioration of the status of a body of surface water or where it jeopardises the attainment of WFD objectives*."

[133] https://www.forestresearch.gov.uk/tools-and-resources/resources-on-managing-resilient-forests/research-forests-and-experiments/clocaenog-continuous-cover-forestry-ccf-research-area/

[134] http://www.epa.ie/pubs/reports/indicators/SoE_Report_2016.pdf

[135] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A62013CJ0461

As such, the impacts of any type of afforestation, even of native trees, must be rigorously assessed in light of our WFD legal obligations. Thus, while the Woodland for Water approach will prove useful in many circumstances, this should not be assumed, as outlined for the Freshwater Pearl Mussel catchments below.

Riparian planting

The benefits of riparian planting have been outlined by Williams et al. (2012)[136], with their potential to both attenuate sediment and nutrient run off to waters, and their benefits for mitigating the impact of flooding. However, given the requirement for any grant aided forestry proposal to provide for *"vigorous growth and sustainable long term development"*, the development of some wet riparian woodland will be precluded.

There should be a recognition that not all forestry cannot provide, nor should it be geared towards achieving, the optimal output, and value should be placed on the ecosystem services which this type of forestry can provide in flood management, and sediment and nutrient attenuation. Wet riparian woodland should still be eligible for grant aid, and given the potential benefits the appropriately situated planting of native riparian trees should be actively promoted.

Replanting requirement

Where non-native grant aided forestry is established, it is a standard condition of grant aid that any felled forests must be replanted. In many cases, where they are adjacent to vulnerable aquatic sites, this may be detrimental to improving the water quality and biodiversity of those sites.

This standard condition should be reviewed, and permission for replanting these areas should first be thoroughly assessed to determine the impacts of this on the water quality. The use of a WFD specific assessment would fill this need, in combination with an Appropriate Assessment for plantations which have the potential to impact on Natura 2000 sites and species.

Tree felling

There is an additional risk posed by the current forest stock in that there are many legacy plantations, which were let unmanaged, and as such are not conducive to harvesting for commercial reasons. Many of these occur in sensitive habitats, for instance adjacent to Freshwater Pearl Mussel sites. These pose a risk if left unmanaged as the trees are aging, are often located on peat soil, and as such are prone to being wind-blown. This would expose the root ball, and disturb the sediment, leading to sedimentation of the river. However, harvesting of these would also pose a risk, also leading to sediment runoff, and complications arising from the unmanaged nature of the plantation. The management and felling within these sites will require a very controlled approach, and one which may require the input of several stakeholders, including the NPWS and those charged with implementation of the WFD.

[136] Williams, L., Harrison, S. and O'Hagan, A.M., 2012. The Use of Wetlands for Flood Attenuation. An Taisce, Dublin, Ireland.

For other less sensitive catchments, but in areas which may still impact high status sites, tighter controls may be needed on clear-felling, and strict controls of coup sizes harvested[137].

Freshwater Pearl Mussel sites

Although the Woodland for Water approach has been proposed as a management method for FPM sites in the recent Draft Plan for Forests & Freshwater Pearl Mussel in Ireland, this approach is often not appropriate for this species. FPM rivers are generally found on peat soils, and tree species are not a feature of the riparian zone on peat soils, and as such afforestation should not be recommended as a management option. A better approach would be to promote the removal and prevention of further afforestation on peat soils. Open peat soils would be far more beneficial to FPM than any type of forestry, and the restoration of these should be prioritised. The application of this Woodland for Water approach beside FPM rivers could prove detrimental for many FPM populations[138]

The KerryLIFE project focuses on supporting sustainable farming and forestry activities within the two FPM river catchments. The project is collaborating with the Forest Service in these areas, although their approach outlined in the Draft Plan for FPM does not fit with the approach being undertaken in these catchments. This collaboration could prove extremely beneficial for these sensitive habitats, and the findings of the project could then be incorporated in to the Forest Service recommendations for other sensitive water habitats. This project has the potential to greatly inform future ecologically sensitive afforestation in similar habitats, and potentially to influence the Forest Service's policy.

Riparian Buffer Strips

The approach taken in the Woodland for Water model is progressive in its use of riparian buffer strips. It promotes the use of native woodland which is 20 m or wider in width, adjoining a 10-25 m setback area beside the watercourse. These type of setbacks are likely to prove effective in most circumstances, particularly when paired with the removal of drains across this area.

However, the setback distances required for standard coniferous planting are much reduced (Table 1). Recent Irish research has found that traditional buffer strips with widths of 15–20 m might not be efficient for P immobilisation[139]. This is particularly concerning when it comes to sensitive high status water bodies, or aquatic SACs.

Table 1: Standard setback distances mandated by the Environmental Requirements for Afforestation Guidelines (2016),

Slope leading to the aquatic zone (apply as appropriate, where slope varies over the site)	**Setback width**	**Setback width for peat soils and for sites within the catchment area of high status**

[137]Ní Chatháin, Moorkens and Irvine (2010). Management Strategies for the Protection of High Status Water Bodies (2010-W-DS-3) STRIVE Report

[138]http://www.antaisce.org/sites/antaisce.org/files/an_taisce_submission_on_forests_fpm_draft_plan.pdf

[139] Rodgers, M., O'Connor, M., Healy, M.G., O'Driscoll, C., Asam, Zaki-ul-Zaman, Nieminen, M., Poole, R., Mûller, M. and Xiao, L., 2010. Phosphorus release from forest harvesting on an upland blanket peat catchment. Forest Ecology and Management 260: 2241–2248.

		objective water bodies (see note opposite)
Moderate (even to 1-in-7 / 0-15%)	10 metre	20 metre
Steep (1-in-7 to 1-in-3 / 15-30%)	15 metre	25 metre
Very steep (1-in-3 / >30%)	20 metre	25 metre
Relevant watercourse: 5 metre		

There is a growing recognition of the need to assess nutrient pathways, from source to sink. This is particularly pertinent when it comes to sediment and nutrient runoff to water bodies. As found in the Demonstration Test Catchments project[140] in the UK, a targeted approach to buffer strips should be adopted rather than a blanket approach. If pathway analysis were incorporated in to the iFORIS GIS system, it could allow for more tailored approach, so buffer strips could be wider in certain areas than others, where they would be more effective. This approach should be prioritised in more sensitive catchments.

The Hydrofor project researched the effectiveness of buffer zones for mitigating for forestry runoff and sedimentation. They found that the use of vegetated riparian buffer zones and blocking drains may prevent elevated sediments in the receiving waters. They also highlighted the need for a site specific approach, outlining that in some instances silt traps may be more effective than buffer zones, depending on the topography and hydrology of the site, and for that reason the site specific assessments are recommended.

Hydrofor

The Hydrofor project investigated the relationship between conifer forests, forestry operations and surface water quality and ecology. It found that there was higher acidity in streams draining closed canopy conifer forests, driven by a loss of dissolved organic carbon from peatlands. In addition, tree harvesting and ground preparation for replanting caused high inputs of nutrients to these streams. Several recommendations resulted from this study, which have yet to be implemented by the Forest Service. With the main recommendation being that afforestation using conifers should cease on peat soil in acid sensitive headwater catchments, and that where replanting is to be considered it should be assessed on a site-specific basis, with proof that impacts can be mitigated.

These recommendations have yet to be adopted in to forestry policy and practice, and should be prioritised for the protection of upland streams in peat soils. Updated best practice forestry guidelines should be drafted with the inclusion of the recommendations and findings of the Hydrofor project.

[140] http://watersandcommunities.ie/wp-content/uploads/2019/01/4-Conference-Presentation-2019.pdf

Summary and recommendations

The Woodland for Water approach is a step in the right direction, and indicates that the Forest Service is acknowledging the impact of afforestation on water. There is a great deal of research outlining ways in which forestry can be implemented in a more ecological way, some of which we have outlined above. From these studies, we would make the following recommendations.

A catchment wide assessment of the cumulative impact of forestry should be carried out. This would inform the appropriateness of the proposed afforestation, particularly in sensitive water catchments. Strategic plans for afforestation should be drawn up on a country, or catchment basis, with recognition of the ecological sensitivities of the area, as opposed to ad hoc piecemeal planting which currently occurs.

Riparian planting has been shown to be valuable, in certain circumstance, and as such the grant aid should be extended to wet riparian afforestation, which does not meet the requirements for vigorous growth. This would allow for ecologically valuable forestry to be grant aided, and thus incentivised to landowners.

The requirement to replant should be removed, and any replanting should be cognisant of the sensitive of the area, and should be informed by a WFD specific assessment, and/or an Appropriate Assessment, as necessary.

Tree felling should be more carefully managed in sensitive catchments, with thresholds for the coupe size which can be felled, and with the inclusion of mitigation measures to limit any sediment or nutrient run-off.

Freshwater Pearl Mussel sites have very unique requirements, and any afforestation in these sensitive catchments should be very tightly regulated, and the research underway in the KerryLIFE project should be utilised to inform the best approach in these catchments. The advice of Ireland's leading FPM experts should also be sought on this. It must be recognised that in many instances that may include the cessation and removal of afforestation.

Riparian buffer strips should be better situated depending on the site topography and hydrology. The Woodland for Water approach maximises use of riparian buffer strips, but the setbacks required for other grant aided afforestation are likely to be insufficient in many cases, and could be improved upon with nutrient pathway assessment, targeted buffer strips and silt traps.

Finally, the recommendations of the Hydrofor study should be incorporated in updated best practice guidelines and forest policy, and all afforestation in acid sensitive peat soils should cease.

We would recommend that there should be some specialist oversight of any afforestation in sensitive water catchments, both high status catchments and water sensitive Natura 2000 sites. As part of the planning procedure, any afforestation proposal in a water sensitive catchment should automatically be referred to an ecologist who can then assess the best way forward. To expect all foresters to have the necessary level of expertise in this is unrealistic.

Chapter 3. Problems and Proposed Solutions

by CELT (Centre for Environmental Living and Training)
Andrew St Ledger

Drafted by Andrew St Ledger, CELT (centre for environmental living and training) representative in the Environmental Pillar who part funded this joint work package.

Introduction

The current Irish Industrial Tree farming model is extremely one dimensional, vulnerable to pests and diseases due to its reliance on monocultures and is also liable to continually deplete the soil fertility because of the use of clear - felling methodology using heavy machinery. With this forestry model there are limited opportunities or benefits for Carbon sequestration, Biodiversity and Local Communities.

- The latest EPA report, 1st March 2019 shows Ireland only achieving a very low 1% reduction in GHG emissions by 2020, the target was 20% reduction and Forestry was hailed as a big contributor to Ireland achieving the 20% reduction (EPA, Year in review 2018 report).

- Ireland's Biodiversity reporting to the UN to comply with the Convention on Biological Diversity shows a continuous decline in species. [141]

- A recent National Biodiversity Data Centre report shows 91 percent of Ireland's habitats designated under EU Law are of inadequate or bad status. Forestry is the second biggest land use after agriculture taking up 11% of the land area and should be making a more positive contribution to Biodiversity conservation and enhancement. They used a range of Indicators to summarise the condition of Ireland's natural heritage. [142]
- The Hydrofor reports show negative impacts on water quality and aquatic species caused by this Industrial forestry model reliant on, heavy machinery for clearfelling, non native trees and chemicals.[143]

[141] https://www.cbd.int/convention/
[142] https://www.npws.ie/sites/default/files/files/NPWS%20Biological%20Diversity%20web.pdf
[143] https://www.epa.ie/pubs/reports/research/water/EPA%20RR%20169%20Essentra%20final%20web.pdf

Employment opportunities are limited, with approximately one job per 64 hectares, when you divide the 12,000 forestry employees figure (Ni Dhubhan et al 2012), many of which are low paid seasonal workers, and harvesting contractors paid by weight of timber, with high overheads to pay for the harvesting machines, into the approximately 770,000 ha (National Forest Inventory 2017) under forestry. This represents an extremely low social return for 64 hectares of forestry land and demonstrates the urgency to change to a more sustainable resilient multi-beneficial forestry model. Sustainable Forest Management (SFM) promises a Social dividend by balancing the Social, Environmental and Economic Pillars of SFM.

This industrial tree farming model is impacting negatively in the Irish landscape, in that it exhausts local minerals and nutrients, is known to pollute rivers and streams, and is also responsible for damaging local infrastructure such as roads and bridges due to the transportation of heavy loads by large articulated trucks unsuited to rural road networks. This cost is being borne by Local authorities using public funding.

Key Points

- Ireland's industrial non native monoculture conifer forestry model is in need of change to a more natural native mixed species forestry model.
- There is a need to increase native tree species and tree age diversity in Ireland's forests
- Improved training and awareness of the benefits of coppicing and agro-forestry with native trees, with incentivized options, need to be provided for farmers.
- Incentives need to be offered to target failed upland conifer sites for conversion to mixed native sites, for soil stability, flood prevention, rural resilience, etc.
- The full greenhouse gas impacts of, fertiliser's, herbicides, clear-felling, log transporting and processing in forestry need to be factored into our UN/EU LULUCF (Land use and Land use Change including Forestry)projections. These include high nitrous oxide content.
- Hedgerows need to be included as forest cover for LULUCF purposes, and expanded as part of increasing our low tree-cover.
- Afforestation, (new planting) targets are still too low and need to be increased to between 15,000 and 20,000 ha
- The vulnerability of non native species to pests and disease as well as wind-throw need to be urgently addressed in the context of climate change. Invasive alien plants including invasive microbes imported with wood and saplings make native species much more susceptible to pests and diseases.
- Improved public information access, transparency and use of best practice technology for assessment
- Promotion and use of hardwoods, native softwood such as Scot's pine, more use of native hardwoods such as aspen, birch, alder, and other useful non natives like European larch, Douglas fir, and western red cedar, western hemlock, for construction and long lived products to ensure longer carbon lock up
- Encourage smaller scale coppice management of mixed native trees and woodlands by local communities for local heating and combined heating and power with at least 70%

conversion efficiency. This type of system could be introduced into tree plantations for the buffer strips and also the large area under power lines.

- Recognition of the value of the increased biodiversity via native trees to act as a further carbon sink
- The need to address the monopoly situation of Coillte and IFORUT (Irish Forest Unit Trust) pension funds, and their influence on the overall forestry Industry/policy.
- The fact that the 1988 Forestry Act which established Coillte pre-dates the Rio and Kyoto agreements and all subsequent State commitments to SFM at EU and UN level. (A review of this outdated Act and an Independent Sustainability audit of Coillte's activities was one of the recommendations of the recent Climate Committee Report)

- Transition to a more sustainable natural forestry model using continuous cover and natural regeneration methods, which is the norm for SFM in a European context.
- Our most valuable land based habitats, ancient and old growth native woodland remain the most threatened and without conservation management plans. They would benefit from tailored management plans, site expansion and connectivity.

Public Good and the stated objectives of the Forestry Programme:2014 – 2020

There has never been a full and rigorous cost benefit analysis (CBA)taking into account the triple bottom line, a prerequisite for Sustainable Development from whence Sustainable Forest Management is derived via the Forest Principles attached to the Rio Declaration of 1992. The triple bottom line looks at, and measures the social, economic, and environmental aspects of any process/Industry to assess the true cost to society, so that in the case of state sponsored forestry, decisions can be made whether to continue to use Public funding, if Public good is not being achieved.

The only cost benefit analysis conducted into the current tree farming model, using the triple bottom line criteria, was conducted by Professor Peter Clinch in his 1999 book, "The Economics of Irish Forestry". Using the Department of Finance own cost benefit analysis rules for use of public funds, he concluded that if it was proven there was damage occurring to water and soil, the model was not a viable use of funding or producing a Public Good and therefore the funding should be used elsewhere. At the time he did not have access to the environmental reports showing damage to water[144], soil[145] and habitats which are now in the public domain.

The current Forestry Programme:2014-2020 is very similar to the last forest plan which had promised to increase Ireland's forest cover to 17% by 2030 as well as delivering on Social and Environmental commitments. Some positive new measures have been introduced, due to pressure to comply with the Rural Development Regulation (RDR) criteria containing EU agreed objectives

[144] https://www.epa.ie/pubs/reports/research/water/EPA%20RR%20169%20Essentra%20final%20web.pdf

[145] https://www.researchgate.net/publication/287759863_Soil_degradation_risks_in_planted_forests

regards, water quality, renewable energy, biodiversity, and climate change. Even though Ireland was not availing of RDR funds for its forestry Programme, under EU State Aid rules, the plan had to satisfy the RDR criteria before EU approval. Had this not been the case then it is doubtful that these token new measures would have seen the light of day, welcome as they are, they remain mere token appendages to what is mainly a business as usual Programme. Most of the funds and support continues to be directed towards the weak industrial tree farming model. The main objectives of the forestry programme remain focused on timber production, with single species, short rotations and fast growth, using the outdated Clearfell/Replant methodology with mainly fast-growing nonnative Sitka spruce conifers.

There are six EU Priorities for Rural Development, the main one concerning forestry is, Restoring preserving and enhancing ecosystems dependent on agriculture and forestry. There are three cross cutting objectives, Innovation, Environment and Climate change. The SFM criteria relate to the main objectives of the 2006 EU Action Plan for Sustainable Forest Management.

Celt would like to see Ireland adopt a 21st century Woodlands and Trees for Ireland strategy similar to the Wales Woodlands and Trees Strategy[146] with its 20 high level outcomes directly linked to EU and UN Sustainable Forest Management principles and a 50-year timeframe. Wales and Ireland share a similar landscape and climate.

Our vision remains that: “Wales will be known for its high-quality woodlands that enhance the landscape, are appropriate to local conditions and have a diverse mixture of species and habitats.”

These will:
• provide real social and community benefits, both locally and nationally
• support thriving woodland-based industries and
• contribute to a better-quality environment throughout Wales.

Background to Ireland’s UN and EU Sustainable Forest Management commitments

The concept of Sustainable Forest Management (SFM) comes from the Rio Declaration on the Environment 1992. The Rio Declaration, or Sustainable Development Principles, informs and underpins all UN and EU Climate and other policies with its accompanying set of Forest Principles, non legally binding, which are the foundation for Sustainable Forest Management (SFM)[147],

SFM has continued to be developed through a range of follow on UN summits and international working groups. The outcomes are voluntary certification schemes (Klooster, 2010), and the creation of international non legally binding guidelines which Individual States can avail of to design their own policy measures to incorporate and ensure SFM.

[146] https://naturalresources.wales/media/2985/woodlands-for-wales-strategy.pdf
[147] http://www.un.org/documents/ga/conf151/aconf15126-3annex3.htm

This process is underpinned by the concept of the Ecosystem Services Framework as a foundation for Human well-being, (Millennium Ecosystem Assessment, 2005)[148] and the Sustainable Development Goals (SDG's)[149].
At EU level, Ireland has signed up to 21 non-legally binding forest policy resolutions adopted at six Ministerial Conferences on the Protection of Forest in Europe(MCPFE): Strasbourg (1990), Helsinki, 1993, Lisbon,1998, Vienna, 2003, Warsaw, 2007,Oslo, 2011, and Madrid 2015.[150]

Sustainability today is a concept used across the entire environmental sector, but its origins lie in forestry. The term sustainability was first mentioned in a Saxonian forest law in the 16th century. In 1713 H.C. von Carlowitz (Speidel, 1984) described the principle of sustainability in the following words:

"...***Therefore the highest skills, science, efforts and planning will be founded on how the conservation and growing of wood has to be organized in order to achieve a continuous, constant and sustainable utilization; this is an indispensable thing, without which the nation cannot exist.***"

Today sustainability is accepted as a general principle of forest management and was laid down in Agenda 21 of the United Nations Conference on Environment and Development (UNCED 1992). The UNCED called for the formulation of scientifically sound criteria and guidelines for the management and sustainable development of all types of forests (UNCED, 1992).

In order to facilitate the implementation of the forest related UNCED decisions several regional processes were launched.

In Europe the, "Ministerial Conference on the Protection of Forests in Europe" (MCPFE) (launched in 1990) is the political initiative for cooperation of around 40 European countries and the European Union.

Reporting on pan-European Criteria and Indicators for Sustainable Forest Management, case study; Experiences from Lichtenstein[151]

At the Second Ministerial Conference in 1993, a common definition of Sustainable Forest Management (SFM) was agreed in Resolution H1, "General Guidelines for the Sustainable management of Forests in Europe"

[148] https://www.millenniumassessment.org/documents/document.300.aspx.pdf
[149] https://www.un.org/sustainabledevelopment/sustainable-development-goals/
[150] https://foresteurope.org/ministerial-conferencies/.
[151] https://www.econstor.eu/bitstream/10419/96614/1/614920930.pdf

Through this FOREST EUROPE, EU approach, Ireland is committed to follow agreed EU SFM principles. These principles have evolved since the guidelines agreed at Helsinki, table 1. With new 2020 targets agreed in 2011, table 2.

1	Avoid site degradation (soil)
2	National Forest policy to strongly promote long term SFM in compatibility with existing local laws and traditions. Support for forest owner if the provision of SFM implies excessive costs.
3	Stable, long term land use policies
4	Forest management to be based on regularly updated Management Plans
5	Promote multiple-use forestry
6	Protect fragile ecosystems
7	Promote forest management for resilience and adaptivity. Close to nature practices to be encouraged.
8	Promote site suitable species for long term stability and climate change resilience. Genetic selection should not favour productivity at the expense of adaptability
9	Promote native species where appropriate
10	Support recycling and wood- energy use of timber products
11	Actively promote timber and non timber forest products
12	Promote research and knowledge dissemination of SFM amongst practitioners and the general public

Table 1. Guidelines for SFM agreed in Helsinki in 1993.

The six pan-European Criteria for SFM (MCPFE, 1998) Pan-European Criteria for SFM

Criterion 1: Maintenance and Appropriate Enhancement of Forest Resources and their Contribution to Global Carbon Cycles

Criterion 2: Maintenance of Forest Ecosystem Health and Vitality

Criterion 3: Maintenance and Encouragement of Productive Functions of Forests (Wood and Non-Wood)

Criterion 4: Maintenance, Conservation and Appropriate Enhancement of Biological Diversity in Forest Ecosystems

Criterion 5: Maintenance and Appropriate Enhancement of Protective Functions in Forest Management (notably Soil and Water)

Criterion 6: Maintenance of Other Socio-Economic Functions and Conditions

1	Definition and implementation of a National Forest Programme (NFP)
2	Improve forest knowledge
3	Considerable increase of timber coming from SFM
4	Estimate the full value of Forest Ecosystems
5	Climate Change adaptation/mitigation strategies included in NFP
6	Cut in half biodiversity loss and reduce forest fragmentation/degradation
7	Use forest management to combat desertification
8	Further promote socio/economic and cultural forest values
9	Root out illegal logging

Table 2. Targets for SFM agreed in 2011 by each signatory State, including Ireland, by 2020.

How is Ireland's forestry model in relation to these basic SFM commitment's? Bottom of the class, as we find in a 2011 Forest Europe report highlighting the fact that Ireland's forestry model is the least natural forestry model and scores last in each of the six EU Sustainable Forest Management criteria tables used for this assessment.[152]

A summary of this report below, with authors comments, highlights Ireland's worrying failure to interpret and implement the most basic EU SFM principles. Forest Europe evaluates the state of Europe's forests, Ireland ranked second lowest in this evaluation.

The report makes it very clear that Ireland's Forestry model is completely out of step with the direction of the rest of Europe's member state SFM practitioners.

70 % of Europe's forests are naturally regenerated and coppicing with rotation of poplar and willow becoming more common for a renewable energy source. Ireland ranks as the third lowest country in the EU for natural regeneration.

Area of introduced species in the EU is 4% of total area, Ireland is unusual with its higher proportion and reliance on, non-native species, more than three quarters of Ireland's forest estate. This leaves the Irish estate vulnerable to Climate change pressures.

Mixed forests and other woodland being composed of several tree species are richer in Biodiversity than those comprised of one tree species.

10% of EU forests are managed for Biodiversity and landscape protection. There is a steady evolution towards mixed forest composition across the EU. Ireland is one of the highest ranked for Plantations of monocultures of nonnative species.

Ireland provided no data for deadwood standing or lying, strange as this is an important habitat and indicator for Biodiversity in forests. Deadwood dependent species are endangered in Ireland, adding to the vulnerability of our forests.

Ireland has very low forest connectivity which hinders Biodiversity and Environment services, the forest model has evolved on an ad hoc basis, being guided more by grant aid than strategic planning. This has led to a patchwork of isolated and noncommercial areas planted purely for grants, much of which has not been managed.

Ireland has the lowest share of protected area of the total forest area, for Biodiversity in the EU, as well as lowest forest area under Natura 2000 protection in the EU.

The area of forest and other wooded land for protection of soil and water and other ecosystem functions was not reported by Ireland.

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[152] http://www.foresteurope.org/filestore/foresteurope/Meetings/2011/FOREST_EUROPE_Expert_Level_Meeting_Oslo_2011/ELM_2011_Oslo_SoEF2011.pdf

Ireland's forest sector contribution to GDP is one of the lowest in the EU.

EU target of 20% renewable energy by 2020, wood is the greatest component for most EU countries, Ireland is lagging far behind in this regard.

EU wood energy usage increased by 22%, between 2002-2007. Wood energy contributed 37% of the final energy consumed in the EU, almost as much as wind, solar, geothermal, industrial and other waste to energy, etc.

Ireland ranked lowest in annual wood energy consumption per capita rural population.

Ireland scored among the lowest for forest related staff figures.

Ireland continues to operate with outdated forestry legislation and regulation.

Ireland consolidated most of its outdated Forestry Acts into the 2014 Forestry Act, as required under SFM commitments. However, this still falls short regarding achieving SFM. Ireland did not review or alter the outdated 1988 Forestry act, which established Coillte, the dominant state forestry player in charge of 1.2 million acres of Public forest land, approximately 7% of the land mass and almost 50% of the forest area. The 1988 Forestry Act predates Rio and all the subsequent UN and EU SFM agreements Ireland has signed up to implement and therefore cannot deliver SFM.

Ireland ranks low on total public expenditure per year per hectare.

8 billion euro's in total was available under the Rural Development Regulation 2007- 2013 for forestry measures in line with EU trends.

Ireland was availing of none of this, in the last two, Rural Development Programme measures, choosing instead to use public funding for forestry.

Ireland is aiming for 1.9 million tons of wood by 2020 for wood energy.

No detail is provided as to how this will be achieved, considering the poor status of forestry today.

Ireland has no plans to increase protected forest areas.

Most of the .026% area of ancient woodland and old growth sites, Ireland's most valuable land-based habitats, have no management plans or commitment or opportunities for expansion. These vulnerable sites are also among the most threatened according to the most recent EPA 21st century Deforestation Report 2018[153].

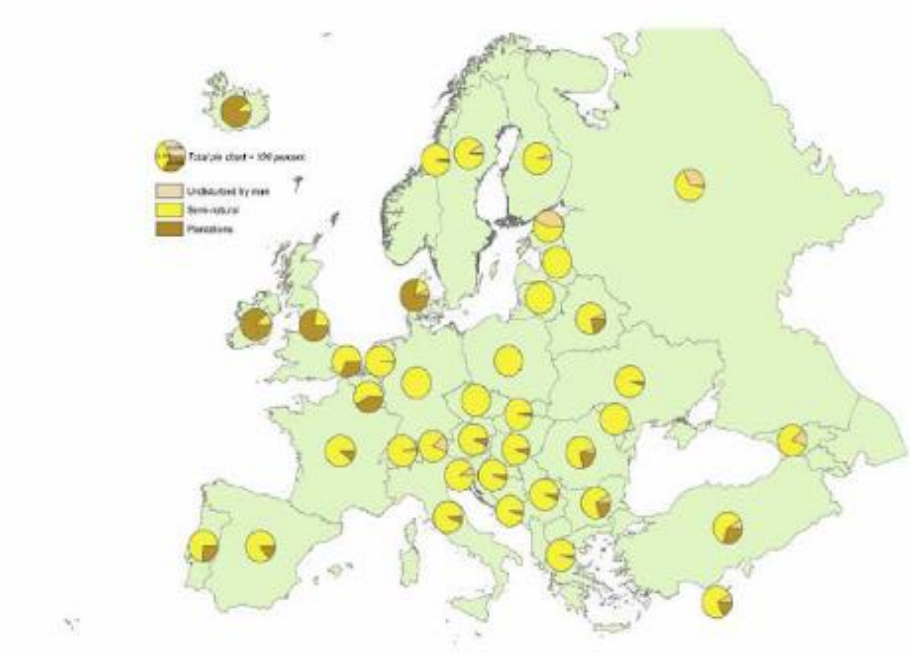
[153] https://www.epa.ie/pubs/reports/research/climate/EPA%20RR%20221%20essentra_web.pdf

The document highlights how good forestry practices are completely compatible with the concept of a Green economy, and describes such an economy as low carbon, resource efficient and socially inclusive. It also describes EU Biodiversity conservation as being at the heart of SFM (Sustainable Forest Management). Both of the above EU qualifying criteria appear to be completely at odds with Ireland's Industrial forestry model and policy**.**

Ireland also has the least amount of natural land area in the EU, **see EU Naturalness Map below**. Naturalness can be defined as "*the similarity of a current ecosystem state to its natural state."* (Winter 2012).

Since biodiversity loss is mainly caused by a loss of naturalness of ecosystems (Hunter, 1990), it is essential to include naturalness in monitoring programme's, in order to support Sustainable Forest Management and Conservation planning.

The authentic landscape of Ireland is Western Atlantic Temperate Rainforest, dominated by oak canopy. [154]The Helsinki Forest protocol 1993,identifies ancient woodland as the priority landscape to be preserved if Europe's forests are to be protected.



[154] https://www.npws.ie/sites/default/files/publications/pdf/Woodlands%20booklet.pdf

What Exactly is a Forest?

Extract below from a US forest research paper

"Real" vs. "Fake" Forests: Why Tree Plantations Are Not Forests
https://docs.google.com/document/d/14RHKTlARdOMQ1D3LuLILvLmMTYIXcKluvr7xa8pppPY/edit

Is a forest merely a collection of trees forming a canopy overstory (i.e., tree cover)? If we plant trees, does that make it a forest? How much of the Earth's forests is planted (more correctly termed "tree farms")? How do planted forests differ from native forests? Can we meet wood demands while minimizing our ecological footprint?

To begin, when it comes to a forest, we each see what we want. A forester sees a crop of trees to be extracted for timber-profit as soon as possible—the economic bottom line.

An ecologist sees an ecosystem where the parts are interwoven and uniquely sculpted by natural processes; deforestation is antithetical to the sum-of-the parts.

When I take a hike into a native (unlogged) forest, I see a rich tapestry of life. This intimate dance of plant and animal, form and function, process and outcome is lacking in a plantation, especially plantations embedded in a sea of industrialized forestry. A walk in an industrial landscape has a different feel, smell, and much fewer dance partners. Wally Menne, a member of the Timberwatch coalition (http://www.timberwatch.org.za), aptly calls timber plantations "fake" forests (http://wrm.org.uy/oldsite/ countries/SouthAfrica/difference.html). I adopt his terminology to distinguish real from fake, native from plantation, natural from engineered. In science, terminology matters—in this case, do we see forests as living, self-willed ecosystems or a crop to be manipulated for the bottom line?

In Ireland we have been practicing for too many years, a tree farming model of Industrial plantations dependent upon fertliser's, pesticides and herbicides for suppression of the competing vegetation and pest control, it should not be labelled "**Forestry**".

This lack of definition hinders proper debate in Ireland around the subject of forest/woodland management which should be separated from Industrial tree farming management.

This lack of clarification suits the tree farming Industry as it can claim all of the benefits that accrue from natural and semi natural woodland management.

The Irish Forestry Programme 2014 – 2020

It is therefore glaringly obvious, the Irish State has failed to achieve the sustainability objectives of the EU approved Forestry Programme, 2014-2020, which has performed poorly in relation to the

SFM measures that were included to improve Biodiversity, Water Quality, Social/Community inclusion, Public Good, Renewable energy, Farm forestry, all criteria essential to show the EU that such continued spending of public funding under EU State Aid rules is justified.

Practically all of the SFM support measures propping up the dominant sitka tree farming business model have failed to materialise. The State produced a mid-term review report which highlighted these failures.

Ireland subsequently drafted an aspirational action plan for the EU in order to try to address these issues and seek ongoing EU support for the failing programme, which surprisingly obtained EU approval.

The objective of the Forestry programme was to reach 7,600 ha of Afforestation in 2017 which is 2,400 ha short of the minimum Coford requirement of 10,000 ha per year just to stand still and avoid a deforestation scenario in the future. According to the Mid Term review only 5,536 hectares were planted, the actual target for the Sustained Yield Forest Industry methodology is 15,000 to 20,000 ha per year, so that allowing for increased year on year harvesting we avoid deforestation.

This Sustained Yield is predicated upon harvesting between 35 and 50 year rotations, the reality on the ground is that recent harvesting is occurring earlier, between 20 and 30 years, (based on observations and anecdotal information provided by harvesters and foresters) which if left unchecked and combined with low afforestation rates will lead to deforestation in the near future.

This premature harvesting was admitted as a potential future problem by the Forest Service in a Forest Policy Review Group meeting attended by the author in 2017, their response was to launch a harvesting calculator or felling decision tool. [155]

They said that they were powerless to prevent felling at any time after the last forestry premium payment has been made. It was paid for 20 years pre 2014 when it was reduced down to 15 years. This failure to control premature harvesting is another major weakness in the current system that needs to be addressed.

The extra pressure to harvest earlier is coming from the private sector, especially pension funds who need a quick return and will seek to harvest when the price of timber is high with no heed of Sustained Yield or sustainable forest forecasting, upon which our Carbon accounting from forests is derived.

[155] https://www.agriculture.gov.ie/forestservice/forestservicegeneralinformation/foreststatisticsandmapping/fellingdecisiontool/

Information below taken from the 2017 mid -term review of the forestry programme required for EU State Aid Rules

Under the latest Forestry Programme 2014-2020 the Irish Government aims to increase the forest cover area in Ireland, from approximately 10.7% to reach a target of 18% forest cover by 2046, using a budget of 482 million euros. Under the previous Forestry Programme, 1996, Growing For the Future, the target was to reach 17% forest cover by 2030.[156]

https://www.agriculture.gov.ie/media/migration/forestry/forestservicegeneralinformation/2014-2020midtermreview/MidTermReview210218.pdf

The new IBEC Forest Ireland Industry Association at their recent inaugural, Press Conference, said it will take 100 years to achieve the 18% target of the Forestry Programme, which is an admission of failure to attain one of the main objectives of the programme.[157]

It is very clear that those objectives could never be met and the targets were unrealistic. This needs to be seen in the context of several billion euro's of public money having been pumped into the Forestry sector since the early 1990's. In the Forest Service Annual statistics for 2013, the forest cover was declared as 10.5%, taken from the 2012 national forest inventory, this tells us that between 2012 and 2018 only 0.2% of an increase in forest cover was achieved, it seems to be a very high price for little gain.

To date no cost benefit analysis that includes the full environmental and social costs of such an ambitious programme, (which constitutes the largest single land use change in such a short time period) has been produced to justify the continuation of this publicly funded forestry policy.
The Government is not on target to meet its planting needs, however, as they adjusted their targets down for the programme, they can claim they are reaching some of the targets, 2015 - 2016 target was 12,660, out turn was 12,700 ha, for the 2 years, showing an average of 6,350 ha pa, it would now appear that 2017 afforestation only reached 5,536 ha.

Information below taken directly from the Mid Term Review of the Forestry Programme 2018.

Native Woodland Scheme target for 2015-2016 was 900 ha, the out turn was 293 ha, only one third of target.

Measure 6. Native Woodland Conservation, private target was 160 ha, for 2015 -2016 the out turn was 0, and for Public Native Woodland Conservation (Including ancient woodlands in care of NPWS) target was 340 ha, out turn was also 0.

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[156] https://www.agriculture.gov.ie/media/migration/forestry/forestservicegeneralinformation/2014-2020midtermreview/MidTermReview210218.pdf

[157] https://www.thejournal.ie/readme/floundering-forests-the-challenges-facing-the-irish-forestry-industry-3989337-May2018/

A poor performance and shocking indictment of the state's commitment to native tree species and woodlands, the bedrock of our land based Biodiversity on this Island

Sitka spruce is still the dominant species planted, new planting/afforestation over the last number of years has included 30% broadleaf targets since approximately 2010, however this has been seriously set back by the devastating impacts of Ash dieback, a disease brought in by importing ash trees from Europe. There has been a removal of a large proportion of ash trees planted in recent years, which had formed part of this 30% commitment. There was no need to import ash trees in the first instance, ash is a prolific native species, this problem further highlights the lack of sustainability of the State forestry programme.

This is one of the main issues facing the state in regard to the sustainability of the Forestry Programme 2014 -2020. The broadleaf figure minus ash trees because of ash dieback, is now reduced to 19%, (according to the Forest Service communication in a 2018 Forestry Programme Implementation Group meeting attended by the author), we suspect the broadleaf figure may actually be lower, due to poor planting and lack of management of broadleaves, which undermines the sustainability credentials of the whole EU approved Irish Forestry Programme.

The National Forest Inventory 2017 provided a figure of 28.7% claiming the broadleaf component of the National forest estate has increased by 3% between 2013 and 2017. What we are not being told is the condition or the age of these broadleaves, many are just saplings and anecdotal (provided by foresters) and observational information on the ground suggests that much of the broadleaf tree planting of the past 20 years has not been successful.

Another information deficit is the approximate volume of hardwood timber within the whole forest estate which would allow a more accurate assessment of the performance and true status of this Broadleaved component, which the Forestry Policy relies upon as an Indicator for SFM. The information on the broadleaf resource should also provide the health and vigour status not just how many are standing, this criterion should apply to the plantations of non native trees stock.

There is also, nationwide cumulative impacts of clearfelling, the unsustainable use of chemicals, acidification via pine needles, etc, over a wide area of the country on an ongoing basis which may be in breach of the EIA Directive which now has provision to take such cumulative impacts into consideration.[158]

Brexit Threat to the Existing Narrow Focus Short Sighted Industrial Forestry Model

Another looming and impending threat to Ireland's forestry model comes from Brexit, as we discover that 80 percent of the Irish Forest Industry production is going to the UK markets. 80,000 truck journeys per year are being made taking wood products across the Irish Sea. The need to diversify and create new markets while ensuring the domestic market is catered for first, with import

[158] http://ec.europa.eu/environment/eia/pdf/EIA_Directive_informal.pdf

substitution top of the list has never been clearer. This issue highlights the shortsighted nature of current Irish forestry policy.[159]

Clear Felling Replant Forest Management System

The dominant silvicultural system to harvest/regenerate the forest in Ireland is, clear-fell then replant with felling expected at the earliest at 35 years(Forest Service, 2000b). However, there is a growing trend within the private sector to prematurely, clear-fell high yield class spruce at age 25-30 due to current high timber prices and the perceived risk of wind -throw.

Less than 1% of total private forests are currently managed with silvicultural systems other than Clear-Fell (Vitkova*et al*,2013). The licencing for tree felling and compulsory restocking is regulated in law by the 2014 Forestry act and it is administered by the Forest Service. Currently there is no limitation in law on the size of Clear fell patch (Forest Service, 2000b). Environmental, biodiversity, water quality and archaeological restrictions are in place (Forest Service,2000b).The average coupe size approved for clear felling is approximately 7-8 ha per site with an upper figure of 25 ha for remote area, 15 ha for more landscape sensitive areas and for areas greater than 50 ha of conifers or 10 ha of broadleaves an Environmental Impact Statement is required (Forest Service).

There is a very obvious disconnect here in relation to Sustainable Forest Management which aims to use good silvicultural practices to ensure a balancing of the Social, Environmental and Economic benefits.

The following research information underlines the negative impacts of clear-felling as a policy and practice:

'Modern timber removal operations involve high capital investments in mechanisation and high quality road construction. For such operations to be economically viable, large timber volumes have to be logged per hectare (Wyatt- Smith, 1987; Whitmore, 1991). The minimum profitable volume per unit area is, however, often much lower than believed, as shown by the profitable creaming operations of species with widely dispersed individual trees (cf, Palmer, 1975)The perceived dictates of harvesting economics is one of the main causes for undesirably high harvesting intensities, This results in:

- *selection of inappropriate yield regulation approaches and associated excessive canopy opening;*
- *pressure for unsustainable harvesting levels;*
- *damage to residual vegetation, including to the regeneration and recruits of desirable*

[159] https://www.independent.ie/business/farming/forestry-enviro/forestry/it-is-extremely-worrying-uk-only-realistic-market-for-trees-36859498.html

timber species;

● *damage to the soil via serious compaction.*

Highly mechanised logging with heavy machines creates conditions not usually encountered in nature (Whitmore, 1991). Particularly troublesome is soil compaction (e.g. Malmer and Grip, 1990), and also disruption of the soil surface, which destroys seedlings, the humus layer and superficial feeding roots and affects the soil seed bank (Whitmore, 1991)'

It would appear to be the case that this Clear-Felling/Replant system is not compatible with the principal SFM criteria adopted by the Irish state.

Proposed Solutions and Alternative Silviculture methodology

This is the context and background to the Environmental Pillar concerns for the need for Greening Irish Forestry, before spending any more billions of public funding. If the known negative impacts of this forest model are not addressed, it will lead to a missed opportunity for Ireland to harness the full potential and multiple benefits of a more holistic land use approach in relation to Forestry Policy.

Celt wish to see two of the Forestry Review group recommendations in 2013 implemented

1. The creation of a two-strand forestry programme, one focused on commercial forestry/sustainable timber production and the second focused on maximising the environmental and social known multiple benefits of native and semi natural woodlands. This will need to receive an equal annual amount of research and development funding.

   Adding weight to this proposal and from the 2013[160] report: The cost benefit analysis of planned afforestation, show that the Environmental benefits and Carbon sequestration, Climate mitigation, could outweigh the value of the timber itself.

2. The introduction of an annual allowable cut, (AAC) so that harvesting at levels greater than the AAC will impact on the sustainability of the resource needs to replace the current system of simply reforesting the areas that are clear-felled. This current method is problematic not least because felling an area of forest that is 20 years old is obviously very different volume wise to the same area felled at 30 years. At present areas can be felled at almost any age but once they are reforested, the impact is assumed to be zero. This system therefore cannot be trusted as evidence for SFM or the accurate calculation of the full volume of timber or Carbon stored in the same area.

The Forestry Review report 2013 also identifies the unviable abandoned Coillte (approx : 200,000 acres) and the 44,000 ha of farm plantations below 5ha, planted for grants and without road access or management. These wastelands should be targeted where appropriate after ecological assessment, for conversion to mixed native woodlands for climate mitigation, eg, flooding and

[160] https://www.agriculture.gov.ie/media/migration/forestry/publicconsultation/forestpolicyreview/ForestPolicyReviewpublicconsult21Jun2013.pdf#

carbon sequestration. This would increase their value and also assist in the State's Climate Resilience and Adaptation Strategy.

Other obstacles to achieving SFM in Ireland

The conflicting objectives of the Department of Agriculture and Marine (DAFM),and the Forest Service, both of which are competing for the same land bank, with DAFM agenda obviously favouring more grassland. The Forest Service remit is to increase forest cover, they are controlled by the Department of Agriculture whose remit is Food Harvest 2020 at all costs, which means finding all available land to maintain the status quo. These State bodies are in direct conflict. See the Society of Irish Foresters link to the Teageasc document, focused on diminishing land availability for tree plantations,[161] this is the same problem facing Harvest 2025 objectives.

Recommendation: The Forest Service needs to be moved away from DAFM and into the Department of Communications, Environment and Climate Action.

We are also facing a real deforestation scenario in the near future as commercial tree plantation planting rates are now down to 5000 ha while harvesting is increasing. The big problem is the increase in the dairy herd numbers in response to Food Harvest 2025[162] plans to increase farm production by 50%, this means the cattle herd has grown immensely and this is where the extra pressure on our water resources is coming from. This has also created land pressure and competition with tree plantations for diminishing land availability.

In turn this has led to widespread mostly unchecked deforestation of natural and semi natural woodlands, this is verified by the EPA 21st century deforestation in Ireland report[163]. And more recent events, such as, in Toonwood, Macroom, county Cork, 30 ha of old growth woodland destruction, which was actually licensed by The Forest Service. An investigation into this is underway and a complaint has gone to DG Environment in Europe.

This issue is at the heart of the Toonwood, old growth native woodland licensed destruction, https://my.uplift.ie/petitions/protection-of-toon-valley-woodland going unchecked, whereby the poacher is the gamekeeper, eg, The Forest Service remit is to increase forest cover, they are controlled by the Department of Agriculture whose remit is Food Harvest 2025 at all costs, which means finding all available land to keep the increased farm production on an upward trajectory.

IFORUT and Pension Funds Driving Forestry Policy for Short term gains

The Irish Forest Unit Trust controls 17000 hectares of plantations and is the largest private supplier

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[161] https://journal.societyofirishforesters.ie/index.php/forestry/article/download/10299/9382/

[162] https://www.agriculture.gov.ie/media/migration/foodindustrydevelopmenttrademarkets/agri-foodandtheeconomy/foodharvest2020/2020FoodHarvestExeSummary240810.pdf

[163] http://www.epa.ie/pubs/reports/research/climate/EPA%20RR%20221%20essentra_web.pdf

of roundwood in the Irish Timber market despite this relatively small area of forestry[164]. much of their forestry consists of forward sold semi mature public forestry purchased from Coillte at approximately 15 years old and harvested when the price of timber is high to maximise their returns. The potential for harvesting early leading to deforestation and for market manipulation is clear from this unusual arrangement. Coillte have never placed these public forest assets out to tender which was raised by TD Clare Daly in a Parliamentary Question ref[165]. The unusual short rotation nature of the Irish Forestry model, 20 to 35 years appears to be linked to pension fund time frames in order to ensure an adequate ongoing cash flow to pay out on pension funds. Celt wish to see this situation reviewed by an Independent body and for changes to be put in place to prevent financial/economic interests dictating Irish Forestry Policy to the detriment of Environmental and Social objectives of SFM in Ireland as is currently the case.

Forestry Act Legal Replanting Obligation

Another obstacle to increasing woodlands on farms is the legal replanting obligation, this needs to be looked at and changed for small areas of planting below the Forest Service threshold of 0.5ha which defines a forest. This would enable more farmers to consider planting small areas of their farm which cumulatively could increase our native treecover by up to 4 percent if only 5 percent of all farms were targeted in this way minus the legal replanting obligation with an ecological assessment. This simple measure could go a long way to improving farm sustainability and biodiversity in a short amount of time as well as boosting our low forest cover.

See. Appendix, Pontbren research project on 1000 hectares positive measured impacts with just five per cent use of strategically placed mixed native woodland copses.

Ireland's farm forestry has been restricted to the tree plantation model to augment the main agenda to supply fast growing pulpwood to the narrow focus Industry. This has skewed farmer attitudes to forestry and prevented alternative diverse small scale agroforestry and other alternative silvicultural systems focused on native trees being tried and tested.

Ref below to paper examining farmers reluctance to engage with forestry ,"*Important questions therefore include the reason why Irish farmers display an apparent reluctance to become engaged in forestry production, and why the promotion of a resource that delivers on so many of the EU's stated Policy objectives for Sustainable Rural Development generates seemingly little appeal within the farming community indeed"*. (Barbier et al - 2010)[166]

Regulation and Monitoring

Improved forestry regulation, higher penalties and monitoring is also urgently required, this will need funding so that there are more Inspectors on the ground and the use of the DAFM satellite

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[164] http://www.iforut.ie/

[165] http://claredaly.ie/agriculture/

[166] *http://www.academia.edu/2764387/NEW_OPPORTUNITIES_AND_CAUTIONARY_STEPS_FARMERS_FORESTRY_AND_RURAL_DEVELOPMENT_IN_IRELAND*

imaging system to identify at the first stage any instances of deforestation of natural and semi natural woodlands of farms etc.

The 1988 Forestry Act

Celt would like to see the 1988 Forestry Act, which created Coillte[167], The Irish Forestry Board, a semi state commercial entity, reformed and brought into line with the new Climate change and Rio SFM realities of the 21st century. This Forestry Act has no public good, SFM or Climate mitigation remit. The Act predates Rio and all of the subsequent State commitments to SFM at EU and UN Level referred to in the Introduction to this section of the Greening report.

Coillte are in fact more of a development company than a Forestry company, and are now embarking on developing more of the Public forest estate to develop wind energy. This will further deplete the national forest cover and is not compatible with stated SFM objectives, in fact, it will contribute to deforestation.

Quote by Mr. Martin Lowery, ex-Coillte chairman, before an Oireachtas agriculture committee 2003.

"***It was established under the Forestry Act 1988, which set out its objectives and duties. The objectives are purely commercial; to operate on a commercial basis in accordance with efficient practices, to manage the resources available in a manner consistent with the company's objectives, and to establish woodland industries and participate with others in forestry to enhance the profitable operation of the company. It is important to emphasise that because there is often a misunderstanding as to the nature of our mandate. We do not provide a public service as that is not in the legislation. We are a commercial entity.***"

This outdated mandate states very clearly that it has no obligation to protect the environment or have any social responsibilities whatsoever. This needs to be understood in the context of the fact that SFM involves the balancing of the social, environmental and economic aspects of forest management.

Coillte have failed to develop and diversify the Irish public forest estate in line with the aims of Sustainable Forest Management. Another example is the fact that a portion of the Coillte estate consists of old broadleaf woodland sites, most suited to native species. In spite of this, the sites are mostly planted with nonnative conifers.

27,000 ha of Coillte estate constituted old woodland sites (Garret 2001, O Sullivan 2004) that is sites that have been continuously wooded since first edition Ordnance Survey maps 1830 – 1844 – subsequent survey work has found these old woodland sites are of higher conservation value than plantations of recent origin, supporting a greater range of native woodland specialists (Daly, 2008)

In 2005 Coillte commissioned a report on the economic viability of hardwoods in Ireland, this was to justify their over reliance on the nonnative conifer, sitka spruce. It was also a response to a query

[167] http://www.irishstatutebook.ie/eli/1988/si/367/made/en/print

regarding their FSC certification claim to Sustainable Forest Management, in regard to their failing to grow and manage hardwoods for multiple benefits.[168]

This Coillte funded report concluded that Hardwoods are not viable in Ireland compared to the Sitka spruce model. The report was critiqued by the NGO Friends of the Irish Environment, who questioned the conclusions with a quote from the ex CEO of the Austrian Federal Forests, Richard Ramhauser, who also peer reviewed the report, in which he says, ***" In Ireland only the Sitka programme works. But it works with methods impossible elsewhere in central Europe - huge clear cuts, negative soil impact and degradation, ugly monocultures, the poorest biodiversity". He went on to say " Coillte is the only State Forestry Board in the EU not to fulfill National Forestry Policy.*** "

Curiously in a Coford publication (Irish forestry research body)[169] "***A guide to Forest tree species selection and silviculture in Ireland " Quote ; " There is some observational evidence that some coniferous species are more stable when grown in a mixture with deep rooting broadleaf species such as oak."***
An external critique of the Coford species manual below, highlights the narrow focus on commercial timber production as the sole criterion for site species selection[170].

Chapters 3 and 4 cover the matching of tree species to site. In Chapter 3 the authors discuss climate (temperature, precipitation and wind), site (topography, exposure and aspect) and soil, which they consider to be 'the major factors influencing growth potential, and consequently species selection'. Species selection guidelines (Chapter 4) are based primarily on the ability of different species to produce commercial timber on different soil types, and are summarized in tables which could be used by practitioners. However, not everyone will agree that the distinctions made between climate, site and soil are sensible, or that growth potential for commercial timber production should be the sole criterion for species selection. To add to the confusion, the header on the pages of Chapter 3 reads 'Site characteristics', though the title given at the start of the chapter and in the table of contents is 'Site productivity'.

The book is nicely laid out and easy to read, and the authors' experience and expertise are evident. It does leave the reader with the strong impression that all forests in Ireland are plantations; natural regeneration is mentioned only in passing, and silvicultural systems are not discussed at all. Presumably this reflects the reality on the ground, but for a wider readership it might have been clearer if the book had been entitled *A Guide to Forest Tree Species Selection and Plantation Silviculture in Ireland.*

Alternative Public Good Coillte Forestry Model.

Coillte, who are in charge of the largest public land bank consisting of 7% of the land mass, are not managing this land to ensure Climate resilience and are not delivering a public good. A

[168] http://www.inff.ie/cmsfiles/pdf/henry_phillips_report.pdf

[169] http://www.coford.ie/media/coford/content/publications/projectreports/speciesmanual.pdf

[170] **https://academic.oup.com/forestry/article/78/3/315/520710**

transformation to mixed native woodlands, of suitable sites, after ecological assessment to identify habitats that should never have been planted, of the Public forest identified by the economist, Colm McCarthy, as not being commercially viable. The McCarthy report assessing state assets for privatisation in 2010 found approximately half of the Coillte public forest estate (500,000 acres) was not commercially viable, and with only a 0.4% annual return from its forest business, was also not commercially viable. He stated the expected annual return from a successful forestry company was 2.5%.[171]

This native tree focused proposal would be in keeping with the Heritage Council recommendations from 1999[172], when they expressed concern at the increasing blanket coniferisation of our delicate uplands.

This could be implemented via a Public works programme, to create a new Public/Community Forest resource using trained community co –operative teams, targeting, biodiversity, soil erosion and flood alleviation. A close to nature system of sustainable forest management is the preferred option, using natural regeneration of native species, with some planting to bring the forest into a continuous cover management system. The objectives would be local sustainable management prioritising biodiversity, soil and water protection with utilisation of the resource, for firewood, biomass, craftwood, charcoal, non timber products, such as mushrooms, nut and berry gathering etc. The simplest way for this to happen is by legislating for Community benefit forestry combined with reform of the Coillte 1988 Forestry Act.

If only 250,000 acres of the unviable component of the Coillte estate was utilised, 25,000 jobs could be created over a five year period in this new public – public partnership model. If you aimed for training in basic sustainable forest management of 5000 people each year, using the 14 existing Coillte management units/facilities as venues and target the transforming of the unviable sites, this would equate to 120 people with four months training, by three times each year, giving approximately 360 jobs per region x 14 equals 5040 people. It would mean the local community taking back control of these unproductive forest areas. The trained teams would also target other local woodland sources currently without management. This could include farmers and utilise available Rural Development funding.

This training could be delivered by Teageasc, who are funded under the Rural Development Programme to provide such training. A component of this training could involve ecological site assessments which could double up and assist in the site assessments for new afforestation sites. A continuous improvement training option would also be provided for ongoing progressive SFM learning. This project would fit well into the Ireland's Climate mitigation and adaptation plans which need to be expedited as the impacts of Climate change become ever more apparent to all.

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[171] Ref :https://www.per.gov.ie/wp-content/uploads/Report-of-the-Review-Group-on-State-Assets-and-Liabilities.pdf

[172] https://www.heritagecouncil.ie/content/files/forestry_national_heritage_policy_paper_1999_106kb.pdf

Funding and investment could also come from existing social welfare payments on back to work and community schemes, the EU Rural Development Funding under LEADER, as well as the National Strategic Investment Fund. The new Native Woodland strategy is another new source of funding which has provision for community woodlands creation. Management of ancient woodland sites in the care of the NPWS, currently without management plans, which they should have in order to be compatible with SFM compliance objectives, could also be incorporated into this programme

There has been a huge increase in the use of stoves for home heating, while at the same time, no planning to provide sustainable wood production to cater for this demand is in place. In fact hardwood firewood is actually being imported which is not sustainable. This importation also brings the risk of bringing in pests and disease into our forests and trees.[173]

Ireland is also importing an average of 30,000m3 of sawn hardwoods per year as well as 100,000 m3 of sawn softwoods per year. [174]

We need to put measures in place immediately to ensure an orderly supply of sustainably managed locally sourced firewood. As native hardwoods provide better burning than softwoods, due to what is known as a higher calorific content, and can be managed using coppicing systems. Coppicing is when you cut the tree close to the ground, they grow back vigorously as new shoots spring back which can be harvested every three to five years, this also prolongs the life of trees and therefore will lock up more carbon. This system increases biodiversity and habitat creation via the rotation of minimal ground/light disturbance. Suitable native species for this system are , oak, birch, willow, hazel, and ash. As these new native woodlands replace the failed softwood conifers, local district heating systems CHP (combined heat and power) could be created and supplied with thinnings, from the long term management of these community woodlands, with inclusion of farm hedgerows/woodlands/scrub areas/copses.

Sustainable hedgerow management could also be incorporated, see successful French initiative[175]

This would provide a long term economic return for local community co-operatives and ensure resilience for rural communities by reducing the need for wood truck movements exporting wood and utilising wood locally. An alternative vision for Ireland's Public Forests, is badly needed. These failed Coillte plantations, were created using Public money and the hard toil of forest workers. We should invest in the transformation of this under utilised Public Forest asset as a long term economic bulwark and backbone for ensuring rural Ireland's sustainable future.

Quote from the Environmental Pillar Opening Statement to the JOC Committee on Climate Action, in relation to the Climate Mitigation Recommendations of the Citizens Assembly.

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[173] https://www.independent.ie/business/farming/imported-firewood-threat-26576818.html
[174] https://www.forestry.ie/images/MiscDocs/2017YearbookArticles/2017YBArticle-WoodFibreUse.pdf
[175] https://ec.europa.eu/eip/agriculture/en/news/inspirational-ideas-setting-short-wood-supply-chains-using-hedgerows

"***Coillte, who are in charge of the largest public land bank consisting of 7% of the land mass, are not managing this land to ensure Climate resilience and are not delivering a public good.***
The McCarthy report assessing state assets for privatisation in 2010 found approximately half of the Coillte public forest estate, 500,000 acres, was not commercially viable, and at 0.4% annual return from its forest business was not commercially viable.
The Environmental Pillar wishes to see an Independent review of Coillte and the 1988 Forestry Act which created Coillte. This latter needs to be reformed to ensure that long standing forests focused on native trees are created for the longer term benefits including climate mitigation. We want to see this, the largest public land bank transitioning to mixed native woodlands and forests that ensure sustainable management of this natural resource for climate mitigation and adaptation."

Regards land suitability, recognition of natural regeneration via the plant succession process of native species should be allowable, which will improve poor land, this should allow for scrub to be recognised as an agroforestry option which could be funded via the native woodland scheme conservation measure.

Public Funding versus EU funding for Forestry

We are spending 100 million euros per year of public funding on a failing Forestry programme, even though Forestry is eligible for funding under the EU Rural Development Funds, with a broad suite of fundable measures related to sustainable forestry, a valid question to ask is, why are we not availing of this funding source ? The Rural Development Regulation [176]
Two possible answers, the EU funds come with annual monitoring of water and soil and other Environmental scrutiny, introduced back in 2007, the same time Ireland decided to use Public funds for forestry. The identity of the grantees does not have to be disclosed by using public funding, EU forest grants require transparency and naming of grantees. The identity of the forest grant recipients would be very revealing as to who is really benefiting from this Forestry model.

Carbon Sequestration

Celt have serious concerns regarding the viability and validity of the current State forestry policy, especially in relation to the Climate change mitigation claims made for this Industry, in the areas of, carbon sequestration, biodiversity value, flood mitigation, soil and water protection. It is worth noting, the Minister for forestry stated, in a recent Primetime special on the future of Ireland's forests, that the State has spent approximately 2.5 billion euros on a forestry programme in the last ten years. [177]

Looming Deforestation Scenario below.

[176] ***https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32013R1305***
[177] http://www.rte.ie/player/show/10913198

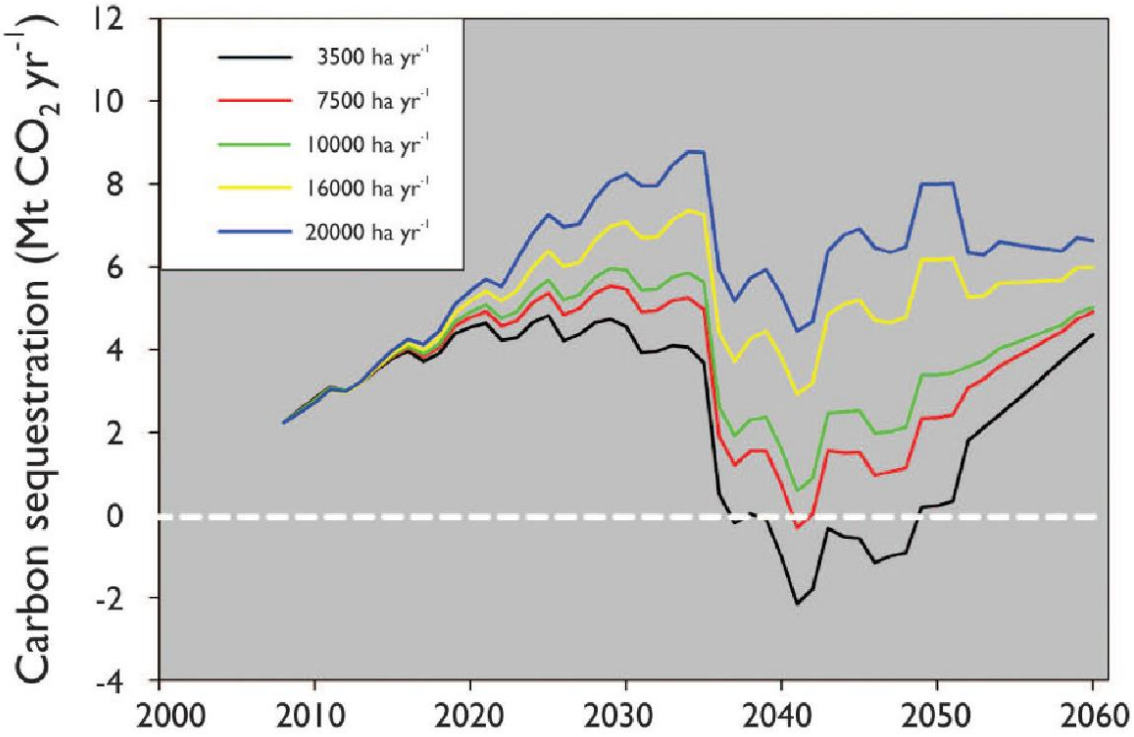

Figure 1. Irish Forestry to become net emitters of carbon dioxide by 2035.
Source[178] http://www.coford.ie/iopen24/pub/ccn09-env09.pdfce:

The Coford graph above illustrates the point that an annual afforestation rate of c.10,000 hectares is required in order to avoid our forests becoming net emitters of CO2 before 2050. Coford reiterated that the desired afforestation target required is 15000 ha per annum.

"*Carbon in wood harvest is immediately emitted to the atmosphere and in the absence of replanting it is not replaced- an annual rate of deforestation of 1000 ha would reduce the allowable carbon sink to half a million tonnes of Co2 and would cost approx 10 million euros per year.*" (Coford doc - Environment no 9, Climate change and Irish Forestry, Eugene Hendrick and Kevin Black)

This further highlights the unsustainable nature of current Irish forestry policy as planting rates have declined to approximately 4000 ha per annum.

Forest Management Alternative Solutions

The potential natural vegetation of most of Ireland is woodland (Cross 1998) and most of the Irish landscape was covered by trees following the last glaciation c. 10,000 BP (Mitchell & Ryan 1997). Millennia of human activity and climate change have dramatically reduced woodland cover, and that which remains is limited in extent, scattered in distribution and much modified from the primeval forest. Today however, Ireland is one of the least wooded countries in Europe, with only about 11% of the State now covered with trees (NFI 2017). Woodland cover was estimated at less than 1% of the total land area at the start of the 20th century (Neeson 1991), and the recent figure reflects an

[178] http://www.coford.ie/iopen24/pub/ccn09-env09.pdfce

active State policy for afforestation since that time. The majority of Irish forest area today comprises commercial plantations of exotic species.

The differences between present forestry practice and sustainable woodland management are listed below.

(Extract is from Ben Laws book "*The Woodland Way*" a guide to sustainable woodland management in the 21st century)

Present Forestry Practice

- Trees are viewed as timber.
- Industrial management-use of pesticides, fertilisers and large machinery.
- All trees are of similar age.
- Short length rotations.
- Clear-fell is main management practice.
- Monoculture plantations are favoured.
- All forest is managed.
- Timber is the only forest product.
- Traditional forest knowledge is seen as outdated and ignored.
- No sacred places or woodland celebration.
- Economics based on short term monetary thinking model.
- Forest workforce trained as timber harvesters.
- Timber transported long distances.
- Management plans drawn up after brief visit.
- Forest designed around machinery operations.
- Management has high capital investment (large machinery).

Sustainable woodland management

- Trees are an integral part of a diverse ecosystem.
- Sustainable management: no chemicals, small-scale machinery and biological resources (horses to extract).
- Trees of all ages (seedlings to veterans).
- Long rotations (leaving veterans).
- Selective felling and coppice management.
- Diversity is favoured.
- Areas are left for their own evolution.
- Woodland offers diversity of products, timber and non-timber, recreation,etc.
- Encouragement of traditional knowledge, coppice woodmanship, craft-work, herbalists.

Woodland offers environment for celebration, contemplation and spiritual growth

- Economics based on long-term sustainability of the whole woodland eco-system, its diversity and multifunctional yield.

- Woodland training through observation, traditional knowledge, and understanding of the whole ecosystem.
- Timber and non-timber produce sold locally.
- Management plans drawn up after long term observation through different seasons.
- Woodland design based upon permaculture principles.
- Management is people (labour) based and locally sourced.

Forest Policy linked to National Spatial Planning

Better use of geographical and spatial tools, and map inventory for management of forestry. Forestry inventory maps to be made more widely available, user-friendly, readable and legible. These should be used for consultation on forestry decisions, showing locations, status and condition of all of the public and private forestry resource and lands. Integrated landscape management using spatial planning to include no conifer plantations planted in proximity, (above or upland) of native woodland - as these change soil constitution and place a strain on native trees. A spatial inventory to be used for biodiversity, habitat and sequestration indicators as well as to identify natural regeneration areas.

Diversifying species mix of Plantations.

Planting of Sitka Spruce plantations with 10% intimate mix of native birch with another 10% native broadleaves mix of Alder, and Birch, Scots pine the native conifer could be added here and planted in the buffer areas and visual perimeters. There is scope to plant in, understorey shrubs such as Hawthorn, Rowan, and Elder for bird food via wild berries. Promoting the existing Forest Service allowance for intimate planting of Douglas Fir, Western Cedar and Hemlock within blocks of Sitka Spruce would also increase the climate resilience, biodiversity and timber values.

Scots pine, Douglas fir, and European Larch could be managed for utility poles for the ESB and Eircom, as they were in the past. Utility poles are being imported at a cost of 600 to 800 euros per pole for the ESB at a scale of approximately 15,000 poles per year.[179] The importation of quality wooden poles by the ESB has been ongoing since 1946, they need slow grown timber of an older age between 60 years and 80 years for the bigger transmission poles. Ireland's forestry Industry is unable to supply this market due to the short rotation fast growing agenda.

Ireland is a net importer of hardwoods, but also much quality softwoods are imported by the building supply sector as the quality of home-grown softwood is very low due to the fast growth and young harvesting age.

The value of introducing broadleaves with spruce has been well documented for increased productivity (Mason and Connolly, 2014), soil maintenance, improvement and pathogens controls (Thelin 2002,Spiecker, 2003; Simard *et al* 2014; Futai *et al,* 2008). (References supplied via online communication with a Pro Silva forester, Jonathan Spazzi, who is now a Teageasc adviser, promoting intimate planting of birch into Spruce stands)

The current Forest Service rules for sitka spruce site planting after clear-felling is for 85% spruce and 15% broadleaves allowed either in groups or intimate in private plantations (Forest Service,

[179] https://www.agriland.ie/farming-news/esb-imports-15000-timber-poles-year/

2018). The 15% broadleaves portion (mostly alder) is never planted intimately, it is usually planted in groups into environmental/landscape sensitive areas.

Celt wish to see this diversity measure increased to 20% as above and split between intimate planting and buffer planting to maximise the environmental benefits.

Reduced Clearfelling Coupes

Encourage felling coupes size reduction below 5 ha with a 30 months restriction on felling adjacent blocks. This will allow better shelter for replanted trees or natural regeneration or both, reduce the landscape impact and reduce soil microbiology recovery time, especially if associated with some green tree retention (Simard *et al*, 2014). For the average private Sitka Spruce plantation (12.7 ha) it should take approx. 7 years and three interventions to complete coupes restructuring with an initial 3 years premature felling. Land form analysis and the existence of wind firm green edges should be considered when designing new coupes shapes (Forestry Commission, 2014). Some wind-throw limitations might rule out some sites.However a strip felling approach,starting from the wind shelter side of the plantation can minimise the wind throw risk. The resulting new structure will be more wind firm in the long term due to a wedge like forest structure. (Detail supplied via online communication with a Pro Silva forester, Jonathan Spazzi, now a Teageasc adviser, who is promoting this policy change)

Continuous Cover with Natural Regeneration Silvicultural Management

Promote Low Impact Silvicultural Systems (LISS) as an alternative to Clear fell.
LISS, also known as Continuous Cover Forestry, is a continuum of Silvicultural Systems, ranging from shelterwood to single tree selection(Forestry Commission, 2014) by which timber is continuously harvested, through thinning or small coupe felling (less than 0,25ha)(Mason *et al*,1999)without total canopy removal, and it represents the norm in Central and Eastern Europe(Kuchli ,2013; Pomeraning and Murphy, 2004; Mason *et al*, 1999). While operationally more complex to Clear felling, LISS has obvious benefits especially in relation to SFM criteria. Specifically the maintenance of soil biological integrity,water quality, overall resilience and greater opportunities for multiple use and landscape values.

It also offers a regular flow of timber/income to the private owner compared to the “bust/boom” approach of Clear-Felling with reduced damage to public roads. However this option will not be available to all Sitka Spruce sites as windthrow, soil fertility, species suitability and browsing are likely to be limiting factors (Mason and Kerr, 2001; Vitkova *et al* ,2013). Also LISS is associated with larger diameter timber (>60 cm dbh) poorly suited to current Irish sawmills equipment(Vítková*et al,* 2013).
(Detail supplied via online communication with a Pro Silva forester, Jonathan Spazzi, now a Teageasc adviser, who is promoting this policy change)

Managing Semi Natural and Native Woodlands

Pollarding and coppice with standards of the semi natural woodlands, and other suitable trees which is considered normal woodland management in many parts of Europe, should be phased into the Irish forestry model. These methods managed by trained local community teams to supply local heating and uses would be a more sensible and sustainable option. Despite the well documented

evidence regarding Agroforestry systems, the provisions for this are too limiting in the new Forestry Programme, to make any viable economic scale possible.

Coppicing and pollarding prolongs the life of trees ensuring that their ability to lock up far more Carbon than usual, into the future is enhanced and maintained. There is also biodiversity increase due to continued creation of new habitat due to availability of light on the forest floor which also locks up more carbon.

Ref, Oliver Rackham, Ancient Woodland[180],

Increased use of native species to augment and replace reliance on monocultures of non native sitka spruce

Regarding species options for future forests, intimate mixing of Birch and Scots pine, and even Sessile oak on suitable upland sites, into commercial plantations have proven results, for soil acidification balancing, and erosion control with biodiversity and seepage (flood attenuation) increases. They would need to be managed under CCF etc. For furniture making and high end crafts, musical instrument making, Walnut, Cherry, and Alder which is being used as hardwood laminate sheeting in Germany and sold for a high price. These select high value species could also be grown on farms as standards in hedgerows and in coppicing situations to be nursed and brought on to a high quality level enabling profits from sales to be reinvested into farms etc.

A guide to using Native Hardwoods timber use specification list was produced by Coford in 2001 and needs to be augmented now and disseminated[181]

The following information relates to four undervalued and under utilised native tree species which are covered by the Coford guide to Native hardwoods. The specification re, uses etc, research is obtained via UK and USA sources

Aspen

Historical uses Forest Research (David C Jardine) have produced a paper on the qualities of aspen timber and the following extract about historical uses is taken from his paper “Not Merely a Habitat: Utilisation of Aspen”, 2008. Historically aspen’s foliage was used as fodder for sheep and cattle, both in a green and a dry state. Our predecessors recognised the low density of aspen and poplar wood and used it in situations where heavier wood would have been less suitable, such as to straining hinges so it was used for doors and gates, particularly those of large dimension. Its soft and even grained texture meant that it was easily carved, leading to its use in furniture and clogs and the ability to peel it into veneers allowed its use in basket making and more recently in use for matches. It does not splinter or crack when nails are used on it, so, like willow, it was valued for cladding of

[180] http://forestry.oxfordjournals.org/content/54/2/213.extract

[181] http://www.coford.ie/media/coford/content/publications/projectreports/GuideHardwoods.pdf

carts, barrows and wagons. Aspen logs were also commonly used for dugout canoes of the type which operated in the Baltic Sea from the Iron Age up to 1900.[182]

Alder

Black alder is a scattered, widespread and short-lived species that thrives in low-lying damp and riparian places. It has a use in flood control, stabilization of riverbanks and in functioning of the river ecosystems. To thrive, precipitation must exceed 1500 mm if access to groundwater is not possible. Alders are unusual among European trees in that they fix nitrogen. To regenerate naturally, alder requires high levels of both light and moisture, usually achievable only on disturbed sites. Growth rates up to ages 7–10 are very fast but then slow rapidly. Sixty to seventy years is the maximum rotation for growing timber if heart rot is to be avoided. Maximum mean annual increments range from 4 to 14 m3 ha−1 year−1. Alder wood is used for energy, as fibre for paper and particle board and, most profitably, in joinery as solid wood or veneer. Logs must be at least 3 m long and ideally 50–60 cm diameter. Aspects of plantation silviculture are discussed with emphasis on thinning, which needs to be started early and to be heavy and frequent around selected final crop trees to achieve marketable timber before heart rot sets in.[183]

Alder is managed in the US as a short rotation mid priced hardwood and exported to Ireland.[184]

Birch

In Europe, two commercially important treelike birch species occur naturally: silver birch (*Betula pendula* Roth) and downy birch (*Betula pubescens* Ehrh.)[185] Both species have a wide natural distribution area on the Eurasian continent, ranging from the Atlantic to eastern Siberia. Although birches occur throughout almost the whole of Europe, the most abundant birch resources are in the temperate and boreal forests of Northern Europe. In the Baltic and Nordic countries, the proportion of birch out of the total volume of the growing stock varies between 11 and 28 per cent. In Northern Europe, birch is commercially the most important broadleaved tree species.
Birches are light-demanding early successional pioneer species, which grow both in mixed stands and in pure stands. This article provides an overview of the most important ecological characteristics and typical growth and yield patterns of birch, based on European scientific literature. Growth and yield research on birch has been relatively active in Northern Europe, where numerous growth and yield models have been developed during the last decades. In this paper, a list of published scientific articles on growth modelling is provided and is grouped according to the different types of model. When growing in forest stands, birches have a relatively straight slender stem form. The current practices and silvicultural recommendations, based on research directed at high-quality timber production in silver birch stands, are reviewed. Although the emphasis is on even-aged pure silver

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[182] http://www.eadha.co.uk/assets/0000/4493/Uses_of_Aspen_Timber_summary_report.pdf

[183] **https://academic.oup.com/forestry/article/83/2/163/519324**

[184] **https://www.americanhardwood.org/en/american-hardwood/american-alder**

[185] **https://academic.oup.com/forestry/article/83/1/103/546795**

birch stands, the management of mixed stands as well as the silviculture of downy birch and curly birch are also briefly discussed.

Scots Pine

Scots pine (Pinus sylvestris L.)[186] is the most widely distributed conifer species in the world, with a natural range stretching from Spain to Norway and from Scotland to Siberia. It is the only conifer species native to the British Isles that has the potential to produce significant volumes of timber, and as such has a key role to play in the rural economy. In addition to timber production, Scots pine forests are highly valued for the wide range of benefits that they can provide – including biodiversity, landscape enhancement and recreation opportunities.[187] There are approximately 220 000 hectares of Scots pine high forest* in Great Britain, comprising around 16% of conifer high forests and 10% of the total high forest resource (Table 1). Almost two-thirds of the Scots pine forest area lies in Scotland, and the species is of particular importance in northern Scotland (Grampian and Highland Conservancy areas) where it represents about 30% of the conifer high forest area (Forestry Commission, 1997–2003). A recent forecast of the availability of Scots pine timber from forests in northern Scotland predicted that it will increase on average by about 15% per annum over the next 15 years (Figure 1), representing approximately 20% of the softwood timber harvest in these areas. The management, timber marketing and use of Scots pine forests in northern Scotland is therefore of considerable importance to the local economy [188]

Restoring Degraded upland Sites

Coford Irish research on restoration of degraded uplands with native species[189]

Professor Daniel Kelly refs in the link below to Irish native woodland survey[190] and the second is a UK paper Kelly contributed to regards restoring native woodlands in uplands etc, which the UK have acted upon especially in Scotland.[191]

Agroforestry and farm forestry

Native trees on farms can also alleviate flooding by reducing and slowing the flow of

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[186] https://www.woodlandtrust.org.uk/visiting-woods/trees-woods-and-wildlife/british-trees/native-trees/scots-pine/

[187] https://www.woodlandtrust.org.uk/visiting-woods/trees-woods-and-wildlife/british-trees/native-trees/scots-pine/

[188] file:///C:/Windows/system32/config/systemprofile/Downloads/FCRN005.pdf

[189] http://www.coford.ie/media/coford/content/publications/projectreports/acidsoils.pdf

[190] http://www.npws.ie/sites/default/files/publications/pdf/Higgins_et_al_2004_Woodland_Interim_Report.pdf

[191] http://www.forestry.gov.uk/pdf/FCRP001.pdf/$FILE/FCRP001.pdf

water from land to river channels, and the sponge effect of their deep roots. Riparian planting would be especially valuable for this purpose and can benefit the connectivity of habitats in the landscape by providing corridors for the movement and dispersal of species of plants and animals.

This is an opportunity for farmers to integrate trees and agriculture via proven agroforestry systems focused on organic farming, with Carbon and ecosystem services payments linked to same to encourage a fast transition. This could save small farms currently under pressure to survive and with no family interest in continuation, leading to land abandonment. Some limited agroforestry measures are currently supported by the department of Agriculture, but with a poor take up. Agroforestry combines trees/shrubs and crops or livestock, to create more diverse, productive, profitable, healthy, and sustainable land use systems. With sensitive ecological planning and on the right scale, it can help solve increasing farm sustainability issues as well as low tree planting rates.

According to a World Agroforestry Centre/UNEP (United Nations Environmental Programme) report from circa, 2009, the agricultural sector could be largely carbon neutral by 2030 and produce enough food for a population estimated to grow to nine billion by 2050, if proven methods aimed at reducing emissions from agriculture were adopted. Key among these methods are, agroforestry, reduced cultivation of the soil, and the use of natural nutrients such as provided by fertiliser trees.[192]

There is a need to be more imaginative with Glas/ and future CAP eco farm schemes, allowing for scrub to be supported as pioneer species forest, increasing and doubling up of hedgerows, with corners and other identified unused areas of farms planted with native trees. Buffer and Copse style groups of trees for flood mitigation in uplands, increase the existing 5m fencing buffer for watercourses allowing for existing fencing to be moved back to 10m and plant them as linear native woodlands for riparian corridors. Combine with creation of swales and attenuation ponds for more soft engineering flood mitigation.

Additional top up payments for farmers who engage in such environmental protection and long term Carbon lock up needs to be considered that places the farmer at the forefront of Environmental soft engineering solutions. This would be money well spent, an investment in biot rural Ireland, farmers, and our Environment, the savings for the State if this was analysed would make it very obviously a common sense idea, and a good start to roll out joined up thinking, again this needs to be addressed before the State spends millions on hard engineering.

Conversion of failed farm plantations to mixed long term native woodlands using some planting with natural regeneration via fencing off the sites after new interventions, with the long term view taken vis a vis benefits. Soft engineering solutions that cost a pittance compared to what the government is about to spend on hard engineering with no guarantees of success. A strong argument must be made to ring fence at least one quarter of the proposed spend on soft options that are proven to work.

Ecological Corridors between Public and Private Forest and Farmlands

[192] http://www.worldagroforestry.org/ar2009/Annual%20Report%202008-2009.pdf

One other critical observation of the 2013 Forestry Policy Review report was the fact that Ireland's forests are very fragmented, with the most important ancient woodlands isolated and vulnerable. A programme using an ecological landscape management approach to link existing pockets of ancient and semi natural woodlands would make a lot of sense and have a high positive impact for Biodiversity. This can be extended to include riparian corridors of native trees planted as setbacks on tree plantation sites and along farm waterways, funding already exists to implement this but it does not seem to be getting sufficient promotion or the promotion is being done in an ad hoc piecemeal way which is not effective. Motorways rivers and railways could also be looked at to create linked consistent native woodland corridors with long term management plans.
The other area for creating corridors is beneath power lines inside tree plantations using native species of birch and hazel, coppicing of these trees would ensure that their height is kept in check so that it will not interfere with the power lines. Current practice is to leave these areas completely free of trees. This measure would increase the biodiversity value of tree plantations and provide local pole materials every seven years, and crops of hazel nuts on an annual basis.

Buffer Zones where Tree Plantations are adjacent to Old growth or Ancient Woodlands

Due to the average size of ancient and old growth woodlands in Ireland, our most valuable land based habitats, being relatively small, 50 percent consist of less than six hectares, [193] this increases their vulnerability in terms of exterior threats such as from pests and disease as well as from illegal felling. Therefore it should be a matter of urgency to allow these pockets to expand, this will also allow the complex biodiversity within to expand and spread into the surrounding landscape.

According to the mosaic-cycle theory (Remmert 1991), the minimum reserve area required has been reached when all development phases of a forest (e.g. regeneration, aggradation, optimum and decay), including small and medium-scale natural disturbances, are in a quasi-equilibrium stage (Korpel 1995; Bücking 2003; Leroux et al. 2007). The minimum area required to achieve this goal in the temperate forests of Europe, lies somewhere between 20 and 60 ha (Korpel 1995; Bobiec et al. 2000; Frank 2004). ... [194]

In the case of tree plantations adjacent to such sites, a suggested buffer zone of 1000m to 1500m would be desirable and for this to be manually felled of conifers to avoid soil compaction damage and runoff affecting the old growth site, and for these sites to be replanted/natural regenerated and fenced/protected from predators such as deer etc.

Conclusion

Celt would like to see a different long-term forestry model focused on our native tree species, with continuous cover, selective felling, close to nature, and coppice management which does not require such expensive and dangerous chemical inputs. This alternative model allows trees to grow old and therefore provide long term habitat and long-term Carbon storage, for genuine Climate change

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[193] https://www.npws.ie/sites/default/files/publications/pdf/Woodlands%20booklet.pdf

[194]https://www.researchgate.net/publication/10835515_Are_there_threshold_numbers_for_protected_forests

mitigation and other multiple benefits. We would also recommend that funding is provided for ecologists to conduct ecological assessment of afforestation sites in sensitive areas to halt the ongoing breaches of EU environmental laws stated above. Substantial funding for research equal to what has been poured into sitka spruce research and development needs to be made available to explore this missing pathway for greening Ireland's forests. There is also a need for substantial funding in the marketing area to create and find local markets for native timber and non timber products.

Appendix:

At a conference in Dublin in 2016, titled "Farming for a resilient landscape" this question was posed, are landscape policies, Flooding and Carbon sequestration connected?

Professor Duncan Halley of NINA an internationally recognised Norwegian institute for nature research, in his presentation showed how South western Norway, with a climate and topography similar to the west of Ireland, regained its native forest cover to reach 50% in 50 years.

This has revitalized the whole area of South East Norway, an area equivalent in size to Munster and Connaught combined. The region is now socially, economically and environmentally in profit, in other words, the Norwegian farmers have achieved Sustainable Forest Management without forestry grants or planting schemes.

Alternative forestry models in Norway and Wales:
There is a good reason why hill farmers in Ireland need to get to know what their counterparts in Wales and Norway are doing regarding sustainable land management.

Attached find information in the Bangor University presentation by Tim Pagella about the Pontbren project in Wales, a farmer led approach to Sustainable Land management in the uplands, where 10 farmers have planted 120,000 trees all native species from local seed to maximise healthy growth and increase biodiversity, without any negative impact on farming, biodiversity and with many largely unmeasured benefits.

This was achieved without grants, 27 km of hedgerows have been planted, 12 ponds have been established covering 5.4 acres of wetland have been fenced off for protection. They cut and chip wood from thinnings to make bedding for animals saving money by not having to pay for straw. They then used the composted bedding in a closed loop to grow more trees. Water sinks into the soil under mixed native trees at 67 times the rate at which it sinks under grass.

The deep tree roots (not found with conifer species) provide channels to send water deeper underground. The soil there becomes a sponge, a reservoir which sucks up water then releases it slowly. All of these benefits even though only 5% of the 1000 hectare area has been reforested, if all the farmers in the catchment did the same thing, flooding peaks downstream would be reduced by approximately 29%. Full reforestation would reduce the peaks by 50%.

In 2010 the Climate Change strategy for Wales (smaller than Ireland similar climate/landscape etc) set an ambitious target of planting 5000 ha of new woodland every year for 20 years, this requires a ten fold increase in recent planting rates, yet if all the farmers in Wales followed the Pontbren example and planted up just 4.5 % of their land, this would achieve three quarters of the 100,000 ha target of the Welsh government.

In Ireland we have spent millions of euros on flood defences that do not solve the problem, millions more will be spent on more of the same failed solutions. We have spent billions on a Forestry policy/programme that is not working or achieving what it set out to do, especially increasing our very low tree cover. We may actually be heading into a net deforestation scenario and if anything the clear felling and vertical drainage in the uplands are contributing to flooding.

A People and Native woodland oriented National Woodland Strategy that could be adopted in Ireland under SDG 15, Protect, Restore and Promote Sustainable use of Terrestrial ecosystems, sustainably manage forests, combat desertification, halt and reverse land degradation and halt biodiversity loss.

Policy brief, SDG15;

Global biodiversity loss is a key threat to food security, human health, and the sustainable development agenda in general. Biodiversity loss reduces the biosphere's resilience as biotic components or assemblages of life forms lose components and therefore lose production and cycling capacity, including water and carbon cycling. The effective mainstreaming of biodiversity in sustainable development policy, and the full and effective implementation of SDGs 14 and 15 and the Aichi targets of the Convention on Biodiversity (CBD) is essential in this respect.

CARMARTHENSHIRE'S RESPONSE TO THE NATIONAL ASSEMBLY FOR WALES' WOODLAND STRATEGY FOR WALES

BACKGROUND

The Wales Woodland Strategy sets out programmes for actions against 5 strategic objectives, each strategic objective has a set of priorities for action that are detailed in the table below, in columns 1 and 2. As a local authority area Carmarthenshire is in position to assist in the implementation of this strategy, and the mechanisms by which this is already being addresses (column 3) as well as suggestions for proposed action (column 4) are outlined below. Column 5 lists possible sources of funding for the projects identified.

The 5 strategic objectives are as follows:

- · Woodlands for people
- · A new emphasis on woodland management
- · Wales as location for world class forest industries
- · A diverse and healthy environment
- · Tourism, Health and Recreation

http://arlein.sirgar.gov.uk/agendas/eng/REGN20040723/REP05_01.HTM Report on the welsh woodlands strategy for carmarthenshire.

From the SEA of Ireland's Forest programme report 2013 - There is good evidence that riparian forests and forests in flood plains reduce flow velocities, enhance out of bank flows and increase water storage in the flood plains, resulting in an overall smaller downstream flood event. The protective function of native riparian woodland is particularly relevant to water quality. They provide a vital conduit for the transfer of nutrients between terrestrial and aquatic eco-systems and play a vital role in capturing nutrients and silt which run off adjacent lands.

Attached also find information in the presentation by Duncan Halley on what has been going on in South West Norway, an area very similar to the west of Ireland, same climate, hills, winds and rain. The area size is equivalent to Munster and Connaught combined, half the size of Ireland. Why is it that this area of Norway which experienced the same weather patterns/fronts that hit Ireland in 2015 causing major flooding, did not have the same impacts over there. They had a 300% increase in rainfall during this period with very little flooding.

Since the 1960's they decided to reduce grazing pressure on their uplands or face complete soil fertility loss, whilst implementing an effective deer management plan, so that they had a 53% increase in tree cover by natural regeneration in 50 years, approximately 2.6% increase every 5 years. Much of the reforestation has occurred on wet peaty soils, including on hard infertile rock types and denuded hill faces in very wet, windy, mild and ocean edge locations.

All of which would not be considered capable of producing woodlands according to Irish forest technical criteria manuals .

Today SW Norway is producing 4 million cu m of wood per year, with an estimated value of 26.5 million euros.

In 2018 Ireland was proposing to reach 17% forest cover by 2046, taking 30 years to achieve a 5% increase, and costing millions of euros.

Land use on farms is farmland and woodland (agroforestry) 65%
Woodland only 15%
Farmland only 20%

Population of the whole country of Norway is 4.9 million people, in 2008 there were 1,200,000 woodland owners with an average of 58ha of productive woodland.
97% of owners are private Individuals
80% of woodland area is owned by private Individuals,
20 % by forestry companies,

3,900 people employed in harvesting, 22,000 full time in the wider Industry, a total of 25,900 people, compared to Ireland with 12,000. Land use is diversified typically with multiple income streams from the same property, agriculture, grazing, forestry, hunting and fishing sales and rights (A by product of restoring their forests is the restoration of the rivers as well), fuelwood production, wooden cabin sales and rental.

Other Models and Options :

One final model is an interesting project in Scotland on an old estate called Corrour, a reforested scottish upland, this research needs serious consideration in order to bring about a fresh approach to mixing woodland habitat with wild birds and bogs, an area that has proven to be highly contentious in Ireland between foresters and conservationists and even within the environment sector itself there is disagreement regarding how these habitats can be managed sustainably for win win situations.

Corrour has a mix of raptors including, Golden eagle, Peregrine falcon, buzzard, osprey, kestrel, and Merlin. They have an important deer management regime in place, they have increased the natural woodland cover from 96 acres to 527 acres in 20 years, a 400 % increase, which included conifer plantation removal of 20 acres. They have also recorded increases in Red Grouse, Black Grouse, Heath, Heather. While they have restored approx 500 acres of bog removing 423 acres of commercial conifers.

About Corrour Our family is a newcomer to the Highlands. We bought Corrour in 1995 from Donald Maxwell MacDonald. Corrour is 23,000 hectares (57,000 acres) of hill, moor, forest and lochs, with no public roads, centered on Loch Ossian. It has a perimeter of 86 kilometres (54 miles). Most of Corrour is above 300 metres (984 feet) and more than a quarter is above 600 metres (1,968 feet). We have six munros, or hills above 936 metres (3,070 feet). The highest point is Beinn Eibhinn at 1,102 metres (3,615 feet).

We do not farm in hand, and we have no crofters or tenants. Corrour is our family holiday home, as well as a medium-sized forestry and tourism business. We let stalking, rent out cottages and the lodge, and run the station restaurant. Nine people work full-time at Corrour: an estate manager; three stalkers; a forester; a housekeeper; a handyman and butcher; and a couple who manage the Lodge. An administrator for our holiday lets, an accountant, and an accounts assistant work part- time. We also employ seasonal team members on the hill, in our forests, in the lodge and in the station restaurant, and we are grateful for the help of volunteers, such as those from the Scottish Rhododendron Society.

Corrour is ecologically important. For example, we have red squirrel, pine marten, otter and water vole. There have been recent sightings of wild boar. Raptors at Corrour include golden eagle, peregrine falcon, hen harrier, buzzard, osprey, kestrel and merlin. Loch Ossian is a Site of Special Scientific Interest for its black-throated divers; the rare dwarf birch (*Betula nana*) is abundant; and there is a nationally important colony of small cow wheat (*Melampyrum sylvaticum*). The diverse woodland by Loch Ossian was established from the 1890s on by Sir John Stirling Maxwell, who bought Corrour in 1891 when he was 24

years old. Maxwell was one of the founding Forestry Commissioners, and at Corrour he experimented with planting methods and tree species to reforest Britain's uplands.

History In 2007 Dick Balharry, then Chair of the John Muir Trust, helped us draw up a management plan that focused on whole habitats and on allowing natural processes to take place. We made a baseline assessment of habitats, and have regularly measured progress since then.

Our stalkers stopped killing meso-predators (or 'vermin'), such as foxes, crows and stoats. We began to reduce deer numbers, and to leave some carcasses on the hills. We put in Argo tracks, so we drive less over fragile moor. In 2006 we removed a neighbor's flock of 350 ewes (with lambs). But today this local farmer runs his 30 (increasing to 60) beef cattle through Corrour each summer, echoing past transhumance.

Prepared by Andrew Wright **1** 17 December 2015

Progress Our work is guided by habitat response. We now have eight years of data since our baseline assessment. We use Scottish Natural Heritage's best practice guidance to measure the impact of deer on the habitat: having selected random plots in each habitat area as the baseline, we take measurements from these same plots annually.
Since 2006 we have reduced deer numbers from 15.8 per square kilometer to 6.6. We currently have around 1,300 deer, versus c. 3,000 in 2007. The average carcass weight of Corrour stags has increased from 52.7kg (116 pounds) in 2008 to 68.4kg (150 pounds) in 2014, and our calf mortality rates and winter mortality rates are lower.

Deer population count and average stag carcass weight

Carcass weight (kg) **N**umber fo Deer

Deer density per square kilometre

Spring pairs of red grouse have risen from 74 in 2011 to 96 in 2015, across twelve kilometre square count sites. Lekking male black grouse have increased from 35 to 67.

Spring pairs of red grouse

We have more, and higher, dwarf shrub heather. The average height of blanket bog heather remains the same.

80

604020 0From our stalkers' annually measured plots, we see that average tree seedling height (for all tree species) has increased between 2008 and 2015. The number of tree seedlings has increased by 43%, and 76% of tree seedlings are now un-browsed, up from 30% in 2008.

Lekking male black grouse

100

2011 2012 2013 2014 2015

70

80 6050604040302020100 2011 2012 2013 2014 2015

Dwarf shrub heath heather (% unbrowsed)

80 604020 0**Blanket bog heather (% unbrowsed)**

100

100

2008 2009 2010 2011 2012 2013 2014 2015

2008 2009 2010 2011 2012 2013 2014 2015

Tree seedling height -

Number of seedlings all species (cm)

25

20151050 0

2008 2009 2010 2011 2012 2013 2014 2015

900 800 700 600 500 400 300 200 100

2008 2009 2010 2011 2012 2013 2014 2015

Prepared by Andrew Wright **3** 17 December 2015

Percentage of seedlings unbrowsed 90 80706050403020100 2008 2009 2010 2011 2012 2013 2014 2015

When we came in 1995, Corrour had few natural woods: 39 hectares (96 acres) of birch, with some rowan, alder, aspen, willow and bird-cherries, at Leitir Dubh and around Loch Ossian. In 2010 we purchased a further 12 hectares (30 acres) of natural woodland at Corrour Forest, Inverlair, and Dun Dearg. These remnant woods are now regenerating. In 2000, we planted 50 hectares (124 acres) of new native woodland by Ossian Woods. We added 6 hectares (15 acres) in 2012. We planted 4 hectares (10 acres) of native woodland in place of felled commercial conifers between 1998 and 2010, and since 2012, we have planted a further 102 hectares (252 acres) of native woodland.

All in all, Corrour now has 213 hectares (527 acres) of native woodland, up from 39 hectares (96 acres) twenty years ago. Since 2012 we have also cleared 8 hectares (20 acres) of commercial conifers, to allow natural tree generation. Trees are spreading naturally over the moors, too, especially by Loch Treig.

50 0**Total native woodland (hectares)** 250

Commerical forest cleared to naturally regenerate 200

Commerical forest cleared 150

and native woodland planted
100
New native woodland planted
Native woodland purchased
1995 2010 2015
Prepared by Andrew Wright **4** 17 December 2015

Over the last few years, we have removed 6.6km (4.1 miles) of deer fences, and erected 3.2km (2 miles), meaning a net reduction of 3.4km (2.1 miles) across the estate. We now have 60km (37.3 miles) of fences, so we have removed 5%.
We are also restoring peat bogs. So far, we have cleared 171 hectares (423 acres) of commercial conifers in Corrour Forest.
Plans Our fragile mountain habitats mean that natural responses may take many years. We will continue our monitoring work, and start to monitor fish as well. We hope to stabilize our deer densities at 5 per square kilometer in 2016, but our work will continue to be driven by habitat response, our plans developing according to the data we collect.
Total fencing (km)
80 60402070
605040302010 02014 2015
Total (cumulative) commercial conifer plantation cleared for peatland restoration (hectares)
180
160
140
120
100
2014 2015
Prepared by Andrew Wright **5** 17 December 2015