IRELAND'S WESTERN PEATLAND FORESTS IN A CHANGING WORLD

Can new types of forest management provide a more appropriate mix of ecosystem services from Ireland's future forests?" By Anders Lundholm, Edwin Corrigan, Charles Harper and Maarten Nieuwenhuis of UCD.

The main purpose of forestry in Ireland is timber production. But in addition to timber, our forests are increasingly expected to provide a broader range of ecosystem goods and services, examples of these include: biodiversity, recreation and carbon-storage. The capacity of our forests to make these provisions is threatened by the uncertainties of climate change, evolving global markets and the demand for bioenergy. The way we manage our forests today may not be adequate to meet the societal demands of our future forests. Edwin Corrigan (Post-Doctoral Researcher at UCD) and Anders Lundholm (PhD student at UCD) explain.

The issue of ecosystem service provision in forest management has been studied at a national level through DAFM funded projects, for example PractiSFM, ECOVALUE and through international collaboration in the INTEGRAL, SIMWOOD and DIABOLO projects. This important research continues in the European project ALTERFOR. The aim of ALTERFOR is to provide improved and new approaches in forest management that are robust enough to address the challenges of the 21st century. Group workshops and one-to-one interviews at local and national level have determined potential options for managing forests in the future. This approach is used by nine European partner countries in a total of ten landscapes. The project is funded by the European Union's Horizon 2020 research programme, led by the Swedish University of Agricultural Sciences.

ALTERFOR IN IRELAND

The Irish counterpart of ALTERFOR comprises individuals from University College Dublin and Coillte Forest. The Western Peatland landscape was chosen as the landscape of study. It is particularly interesting as traditional forest management in the Western Peatlands has typically been based around timber production, while the new political intention is to pursue multi-functional forest management. This change stems from the introduction of Sustainable Forest Management principles. The implementation of these principles into forest management in Ireland is encouraged through FSC and PEFC certification, which encompass the environmental and social pillars of Sustainable Forest Management in parallel with the traditional economic timber production focus. ALTERFOR captures these socio-economic and environmental non-timber aspects through ecosystem services. So, the question we are seeking to answer in this landscape: can new types of forest management provide a more appropriate mix of ecosystem services from Ireland's future forests?

THE LANDSCAPE - CLOOSH VALLEY FOREST

The Cloosh Valley Forest and surroundings in Connemara was selected for Ireland's case-study landscape (Figure 1). It was chosen as it is an area of peatland forestry with bog restoration, watercourses with freshwater pearl mussel populations in the Owenriff River, wind farm development, proximity to Galway and its international and national popularity for recreation and tourism (Figure 2). The landscape area is 77,500 ha and has 10,200 ha of forest. Much of the forest is on peatland and many of the current forests were established at a time when environmental legislation and consideration were minimal. This meant that large quantities of rock-phosphate fertiliser were used for forest establishment. Now, fertilisation in many of these areas is no longer permitted, meaning that it wouldn't be possible to reforest many of these areas. The challenge is how best to manage these forests into the future?

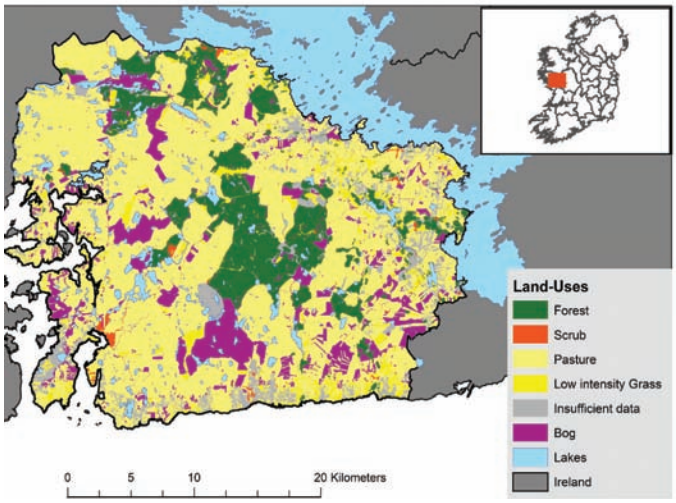

Figure 1. Land-uses in the ALTERFOR case study area.

Figure 2. Galway Wind Park located in Cloosh Valley forest. The treeline in the foreground is a typical Sitka spruce forest. It is decades old and yet to close canopy meaning that it will never produce a productive timber crop © Anders Lundholm.

DECISION SUPPORT SYSTEM - REMSOFT

The Irish ALTERFOR team uses the Remsoft Spatial Planning System. It is a spatial natural resource planning tool developed in Canada that is being used all over the world to evaluate the financial, ecological, environmental and social benefits of forest land. The system uses a model which produces a list of forest management options for each stand and then chooses the combination of options for all stands that leads to the most desirable landscape-level outcome.

Determining which management options are appropriate for a stand requires consideration of, among other things, the spatial location, soil type, and elevation. For example, appropriate aquatic setback widths are established for any stand harvested within a certain proximity to a road or watercourse.

STAKEHOLDERS

National and local organisations with an interest in forestry were interviewed to gauge their opinions on ecosystem services from current forest management within Ireland (Figure 3). They were also asked to indicate the organisations they network with and how they felt the management of forests could be improved in the future.

Decision support systems are quite common in forest management to investigate the 'What ifs'. For example, UCD's INTEGRAL project used Remsoft to investigate changes in policy such as the removal of the requirement to replant forests after clearfell. It was particularly useful as the effect of these changes was presented to stakeholder groups during their consultation workshops.

Figure 3. Irish stakeholders in ALTERFOR.

ECOSYSTEM GOODS AND SERVICES

The international ALTERFOR team includes five ES experts, each with a specific area of expertise: Carbon in living and harvested wood products and substitution of construction material; water quality; Wind and fire; Biodiversity and Cultural. Generally mixed forest stands and those at commercial maturity or pre-canopy closure have higher scores for biodiversity and cultural ecosystem service provision. The experts consulted with each country team and created a standardised method of reporting for each ecosystem service. This makes comparing the changes in ES provision between different European countries easier.

GLOBAL SCENARIOS

The effect of climate change on tree growth and corresponding demand and price changes for the sawlog and pulpwood products were modelled as scenarios. The scenarios run for 100 years, i.e. 2016 to 2116.

SCENARIO 1 – REFERENCE (S1)

There is no change in the utilisation of harvested wood products compared to today and no major effort is made to halt climate change. This scenario has the largest increase in climate change at 3.7°C rise in global temperatures by 2100. It means this scenario has the steepest decline in Sitka spruce productivity. To reduce timber production loss and to realise the economic benefit of this scenario's highest early pulpwood price increases, this scenario has the most immediate harvesting of Sitka spruce and reforesting by Lodgepole pine in the first 15 years.

SCENARIO 2 – EU BIOENERGY (S2)

There is a European effort to halt climate change. This effort means a temperature increase of 2.5°C by 2100. Wood price increases are like the Baseline Scenario but the utilisation of harvest volume for sawn timber for construction is favoured over the use of biofuels and wood-based panels meaning that there is a higher increase in the price of sawlogs.

SCENARIO 3 - GLOBAL BIOENERGY (S3)

Joint global efforts succeed in halting climate change in the Global Bioenergy Scenario, because of increased global utilisation of biofuel and wood products in construction leading to a steady increase in sawlog price. This results in a 1.5°C increase in global temperatures by 2100. In this case, the harvested assortments from lodgepole pine experience a steep rise in prices as there is more demand for biofuel, in fact prices have more than doubled by 2100.

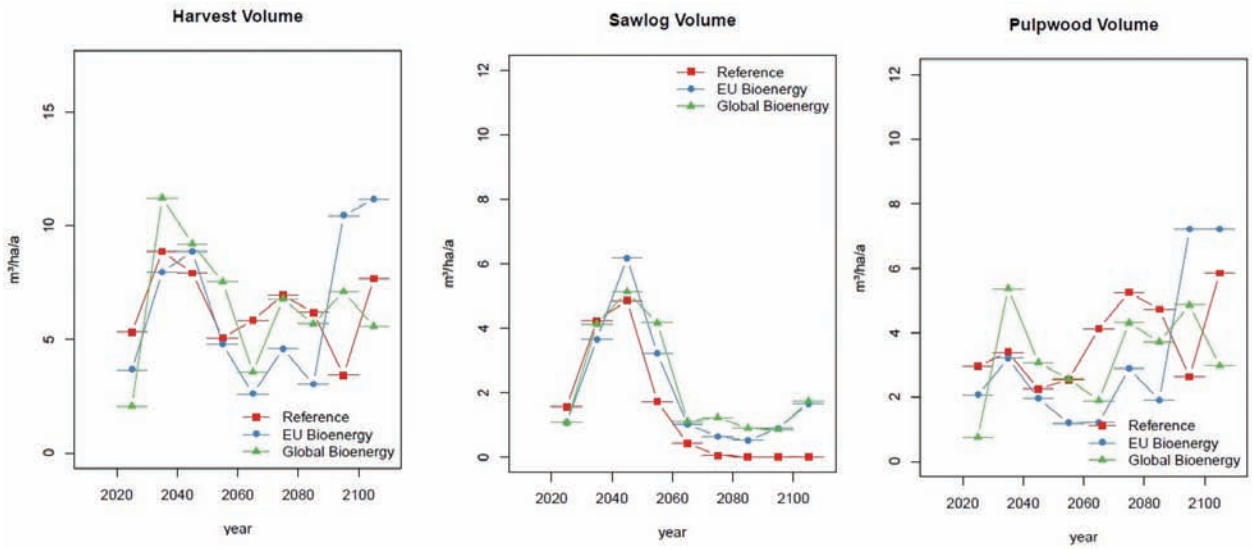

Figure 5. Total harvest volume (left), volume sawlog (middle) and pulpwood (right) per ha in S1 Reference, S2 EU Bioenergy and S3 Global Bioenergy.

Common to all scenarios is that a large portion of the Sitka spruce forest area (monocultures and mixtures) is replaced by lodgepole pine. This is largely due to the dominance of peat soils, which are severely limiting species choice especially since fertilisation that was applied historically for establishment is no longer permitted. This is no longer an option, due to water quality risks and the presence of the freshwater pearl mussel populations and as a result the proportion of Sitka spruce stands, Sitka spruce mixtures and diverse conifer stands decrease (Figure 4). Aquatic setbacks and road buffers are established through clearfelling and planting of broadleaves, increasing the total buffer area from 70 ha to 655 ha as current policy is implemented. The recreation potential of the forest remains steady in all scenarios. The increase in species diversity (mainly from bufferzones) increase the recreation potential in the area. However, this is offset by the higher harvest residue volumes associated with lodgepole pine stands, compared to Sitka spruce. Implementation of current forest policy had the highest impact on the timber assortment mix, with the increase of lodgepole pine leading to more pulpwood and less sawlog being harvested in the future (Figure 5). Detailed analysis showed that the dynamic prices had more of an effect on harvest levels and species choice than the effect of climate change.

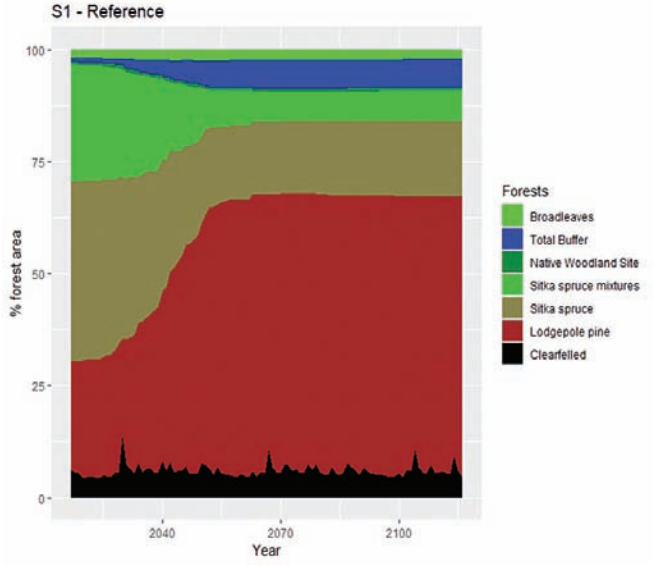

Figure 4. Percentage forest type area in the S1 – Reference. The change in forest types is very similar in S2 - EU Bioenergy and S3 - Global Bioenergy scenario.

ALTERNATIVE FOREST MANAGEMENT TYPES

Alternative approaches to forest management were mainly developed in cooperation with Coillte and in line with the information gathered from the stakeholder interview process. The common theme is that they are suitable for the infertile soils in the Western Peatlands, or other infertile areas in Ireland and the British Isles.

The management prescription is outlined below.

- Lodgepole pine for fibre: planted at 1600 stems ha-1, left to grow for approximately 60 years until clearfelled for biomass. Lodgepole pine for conservation: planted at 1100 stems ha-1, left entirely unmanaged to fulfil reforesting requirement.
- Modified-Kronoberg system: Sitka spruce established with birch as a nurse species on shallow blanket peat.

> "The aim of ALTERFOR is to provide improved and new approaches in forest management that are robust enough to address the challenges of the 21st century"

- Bog restoration: Restoring drained bog to peatland habitat.

It should be noted that these are preliminary results and are subject to alteration pending discussion with our stakeholders during workshops in September 2018:

CONCLUSIONS

Resulting from current management policy, large tracts of Cloosh Forest will be converted from Sitka spruce to lodgepole pine to reduce the impacts on water quality from fertilisation at establishment. The shift towards lodgepole pine will cause a long-term reduction in sawlogs and an increase in pulpwood. By 2080, Sitka spruce is expected to have its productivity reduced to 82.5%, compared to 1990 YC. Meanwhile, lodgepole pine is expected to increase its productivity to 106.8% of 1990 YC. Additional scenarios were tested where fertilising for Sitka spruce was allowed. In S1 and S2 it was preferred, financially, to establish Sitka spruce over lodgepole, even with the reduction in Sitka productivity. Lodgepole pine was only preferred in S3 due to the high increase in pulpwood prices. Since lodgepole pine can grow on nutrient poor sites it could be a very suitable species on blanket peat in the future, especially if demand for biofuel increases in attempt to halt climate change.

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ALTERFOR

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