

The practice of continuous cover forestry in Ireland

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Abstract

There is increasing interest in continuous cover forestry (CCF) in Ireland, however little is known about the extent to which CCF is currently practiced. To this end, a survey of forest owners/managers was conducted in 2012 to determine the extent to which, and on what site types, CCF is being practiced in Irish forests. The survey revealed that there are 271 forests managed under CCF in Ireland, 235 public (Coillte and the National Parks and Wildlife Service) and 36 private, with a total area of 10,603 ha (8,292 ha and 2,311 ha, public and private respectively). The survey further indicated that the average size of a CCF forest property is 50 ha and that most of the forest area being managed under CCF comprises mixed-species stands. The survey further revealed that 66% of the properties have been managed under CCF for less than 15 years. A 10% random sample of the properties for which questionnaires were completed were visited. This showed that there was little evidence yet of management specifically directed at transforming stands to CCF – suggesting that CCF management was more likely to be an “aspiration” rather than a “reality” to date. Nevertheless it was shown that over two-thirds of the surveyed forest properties appeared suitable for CCF management. Although some initiatives have been taken to increase the awareness of CCF in Ireland, and to expose foresters to aspects of CCF management, more needs to be done if those aspirations are to be realised.

Keywords: *Silvicultural systems, transformation, thinning.*

Introduction

Forest cover in Ireland has increased from just 1% at the beginning of the 20th century to a current level of 10.8% (700,000 ha). This change in land use has come about as a result of an afforestation programme that began in the 1920s and expanded in the intervening years. The land afforested was, until recently, generally marginal or sub-marginal agricultural land typically in upland areas. On these exposed and relatively impoverished sites species choice was limited to conifers of mostly North American origin, e.g. Sitka spruce (*Picea sitchensis* (Bong.) Carr.) and lodgepole pine (*Pinus contorta* Dougl.) (Upton et al. 2012). Subsequent management of these forests tended to be similar to that practiced in Great Britain where similar forest site conditions prevailed. This involved the use of the clear-cut silvicultural system followed by replanting. Stands were thinned on sites where windthrow was not a major threat (and where pulp markets were available) and

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artificial regeneration (planting) was used by necessity where afforestation took place. When restocking by natural regeneration became an option as forest stands reached seed bearing age, foresters did not exercise or consider this option favouring the “familiar and reliable” practice of replanting.

As was the trend in other countries, concerns began to be raised about the practice of clearfelling in Ireland in the 1990s (Ní Dhubháin 2003). The negative visual impact of this practice was one of the key issues raised during a public consultation process conducted by Coillte in 1998 (Pfeifer 1998). Alternative silvicultural systems to clearfell (or continuous cover forestry, hereafter CCF, as they were more commonly referred to) were gaining increasing attention internationally in the context of a wide societal debate on sustainable forest management and multi-purpose forestry (further details on the historical context to the current interest in CCF along with a review of the literature on transformation to CCF can be found in Vítková and Ní Dhubháin (2013; this issue)). Reflecting this, the forest area on which CCF is practised is used as an indicator of sustainable forest management in a number of national standards. The UK Forestry Standard, for example, requires managers to “identify areas which are, or will be, managed under a CCF system and to build them into the forest design” (Mason et al. 1999). The Woodlands for Wales Strategy (2001) included an aim to convert at least half of the National Assembly woodlands to CCF over the following 20 years, where practical, and to encourage conversion in similar private sector woodlands. In a recent review of this Strategy the target of 50% was removed, but the aim to use CCF remained (Welsh Assembly Government 2009). In the Irish National Forest Standard, the area of forest managed for CCF is included as a measure of sustainable forest management (Forest Service 2000). More recently two certification bodies, the PEFC and FSC refer to CCF in their Irish standards. The PEFC Irish Forest Certification Standard (2010, section 3.4.1.) indicates that “for woodland management units greater than 100 ha in size, 10% of this area will be identified and plans made for the phased implementation of low impact silvicultural systems with a preference for use of natural regeneration where parent seed is suitable” on windfirm sites with favourable soil conditions and suitable species. Less detail is given in the FSC Irish Forest Standard (2012) where indicator 10.3.2. merely states that “transformation to CCF shall be considered as a means of achieving management objectives”. A new Forest Management Planning System was put in place in Coillte in 2005 wherein a silvicultural system was prescribed for each management unit within the estate. The process was revised in 2010 and at present there are 11,759 ha in Coillte with a CCF designation.

Previous research on CCF in Ireland

Research on CCF in Ireland has been limited. There has been research on natural regeneration, which is considered to be a key component of CCF. This research was prompted by the challenges for management arising from the sporadic occurrence of natural regeneration of Sitka spruce and lodgepole pine in Irish forests following clearfelling. For example, Von Ow et al. (1996) and subsequently Dagg (1998) explored the phenomenon of natural regeneration in Sitka spruce, identifying factors that influence its establishment. Tiernan (1998) studied natural regeneration in

lodgepole pine, focusing on the distance from the seed trees that seed can travel. Further work on lodgepole pine regeneration was carried out by O’Keefe (2002), while O’Leary et al. (2001) quantified the extent of natural regeneration within the Coillte estate. The factors that influence the occurrence of natural regeneration of lodgepole pine and ash (*Fraxinus excelsior* L.) have also been identified (O’Leary 2000). The latter two studies were conducted as part of the first COFORD-funded project to examine CCF in Ireland “Alternative silvicultural systems to clearfelling” between the years 1999 and 2001 (Ní Dhubháin et al. 2001). The successor to that project, CONTINUCOVER (Ní Dhubháin 2010), explored how transformation to CCF might be initiated in both a mature and semi-mature Sitka spruce stand in Co. Wicklow. In the project, an underplanting experiment was established as well as a shade-house experiment. Specifically the key areas addressed in the research conducted as part of the CONTINUCOVER project were:

- the survival and associated growth rates of Sitka spruce, hybrid larch (*Larix x eurolepis* Henry), western red cedar (*Thuja plicata* Donn ex D. Don), European beech (*Fagus sylvatica* L.), downy birch (*Betula pubescens* Ehrh.) and sessile oak (*Quercus petraea* (Matt.) Liebl.) when planted under three different levels of canopy cover in a 40 year-old Sitka spruce stand (Coghlan 2007);
- the survival and growth of seedlings of the three aforementioned conifer species when grown in plots under shade-houses (Kennedy et al. 2006, Kennedy et al. 2007);
- the effects of scarification, fencing and seeding on regeneration of Sitka spruce within gaps created in a mature Sitka spruce stand (Ní Dhubháin et al. 2001);
- the relationship between light levels and stand characteristics in a Sitka spruce stand (Holzmann 2004).

Initiatives undertaken to date in Ireland in relation of CCF

The Association Futaie Irrégulière (AFI) is an international network of research stands established in 1990 by a working group, the aim of which is to study the development of the forest stand over time along with disseminating data on forest management practices (Süsse et al. 2011). A primary objective of the network is to demonstrate that the principles of CCF management can be used in a wide range of different situations. In 2007 a research stand was established by Coillte in Curraghchase Forest in Co. Limerick as the first stand in Ireland to become part of the network. In 2012 the network in Ireland was expanded to include a further six stands (Table 1). The AFI network records a detailed inventory of forest stands at five-year intervals and also records management inputs and outputs in the form of forest products. This allows for an economic analysis to be carried out in conjunction with the recorded inventories. The Irish AFI stands were selected as representative of a range of typical stands in Ireland which have the potential to be transformed to CCF. A key principle of the network is that joining the network does not change the management being undertaken in the stand (Poore 2006); it only requires the commitment to the inventory and record keeping as described above.

A number of Coillte foresters have been trained in marking trees for thinning as

Table 1: *A list of AFI research stands established in Ireland.*

Forest	County	Ownership	Year established
Monivea	Galway	Coillte	2012
Lackinrea	Waterford	Coillte	2012
Tikincor	Tipperary	Coillte	2012
Jenkinstown	Kilkenny	Coillte	2012
Knockrath	Wicklow	Private (D. Brabazon)	2012
Rahin	Kildare	Coillte	2012
Curraghchase	Limerick	Coillte	2007 (2012 ^a)

^a re-measured

a part of CCF management. This training has been conducted in fixed area plots known as Martelosopes in which a detailed inventory has been undertaken. The economical, silvicultural and ecological consequences of the marking decision made by the trainees are revealed to the trainees using software into which the inventory data have been inputted. The first Marteloscope training plot was established in Ireland in Curraghchase Forest in 2007, with a further three being set up in Ireland in 2013 (Table 2).

ProSilva Ireland, which was founded in 2000, is an organisation involved in promoting CCF on the island of Ireland. It is part of a wider network of similar organisations in 25 European countries under the umbrella of Pro Silva Europe. Its aim is to promote a greater awareness and understanding among foresters, forest owners, forest policy makers and forest industry members in general of CCF. Field visits throughout Ireland and study tours to Europe help members to experience CCF in practice and engage in networking with foresters, skilled in CCF techniques, who are actively using this approach to management. ProSilva Ireland also supports research into the dynamics of forest ecosystems and the adaptation and development of CCF (ProSilva Ireland 2013).

Coillte has adopted the principles of sustainable forest management, as laid down by the Forest Stewardship Council, and thus is committed to consider CCF in windfirm conifer plantations. Coillte adopted a Low Impact Silviculture Policy in 2005 and within that policy stated that all broadleaved high forests will be managed under CCF. In addition, CCF is the favoured option for management in amenity areas and old woodland sites within the Coillte estate. An increasing number of Irish

Table 2: *A list of forests stands where Marteloscope training plots were established (all sites are under Coillte management).*

Site	County	Main species	Year established
Curraghchase	Limerick	European beech (<i>Fagus sylvatica</i> L.)	2007
Tikincor	Tipperary	Sitka spruce	2013
Oughval	Laois	European beech, ash	2013
Donadea	Kildare	Pedunculate oak (<i>Quercus robur</i> L.), European beech, ash, mixed conifers	2013

private forest owners have also begun to consider, and commence the process of introducing, CCF in their forests. This is particularly the case amongst those private forest owners with a long experience in forestry across multiple rotations and generations. In general terms, economics appears to be the main motivation amongst this category of private forest owners who decide to transform to CCF. Many of these private forest owners also believe that CCF is more sustainable both ecologically and economically in the long term.

Despite the increasing interest in CCF in Ireland, to date no detailed information on the actual use of CCF in Ireland has been available. To address this information gap a study was initiated to determine the extent to which, and on what site types, CCF is being practiced in Irish forests. The results of this research are reported in this paper.

Materials and methods

To determine the extent to which CCF is practiced in Ireland, forest owners/managers were invited to complete a survey for each forest property in which they practiced CCF. Forest owners/managers in the following organisations were circulated: Coillte (which manages 57% of the forest estate (Forest Service 2007)), the Society of Irish Foresters, the Irish Timber Growers Association and ProSilva Ireland.

Information on the following was queried in the survey: forest name, location, county, nearest town, forest area and stand age, species composition (main and secondary species), duration under CCF management, presence of a forest management plan, presence of a designated area such as an NHA (National Heritage Area), SAC (Special Area of Conservation) or SPA (Special Protection Area), silvicultural system used, and additional comments relevant to the forest management.

A sample of the forest properties identified in the survey was randomly selected, visited and surveyed (10%, i.e. 27 sites) in spring 2013. The purpose of these property surveys was two-fold. Firstly, they were used to verify details submitted to the questionnaire. A second aim was to assess the suitability of the property for CCF management. This latter assessment was informed by Mason and Kerr's (2004) guide to site evaluation for transforming even-aged coniferous stands to CCF management. The properties visited were assessed according to the following attributes:

- stand stability (evidence of windthrow; crown development);
- presence of potential seed bearing trees;
- presence of quality stems (trees of good form; species suitable to the site);
- evidence of natural regeneration of any tree species (size and quantity; possible reasons for regeneration absence);
- extent of ground flora (presence of vegetation which might compete with any potential natural regeneration, presence of litter layer);
- evidence of browsing (browsing present on natural regeneration);
- need for deer management (culling or fencing);
- access and topography (state of within-stand infrastructure).

Results

According to the survey returns, CCF was being practiced in a total of 271 forest properties (36 private; 235 public) covering 10,603 ha (Table 3). The average size of these properties was 50 ha, but many were smaller than this (Figure 1a). Private properties where CCF was being practiced were larger, on average, than public properties with 25% greater than 80 ha. Co. Wicklow had the highest number of forest properties managed under CCF (Table 4).

Forest age

Almost 60% of all CCF properties were of mixed age (57% and 64% for public and private properties, respectively) (Figure 1b). There was a greater representation of older properties in the public sector.

The duration of CCF management

The duration of CCF management was relatively short with 66% of properties being managed using CCF for less than 15 years (Figure 2a). The average length of CCF management for public and private properties was 13.2 and 6.3 years, respectively.

Other characteristics of the forests surveyed

Sixty-four per cent of the area of the CCF properties comprised mixed species (i.e. more than one species) (Figure 2b). These mixed species forest properties consisted of mixtures of both broadleaved and conifer species (66%); the remainder comprised conifer mixtures (20%) and broadleaved mixtures (14%). Pure conifers formed a major part of the area of privately owned CCF properties, i.e. 62% versus 20% for public properties. Almost three-quarters of all the area managed under CCF

Table 3: Information about Irish forest properties currently managed under CCF.

	No. of sites	Forest area (ha)	Mean forest area (ha)	Mean length of CCF management (years)
Public	235	8,292	35	13.2
Private	36	2,311	64	6.3
Public & Private	271	10,603	50	9.0

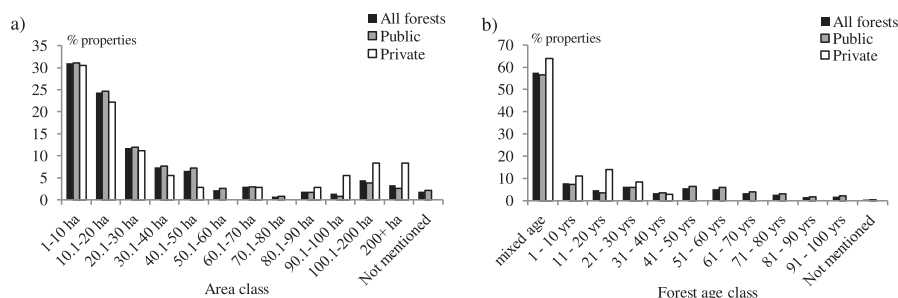


Figure 1: a) the area managed under CCF; b) the age of the forest properties managed under CCF.

Table 4: Area and number of forest properties managed under CCF by county, and the number of these surveyed. County totals have been broken down into public and privately owned properties.

County	Area (ha)			No. of properties			No. of properties surveyed		
	Total	Public	Private	Total	Public	Private	Total	Public	Private
Carlow	19	18	1	2	1	1	1	0	1
Wexford	24	0	24	2	0	2			
Clare	30	20	10	2	1	1			
Sligo	31	31	0	1	1	0			
Galway	76	76	0	3	3	0			
Mayo	81	82	0	3	3	0			
Kildare	103	103	0	2	2	0			
Longford	135	135	0	2	2	0			
Offaly	230	230	0	5	5	0	1	1	0
Leitrim	242	153	89	14	13	1	5	4	1
Kilkenny	245	199	46	7	6	1			
Cavan	254	254	0	4	4	0			
Roscommon	260	219	41	4	2	2			
Dublin	266	253	3	3	2	1			
Westmeath	350	350	0	2	2	0			
Kerry	351	351	0	7	7	0			
Limerick	362	362	0	3	3	0	1	1	0
Waterford	387	83	304	6	3	3			
Laois	464	228	236	12	9	3	2	1	1
Louth	562	562	0	2	2	0			
Cork	635	611	24	22	20	2	2	2	0
Monaghan	647	449	198	5	3	2	2	2	0
Tipperary	838	332	506	13	11	2			
Wicklow	4,011	3,191	819	145	130	15	13	13	0
Total	10,603	8,292	2,311	271	235	36	27	24	3

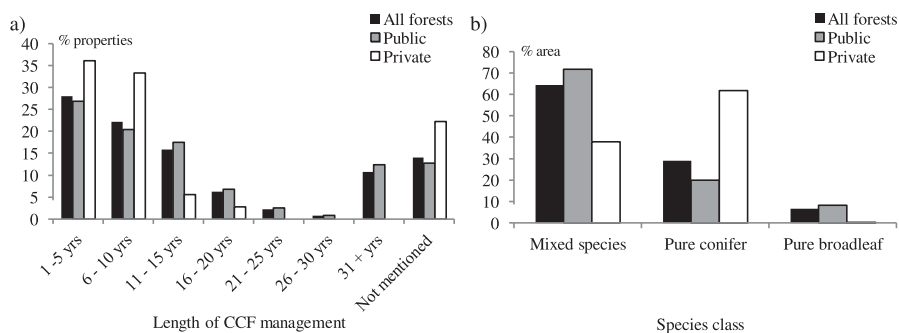


Figure 2: a) the length of time the forest properties have been managed under CCF; b) the species composition of the CCF-managed properties.

did not have an environmental designation (Figure 3a). Almost two-thirds of the CCF managed area had a management plan in place (Figure 3b).

Silvicultural systems used

For one quarter of the area managed under CCF, respondents did not specify the silvicultural system being used. Selection systems (group selection and single tree selection) were used to manage 49% of the total forest area; 62% and 2% in public and private properties, respectively (Figure 4). On a further 12% of the forest area, shelterwood systems (irregular shelterwood, group shelterwood and uniform shelterwood) were used; 8% and 23% on public and private properties, respectively.

Ground survey of selected forest properties

Ten per cent of the properties (i.e. 27 properties) for which surveys were returned were randomly selected for inspection. Two of these were found to be too young to be classed as “currently managed under CCF” (less than 12 years-old).

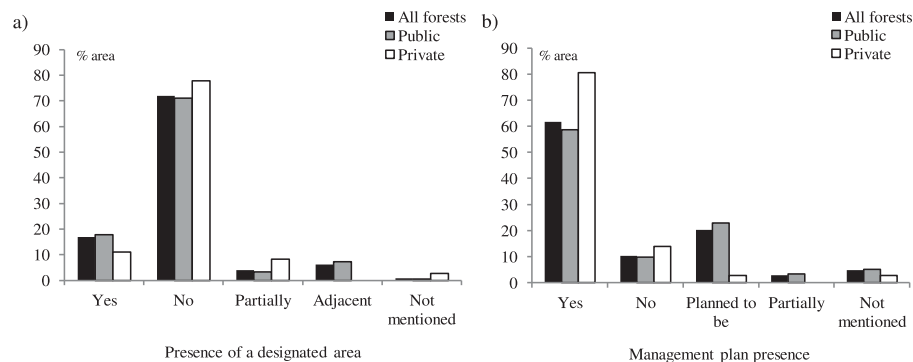


Figure 3: a) the presence of a designated area in the CCF-managed properties; b) the presence of a management plan in the CCF-managed properties.

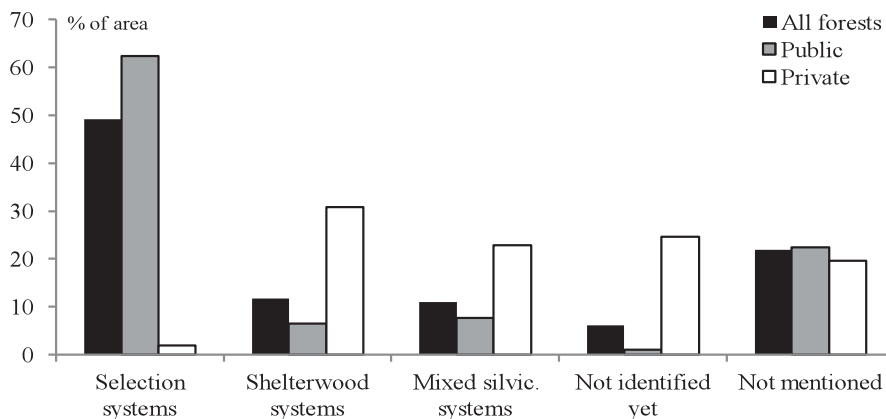


Figure 4: Silvicultural systems practised in properties managed for CCF.

Eighty-two per cent and 78% (Figure 5a, b) of the properties inspected were found to have good suitability and stability, respectively, with 80% having potential seed-bearing trees (Figure 5c). Almost half of the properties had trees with good stem quality (Figure 5d). Two-thirds of the properties had natural regeneration of all tree species present (Figure 5e). However, competing vegetation such as bramble (*Rubus* spp.), ivy (*Hedera* spp.), rhododendron (*Rhododendron* spp.), laurel (*Laurus* spp.), and various grasses were present on two-thirds of properties (Figure 5f). Evidence of deer browsing was found on 30% of inspected properties (Figure 5g) and was a particular constraint in Co. Wicklow where the majority of CCF sites were located (Table 4). The extent of browsing confirmed why 33% of properties were considered to need population management (Figure 5h). The infrastructure within half of the properties was found to be good. However, a further 33% required access roads to be constructed (Figure 5i).

The inspections revealed that only 11% of the properties did not exhibit any of the requirements for a successful transformation to CCF, while 7% had all the requirements (Table 5). Fifty-nine per cent had at least seven of the nine requirements. Although some additional deer management and vegetation control may have been necessary on some properties, in general, the majority of the sample of properties visited were found to be suitable for the application of CCF since they

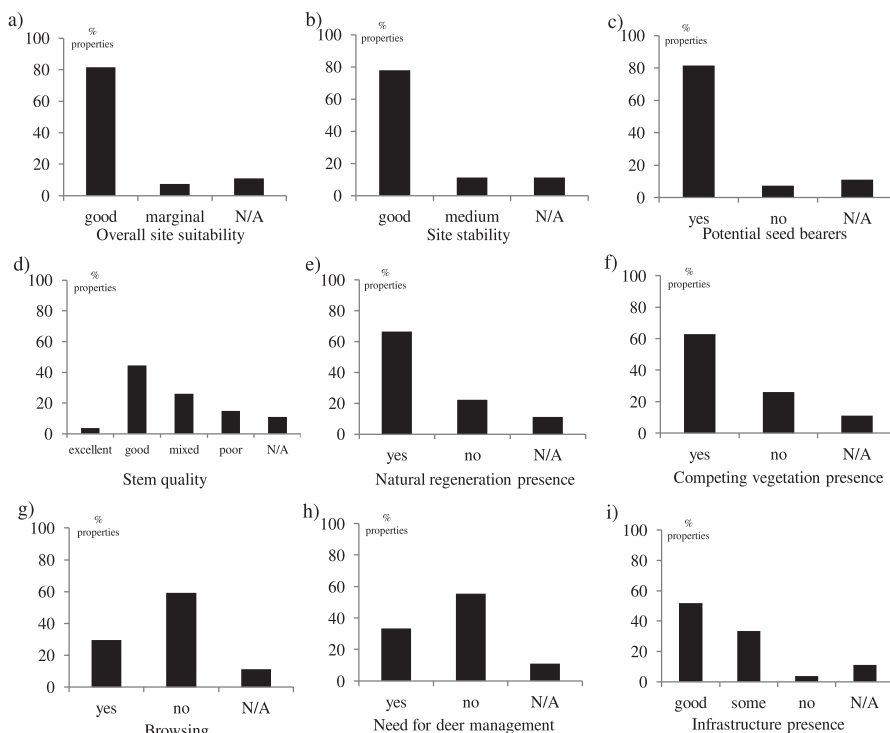


Figure 5: Requirements for successful transformation to CCF based on a sample of properties inspected.

Table 5: *Forest properties that fulfilled the requirements for successful transformation to CCF observed during the survey of forest properties.*

Number of requirements	% of sites fulfilling requirements
0	11
1	-
2	-
3	4
4	-
5	4
6	22
7	33
8	19
9	7

were regarded as stable with a presence of quality seed-bearing trees, with good overall stem quality and good within-stand infrastructure. Natural regeneration of tree species, which is a key element of CCF, was present on almost two-thirds of the properties indicating the potential of the trees on these properties to naturally regenerate.

Discussion

The increasing interest in CCF in Ireland is partly in response to the demands of society for alternative forest management approaches to clear-cutting. Within Coillte the process of certification and the subsequent engagement with the Low Impact Silviculture Policy are likely to have been the drivers for the expansion of CCF management in Coillte-owned forests. The reasons for engaging with CCF in the private sector may differ. These may include perceived amenity values and an overall interest and enthusiasm of the forest owners to engage with more “close to nature” forest management. Economic reasons may also be important as the threshold level at which forestry incomes become subject to income tax has fallen in recent years and is currently €85,000 per annum. Stands management under CCF can provide smaller but more frequent revenues below the tax threshold. In addition, some private forest owners also simply may not like seeing their forests being clearfelled.

Irrespective of what has promoted a desire for CCF management, forests managed under CCF are likely to have more complex structures in terms of sizes and/or ages of trees (Kerr 2012). CCF management will require an adaptive rather than a prescriptive forest management approach and forest management decisions will be driven by changes in the forest stand triggered by previous silvicultural interventions. Skilled managers are therefore required. Only a handful of foresters in Ireland, however, have experience of the practice of CCF and the process of transformation to this type of management (Ní Dhubháin 2010). The forests of Central Europe are commonly considered “templates” of CCF practice (Vítková and Ní Dhubháin 2013; this issue). However, CCF management under Irish conditions

must differ and it is important that Irish foresters, along with colleagues in similar areas such as Wales, Scotland, parts of England and North West France, adapt suitable practices for local conditions.

A number of initiatives have been undertaken which should provide foresters with some exposure to, and experience of, CCF management. First, the expansion of the AFI network in Ireland will provide foresters with an opportunity to visit sites where transformation from even-aged forests to forests managed under CCF is being practiced and to gain an understanding of the consequences of silvicultural interventions over time. The AFI sites were chosen to represent the range of stands that could potentially be transformed to CCF under Irish conditions.

The implementation of CCF will require forest managers and owners to place a greater emphasis on the management of individual trees. Thinning will play a key role in the transformation process (Vítková and Ní Dhubháin 2013) and in the long-term management of CCF stands. Foresters should mark final crop trees ahead of thinnings, a practice that has not been applied routinely in Irish forests for some time, so new skills in this area may have to be developed. The Marteloscope training exercise is a tool that can facilitate the understanding of the consequences of stand interventions, including thinning, at the individual tree-level. In addition to this, new skills will be required by harvesting contractors (Ireland 2009).

Extent of CCF management in Ireland

The aim of the survey was to identify properties that are managed under CCF. Implicit in that aim was that the properties were being actively managed. Given the relatively short time period since Coillte has implemented its Low Impact Silvicultural Policy, it was anticipated that in a number of stands classed as being managed under CCF, the process of active management to deliver on that objective may not yet have commenced. Hence when the questionnaire was circulated, the accompanying email to Coillte stressed that stands should be under active management. The survey results indicated that 10,603 ha of forest are currently managed under some form of CCF in Ireland. However, the subsequent forest property inspections suggested that not all of these were under active CCF management. Active management is a key feature of CCF and Mason et al. (1999 p.2) stressed that CCF management “does not mean abandoning stand management or timber production”. In the questionnaire a number of respondents had indicated thinning had taken place in the property. Although there was evidence of recent thinning at these sites, however, there were no signs of an active approach to the transformation process, i.e. no evidence of steps being taken to favour natural regeneration, to select and favour future frame trees, or to apply early thinning in young stands to gain stability. Furthermore, almost half of the forest area recorded by the survey was classed as being managed under “selection systems”. This figure seemed rather high since the area managed under the selection system did not exceed 10% of the forest cover in countries such as Slovenia and Switzerland, where selection systems have been considered a traditional type of silviculture (Schütz et al. 2012). There may be a misunderstanding amongst some respondents with regards to the terms “selection systems” and “selective thinning” and perhaps

the terms were being used interchangeably. The former denotes a specific silvicultural system (see Matthews, 1989), while the latter refers to a thinning pattern whereby trees are removed on the basis of their quality to fulfil the objectives of forest management.

In the case of Coillte forest properties, the Forest Management Planning System introduced in 2005 required a form of silvicultural prescription to be assigned to each Management Unit. There were two options: one being a variation on the clear-cut system, and the second option included CCF, long-term retention and small coupe felling which are considered Low Impact Silvicultural Systems by Coillte. The designation for CCF is too broad and does not provide sufficient detail on the silvicultural system needed to deliver CCF. As Yorke (1998) states, CCF is not a silvicultural system, but it involves “the use of silvicultural systems whereby the forest canopy is maintained”. A more precise indication of which silvicultural systems can be employed is needed to enable forest managers to identify suitable systems for a given site and actively engage with the transformation process to CCF management. As Mason and Kerr (2004) stated, a management plan outlining the objectives and proposed silvicultural system(s) with aspirations for a desired forest structure is a prerequisite to ensure successful CCF management.

Species composition and CCF practice in Ireland

Conifers make up approximately three quarters of the forest estate in Ireland (Forest Service 2007). However, only 28% of the area of CCF-managed forests recorded in the survey (both public and private) was made up of conifers. In the private sector, the survey revealed that conifers form 62% of the CCF-managed forest area. However, the majority (64%) of the forest area reported on was of mixed species composition, including broadleaves and broadleaf/conifer mixtures. The large proportion of broadleaf forests under CCF management in Coillte is undoubtedly a reflection of the company’s decision in 2005 to assign all its broadleaved forests to CCF management including those comprising pure stands of broadleaves, mixed broadleaves and broadleaf/conifer mixtures where the broadleaves were the primary species. This was an important shift in the management of public forests in Ireland. However, such a shift may also have triggered a belief that CCF tends to be primarily suited to broadleaved forests. Experience from Europe shows that CCF is practiced in a wide range of forest types, including those with a substantial coniferous component (e.g. Glöde and Sisktröm 2001, Kenk and Guehne 2001). Coniferous species also form a key component of the species mix in CCF transformation trials in the UK (e.g. Cameron and Hands 2010, Kerr et al. 2010) and, as shown in this study, in private sector forests in Ireland.

Suitability of Irish forests for CCF

The site inspections identified that the vast majority of CCF designated sites had at least six of the nine characteristics identified by Mason and Kerr (2004) as pre-requisites for stands being transformed to CCF. Forest stability is an important aspect of the transformation to CCF and its subsequent management (for details see Vítková and Ní Dhubháin 2013, this issue). The inspections showed that 78% of

forest properties appeared to be stable with no obvious presence of windthrow (Figure 5a). Sufficient natural regeneration is generally considered a key precondition to successful transformation once stand stability has been achieved (Schütz 2001). It is however, important to note that the process of transformation often begins before the initiation of seed production (see Vítková and Ní Dhubháin 2013), so it may not always be possible to determine this when assessing the suitability of a stand for CCF. Nevertheless, the site inspections showed that although there was evidence of vegetation competing with natural regeneration and browsing by deer on 63% and 30% of the properties inspected respectively, natural regeneration was present on almost three-quarters of the properties inspected (Figure 5). CCF management emphasises log quality; although 15% of the inspected properties did not have trees of good quality, 44% and 4% of properties had stems of good and excellent stem quality, respectively. In 82% of the inspected properties there were potential seed-bearing trees denoting the potential for natural regeneration of trees of good quality.

Consequences of CCF management for the sawmilling industry

One of the primary objectives or economic drivers of CCF is to “provide a regular income over time by producing a high proportion of high quality large wood or very large wood” (Süsse et al. 2011 p. 25). If CCF is practiced on a greater scale that it has been to date, a greater quantity of larger logs from a range of species would be available. Currently, the sawmilling industry here is not set up to cater for processing large dimension logs >60 cm, which is the standard diameter of spruce logs processed in CCF forests across much of Europe. This is a part of a “vicious circle”, where there will be an increased supply of larger logs, while on the other hand, the market for larger logs has not developed enough to cater for such dimensions. Upgrading some sawmills to handle larger logs may be costly, but the growing demand for CCF may present opportunities for investment by the sawmilling industry if the supply of larger logs produced as a result of CCF management materialises.

What is needed to improve knowledge of CCF in Ireland?

More detailed CCF methodologies specific to Irish conifer plantations are needed. Although some research on the practice of CCF in Ireland has been carried out (see introduction for details), these studies have mainly focused on aspects of natural regeneration. As part of the study outlined in this paper, an experiment on thinning patterns that could be used in the transformation process has recently been set up. However, further research and training is required if CCF is to be adopted on a larger scale.

Limitations to the survey

It was hoped that the survey would encompass a significant proportion of the stands being managed under CCF in Ireland. In the case of Coillte, the survey returns represented approximately 70% of the area classed as being managed under CCF by the company. It is believed that the request to complete the survey for forests

“actively” managed may account for this shortfall and would suggest that the data returned in the survey represents a more accurate picture of the extent of CCF management. Since completing the survey, however, there has been a renewed emphasis on the management of the broadleaf estate within Coillte. A thinning prescription has been put in place for Coillte-owned broadleaf areas and it was envisaged by Coillte that the area managed under CCF will be larger at the next Forest Management Plan review. The survey is unlikely to have gauged exactly the level of CCF management in the private sector. However, those with extensive experience of working with CCF stands in the private sector have indicated to the authors that the majority of the area under CCF management in the private sector was included in the survey, so the results were likely to have been representative.

Conclusions

This study presents a snapshot in time of the status of CCF in Ireland. There appears to be no single overwhelming economic, ecological or policy driver that causes forest owners to decide to adopt this approach to forest management. Neither is there any overwhelming pattern to the type of woodland being transformed. It is clear that Irish forests being transformed to the silvicultural systems that deliver CCF are still at the beginning of this process and there is no clear pattern as to what system will be best adapted to Irish conditions. In this regard, there is more aspiration than certainty in how these forests will be managed in the long term. Nevertheless, there are clearly significant areas being nominated as CCF and a repeat survey in five or ten years will give an indication of the rate of this change and the success or otherwise in transforming even-aged plantations to more structurally diverse forests.

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