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INTRODUCTION

Biodiversity describes the variability among living organisms and the ecosystems of which they are part. Three conceptual levels of biodiversity are recognised - ecosystem, species and genetic.

Forests are among the most diverse and complex ecosystems in the world, providing a habitat for a multitude of flora and fauna. Ireland's forests represent an important opportunity to conserve and enhance biodiversity at both a local and national level. The FOREST BIODIVERSITY GUIDELINES focus on how best to conserve and enhance biodiversity in Irish forests, through appropriate planning, conservation and management.

The FOREST BIODIVERSITY GUIDELINES have been developed through extensive consultation with a wide range of relevant parties. They set out sound and practical measures based on the principles of Sustainable Forest Management (SFM), and are firmly rooted in the best available scientific information. The guidelines will be kept under review to facilitate amendment in the light of new research findings.

To ensure the successful implementation of SFM in Ireland, it is important that forest owners adhere to the guidelines and undertake all work in a way which is compatible with the protection of the environment.

The guidelines describe a range of measures intended to cover all situations relating to forestry and biodiversity. Not all of the measures outlined will be applicable to every site. It is recognised that, due to limitations imposed by size, some of the measures set out may be impractical in smaller forest holdings, particularly in relation to promoting age and structural diversity. However, it is the responsibility of forest owners to identify and apply those measures which are appropriate to their particular forest.

The FOREST BIODIVERSITY GUIDELINES apply to all grant-aided projects and to all activities associated with a Felling Licence. Any breach may result in the forfeit of grant aid and premium payment or the withdrawal of a Felling Licence.

It is essential that all forest workers and machine operators involved in any forest operation are made aware of and understand the guidelines, all relevant environmental issues relating to the site, and working practices which minimise environmental disturbance. All operators should have contact telephone numbers onsite for all relevant agencies (Local Authorities, Regional Fisheries Boards, Dúchas The Heritage Service, National Museum of Ireland, Garda Síochána, etc.) in case of accidental damage to aquatic zones, archaeological sites, important wildlife habitats and other environmental features.

SITE DEVELOPMENT

The incorporation of biodiversity considerations (in map and descriptive format, as appropriate) into the initial site development plan creates a unique opportunity to consider biodiversity, habitat and nature conservation issues from the outset of any forest development. It provides the basis for adherence to biodiversity principles throughout the rotation, and is a condition of grant aid. Reforestation also provides an opportunity for the site to be reassessed and re-planned according to the FOREST BIODIVERSITY GUIDELINES. Biodiversity considerations should be incorporated into all forest development, harvesting, roading and maintenance plans. Where practical, they should also be illustrated on maps. All recorded information on biodiversity considerations should be updated periodically throughout the rotation to take account of new species arrivals, new knowledge and other changing circumstances.

- During the compilation of a site development plan, identify whether or not the site contains or adjoins Special Areas of Conservation (SACs), Special Protection Areas (SPAs) or proposed Natural Heritage Areas (pNHAs). If one or more of these is present, the Forest Service will consult with Dúchas The Heritage Service - the statutory body with responsibility for nature conservation and biodiversity - on how best to plan the forest in relation to these areas.





- Identify and incorporate local biodiversity factors (including habitats and species of particular interest) into the site development plan. Such factors and how they should be dealt with should become apparent through a combination of local knowledge, careful site inspection and consultation with local Dúchas staff and relevant wildlife interests in the area.
 - Identify important woodland and non-woodland habitats present on the site (see box), many of which may be of local significance even though they are not included within the formal nationally designated conservation areas. Clearly indicate their location on the map and include a written description.
 - Note the presence of fauna of particular interest present on the site, such as birds of prey (buzzard, eagle, falcon, harrier, hawk, kite, osprey and owl) and important mammals such as badger, bat species, red deer, hare, hedgehog, otter, pine marten and red squirrel. Identify considerations for management (e.g. specific nesting periods, suitable proactive measures such as the installation of bat boxes, etc.). Also note the location of features such as badger setts and heronries, together with a prescription for protective and enhancement measures, e.g. broadleaf planting and heavier thinning in the proximity of badger setts.

A **habitat** can be defined as a place where an organism or a population of organisms lives. In addition to the forest itself, habitats associated with forest cover in Ireland include the following: hedgerows, areas of scrub, pockets of native broadleaf cover and individual old trees; aquatic zones (rivers, streams and lakes shown on an Ordnance Survey 6 inch map) and wetlands such as ponds, old drainage ditches, reedbeds, swamps, marshes, turloughs and peaty hollows; woodland glades, unimproved grassland and wildflower meadows; caves and rocky outcrops; and features such as old quarries, sand pits and old stone walls.



Left: Light canopied conifer species such as Scots pine and larch facilitate the development of rich ground cover.

Right: Retain existing pockets of broadleaf woodland, particularly native and semi-natural woodland.



SPECIES SELECTION

The selection of tree species has a major influence on the habitat value and biodiversity of a forest.

- Species diversity at the property, compartment and stand level contributes to the habitat value and biodiversity of a forest. Mixtures can include native and non-native broadleaves and conifers, and must be silviculturally compatible. For example, the light shade cast beneath a compatible mixture of broadleaves and European larch encourages the development of native shrub and ground layers.
- Favour broadleaf species as much as possible, where appropriate to site conditions. In conifer forests, plant broadleaves in swathes and not as single stems within the canopy. These swathes are particularly valuable when positioned along the forest's external and internal margins.
- Biodiversity also relates to the conservation and enhancement of genetic biodiversity. Where possible, select native tree species suited to the site and geographical location, ideally using local or Irish provenances.
- If non-native species are being used, include at least two species in the mix. In all cases, the dominant species should account for no more than 80% of the mix.
- Promote the natural regeneration of desirable species on the site, with enrichment planting where necessary. In particular, encourage the natural regeneration of native tree species, particularly along the forest edge, aquatic buffer zones, paths and roads.

A diverse, multi-layered canopy creates a greater range of habitats within the forest.



AGE AND STRUCTURAL DIVERSITY

Careful design, planning and scheduling of operations can be used to create a forest diverse in both age and structure and, therefore, habitat value and biodiversity.

- Existing hedgerows, areas of low-lying scrub, pockets of native broadleaf cover and individual old trees should be retained to form wildlife corridors between forest patches. These corridors are essential as they facilitate the movement of both plants and animals between forests, providing biological continuity and connectivity.
- Age diversity adds greatly to the conservation and enhancement of biodiversity, as it provides within an area forests in various stages of development - from the open establishment stage to the late pole stage - each with its own particular habitat value and flora/fauna community. In larger, more mature forest blocks, encourage a range of age classes, particularly where the scale of the forest allows a degree of flexibility. This may have to be achieved over time in even-aged forests through the staggered felling/reforestation of coupes, or on new sites through staggered planting of adjacent



The installation of bird boxes and other practical measures contribute significantly to forest biodiversity.



coupes at different time intervals. Smaller coupes tend to benefit biodiversity the most, but coupe size must be balanced with landscape considerations (see FORESTRY AND THE LANDSCAPE GUIDELINES) and operational practicalities (see FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES).

- Different tree species occupy different layers or storeys within the forest canopy. Select species to encourage the development of a multi-storey canopy, in order to provide structural diversity. However, ensure species compatibility.

OVERMATURE TREES AND DEADWOOD

Old trees are important for forest biodiversity, as they provide a range of additional habitats, particularly for invertebrates and birds, e.g. deep fissured bark, broken snags, cavities, holes created by fallen branches. Deadwood also represents an important resource for biodiversity. Decomposing wood provides a habitat for numerous species of plants and animals which might otherwise be absent from the forest.

- Retain some stems to grow on to old age, ideally scattered throughout the forest. Trees can be retained at both afforestation (if already present on the site) and at the harvesting/reforestation stage, where windfirmness and landscape considerations allow. Consider retaining groups of trees beyond normal felling age, indefinitely if possible, locating them on the less productive or more inaccessible areas of the site to minimise impact on productivity. The selection of misshapen trees for this role will also minimise impact on production.
- With due consideration to productivity and forest health, some deadwood should be left *in situ* after both thinning and final harvesting. Deadwood can be left in the form of standing dead stems or naturally fallen trunks (if present), or as logs deliberately left behind on the forest floor. Small windthrown areas could also be left unharvested. Consider the safety implications of retaining deadwood. For example, top off standing dead trees to delay windthrow, and make safe fallen trunks by cutting dangerous weight-bearing branches. In the case of logs deliberately left on the forest floor, minimise the impact on production by selecting misshapen and rejected material. Approximately 2 m³/ha of deadwood (standing dead stems, naturally fallen trunks and/or felled logs) should be present on the site immediately after each thinning, and approximately 5 m³/ha after final harvesting.



Deadwood left on the forest floor enhances biodiversity opportunities.

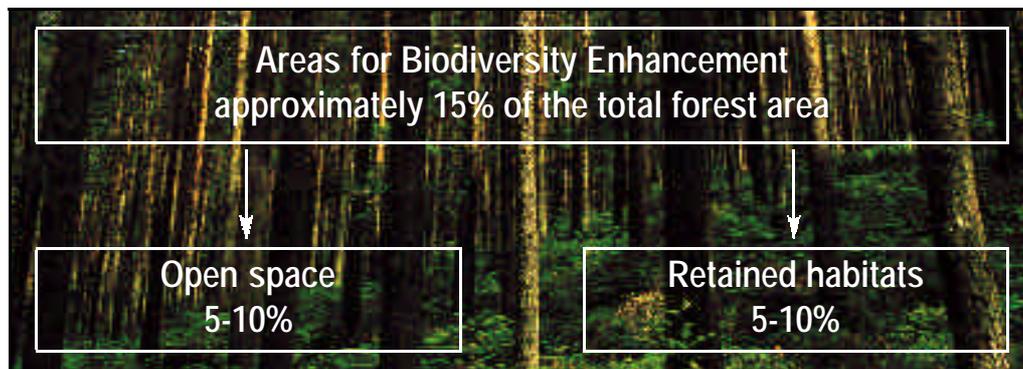




AREAS FOR BIODIVERSITY ENHANCEMENT

Good forest practice coupled with adherence to the FOREST BIODIVERSITY GUIDELINES will conserve and enhance the biodiversity value throughout the entire forest. However, approximately 15% of the forest area must also be treated with particular regard to biodiversity. These Areas for Biodiversity Enhancement, which comprise open spaces and retained habitats, are aimed at encouraging the development of diverse habitats, native flora and fauna, and biodiversity. The treatment of open spaces and retained habitats is described below.

OPEN SPACE



Between 5-10% of the forest should comprise open space. In sites less than 10 ha in area, this should be designed in conjunction with neighbouring landuse and may be reduced. Open spaces are required for good management operations and to comply with the FORESTRY AND WATER QUALITY GUIDELINES, FORESTRY AND ARCHAEOLOGY GUIDELINES and FORESTRY AND THE LANDSCAPE GUIDELINES. As such, they include ridelines and firebreaks, forest roads, turning bays, landing bays and their associated margins, together with buffer zones adjoining aquatic zones, exclusion zones adjoining archaeological features and areas left unplanted for landscape purposes. Through careful design, planning and management, these open spaces can contribute significantly to forest biodiversity.

Management should aim to encourage structural and species diversity within open spaces. For example, careful design can ensure an undulating forest edge with protrusions into adjoining open spaces, both internal and external, in order to maximise the habitat edge effect between the forest canopy and the open space. Careful species selection and subsequent management can also be used to encourage a gradual transition from ground layer within the open space through low-lying native shrub and medium-sized native broadleaf trees to the forest canopy itself. Widely spaced groups of native broadleaf species associated with riparian zone habitats (e.g. alder, willow, birch, hazel) planted within the aquatic buffer zone can contribute greatly to water quality and ecosystem enhancement of adjoining aquatic zones (see FORESTRY AND WATER QUALITY GUIDELINES). On good fertile sites, natural regeneration of such species from local seed sources is likely to occur.

RETAINED HABITATS

Important local habitats present on the site should be identified on the site development plan for retention throughout the rotation. As previously described, these include both woodland and non-woodland habitats. Retained habitats should account for approximately 5-10% of the overall site area. Design, planning and management should aim to protect, conserve and enhance these habitats throughout the current rotation into the subsequent rotation(s), and to facilitate the development of associated native flora and fauna.

Careful design and planning is the first step in habitat enhancement. For example, ensure that these areas are separate from the main stocking area within the forest and are clearly designated both on relevant maps and on the ground during sensitive times such as planting, thinning and harvesting. In order to avoid disturbance, forest roads and extraction routes and all commercial operations should be excluded from these retained habitats. The sustainability of these habitats can be enhanced further by enforcing a 3 m protective zone.

With careful planning and appropriate management, open spaces and retained habitats will maximise the range of plant and animal communities present within the forest.



Retained habitats may require management. Examples of proactive management for different habitats are as follows:

- the removal of naturally regenerating sycamore from retained pockets of semi-natural woodland, coupled with underplanting with native trees of local provenance;
- occasional cutting on retained areas of unimproved grassland, to encourage wildflower development;
- gap planting and layering, to rejuvenate declining hedgerows.

If necessary, information on suitable management approaches for retained habitats can be obtained from relevant organisations and agencies.

PEST MANAGEMENT AND TROUBLESOME SPECIES

- In relation to pest management and forest biodiversity, prevention is better than cure. Manage the forest in a way which reduces the risk of pest outbreak, adopting an integrated pest management approach involving, for example, diverse species selection and forest hygiene.
- The use of chemicals such as herbicides and pesticides should be minimised. Carefully assess the need for application, and apply only when absolutely necessary. Adhere strictly to manufacturer instructions and to FORESTRY AND WATER QUALITY GUIDELINES at all times. Undertake manual vegetation control, where possible.
- Pests live in association with other organisms which are not troublesome and which form a natural component of the local biodiversity. In selecting a method to control pests, the most species-specific pest control is the most desirable. This will enable pest elimination or reduction without damaging these other organisms.
- Stump protection is essential for all conifers to control the spread of butt rot (*Heterobasidion annosum*). Apply a stump protectant such as urea immediately after felling, referring to the FORESTRY AND WATER QUALITY GUIDELINES regarding the storage, handling and use of chemicals in relation to aquatic zones.
- It is essential to protect against deer in areas where natural regeneration is being encouraged.
- Some exotic woody species such as rhododendron and laurel spread rapidly beneath the forest canopy, eliminating the native shrub and ground layer. Rhododendron and laurel persist through re-invasion and require constant intensive management to control. Both should ideally be eradicated and re-invasion prevented throughout the rotation. At the very least, remove all stems of these species at the afforestation or reforestation stage.
- Refer to *Guidelines for the Use of Herbicides in Forestry*¹.



The control of rhododendron and other troublesome species is often essential in securing natural regeneration and the development of rich ground cover.

MACHINE OPERATIONS

- During all forest operations, from site preparation to harvesting and road construction, avoid soil damage and minimise general site disturbance. Follow correct procedures for all machine operations throughout the rotation, including site development, roading and harvesting. In all cases, adhere to FORESTRY AND WATER QUALITY GUIDELINES and FOREST HARVESTING AND THE ENVIRONMENT GUIDELINES.
- Plan all forest operations, including roading, thinning, final harvesting and extraction, with due regard to the breeding and nesting seasons of important species, and associated features such as badger setts and heronries, as identified in the site development plan and through subsequent observations.
- Ensure that all hazardous compounds are removed from the site for correct disposal. All containers, machine parts and refuse generated by the operations should also be removed.

¹Ward, D. (ed.) 1998. *Guidelines for the Use of Herbicides in Forestry*. 2nd Edition. Coillte, Forest Protection, Newtownmountkennedy, Co. Wicklow.

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Photos: Forest Service.