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Landscape planning and design for Irish forestry: Approach and model proposed

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Abstract

The afforestation programme in Ireland over the next 30 years is aimed at increasing forest cover from approximately 9% to 17%. Given the frequency of adverse impacts upon the landscape arising from forestry, particularly large-scale commercial plantations, measures such as planning and design guidelines and strategies which ensure overall positive results and avoidance of damage, are urgently required.

Focusing upon landscape issues, this paper outlines the complexity of forestry problems in Ireland, identifying the need for an approach to forest landscape planning and design. A detailed literature review is used as a basis to develop such an approach, emphasising the importance of landscape assessment based upon landscape character typology. Arising from this, a 2-part model is proposed, the first part concerning guidelines developed for nationally generic landscape types, and the second concerning strategies for specific landscape character areas applied to counties. The three main components of this model are examined: forestry capabilities; landscape aesthetic character enhancement potential; and landscape values with their sensitivities. The first two components provide the basis for a proactive approach to forestry, and the third introduces the constraining or qualifying influence.

As far as landscape is concerned, forests can be a major force in landscape enhancement and a medium for the aesthetic experience of nature. It is very important to rise to the challenge by developing forestry in Ireland in a way which is decisively proactive.

Keywords: Forest landscape planning and design, forestry guidelines and strategies, landscape assessment, forestry capabilities, landscape aesthetic character enhancement potential, landscape values with sensitivities and constraints

Introduction

Forestry, particularly large-scale commercial plantation forestry, can have a significant adverse impact in terms of, for example, landscape aesthetics, environment and culture. Increasing public concern over the effects of forestry cannot be ignored by either policy makers or practitioners. Appreciation of the potential for landscape enhancement by forests seems limited among the public and even among many foresters. In order to optimise its impact on the landscape, therefore, more clearly defined strategies and guidelines specifically for forestry which attempt to lead positively towards the realisation of this potential, are required.

The need to develop an approach to forest landscape planning and design in Ireland is highlighted by the emphasis of recent key policy statements, legislative changes and

guideline recommendations concerning forestry and the environment, including the national strategic plan for forestry (Department of Agriculture, Food and Forestry, 1996). In January 1997, the Department of the Environment published a report entitled *Forestry Development - Consultation Draft of Guidelines for Local Authorities* (Department of the Environment, 1997). These draft guidelines dealt with the role of planning authorities in relation to commercial forestry, and emphasised the following:

- the urgent need to prepare maps indicating areas within each county which might be regarded as being 'sensitive' in relation to forestry development;
- consideration of the need for an indicative forestry strategy for each county;
- notification to the Forest Service of areas which may be particularly sensitive to clearcutting, and consideration of whether marginal forest sites should be replanted or left to revert to their original state; and
- the intention of the Department of the Environment to introduce more flexible control enabling planning permission to be required for afforestation projects not requiring an environmental impact assessment.

The danger with the above call from the Department of the Environment is that each local authority would proceed to develop forestry strategies independently without a common methodology or procedure. To ensure a rational and nationally effective approach, a structure comprising a single methodological basis is required. The criteria by which analysis is carried out and standards by which evaluation and decisions are made should be applied nation-wide, with due allowance for regional aesthetic, biophysical, social, infrastructural or economic variations. To be effective in practice, the distinct roles played by the Forest Service and local authorities, and their relationship in forestry development, must also be clearly defined and balanced (Environmental Resources Management, 1998).

There is a need to develop a tool for forest landscape planning and design strategies and guidelines, and to provide an administrative framework in which these can play their intended role. Forest planning and design strategies and guidelines can provide national guidance to ensure that appropriate standards are understood and implemented to achieve a cultural, environmental and economical balance. They would provide administrative authorities, forest managers, planners, non-government organisations (NGOs) and other interested parties with a common, adaptable reference base. Technical back-up for this is already being put in place, with the development of the Forest Inventory and Planning System (FIPS) and a national forestry inventory and county-by-county indication of species potential. This paper broadens the scope by highlighting key issues pertaining to the development of an integrative landscape component of a national forestry strategy and guidelines. It examines the spatial planning and design of forestry primarily from a landscape aesthetic perspective understood in the broadest sense.

First, however, it is necessary to identify the many landscape-related problems of forestry in Ireland, in order to illustrate the complexity of the task involved in formulating a forest landscape planning and design model. This will be followed by a review of publications relevant to planning and design, which will help to identify key factors and to direct methodological development.

The problem in Ireland – forestry starting from scratch

Unlike developments such as transmission lines, forestry has the potential to significantly contribute to landscape enhancement. In order to ensure this, however, ways in which plantations have adversely affected the landscape should be recognised. These are not limited to purely visual concerns, but extend to embrace the broader scope of land-

scape aesthetics. These problems are listed below, not to suggest the inappropriateness of coniferous plantations in Ireland, but to highlight the challenge to be met by forest planning, design and management:

- the sensitivity of many forested landscapes in upland and moorland areas;
- visual fragmentation of the landscape by forest blocks with inadequate integration;
- weakening of landscape character and obliteration of characteristics;
- visual conflict of forests with their contexts in scale, configuration and composition;
- submergence of amenity and cultural features;
- scarring of the landscape by management operations such as forest road construction and harvesting;
- abruptness of change due to clearcutting;
- visual obstruction between, and isolation of, remote rural dwellings;
- cultural failure to understand and appreciate forests;
- shift from the traditional images of Irish landscapes;
- ecological damage concerning, for example, water, soils and biodiversity; and
- infrastructural limitations, possibly causing road damage and traffic hazards.

Distinction between forest landscape planning and design

Forestry strategies can prove important for planning by providing an indication of appropriate use of resources in any given district, including the identification of important environmental, cultural, landuse, aesthetic and social values. They should address forest landscape planning in the spatial sense, being essentially concerned with the effects of forests and forestry practices on landscape, particularly in regard to character and quality. Strategies should also include forest design, indicating the desired appearance of the forest in relation to its context, and incorporating silvicultural and management implications.

This distinction between planning and design in forestry is not always explicit or effectively used by forestry authorities. A similar distinction between the two concepts has been recognised by the Forestry Commission (Campbell and Fairley, 1991), but it does not seem to have been developed systematically into an integrated structure for the control of forestry development. A recent publication by the Forestry Authority (Bell, 1998) also incorporates these terms. But planning is used at a finer scale than that defined above, and would need to be increased and the criteria and implications more fully explored, in order to become effective for the type of planning defined in this paper.

Literature review

Much material pertaining to forest landscape planning and design has been published internationally over the past decade. The following review functions as a framework or scaffold for the construction of a model for strategic forest landscape planning and design and guidelines. The review studies indicative forestry strategies and landscape assessments which can provide the necessary methodological foundation. Material relating to guidelines is more limited to design, and includes guidelines, training manuals, handbooks, codes of best practice, forestry standards and public surveys.

Indicative forestry strategies

Indicative forestry strategies, involving the designation of *preferred*, *potential* and *sensitive* landscape categories, have been produced during the past few years by several Scottish regional authorities, including those for the Tayside, Strathclyde, Highland and

Grampian regions, but have come under considerable criticism (Stuart-Murray, 1994; Sidaway and Turnbull Jeffrey Partnership, 1997, cited in Environmental Resources Management, 1998). Firstly, indicative forestry strategies have tended to adopt a conservative and restrictive approach, resulting from the assessment of sensitivity as a priority without seeking positive opportunities for forestry. Secondly, areas deemed to be *sensitive* are often planted, while those in the *preferred* category are often not (MacMillan, 1993). Thirdly, inconsistency exists between regions in the methodologies employed and resulting designations. Fourthly, there is little evidence of the use of indicative forestry strategies during consultation on afforestation grant applications or in the provision of advice on local sensitive areas with planning authorities.

A draft indicative forestry strategy developed by Wicklow County Council (1997) offers an Irish example. This strategy also seems to treat forestry purely as a sensitive issue, rather than accepting it as being potentially positive for the landscape. Such reservation is understandable, given the poor design of existing plantations and concerns with water quality in areas where rock and/or soils are acidic. Nevertheless, instead of searching for opportunities for enhancement, the strategy seems to adopt a defensive position. The blanket stipulation of distance limits to roadsides and elevation thresholds on mountains for certain parts of the county are both examples of caution which may have arisen from a lack of knowledge about forestry in general, and from a reaction against the plethora of existing poorly integrated forests. Ironically, in regard to this latter point, as well as being the most afforested county in Ireland, Wicklow contains some of the better examples of design.

Landscape assessment and character

A fundamental basis for forest landscape planning and design is landscape assessment methodology. This can provide a thorough understanding of the landscape and help to identify opportunities for enhancement and creative alteration. A considerable portion of the review provided below will draw from work carried out in the UK. This is due to the overall maturity of its landscape assessment strategies (Environmental Resources Management, 1995), landscape similarity and linguistic accessibility.

Initial exploration of the potential of more pragmatic science-based criteria involving land classes, such as those developed by the Institute of Terrestrial Ecology (ITE) in Britain or by Cooper and Murray (1992) in Northern Ireland, resulted in recognition of the importance of visual interpretation. This allowed for assessment of landscape visual character, which in turn provided the basis for strategic landscape planning and designation. This has been affirmed in the methodological guidance for landscape assessment produced by the Countryside Commissions for Scotland (Land Use Consultants, 1991a) and England (Cobham Resource Consultants, 1993).

An important distinction was made in the Warwickshire Project by the Countryside Commission (1991) between *landscape character types*, which are generic, and *landscape character areas*, which are geographically specific examples of these. This project, along with studies relating to the Blackdown Hills (Cobham Resource Consultants, 1989), the Cotswolds (Cobham Resource Consultants, 1990), the Cambrian Mountains (Land Use Consultants, 1990), the North Pennines (Land Use Consultants, 1991b), Northamptonshire (Cobham Resource Consultants, 1992a), the Tamar Valley (Cobham Resource Consultants, 1992b), the Forest of Bowland (Woolerton Truscott, 1992a) and the Cleveland Community Forest assessment (Woolerton Truscott, 1992b), involved landscape character established by visual analysis of physical features including the history of land-

scape evolution, such as geology, geomorphology, landuse alterations and cultural interpretations throughout time. These factors have since become the hallmark of landscape assessment in the UK.

While guidance produced by the Forestry Authority for England on the preparation of indicative forestry strategies (Price, 1993) emphasised the need to respond to existing visual character, it lacked development into an approach to positively change this character. Notwithstanding this, landscape character has proved useful for forestry strategies. The Great North Forest assessment (Land Use Consultants, 1992) and the Staffordshire (Murray, 1995) and Central Scotland (Central Scotland Countryside Trust, 1995) forestry strategies have each taken a step towards landscape typological guidance for forestry. They have identified afforestation opportunities for specific landscape character areas in relation to different woodland types.

Landscape character types can also be considered as a basis for forest landscape planning and design guidelines. The Forestry Authority in Scotland is currently developing landscape character-specific woodland design guidance for the Dumfries and Galloway regions (Environmental Resources Management, 1997), involving a listing of opportunities and constraints and an indication of appropriate design response. The approach is useful in principle for the development of national landscape typological guidelines. Having conducted an on-the-ground examination of the Dumfries and Galloway regions in Scotland, it is the opinion of these authors that the scale of landscape character areas used in the above forest landscape design guidance is too fine, resulting in unnecessary repetition. It is important to ensure sufficient detail on one hand, and the avoidance of repetition and superfluous distinctions on the other.

Hierarchical structure for national and regional levels

The importance of a hierarchical structure for landscape assessment, strategies and guidelines has been recognised in studies such as the Warwickshire Project (Countryside Commission, 1991). One of the main conclusions of that project's pilot study was the need to adopt a strategic rather than a small-scale farm-based approach to landscape assessment, in order to establish a framework within which more detailed landscape studies could be based. This has also been affirmed by the delegates at the conference reviewed by Moore (1998), and also by Diacono (1998), who highlights the need for a strategic framework within which the assessment process across the tiers of local authority can be co-ordinated. Such a structure would help to overcome the problem of incompatibility and inconsistency between different assessments and assessors.

Even within the broad categories of upland and lowland, the UK forest landscape guidelines (Forestry Authority, 1994; Forestry Commission, 1992a; Lucas, 1991) succeed in covering a considerable variety of landscapes in relation to visual response. But while landscapes such as plateau moorland or drumlins may correspond visually to the generic flat or hilly landforms included in those guidelines, their ecology involving soils, hydrology and vegetation, as well as their cultural meaning in terms of landuse, history, image and aesthetics, are quite distinct. Of equal importance is the difference in species potential and silvicultural systems possible between such landscape types. Some degree of typological distinction, therefore, could provide more direction to forest designers and managers without necessarily compromising flexibility. Swanwick (1998) suggests that a hierarchy of common guidelines could be provided at a broad character area level, with more specific guidelines at the level of generic landscape type, and some at the more local level.

In essence, therefore, a hierarchical approach to landscape assessment for forest landscape development is important to ensure correspondence between both planning and design, and to provide a procedure which educates foresters and planners to understand landscape and its assessment. This can comprise national guidelines based on generic landscape character types, and county strategies involving a methodology for landscape-specific assessment and application of these guidelines.

Integrative approach – the science, art and culture of forest landscape

Unlike many other types of development, forestry comprises natural material and processes which can be scientifically determined. The Irish national forestry strategy (Department of Agriculture, Food and Forestry, 1996) fails to address these adequately, whether concerning nature conservation or the value of new landscape and habitat creation (Environmental Resources Management, 1998). Landscape in terms of such scientific factuality must be complemented by the realisation of its complex reality as a palimpsest of historical and cultural overlays. This is apparent when studying the effects of forestry on archaeology, as well as recreational and functional meaning, from which a more complete aesthetic experience is derived.

Thus, landscape assessment methodology should be integrative (Warnock and Brown, 1998a; Swanwick, 1998). *Characterisation* has been used in the UK, specifically by the Forestry Commission and Countryside Commission, to broaden the basis of landscape assessment to include aspects of a landscape area other than the visual. Methodologically, however, characterisation has not been used effectively for either planning afforestation (Environmental Resources Management, 1998) or in achieving an “integrated treatment of different environmental domains” (CAG and Land Use Consultants, 1997).

UK forest design guidelines (Forestry Authority, 1994; Forestry Commission, 1992a; Lucas, 1991) have opted for a visual basis without due regard of their interrelationship with nature conservation, recreation, water and archaeology, which are all dealt with in separate guidelines (Forestry Commission, 1990 & 1992b; Forestry Authority, 1993 & 1995). The forest design guidelines produced by Ireland’s Forest Service (1991) are equally narrow in their focus on the visual, as well as being general and superficial. Considering the imminence of landscape transformation through forest plantation and management practices in Ireland, more substantial and integrative guidelines are urgently required. This involves consideration, both separately and integratively, of the science and aesthetics of landscape, as well as of landscape values and their sensitivities. FIPS may represent a tool to achieve such integration.

Conservation oriented and/or proactive planning and design

The approach to landscape prevalent in the UK has typically been conservation oriented rather than proactive regarding alteration and development. Even where balance in strategies is aimed for between conservation, restoration and innovative design (Warnock and Brown, 1998b), many of those involved in landscape assessment and planning (Moore, 1998) remain cautious, or even fearful of change. The stronger the landscape integrity, the greater is the tendency to conserve, while landscapes of lesser sensitivity comprising weak character, degradation or low visual exposure might be favoured for ‘creative’ development. Some forestry strategies, however, have ostensibly moved towards a more positive acceptance of commercial plantations. Examples of these include the Airdrie Woodlands Initiative (Strathclyde Regional Council and the Central Scotland Countryside Trust, 1995), the Argyll and the Firth of Clyde report (Environmental

Resources Management, 1996) and the Staffordshire strategy (Murray, 1995).

In order to ensure a balanced approach to forestry in the landscape, different kinds and degrees of sensitivity must be introduced into the process (Warnock and Brown, 1998a), considering, for example, quality, distinctiveness, popularity, rarity, cultural meaning, representativeness and social use. In their study of Warwickshire, Warnock and Brown (1998b) have established the concept of appropriateness as the proactive basis for assessment, while that of sensitivity introduces the constraining and qualifying influence. The same caution noted earlier is again evident, however, as development seems to be considered for areas without strong landscape character.

While a proactive approach to forestry could be adopted in any country, it would be particularly appropriate in Ireland where, due to a relatively low population density and prevalence of extensive areas of traditional landuse and landscape pattern, regional character is generally intact and not critically threatened with destruction or under pressure for recreational use. Thus, besides constraints based on evaluation of the sensitivity of different landscape values, the approach should consider the enhancement of any landscape by appropriate aesthetic response to its character and pragmatic or scientific capability.

Adding the why, how, how much and to whom to the what of character

The concept of a more integrative characterisation which reflects coherence across a range of environmental topics has recently emerged in the UK. For example, the so-called environmental capital approach (CAG and Land Use Consultants, 1997) recognises the need to simultaneously address a host of factors which affect the "features and characteristics" of the environment in relation to sustainability. It attempts to broaden the basis of assessment to consider, not simply the *what* of landscape, but also the *why*, *how*, *how much* and *to whom*, by identifying the benefits which these features and characteristics provide in terms of "attributes, services and functions". These in turn provide the basis for evaluation and consideration of their substitutability. Incorporation of the latter is key in attempting to overcome the conservative conservation-oriented ethos. It ensures flexibility in allowing a proactive openness to development on the grounds of gains and losses of, for example, characteristics and attributes considered from the local to the global scale. There is considerable scope in the environmental capital approach for methodological investigation, development and adaptation in regard to forestry.

Common approach comprising purposeful planning and design criteria

The visual design principles listed in the UK (Forestry Authority, 1994; Forestry Commission, 1992a) and British Columbia (Forest Service, 1994) publications are ambiguous in regard to their role. Principles such as shape, visual force and scale seem to be design tools, while diversity, unity and spirit of place are more like design objectives. Furthermore, scale is ambiguously applied in the sense of extent of forest cover and also more intimately in the sense of proportion. Rather, it would seem logical to establish a set of principles as tools to achieve specific aspects of desired forest landscapes.

The establishment of a common methodological approach to forest planning and design is important in Ireland, given the relatively compact county administrative areas and the continuity of landscape types from one county to the next. Indicative designations concerning forest landscape planning and design could be produced for the Forest Service where this would be related to other factors affecting forestry, such as land value, and become accessible to interested parties through FIPS. When application is being made for forestry development, the planning and design guidelines, comprising criteria with appli-

cation adaptable to each landscape character type, could serve as an important consultation medium for all parties concerned. In particular, they could help to bridge the knowledge gap between foresters, planners and landscape experts.

Flexibility of planning and design response

In relation to design, guidelines invariably encourage naturalistic forest design (Forestry Authority, 1994; Forestry Commission, 1991 & 1992a; Ammer and Pröbstl, 1991; Lucas, 1991; Udgivet af Skov, 1991; Logging Industry Research Organisation, 1993; Forest Service, 1994 & 1995; USDA Forest Service, 1995). In reality, however, this may not always be feasible or necessary, especially in Ireland where little forest context exists or where extensive areas of landscape are strongly characterised by human use and rectilinear pattern. Regarding planning and design, guidelines should reflect reality by depicting the impact of different areas of cover on any given landscape character type, in particular tiny 'postage stamp' plots in open areas, and how this impact can be mitigated and exploited aesthetically. Furthermore, strategies and guidelines should not only contend with afforestation, but also with restructuring existing forests, many of which will not meet new aesthetic standards. They need to be flexible and realistic, being performance-based rather than prescriptive, and indicatively suggesting planning and design solutions to typical problems.

An Irish approach to forest landscape planning and design

In developing a tool for forest planning and design based upon the above review concerning strategies, assessment and guidelines, key recommendations are listed below as the basis for an Irish approach.

1. Develop a common methodology for assessment, forest planning and design.
2. Provide a medium for consultation and education through strategies and guidelines.
3. Distinguish criteria and factors in relation to forest planning and design.
4. Identify landscape character types/areas as the basis for assessment and designation.
5. Establish a hierarchical approach to landscape assessment, planning and design.
6. Ensure comprehensive integration of the science and art of forestry.
7. Aim for balance between proactive drive and constraint.
8. Strategies and guidelines to be indicative and performance-based, not prescriptive.
9. Be realistic rather than idealistic, by contending with typical and difficult problems.
10. Improve existing forests to meet new aesthetic standards.

Essentially, the approach to forest landscape planning and design being proposed comprises landscape character areas, determined by a process of integrative characterisation, as the basis for assessment in regard to the following three key components:

- scientific forestry possibilities;
- landscape aesthetic enhancement potential; and
- sensitivity of landscape values.

The first two of these components provide the proactive vision of landscape alteration and development by forests. The third component introduces the braking action, qualifying the acceptability and type of forestry appropriate to a given location. The key is to temporarily postpone consideration of landscape sensitivity and focus initially upon landscape character and its potential for enhancement. This separation is important: instead of considering forestry for a given landscape on a *posteriori* basis (i.e. as a result of an initial landscape assessment deeming various values of sufficiently low sensitivity), it considers

it on an *a priori* basis, whereby the potential for landscape character enhancement is prioritised. In light of the above review, such an unambivalent acceptance of the potential of forestry for landscape enhancement would be a departure from the current approach to landscape assessment and planning.

Proposed forest landscape planning and design model

This paper will now proceed to propose two models of forest landscape planning and design. The first model (Figure 1) outlines the basic relationships between its three components: the assessment of landscape physiography to scientifically establish its forestry capabilities; landscape aesthetic character to determine enhancement potential; and the sensitivity of different landscape values to indicate the need for the introduction of constraints and qualifications.

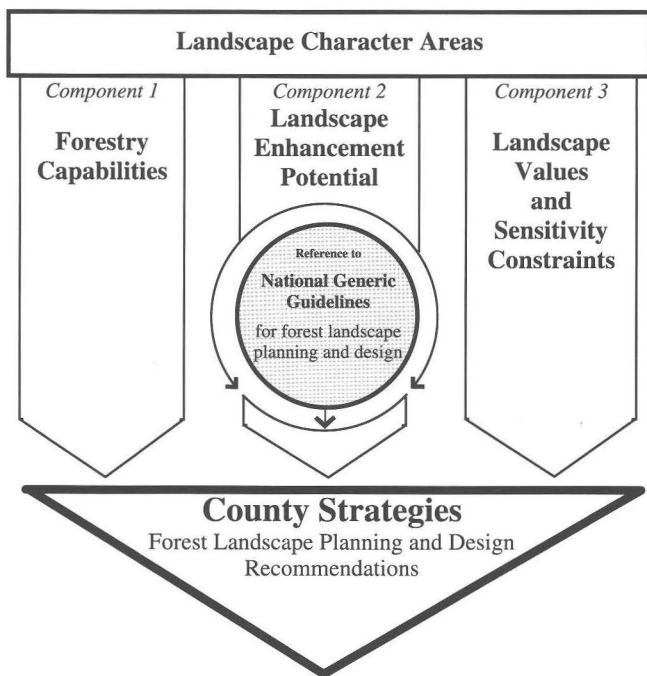


Figure 1. *Simplified model for forest landscape planning and design.*

The second model (Figure 2) elaborates upon the first and is structured in two parts comprising guidelines and strategies. The models are based on a foundation of landscape

character typology. They involve the integration of the three components, the first two providing the driving mechanism by proactively identifying pragmatic capability possibilities and landscape character enhancement potential of forestry, and the last component introducing constraints.

The first part of the more complex model depicts a methodology for forest landscape planning and design guidelines to be developed generically at a national level. The second part comprises a more complex methodology for forest landscape strategic planning and design pertaining to specific landscapes, such as that at a county scale. Production of strategies depends upon the guidelines as an indication of preferred solutions. While the three components listed above are relevant to both parts of the model, only landscape enhancement potential is of primary concern for the guidelines, the other two components being considered generally and typically. For this reason, the paper will focus upon the second, more complex, part of the model concerning the production of forest landscape planning and design strategies. The model establishes the respective autonomy of each of its three main components, orchestrating when and how they interrelate to achieve balanced forest landscape planning and design strategies for landscape character areas.

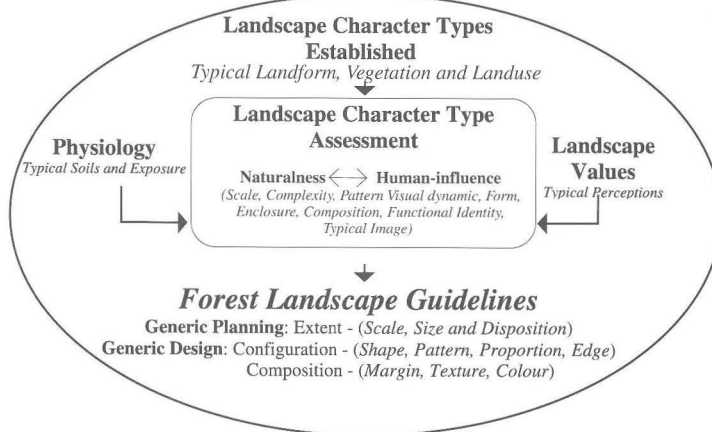
Character area identification

In order to develop a landscape planning and design model, it is necessary to attempt to grasp how man understands the landscape and how this can be systematically incorporated into a methodology. The process of landscape assessment for systematic and methodological clarity can correspond to three levels of understanding, moving from the quantitative to the qualitative. All of these levels might be used to determine a landscape character area, but typically either the first or a combination of the first and second may be more useful for initial forest landscape planning and design. These three levels of understanding are described below.

1. The first level produces physical units and concerns physical features, including geology, soils, vegetation, landuse, elevation and climate, which provide the basic data for an initial desk study breakdown of landscape. Whether natural or cultural, such factual character can be determined by considering landform and landcover. Features could include those at the micro-scale, such as the flora of the Burren, but would more typically include larger scaled elements such as topography, hedgerows, copses and woods, watercourses and roads.
2. The second level produces physio-visual units. It builds upon the first and broadens the scope to allow for actual visual experience, i.e. perception of physical units within larger landscape contexts. This physio-visual level combines distinction in relation to physical features with viewshed. While the character areas identified at the second level may typically prove adequate for planning and design, due consideration should also be given to other ways of reading the landscape.
3. Thus, at an even broader, albeit more complex, level, the apprehension of landscape is considered, involving meaning to produce characterised units. This includes typical public apprehensions or image of the landscape, as well as popularly perceived characteristics such as function, openness, accessibility, tranquillity and historical associations. At this level, landscape characterisation, which is concerned with the sustainability of place identity understood holistically, becomes particularly important.

Environmental features and characteristics are specifically identified for each of the three components of the model, but continue to emerge and accumulate as the process

National Generic Guidelines



Country Specific Strategies

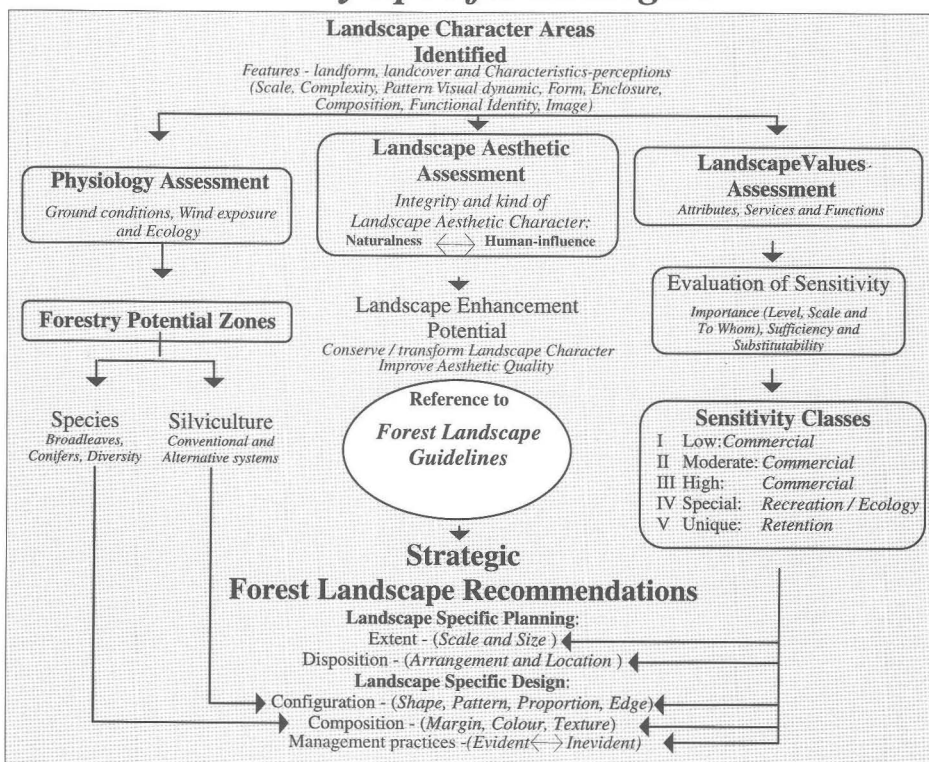


Figure 2. Forest landscape planning and design model.

moves from one to the next. This process starts with the physical environment in the first component, expands to reflect aesthetic apprehension in the second, and broadens in the third to include other characteristics not previously covered, as well as considerations such as the relative importance, meanings, values and associations attached to these characteristics. Thus, the proposed model gradually unfolds, being consummated in the production of forest landscape strategic recommendations concerning planning, design and management.

Assessment of landscape with respect to its character and characteristics can be subtle and complex. As the assessment process is ultimately integrative and concerns a landscape perceived as a whole and as a continuum, it is important to identify key criteria despite the abstraction and apparent autonomy of each. Together, these criteria should reflect the process of landscape character and characterisation assessment outlined above. Among these criteria, the following are particularly important:

- *scale*, concerning the visual extent as perceived and is determined by complexity and size of landform;
- *complexity*, concerning the variation of landform, vegetation and landuse throughout the landscape;
- *pattern*, addressing the superficial appearance of the landscape, as determined by, for example, vegetation, rock, water and landuse;
- *visual dynamic*, concerning the generation of a sense of spatial and formal flow;
- *enclosure*, concerning the sense of containment or openness;
- *form*, regarding the shape of land mass;
- *composition*, providing for the possibility of different units of physical character being seen together, so forming a new whole viewshed character;
- *functional identity*, derived from the apparent use of the landscape; and
- *image*, reflecting cognitive response and the spiritual sense (for example, a mountain moorland typically signifies a place of remoteness and wildland character quite distinct from that signified by a green patchwork agricultural landscape).

Examples of landscape types relevant to forestry in Ireland are as follows:

- mountainous moorland, e.g. Wicklow Mountains and the Twelve Bens;
- rolling hills with agricultural mosaic, e.g. Wicklow and Wexford agricultural land;
- plains with agricultural mosaic, e.g. plains of Tipperary and north Cork;
- plains of moorland (including cut-away bogs), e.g. peatlands of north-west Mayo; and
- drumlins with agricultural landcover pattern, e.g. Leitrim, Cavan and Monaghan.

Model Component 1: Physiographic assessment for forestry capabilities

The capabilities of a landscape for forestry are primarily dependent on physiographic factors of landscape which are objectively determined and scientifically assessed. While the landscape character areas already established are likely to include more than a single physiographic unit, they will nevertheless provide a basis for the physiographic assessment, thereby maintaining methodological consistency. This physiographic assessment involves the pragmatic and science-based approach of the forester who, taking landform and vegetation as primary indicators, establishes exposure and soils in order to determine the species and silviculture for which the land is capable. But while forest site types have conventionally been identified based upon physiographic (geology, topography and aspect), edaphic (soils and drainage) and climatic (rainfall and frost) conditions, if environmental sustainability is being sought, it is necessary to broaden the basis to include ecology.

The result of this assessment is to break down landscape character areas into zones of capability for different forest species and silvicultural systems. This would include not only species for commercial production, but also for biodiversity. Silvicultural systems would include the 'classical' systems of clearcutting, group selection, shelterwood, strip system, single tree selection, agro-forestry, short rotation coppice and combinations of these, as well as more ecologically sympathetic systems such as native and semi-native woodlands and the mimicking of natural disturbances. At this stage in the development of forestry in Ireland, consideration of many silvicultural systems at the county level would prove almost impossible, due to the lack of sufficient experience. Rather, it is more realistic to carry this out at the site level. Nevertheless, with time and experience, this factor of the pragmatic side of the model should be more attainable.

Where forestry capabilities have not been realised with existing forests, the zones will also have implications for restocking. The provision by forestry capability zones of the option to redesign existing forests for improvement represents a major opportunity for Irish forestry during the coming decades.

In relation to administrative control of forest landscape planning and design, the objective here is to establish an objective 'open book' of actual land capability for species and silviculture. This would be particularly useful to non-foresters such as planners, landscape experts and NGOs, who would otherwise have to struggle without sufficient technical expertise. It thus becomes a necessary starting point for all interested parties, whether investor, forester, planner or landscape designer. But rather than attempting to provide a categorical and definitive classification, it would be general and indicative.

Model Component 2: Landscape aesthetic character assessment for enhancement potential

Complementary to the scientific capabilities for forestry in a given landscape is the potential for alteration and aesthetic enhancement of landscape character by forests. This potential is identified during the assessment process. Recommendations in regard to enhancement would be facilitated by reference to, and adaptation of, generic landscape typological guidelines. The latter guidelines, as indicated in the model, would be developed independently of the strategic assessment.

The physical features and characteristics of landscape identified earlier in establishing landscape character areas can now be assessed to gain the understanding necessary for such alteration and enhancement in relation to planning and design. This can be achieved to some degree by using visual criteria similar to that employed by the USDA Forest Service (1995), the Forestry Authority (1994) and the Forestry Commission (1992a), involving various ways of interpreting landform and landcover analytically. It is, however, the sum of the parts which gives the sense of landscape and its integrity of character, and which provides the grounds for a sympathetic forest landscape planning and design response (McCormack and O'Leary, 1995). For now, an understanding is sought of the particular visual expression which the physical indicators give as perceived within a viewshed from the ground in each landscape area. While the criteria previously used to determine landscape character areas (i.e. scale, visual dynamic, complexity, pattern and image) would be used to examine the landscape in relation to its aesthetic quality and integrity of character, subjectively apprehended landscape meaning should also be interpreted as part of the assessment process.

Indication of the potential for landscape enhancement by forestry is expressed in landscape spatial planning and design terms. More fundamental from a planning perspective is the capacity of landscape types to absorb forestry without loss of character integrity. This capacity is determined by complexity of landform and landcover. Alternatively, the possibility of changing the existing landscape character by forest cover to produce a new character, can be considered. The criteria proposed for forest landscape planning are *extent* (involving the factors of *scale* and *size*) and *disposition* (involving the factors of *arrangement* and *location* of forests within the visible landscape). The greater the extent of cover, the greater the probability of landscape character transformation. Whether small, medium or large, the scale of cover is a function of the scale of the landscape concerned. What seems large in one, therefore, may not be so in another. For example, a forest of 69 ha, just below the threshold for an environmental impact statement, would completely cover a valley such as Glenmacnass, Co. Wicklow. Meanwhile, smaller areas of afforestation can incur a very significant adverse impact upon large-scale open landscapes, depending upon size and disposition in the landscape.

Complementing a strategic approach to forest landscape planning is the design of individual forests, concerning the degree of contextual integration as well as whether the forest is natural or human-influenced in design expression. As part of the assessment process for the strategy, therefore, an indication of a number of enhancement possibilities would be made for each landscape character area articulated using the criteria of forest *configuration* and *composition*. Configuration covers the design factors of *shape*, *pattern*, *proportion* and *edge*, while composition covers *margin*, *texture* and *colour*.

It should be recalled at this point that, with the development of the planning and design guidelines independently, a selection of prototypical scenarios based on landscape character types, comprising a range of possible solutions, would be available as the 'touch stone' against which the specific landscapes being assessed can be related. These should not be regarded as prescriptive, for flexibility of choice is important both as a matter of principle and for practicality. Regardless of an intrinsic tendency within a given landscape character type towards the naturalistic or the human-influenced, interpretation and adaptation of forest landscape guidelines are inevitable in response to a host of possible variables.

The forest planning and design criteria and their factors are defined below. They are the tools in the forest planning and design process for responding to landscape character and determining design expression. Finer qualification would also be made depending on the sensitivity of the area, as discussed later (Tables 1 and 2).

Planning criteria

Extent (landscape character capacity to absorb change): Extent contends with the amount of forest cover in the landscape relative to the overall visible distance. It is the criterion for the control of afforestation in relation to the alteration of existing landscape character, and comprises:

- *Scale:* Overall area of forest cover, expressed as a percentage in relation to the openness of landscape (landscape character type or viewshed), as determined by landform complexity. It is a major determinant in regard to the preservation or obliteration of existing landscape character.
- *Size:* Area of individual forests. The greater their area, the more likely they are to coalesce into continuous units and so affect the perceived visual dominance.

Disposition (articulation of landscape character): Disposition focuses on where forests are in the landscape and how they spatially relate to each other. It comprises:

- *Arrangement:* Spatial relationship of forests throughout the landscape relative to one another, ranging from the unitary to the scattered. This will determine whether the character is one of continuous homogeneity or piecemeal. It will especially affect landscape visual dynamic or flow, as well as continuity of landcover.
- *Location:* Position of a forest or forests in a landscape, providing visual structure and articulation to certain parts of the landscape character concerned. For example, the location of forests on a valley floor and perhaps extending up part of the adjoining slopes may prove optimal in terms of silviculture, practical regarding management, and enriching from both an ecologically and aesthetical perspective.

Design criteria

Configuration (spatial structure and silviculture): The criterion of configuration shifts the focus from relative extent of forest cover to the intimate design of the forest itself as part of the landscape. It is concerned with the aesthetic relationship of the forest, both the overall mass and compartmental subdivisions, to context, and comprises:

- *Shape:* Outline of the forest or the forest footprint, ranging from organic curvilinearity to geometric rectilinearity, and concerning the plantation externally as an overall mass and internally in relation to compartments, as defined by roads, rides, fire breaks and clearings.
- *Pattern:* The combination of canopy and clearings (or solid to void), and their relative area and disposition, involving, for example, deer lawns and open areas for roads, rides and fire breaks.
- *Proportion:* Size of constituent components of the forest relative to those of the surrounding landscape, involving compartments or blocks as might be delineated by roads, rides and fire breaks, and also clearings, projections and recesses.
- *Edge:* The juncture of the plantation and open ground, concerning the spatial disposition of trees at both the external and internal peripheries. Edge treatment could range from dense straight to open structured recess and projections, and may include outliers, ranging from straight densely packed edge to loosely formed scattered outliers.

Composition (species selection and species and age structure): This criterion completes the basis for design by establishing the structure and content of the forest canopy, i.e. the species and their location throughout the forest. Here, the forest and the surrounding landscape can be aesthetically blended through species selection and silviculture.

- *Margin:* The peripheral zone with respect to species, whether monocultural or mixed, uniform in height or multi-layered with age class differences and scrub.
- *Texture:* Three-dimensional variation of the canopy surface due to species and age diversity.
- *Colour:* Chromatic variation, whether involving the subtle differences between conifer species or the stronger contrast between conifers and broadleaves.

Model Component 3: Landscape values and sensitivity assessment

To realistically seek ways of encouraging well-designed forests, we require not only a sound basis for developing alternative forest landscape scenarios, but also a means of constraining or qualifying these alternatives. Landscape values, therefore, must be identified

and then evaluated regarding the degree of sensitivity to indicate the need for planning and design constraints. Of the three components, it is in the identification and assessment of values that parallels can be drawn with the environmental capital approach (CAG and Land Use Consultants, 1997).

This assessment involves identification and evaluation of environmental attributes, services and functions of the features and characteristics established earlier. It involves both desk studies and field work, using ordnance survey 1:50,000 and 1:25,000 scaled maps as well as amenity maps, national designations, county development plans and special studies and reports. All of these provide an indication of viewer numbers, road class and structure, and information on landform and features, including water bodies. Substantiation of the sensitivity classification may be achieved from national or foreign public survey data (including attitudes, preferences, opinions or behaviour) (McCormack and O'Leary, 1997), local consultation and from poetry, prose and paintings.

Issues pertaining to social sensitivity, for example, could be: the popularity of an area; its educational function or potential; its economic role in the locality or region; the existence value of, and public interest in, the landscape; and social interconnection between remote or isolated houses (McCormack and O'Leary, 1997). Values which pertain more specifically to landscape might be the aesthetic quality, the prevalent sense of nature, representativeness, typological rarity, context, water catchment, tourist routes and log transport links to processing centres. Ecological integrity would also be considered and could be important at the small scale. Cultural use patterns, whether as an existing or historic process, as well as ancient and historic structures such as discrete artefacts, are also values and indicate possible sensitivity. A landscape could be highly valued simply due to the publicly perceived significance of a single structure, such as a pre-historic site or a stately manor house. Areas of significance to the public also include those already designated, such as Areas of Outstanding Natural Beauty (AONBs), Special Areas of Conservation (SACs), Areas of Special Amenity (ASAs), Natural Heritage Areas (NHAs) and Special Protection Areas (SPAs).

Evaluation of sensitivity involves more than simply determining a general sense of importance of the issues concerned. The assessment must also consider, for example, the degree of importance (whether low, medium or high), the scale of importance (whether local, regional, national or international), and the people affected. In addition, consideration should be given to whether there are enough of the attributes, services and functions for both now and the future, and also their substitutability (CAG and Land Use Consultants, 1997). In regard to the latter, assuming, for example, that biodiversity or recreational facilities in an area are important but will be adversely affected by harvesting, the question of whether the loss would be balanced by the provision of the same close by, could be considered. Thus, the concept of substitutability introduces flexibility to the process of planning and design, and this is important for a proactive approach.

While substitution options can be quite precise for a specific development proposal, they will tend to be general for strategies. Furthermore, identification of attributes, services and functions will depend upon the availability of data. Notwithstanding these possible limitations, it is important to introduce into the process the criteria and rigour of application necessary for a thorough and balanced assessment, such as those proposed by the environmental capital approach. With time, data will increase and expertise improve, and the process can be more fully realised.

Sensitivity classes

Five classes of sensitivity are proposed to achieve equanimity towards forestry in regard to strategic landscape planning and design. Together they should also provide a practical framework to which various kinds and degrees of sensitivity can relate, and from which their implications can be determined. These classes are as follows:

Class I – Low sensitivity: Commercial: These landscapes are of low sensitivity due, perhaps, to flat terrain, poor visibility or low public significance, and often comprise fertile and marginal agricultural plains. Commercial forests would be acceptable with relatively few aesthetic constraints. Monoculture and clearcutting would normally be acceptable. In addition, forest roads could be laid out for operational optimisation. In typically flat terrain, the key to success would usually be well-designed external edges, as a screen to sensitive areas adjacent to the site. Particular attention should be paid to public roadsides and the interface with adjacent homesteads. Design emphasis will be on configuration, especially in relation to edge. Typically, forests in these landscapes would be designed by a forest manager with basic training in forest landscape design.

Class II – Moderate sensitivity: Commercial: Landscapes in this class are of moderate sensitivity, likely due to either undulation and elevation of landform or high viewer numbers and public interest. Management practices would involve, for example, phased and contained operations to minimise aesthetic and environmental impacts. Besides including the particular concerns of Class I, the forest in its entirety would be addressed in regard to its relationship with its surrounds as well as its pattern, i.e. the creation of clearings within the canopy. This would also include the location, frequency and direction of forest roads, ride lines and fire breaks. Furthermore, it would encourage species diversity and suggest modest constraints upon thinning and harvesting practices. One fundamental objective would be to ensure that forest landscape design guidelines are adhered to in detail throughout all aspects and stages of the forest rotation, in order to achieve modest impact. Forests in this class would be designed and monitored by a forester with substantial training in landscape design.

Class III – High sensitivity: Commercial: Forests in these landscapes can be commercial but should explicitly provide visual quality. This class would apply to highly sensitive landscapes which are scenically attractive, and also to those which are visually intense such that landform structure strongly defines a viewshed. A clearly articulated valley or deeply incised fjord would be examples of the latter, as would a large dominant mountain standing in relative isolation and commanding the surrounding space. In these cases, it is not sufficient to consider the aesthetic impact of management and species simply within the forest and its immediate context. Instead, one must step back to examine its relationship to the larger landscape context. As the forest must be visually integrated into the broader landscape, consideration should be given to its impact on the landscape as a whole, in relation not only to its design configuration and composition, but also to its planning scale, size and disposition. The objectives would be to ensure that commercial forests and their management practices would respond to the character of sensitive viewsheds, and that their management would reflect very high standards of planning and design. Species selection, silvicultural systems and all aspects of management should come under very careful consideration, in order to avoid adverse aesthetic impact and to ensure enhancement. The forest should not conflict critically with any of the values identified. These forests would be designed and monitored by a forester in conjunction with a relevant professional, such as landscape design or ecology experts.

Class IV – Special landscape: Conservation: Only non-commercial forests providing

recreation or reserves for wildlife would be permitted in this class. Typically, designation to this class would be due to landscape quality, recreational or cultural value, or ecological significance. In many cases, such forests will already be in existence as popular amenities, such as forest parks, or might be zoned, for example, as SACs, NHAs or AONBs. It would be desirable that existing commercial forests at such locations be converted entirely or in part to provide an amenity or a nature reserve, although this has implications for compensation. A strong sense of naturalism would be required in these landscapes, usually involving an abundance of broadleaves. While forests would not necessarily comprise purely native species, diversity would be expected. Typically, these forests would be designed by landscape or ecology experts in conjunction with a forester.

Class V – Unique landscape: Retention: This class addresses landscapes, whether with or without forests, in which avoidable change is not acceptable. This could apply where, for example, national or local authorities as well as public awareness have recognised the beauty or uniqueness of landscape character, or where land use is of historical or cultural importance. Thus, the concern could be for the preservation of a landscape type for reasons of amenity, cultural or spiritual significance, aesthetic value or ecological uniqueness. This may include, for instance, visually pristine, pure and undefiled barren and treeless landscapes such as an open moorland, or perhaps simply representative examples of landscape types which might be in danger of being lost due to change. The objective would be to retain or, if necessary, restore the essential integrity. In most cases, the landscapes concerned will comprise SACs, NHAs or AONBs. Some landscapes, however, may not be designated yet obviously warrant maintenance to sustain their intrinsic qualities. A forest would be deemed to be an unacceptable intrusion and disruption of existing conditions, and would not be permitted. In such instances, common sense must prevail and a sound understanding or agreement be reached between the deciding parties, namely the Forest Service, the local authorities and, where the land is not public, the private landowner. The legal complexities of precluding afforestation by private owners must be considered against the duty to ensure the preservation for posterity of a variety of landscapes and of special landscape qualities and characteristics.

Strategic forest landscape planning and design recommendations

The earlier identification of landscape enhancement potential, produced from the assessment of the second component of the model, now becomes the basis for the development of forest landscape planning and design recommendations. This potential, however, must be qualified by the other two components concerning forestry capabilities and kinds and degrees of sensitivity. The interaction of the three components of the model is indicated in the lower portion of the model illustrated in Figure 2.

From the results of the physiographic assessment, greater accuracy of design can be achieved in relation to both configuration and composition. The practical implications of the former are directly determined by silvicultural systems, while the latter is considered in relation to species options. The results of the values and sensitivity assessment will influence planning in regard to the acceptability of forestry and, if so, the kind and extent appropriate. Following through from the kind of forestry appropriate, values will also influence design configuration and composition in response to possibilities such as the common perception of the landscape as open, accessible and remote or as a place of work and production, or the degree to which biodiversity is important or cultural values and

associations are prevalent. Forestry management practices will also be determined systematically as a result of this integrative process involving the three components of the model. From the first component, certain management practices will be implicit to the silvicultural and species capabilities identified, but their impact in relation to both aesthetics and sensitivity must also be considered and modified as appropriate.

It would be important to address each kind of value and its degree of sensitivity, as identified earlier, to determine how the planning and design strategy can respond to ensure sustainability. The approach adopted for this proposal is development-led. Sound forest planning, design and management are the goals, not limited forestry. Thus landscape enhancement is prioritised over, but does not override, a more defensive emphasis on conservation. According to this proactive approach to forestry, the results of the sensitivity assessment will not simply introduce constraints, but can more positively provide prompts for planning and design. As with all creative acts, decision makers and creators of forest landscapes need real contexts and conditions in order to educate and develop solutions.

The purpose of this integration stage of the proposed process is to assist forest planning in three ways. Firstly, it determines the acceptability of different types of forestry. If forest expansion is deemed appropriate in a given landscape, options include, for example, the purely commercial, commercial and visual amenity, or amenity and/or ecological conservation. Secondly, it can be used to determine appropriate design details (Table 1) and species, silviculture and management practices such as harvesting, thinning, brash deposition and forest road design (Table 2). Given the main focus of this paper on forest landscape aesthetics, the management constraints proposed reflecting different sensitivity levels are aimed at minimising adverse landscape aesthetic impact. Further constraints can be added later, based upon due consideration of each sensitivity class, to address the other areas of concern. The third function is to provide a structure for the content and level of detail required by both forestry and planning authorities, when submitting for approval and grant aid (Table 3).

The contents of Tables 1 and 2 are intended as examples of the possible implications of sensitivity. Rather than proposed standards degenerating into rigid prescription, they should be implemented simply for reference without legal or regulatory enforcement, thus providing useful assistance to all concerned bodies. It should be noted that the suggested administrative requirements in Table 3 could be further developed to provide the basis for a self-assessment process in relation to landscape impact. Different levels of detail should be required in formal submissions, corresponding to the differences in sensitivity. Accordingly, more information, in the form of both graphic simulations and written assessments and specifications, might be required for a site in a landscape of high sensitivity. Such a process could obviate the need to prepare a complete environmental impact statement where the assessment of other impacts might not be critical. It would ensure that the landscape impact of each proposal would be assessed according to the sensitivity class concerned.

The final outcome of the model would be a clear indication of desired afforested landscapes at a regional or county scale in the form of a forestry strategy. The resulting document would parallel and complement a conventional county development plan. It would not be prescriptive, but rather would serve for consultation, providing a starting point for ultimate compromise by all parties concerned.

Table 1. Forest planning and design alternatives in response to landscape character and sensitivity.

Planning		<i>Limited cover</i>	<i>Extensive cover</i>
Relationship to macro context		←	→
Extent	<i>Scale</i>	% Cover expressed as a percentage of landscape character area %	
<i>Character integrity</i>	<i>Size</i>	Small (confined)	Small-medium Medium-large Large (extensive)
Disposition	<i>Arrangement</i>	Occasional	Scattered / frequent Continuous
<i>Character articulation</i>	<i>Location</i>	Focus forests in certain parts of the landscape	
Design		<i>Human-influenced</i>	<i>Naturalistic</i>
Relationship to immediate context		←	→
Configuration	<i>Shape</i>	Rectangular	Rectangular-curvilinear Curvilinear Interlocking
<i>Spatial structure</i>	<i>Pattern</i>	Uniform	Occasional clearings Frequent clearings Parkland
<i>including silviculture</i>	<i>Proportion</i>	Not corresponding to context Corresponding to context	
	<i>Edge</i>	Solid / dense	Open Diffuse
Composition	<i>Margin</i>	Coniferous	Broadleaf Mixed Scrub included
<i>Species structure</i>	<i>Colour</i>	Homogenous Peppered Mottled drifts	Deciduous species included
	<i>Texture</i>	Dense Fine variation	Coarse variation (drifts) Graduated drifts

Table 2. Forest management practices in response to landscape character and sensitivity.

Management Practice		<i>Evident</i>	<i>Inevident</i>
Relationship to immediate context		←	→
Shape and Edge	<i>Roads</i>	Straight	Curvilinear Curvilinear and diffuse
	<i>Rides</i>		
	<i>Fire breaks</i>		
Surface	<i>Thinning</i>	Regular lines	Irregular lines and single trees Single tree selection
	<i>Brash</i>	Scattered	Windrows Burnt / chipped Removed
	<i>Boulders</i>	Visible	Not visible
	<i>Boundary zone</i>	Distinct	Indistinct

Table 3. Suggested administrative requirements for sensitivity classes.

	Class I	Class II	Class III	Class IV	Class V
Description	Low sensitivity	Moderate sensitivity	High sensitivity	Special landscape	Unique landscape
Objectives	Commercial	Commercial	Commercial / visual amenity	Amenity Ecology Culture Social interconnection	As existing
Professional involvement	Forester with some training in landscape principles	Forester adequately trained in landscape principles	Forester adequately trained plus landscape expert	Forester plus ecologist / amenity expert	Not relevant
Graphic submission to Forest Service*	As per current standards with maps at min. 1:10,560	Maps at min. 1:10,560 and specific details for special locations at 1:2,500 as well as photographic overlay visual simulations from min. two VRPs† depicting phases in rotation	Maps and plans detailed at 1:10,560 - 1:2,500 and photorealistic visual simulations from all VRPs depicting phases in rotation	Maps / plans and sections detailed at 1:10,560 - 1:500 depicting ecological / amenity management plan	Not relevant
Specification submitted to Forest Service*	List species and outline silvicultural & management systems proposed	Detailed description of species, silvicultural & management systems proposed	Detailed description of species, silvicultural & management systems proposed. Consideration of windthrow to be evident	Detailed ecological / amenity management plan	Not relevant
Aesthetic assessment and justification submitted to Forest Service*	Not necessary	Outline landscape architectural assessment of and response to both site and context concerning all rotation phases	Detailed landscape architectural assessment of and response to site and context concerning all rotation phases	Not necessary	Not relevant

*Note: Under existing legislation, a forestry proposal would be reviewed by both the Forest Service and the relevant Local Authority under the following circumstances:

- (a) If the proposal is greater than 25 ha (if development is greater than 70 ha, an environmental impact assessment would also be required).
- (b) If the development is located in an area deemed to be 'sensitive' by the Local Authority.

† VRP or viewshed reference point representing a key viewing area, such as a road or a golf course.

Implementation

Our profession needs a proactive, environmentally responsible, economically reasonable approach to regulatory proposals... Foresters must take the lead in regulation if they are to be land managers and stewards, not just technicians controlled by other citizens, professions and politicians.

(Cubbage, 1991)

A fundamental question regarding the achievement of sound forestry is the degree to which legislation should be introduced and strict controls imposed. In considering the effectiveness of legislation for the USA, Cubbage (1991) points out that it can range from being "a toothless model law" likely to be ignored, to a rigorous model likely to restrict the necessary freedom for adaptation to individual conditions. Against a background where different environmental groups have successfully brought numerous lawsuits against the USDA Forest Service, environmental protection agencies and private landowners, the same author advocates formalised co-operation and consensus rather than regulation. Furthermore, he advocates a careful public relations effort, the concerted education of all foresters and land managers, and the implementation of the concept of best management practices.

In Ireland to date, considerable freedom exists for landowners regarding the extent, configuration and composition of their forests. Control by the Forest Service, as the governing body, is exercised through grant aid, but also through guidelines, licences and incentives. These together provide a controlling mechanism which is seen as preferable to one of rigid demands and imperatives. Certainly, the possibility of introducing a legislative mechanism for the implementation of forest planning control and design guidelines cannot be undertaken lightly. But some regulation, including that backed by law, is necessary.

As is evident from the contents of this paper, planning and design of forestry involves the identification and subsequent reconciliation of a complexity of factors. One way of achieving this is by interaction of the relevant expertise in an attempt to achieve optimisation of forest landscape enhancement, as well as adaptation to specific circumstances. The GIS-based FIPS will provide a medium for the realisation of this interaction.

Conclusion

The urgent need to develop ways in which appropriate standards for forestry in the landscape can be established, whether through planning, design, management or operations, is clearly evident, given the current climate of 'bottom-up' public pressure and 'top-down' pressure on local authorities by government departments. The development and implementation of forest landscape planning and design tools will have positive consequences for much of the Irish countryside, particularly in scenic areas. It will also have consequences for forest productivity. For example, design and management constraints might entail a certain amount of loss in forest cover or management efficiency at the site level. At the broader landscape scale, however, the greater acceptability of forestry by the public, arising from landscape enhancement and improved recreational opportunities, will result in a net gain in the form of increased forest cover. Care must be taken, however, to avoid encumbering the whole process, due to onerous statutory procedures in applications for approval or even appeals.

Some of these procedures could be obviated by providing a common reference for all concerned, comprising forestry capability zones, a comprehensive set of guidelines covering forestry in a representative selection of landscape types, and categories of requirements in relation to values and their sensitivity. These would add to existing forestry control mechanisms such as the various grant schemes, tree felling licences and environmental impact assessment requirements, and would thus contribute substantially towards the establishment and achievement of overall forestry standards. The entire process, as depicted in the proposed model, could draw together foresters, planners, landscape architects and administrators, as well as other expert and interested parties. The process could thus provide the basis for consultation, involving conciliation and compromise. Flexibility in both interpretation and application of landscape objectives at the site-specific level would be inherent to this process. Accordingly, the use of common reference material such as guidelines and sensitivity classes must be one of indicative performance, not rigid prescription.

At this point in the development of forestry in Ireland, the opportunity exists to achieve an overall synthesis of policies, structures and measures to ensure that a balance is achieved among the issues facing forestry. As far as landscape is concerned, forests need not be a problem, but rather can act as a major force in landscape enhancement and as a medium for the aesthetic experience of nature. It is very important to rise to the challenge by developing forestry in Ireland in a way which is decisively proactive. While referring specifically to USA, the following quotation captures something of the complexity of this challenge:

We need at this moment, as much as any country ever needed, the development which makes clear the influence of nature upon intellectual and spiritual life; an integration that involves science, the arts, and human interest in order to give clear expression to what is most significant in our relation to nature.

(Smith, 1936)

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