public that is likely to judge forestry by its appearance.

See also: **Landscape and Planning**: Perceptions of Forest Landscapes; Perceptions of Nature by Indigenous Communities; The Role of Visualization in Forest Planning; Visual Resource Management Approaches. **Recreation**: Inventory, Monitoring and Management.

Further Reading

Appleton J (1996) *The Experience of Landscape*. Chichester, UK: John Wiley.

Bell S (1999) *Landscape: Pattern, Perception, and Process*. London: E & FN Spon.

Brown TC and Daniel TC (1986) Predicting scenic beauty of timber stands. *Forest Science* 32(2): 471–487.

Crowe S (1966) *Forestry in the Landscape*. Forestry Commission Booklet no. 18. London: HMSO.

Gobster PH (1995) Aldo Leopold's ecological esthetic: integrating esthetic and biodiversity values. *Journal of Forestry* 93(2): 6–10.

Institute of Environmental Assessment/The Landscape Institute (1995) *Guidelines for Landscape and Visual Impact Assessment*. London: E & FN Spon.

Litton RB Jr. (1968) *Forest Landscape Description and Inventories*. US Department of Agriculture Forest Service Research Paper no. PSW-49. Berkeley, CA: US Department of Agriculture, Pacific Southwest Forest and Range Experiment Station.

Lucas OWR (1991) *The Design of Forest Landscapes*. Oxford, UK: Oxford University Press.

Province of British Columbia, Ministry of Forests (1996) *Clearcutting and Visual Quality: A Public Perception Study*. Victoria, BC: Range, Recreation and Forest Practices Branch, Province of British Columbia, Ministry of Forests.

Province of British Columbia, Ministry of Forests (2001) *Visual Impact Assessment Guidebook*, 2nd edn. Victoria, BC: Forest Practices Branch, Province of British Columbia, Ministry of Forests.

Sheppard SRJ (1989) *Visual Simulation: A User's Guide for Architects, Engineers & Planners*. New York: Van Nostrand Reinhold.

Sheppard SRJ and Harshaw HW (eds) (2001) *Forest and Landscapes: Linking Ecology, Sustainability and Aesthetics*. Wallingford, UK: CAB International.

Smardon RC, Palmer JF, and Felleman JP (eds) (1986) *Foundations for Visual Project Analysis*. New York: John Wiley.

US Department of Agriculture Forest Service (1973) *National Forest Landscape Management*, vol. 1. *The Visual Management System*. Agriculture Handbook no. 434. Washington, DC: US Government Printing Office.

US Department of Agriculture Forest Service (1974) *National Landscape Management*, vol. 2. *The Visual Management System*. Agriculture Handbook no. 462. Washington, DC: US Government Printing Office.

Visual Resource Management Approaches

S Bell, Edinburgh College of Art, Edinburgh, UK

Background and History

The issue of visual resource management in forestry largely came to prominence after World War II, as the increasing network of highways and mass car ownership enabled large numbers of people to explore the countryside or natural landscapes of North America, Europe, and other developed countries. This period also coincided with greatly increased forestry activity such as afforestation programs in Britain, Ireland, and New Zealand and with increasing levels of timber harvest in the USA, Canada, and Scandinavia, especially on public lands. By the mid-1960s public concerns over the appearance of both newly planted forests and logging operations had increased, prompting agencies such as the British Forestry Commission and the US Forest Service to look for ways in which to safeguard the landscape. The models developed in Britain and the USA followed different routes, partly due to the scale of the forests and forest operations but also reflecting the type of forestry.

The US Model

In the USA logging took place (and still mainly takes place, at least in the National Forest System) in extensive natural forests, where the visual impact of sudden changes to the scenery, occurring over a large-scale landscape, can be very great. While the impact of an individual cutblock could have a negative visual effect, the cumulative impact over large areas was often considered to be greater still. This prompted the development of an approach to suit the scale of the landscape, the extent of the forest, and the need to try to control the rate of landscape change and its degree of impact, an approach that is generally referred to as 'visual resource management' or VRM. This approach aimed to manage the level of impact of logging on the natural scenery, especially as seen from key viewpoints, and this led to a highly developed visual management system intended to prioritize areas within large tracts for different levels of scenic protection (described below in more detail).

The UK Model

In Britain, the program of afforestation led to significant landscape change but each new planting project was relatively self-contained and there was

some degree of flexibility over the layout of such forests. Owing to the fact that conserving an existing landscape was not an option, and considering the freedom to create new landscapes offered to the foresters of the time, a design-led model was developed following the appointment of a landscape architect, Sylvia Crowe, to be a consultant to the Forestry Commission, which aimed to use creative landscape design to produce new forest landscapes of good visual quality to fit into the landscape, especially as seen from significant public viewpoints. This is referred to as the 'proactive design approach.'

The Picturesque and the Natural

Although these approaches are generally quite different, they do have some similarities. Both models emphasized the value of the scenic, external mode of landscape experience. Viewers observe the scene from a distance and the aesthetic quality is associated with the notion of the picturesque, the landscape aesthetic model that emerged in the late eighteenth century and which for the first time celebrated the wild beauty and sublime qualities of untouched nature. Viewers expect to see 'natural' scenery and the presence of unnatural elements disturbs the quality (although in many countries, especially Britain, there is no actual natural scenery left). Design aspects were included in the American system, though not so highly developed and not so rigorously applied, while in Britain a degree of management based on relative sensitivity or landscape importance (based on visibility and numbers of likely observers) meant that some areas were designed more carefully than others.

Both Britain and the USA have hills and mountains that are highly visible from roads, settlements, hiking routes, and mountain summits, which partly explains the importance given to the scenic external mode of viewing and appreciation. Forest policy-makers and managers in other heavily forested countries with less dramatic topography, such as Sweden or Finland, where views of the landscape are confined more to forest interiors, did not feel a need to develop VRM programs to the same degree until much more recently. Nor did countries with forested mountains and high scenic qualities, such as Alpine countries, where the forests are managed by continuous cover or selection types of silviculture system. In these areas, although the landscape is highly visible and valued for its scenic, picturesque qualities, dramatic changes to the landscape tend not to take place because there is no clear-cutting, so that the perception of a never-changing natural landscape can be maintained.

The Former Soviet Union

In the countries of the Soviet bloc a much simpler approach was taken which remains in force in many of the former Soviet countries and in Russia itself. Here the forest was divided into three groups. Forests in Group One, accounting for some 25% of the forest area, include many forest reserves, protected for a variety of reasons, landscape and scenic value being one. In such reserves clear-cutting or any form of final felling is not permitted. Therefore, the landscape tends not to suffer dramatic changes, once more preserving the illusion of the never-changing character of the natural forest. Special landscape zones, where such landscape protection is applied, are frequently along roadsides, around cities and towns, and in other places where people can be expected to want the landscape to be protected. It was a highly centralized, regulation-based model, with no support from public preference studies or other evidence. Group Three forests are those where commercial exploitation is permitted (about 70% of the area) and Group Two forests represent an intermediate category. Such a system is effective at controlling the rate of landscape change in visually sensitive areas as long as the land is owned by the state and the central control is strong. Countries of the former Soviet Union, such as Latvia, which became independent and where much of the land was given back to its former owners, were forced to abandon such methods and look elsewhere (see below).

Following the development of the VRM systems in the USA and Britain, the other countries where these methods were adopted also tended to be where either large-scale clear-cut logging or significant afforestation took place in dramatic, highly visual landscapes and where the population expressed concern for the landscape (or where tourism in such areas was important). Thus, places like British Columbia in Canada, New Zealand, parts of Australia, and Ireland tended to be interested in developing similar systems. In the case of New Zealand, an early landscape design-based system was developed independently, whereas in most of the other cases it was adapted from either the USA or Britain, or included elements from both countries.

The Visual Management Approach

The US Forest Service developed a comprehensive system, starting in the 1960s and continuing through the 1970s. The first stage of development was to hire a researcher, R. Burton Litton Jr, to look at forest landscapes and to develop a visual resource

inventory and evaluation program. Following this a basic description, analysis, and classification system was developed and implemented. The system was presented in a series of booklets, the first of which explained how to consider a landscape, how to describe and analyze its various characteristics and it introduced some basic design principles, such as line, form, color, and texture and considered the effect of scale, light, time, viewpoint, etc. on how landscapes are perceived in order to introduce some rigor and rationale into the subject (**Figure 1**).

The second booklet presented a method of landscape inventory and analysis so that a forest area could be divided into landscape units, emerging from an overlay analysis, each with its own combination of visual character, visibility, and level of sensitivity. This enabled planners to ascribe a series of visual quality objectives (VQOs) to each landscape unit. For example, in a highly sensitive landscape – one that was very visible to a lot of people, with a high visual quality (often meaning an undisturbed canopy of climax mature forest) and no visible logging – the foreground area might be given the VQO of 'preservation' where no logging was allowed, and the middle ground area, a little further from the viewer, given a VQO of 'partial retention,' where some logging was permitted as long as it did not disrupt the character of the area and any visible logging was subordinate to the rest of the landscape. The base level of VQO for the least sensitive areas was always 'maximum modification,' which meant that logging could proceed free of visual constraints (in some ways the implementation of the system was very similar to the Soviet model, though with some democratic input at the forest plan approval stage). Subsequent books in the series dealt with more detailed aspects such as the design and layout of logging, roads, utilities, and range issues to minimize visual impact.

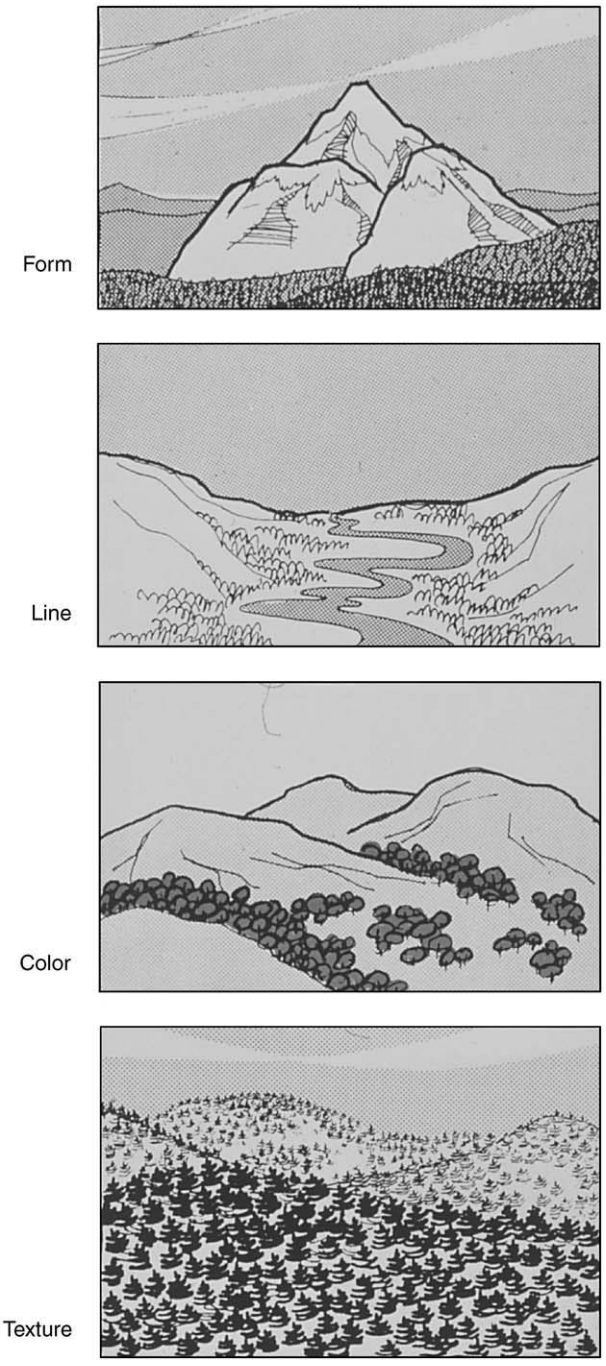


Figure 1 An example from the early US Forest Service visual landscape management system, presenting basic design principles for use in forestry. From US Department of Agriculture Forest Service.

Implementation

The implementation of this system was often prioritized for the visual portion of the landscape as seen from roads and key viewpoints (given that maximum modification was the baseline VQO supposed to be applied everywhere). Viewshed analysis identified what was and was not visible from a set number of viewpoints and the landscape was divided into units, analyzed, and given visual quality objectives. VQOs, set by experts, therefore represented the desired requirements for the visual resource, to be incorporated into the wider forest planning process which included many other resources, such as timber, water, wildlife, recreation, range, and so on. All these competing requirements had to be balanced and this led, in some circumstances, to the visual resource being overridden by other values.

As forest management came under increasing pressure from campaigners for biodiversity and the protection of endangered species (during the late

1980s and 1990s) ecological factors and ecosystem management began in many cases to supersede the significance of the visual and other resources. Logging in some forests of the Pacific Northwest was reduced in scale or ceased altogether for a time, so that changes to the visible landscape became less significant.

Scenery Management System

During the 1990s the system, then some 25 or more years old, was in need of an overhaul and the result was the Scenery Management System. This incorporated much of what was good about the original system but placed more emphasis on landscape character, which recognized the uniqueness of every area and the contribution made to it of cultural as well as natural features.

The current system starts with an Ecological Unit Description, sometimes called a mapping unit description, which represents the common starting point for both the Scenery Management System and for Ecosystem Planning. This was introduced in order to integrate scenery and ecosystem management to some degree and to overcome perceptions that the two aspects could be in conflict with one another. From the Ecological Unit Description an objective (i.e., factual) description of biological and physical elements is extracted, and combined with attributes for landscape character to produce a landscape character description. The idea is to be able to group the combination of scenic attributes that make each landscape distinct, identifiable and unique. This description provides the baseline or reference for the next stages, of defining scenic attractiveness classes and degrees of scenic integrity.

Scenic attractiveness classes are used to determine degrees of relative scenic value of different areas within a particular landscape character zone. There are three possible classes: A – Distinctive, B – Typical, and C – Indistinctive. The method of calculating relative scenic value is to describe the landscape elements that make up each character zone in terms of line, form, color, texture, and composition. Scenic integrity indicates the degree of visual disruption of landscape character. If a landscape has very low disruption it has a very high degree of scenic integrity and vice versa. There are six classes of scenic integrity, from Very High to Unacceptably Low.

The next stage examines the visibility of the landscape and takes into account two factors: (1) the relative importance to the public of various parts of the landscape and (2) the relative sensitivity of the scene based on its distance from observers. Relative importance to the public may come from a variety of sources, including special perception and preference studies. Constituent analysis (a technique for evaluating the views of different people) is used to gauge a level of public concern about aesthetic qualities, assessed as high, medium, or low. Distance zones of foreground, middle ground, or background are used to classify relative sensitivity.

The scenic attractiveness classes and landscape visibility data are combined to create Scenic Classes, ranging from 1 to 7, which indicate the relative importance or value of discrete landscape areas. These scenic classes are used during forest planning (**Figure 2**).

Landscape Value Maps

It is also possible to prepare a landscape value map using overlays in a geographic information system (GIS), in order to present the information spatially for use in various planning procedures. During the development of a plan for a forest area, the descriptive aspects of landscape character are used to develop landscape character options that are deemed to be realistic within the overall multi-objective forest plan. Once the forest plan has been adopted, the landscape character description becomes a management goal and the scenic integrity levels become scenic integrity objectives. These are very similar in nature to the previous visual quality objectives. The idea is that a given level of scenic integrity should not be reduced by forest activities, although it is also recognized that the degree of scenic integrity can change over time through natural landscape processes. In order to meet a specific integrity level and to carry out logging or road construction some design is needed. This is where the system is weakest: it provides very little guidance and few examples of how to achieve a satisfactory result.

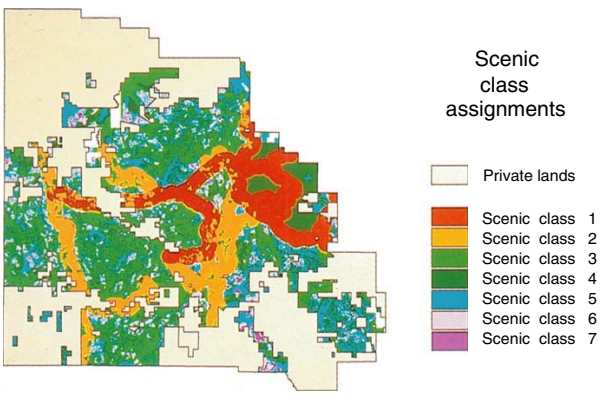


Figure 2 An example of a map showing Scenic Classes derived using the Scenic Management System. From US Department of Agriculture Forest Service.

There have been a number of spin-offs from the US Forest Service systems. The US Bureau of Land Management adopted the VRM system and also incorporated a systematic visual impact assessment process into it. This system was widely implemented during the 1980s and 1990s.

The British Columbia System

The VRM approach was also adopted by the Ministry of Forests of British Columbia, Canada. British Columbia is mountainous and densely forested, and also relies heavily on the timber industry for its economic well-being. In the early 1970s managers recognized that as more and more logging became visible on prominent mountainsides and from significant tourist routes, whether roads or shipping lanes, some kind of visual resource management was necessary. A landscape forester was charged, in 1979, with developing this based on the US Forest Service system, with many adaptations.

The system as originally developed and applied consisted of three steps. Step 1 is landscape inventory, where three elements are identified. The first is the identification of the extent of the landscape visible from established viewpoints such as roads, settlements, and recreation areas. The second element is the suite of landscape features present, both natural and human-made. The third element is landscape sensitivity, calculated from physical factors and viewer-related factors such as numbers of viewers, viewing distance, viewing duration, and perception.

Step 2 is landscape analysis, consisting of detailed mapping, the recommendation of VQOs, and the final establishment of VQOs by the forest manager, taking into account the other resource factors that have to be balanced against aesthetics. Step 3 is design and layout of roads and cutblocks, Step 4 is logging and silvicultural practices, and Step 5 is follow-up (**Figure 3**).

In 1997 a revised method was approved, moving to a more quantitative, numeric and prescriptive

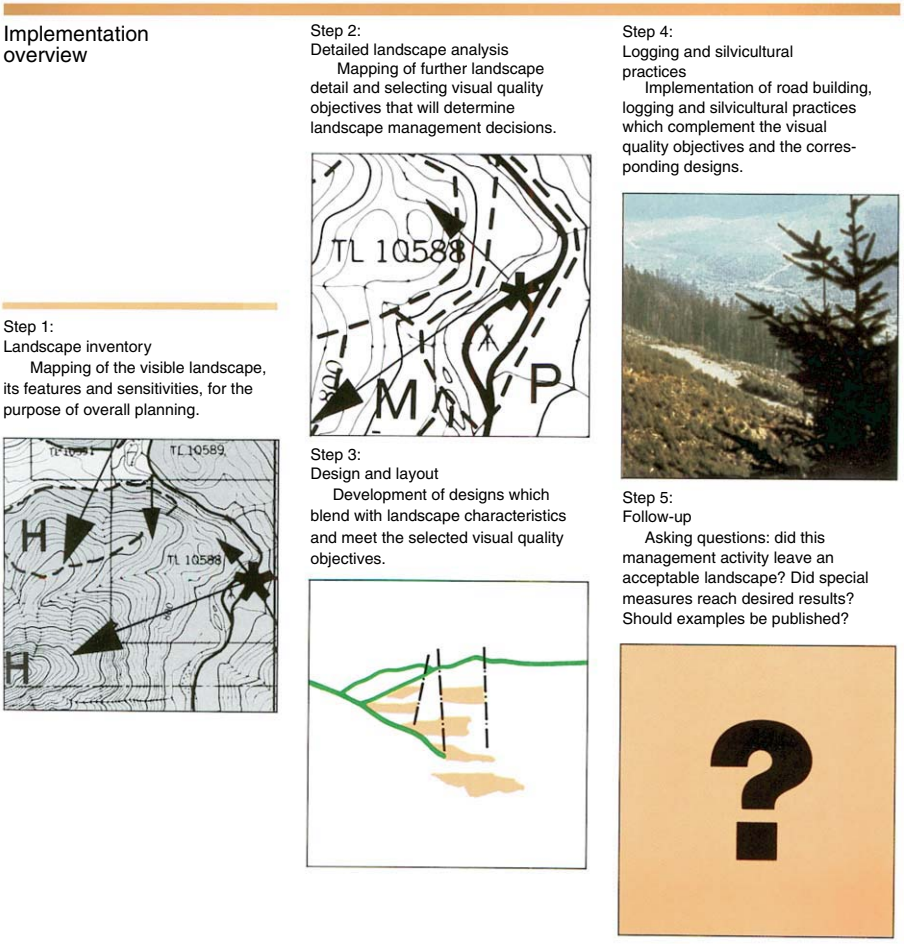


Figure 3 A section from the British Columbia Forest Landscape Handbook demonstrating the five steps of the original version. From British Columbia Ministry of Forests.

system of Visual Sensitivity Classes (similar to VQOs) within preidentified Visual Sensitivity Units.

The information is incorporated into the forest database on the GIS at each forest district and used to inform planners working for both the Ministry of Forests and forest licensee companies. By the early 1990s managers realized that the concept of visual management only achieved a limited level of landscape quality: it could direct how much harvest was possible in a given landscape unit but was not very successful at achieving good design. Thus a form of the proactive design approach was introduced to supplement the visual management system (see below).

Visual impact assessment is the logical development of the visual landscape management system in British Columbia. Where a timber harvest is being planned in a known scenic area with established VQOs, a visual impact assessment is required, in order to prove that the VQOs will be met. It is considered to be an integral part of Step 3 of the process described above. For this it is necessary to prepare a design for the proposed activity and to illustrate how it will look from established viewpoints using various simulation tools, and then to justify how it will meet the VQOs. This includes a qualitative assessment based on the adherence to design principles and also a quantitative assessment based on a concept of 'percent alteration,' where the proportion of the visual scene that will be altered by the proposal is calculated (in perspective, not plan). A table is used to assign allowable percentages in relation to different VQOs.

Australia

The US Forest Service system was also introduced into Australia. The states of Victoria and Tasmania adopted it and, especially in the case of Tasmania, developed their own variations. In Tasmania, the whole island has been divided into broad regional landscape character types. This was an integral part of the Visual Management System following US methodology, giving priority for visual management and generalized visual objectives to be achieved. It did not include design-based principles as in the UK but rather specified generic guidelines for various viewing situations and forestry related operations (**Figure 4**). The system is controlled by staff in the Forestry Practices Board, who regulate the environmental quality of logging proposals.

The most recent version of the Tasmanian Visual Management System incorporates a new tool for rating the importance of any area of the landscape and setting visual objectives to guide management, especially of the location and management of plantation forests. This is called the Rural Landscape Priority rating and has accompanying Plantation Landscape Objectives, which relate to three scales of the landscape and viewing. The new visual objectives are 'Integrated effect,' 'Codominant effect,' and 'Dominant effect,' based on the acceptable degree of influence of the plantation forest in the landscape.

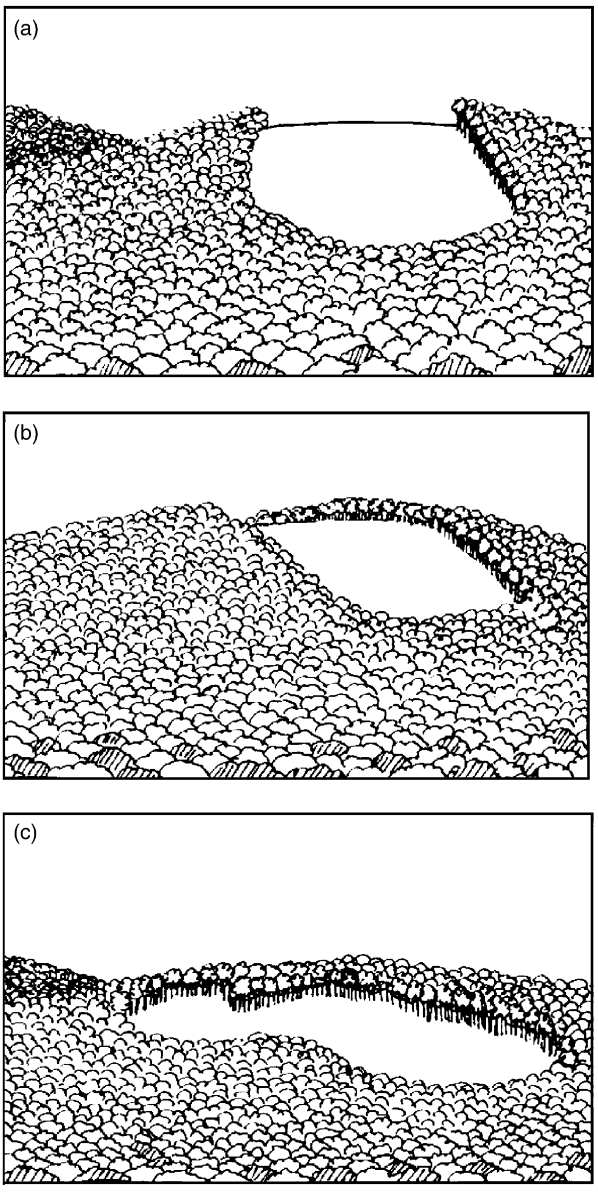


Figure 4 A sample of applied design from the Tasmanian handbook, demonstrating design in relation to a skyline. Skyline notches can have a strong visual impact even when seen in the distant background. (a) Skylines should not be cut directly across in the direction of the principal viewpoint, as the coupe edges will remain clearly visible for many years. (b) If skyline cutting is necessary, arrange the harvest at an angle to the main viewpoint. (c) The impact is lessened if the harvest is along, instead of across, the skyline. From Tasmanian Forestry Practices Board.

In the most sensitive landscapes the assumption is that the integrated effect would be appropriate using strongest adherence to positive design. However all three objectives require the application of principles taken from the proactive design approach (see below).

As an adjunct to the new visual objectives, local visual units are identified and corresponding landscape character attributes defined as a guide to forestry (**Figure 5**). The aim is generally to retain (and in some cases improve) the character diversity between different visual units by achieving specific designs for harvesting and establishment within each visual unit. This is being applied progressively to operations but could be most useful for strategic planning. Thus the management system evolved into a series of local design guidelines as well as incorporating the concept of visual quality objectives based on a viewing rating.

Computer Visualizations

The systems employed in the USA, Canada, or Australia also used early versions of computer visualization software to test the extent to which proposals for logging would meet the established VQOs (*see* **Landscape and Planning**: The Role of Visualization in Forest Planning). In this way a degree of quality control could be exerted in the design and approval process. More sophisticated visualization systems are now available to present much more realistic simulations, especially useful for public participation processes, public consultation, and visual impact assessment.

As well as the visual resource management methods described above for large-scale landscapes, some jurisdictions have developed guidance aimed at the smaller scale of individual logging operations. These concentrate on the leaving of screening belts along roadsides, reducing the impact of slash, ruts caused by harvesting machinery, and road construction. Attention to this kind of detail is important, especially when most views are from within the forest. US states such as New Hampshire and Minnesota have produced booklets describing such practices.

The Proactive Design Approach

In Britain, with its program of large-scale afforestation and, more recently, felling and replanting of its plantation forests, an approach has been developed based on designing forests to fit into the landscape. This originated in the 1960s, aimed mainly at new plantations of nonnative conifers that were being planted on bare, deforested hills and mountains. The original layouts were often highly regular, with

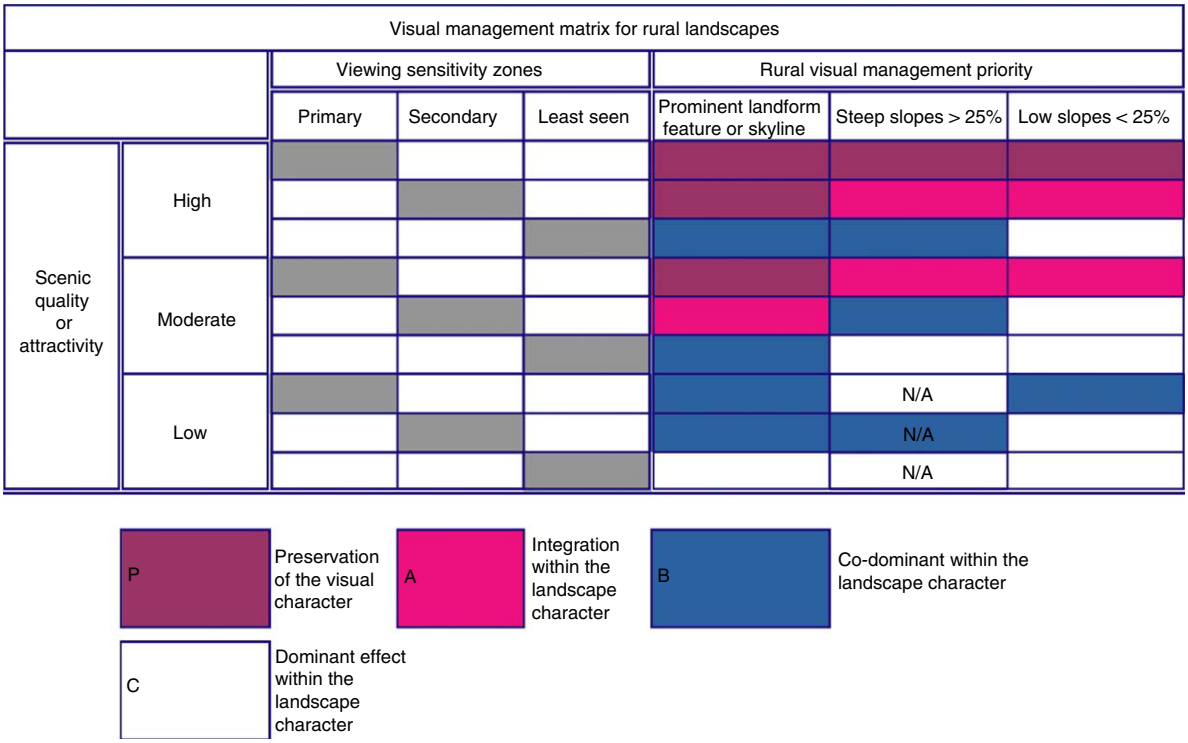


Figure 5 The new visual management matrix for rural landscapes, part of the Tasmanian system. From Tasmanian Forestry Practices Board.

rectangular compartments, vertical fence lines and horizontal upper margins where the trees were planted up to a contour line.

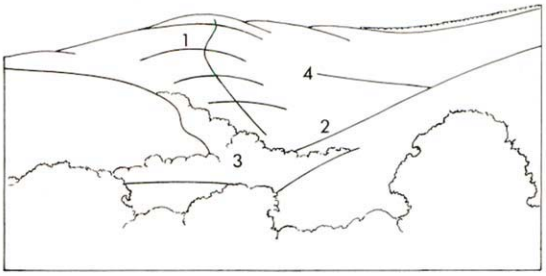
To overcome the artificial appearance of these forests a number of design principles were adopted from landscape architectural practice, for example considering the shape of the forest, its scale and proportion, the degree of diversity of different species, the unity of the forest with its surroundings, how it related to landform, and so on. These principles were developed from the initial work of Sylvia Crowe (**Figure 6**) by Duncan Campbell, Oliver Lucas, Simon Bell, and later generations of landscape architects working for the Forestry Commission.

By the 1980s many of the early forests were ready for harvest and the rate of new planting declined, so the focus shifted to designing the patterns of felling, and the opportunity was taken to use the process of gradually harvesting these forests to completely redesign them, especially if they had not had much design input at planting. At this point a series of detailed guidelines on forest landscape design were published, aimed not only at the state forest sector but also at private forest owners. These guidelines describe what standards are expected and how to achieve them (**Figure 7**). They set out the way the design principles should be applied to aspects of the forest layout but as they need to be interpreted to fit each unique landscape area, they avoid being too prescriptive.

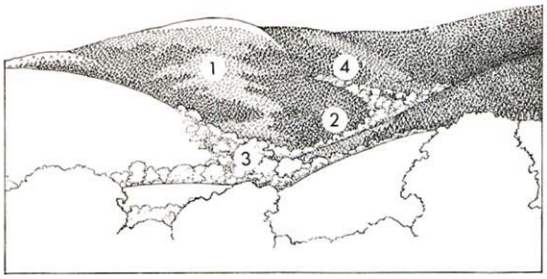
Forest Design Plans

This forest design approach was adopted in the early 1990s as the primary forest-level planning method to be used in Britain. Today, sophisticated 'forest design plans' are the main tool for planning and managing the forests, and they contain a significant element of

The great beauty of this landscape lies in the subtlety of the land-formation.



Analysis
The strongly modelled shoulder (1) flanks the amphitheatre-shaped valley (2). The drift of broadleaves (3) accentuates the composition whilst the forest road (4) cuts across it.



Solution
The modelling of the shoulder could be accentuated by larch (1). Broadleaves would accentuate the valleys (2), linking them to the existing trees (3). The encouragement of native growth at the sides of the forest road (4) curving down to join the valley broadleaves could permanently heal the road scar.

Figure 6 A sample from the first design book prepared by Sylvia Crowe for the British Forestry Commission. © Crown Copyright, reproduced with permission of the Forestry Commission.

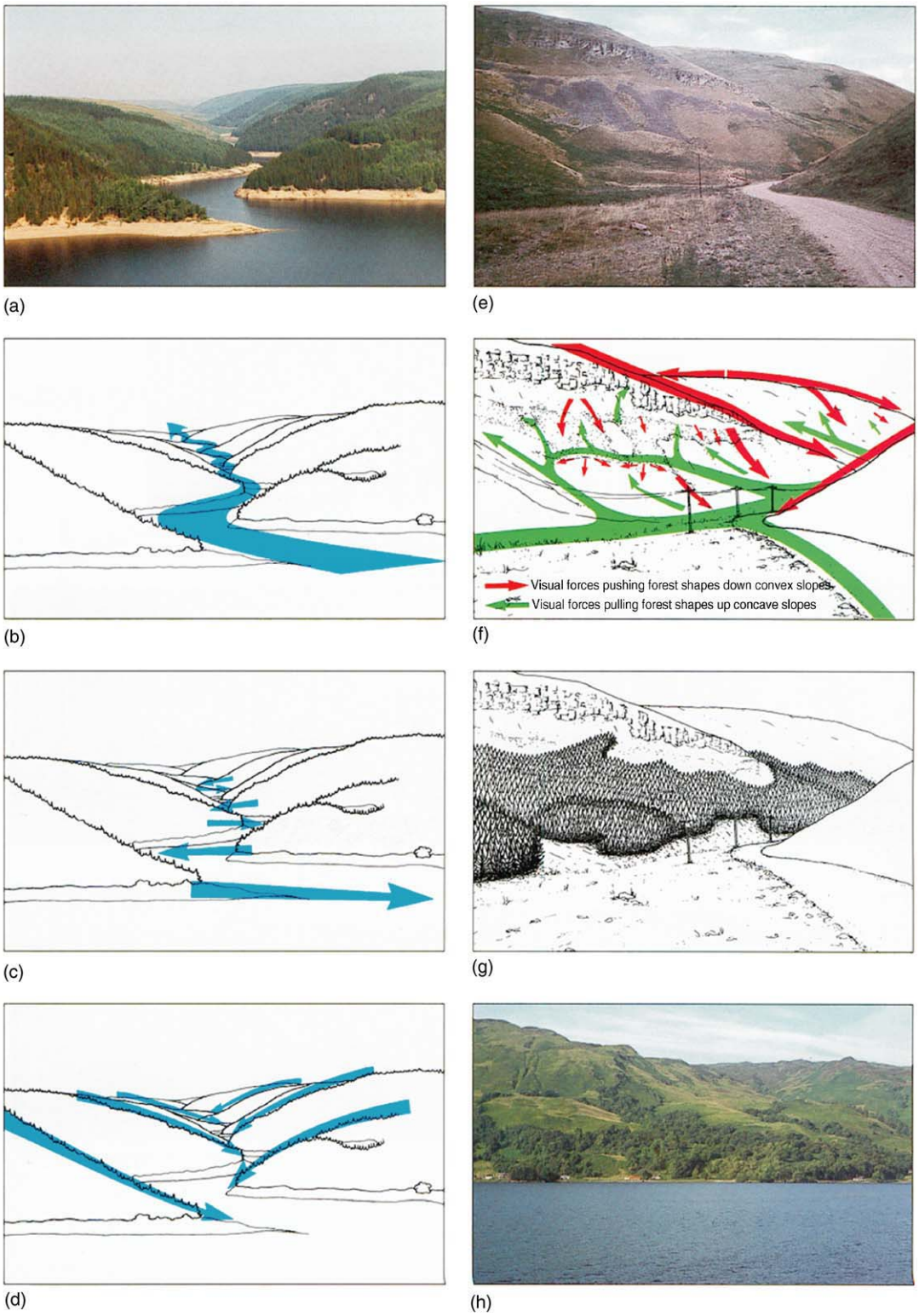


Figure 7 A sample from the Forest Landscape Design Guidelines. (a) Llyn Brianne, Dyfed. (b) The eye is drawn bouncing from one spur to another. (c) The spurs appear drawn together, each into the bay opposite. (d) The eye is drawn downwards on the spurs. (e) A landscape in Northumberland. (f) Analysis of visual forces. The strongest arrows illustrate the largest and most pronounced forms, the smallest the more subtle shapes. (g) The forest margin shapes responding to the visual forces creating a direct relationship between the forest cover and the landscape. (h) The effect of visual forces can be seen in this example at Ratagan where effects of grazing and burning have restricted the woodland to the lower slopes and valleys.

redesign to change the original monoculture, even-aged plantations into something more diverse and attractive.

The forest design planning system follows the well-established design process drawn from landscape architecture. Step 1 is to set objectives. These are not solely for visual quality but also for all the other resource values (this emphasizes the integrated character of this approach compared with the single focus on scenic aesthetics of many others). Step 2 is landscape survey (or inventory) where all the information needed for forest planning is collected. Step 3 is analysis. One key type of analysis is that of landscape character, using perspectives as well as plans (*see* **Landscape and Planning**: Visual Analysis of Forest Landscapes). This analysis is carried out by applying design principles as descriptors, especially focusing on the main components of the landscape and on the visual problems associated with the existing forest. Step 4 is to develop a design concept, which describes the overall strategy for redesign and the desired future character of the forest. Step 5 is more detailed design, where options for dividing the entire forest into coupes/cut blocks and for replanting it over time are developed and evaluated. The final design is presented using computer-based graphic simulation and submitted for approval in Step 6 (**Figure 8**). Steps 7, 8, and 9 are implementation, revision, and monitoring.

The idea of proactive design has also been tested and developed in British Columbia into a complementary method by which to ensure that the VQOs are being met. A program of training was undertaken to support this and a manual published to demonstrate the process. The design approach also expanded the scale from the single cutblock to the entire forest, looking into the future, so that anticipated changes over time and any unforeseen problems caused by cumulative effects could be tested (**Figure 9**). This developed into a much more integrated design method similar to that used in Britain, with the added element of a more comprehensive ecological analysis, based on work developed in the US Forest Service by Nancy Diaz and Dean Apostol, where the proactive design approach was also tried out (see below).

A similar program to that of British Columbia was developed in the Maritime and Atlantic provinces of Canada (Labrador, New Brunswick, Newfoundland, Nova Scotia, and Prince Edward Island) and Ireland. The integrated model was also applied, looking at the whole landscape over time.

Elsewhere, similar design approaches have been developed over the years. In the 1970s and 1980s a method was established in New Zealand and some regional guidance booklets were produced by Clive Anstey and Steve Thompson. In France researchers at CENAGREF, a government forest research agency, also looked at the British model and developed similar guidance for French foresters. Expansion of forestry in Denmark led to guidelines being produced on forest location and design, while researchers in Sweden have also produced a book which seeks to integrate ecology and aesthetics. In Latvia the design approach was also developed, based on the use of a simpler landscape character system and aimed largely at new afforestation, partly in response to the need to replace the Soviet system and also to reflect the change in land ownership and the abandonment of farmland to natural forest regeneration.

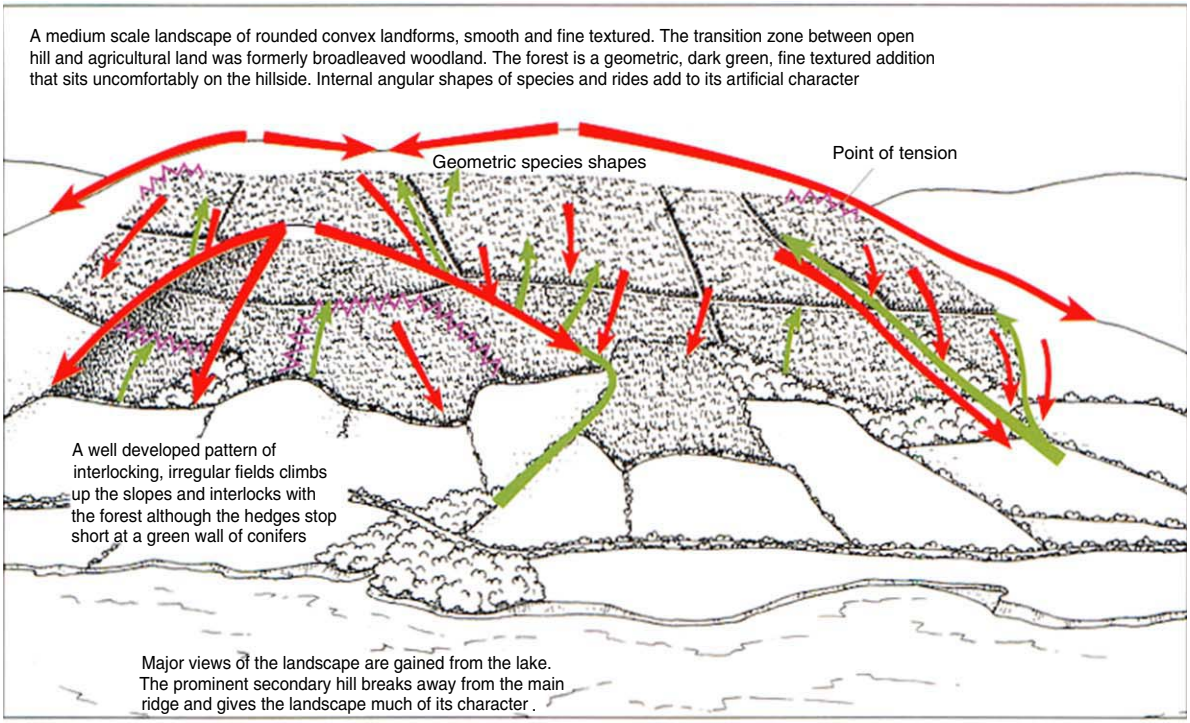
Privately Owned Forests

In countries where the forest area comprises the holdings of many small landowners, the kind of broad-scale assessment and design models described above are less easily applied. In Finland, guidance for forest owners considers three key objectives: paying attention to the regional characteristics of the Finnish forest landscape, harmonizing forest management measures with the long-range panoramic views of the landscape, and preserving the pleasant impression of the close range, or feature view. The design of felling coupes is also considered.

Assessing the Success of Visual Resource Management

There has been little recent scientific evaluation of the success of the approaches described above. Casual observation of the US national forests suggests that the VRM approach was successful at directing where logging took place but was unable to exert much influence on the design of individual cutblocks, let alone their cumulative impact. In British Columbia the introduction of design was largely in response to the perceived weakness of the VRM system in this area. Studies have taken place to test whether the expert-led system is supported by the public, for example in the degree of tree growth and stocking densities needed to deliver visually effective 'green-up' following logging.

In Britain two routes have been used to validate and test the design-led approach. Several studies have been carried out from the 1980s through to the present to validate the design principles used in the various guidelines and these broadly show public support for the proactive design approach. Secondly,



An example of a landscape character analysis presented in plan and perspective.

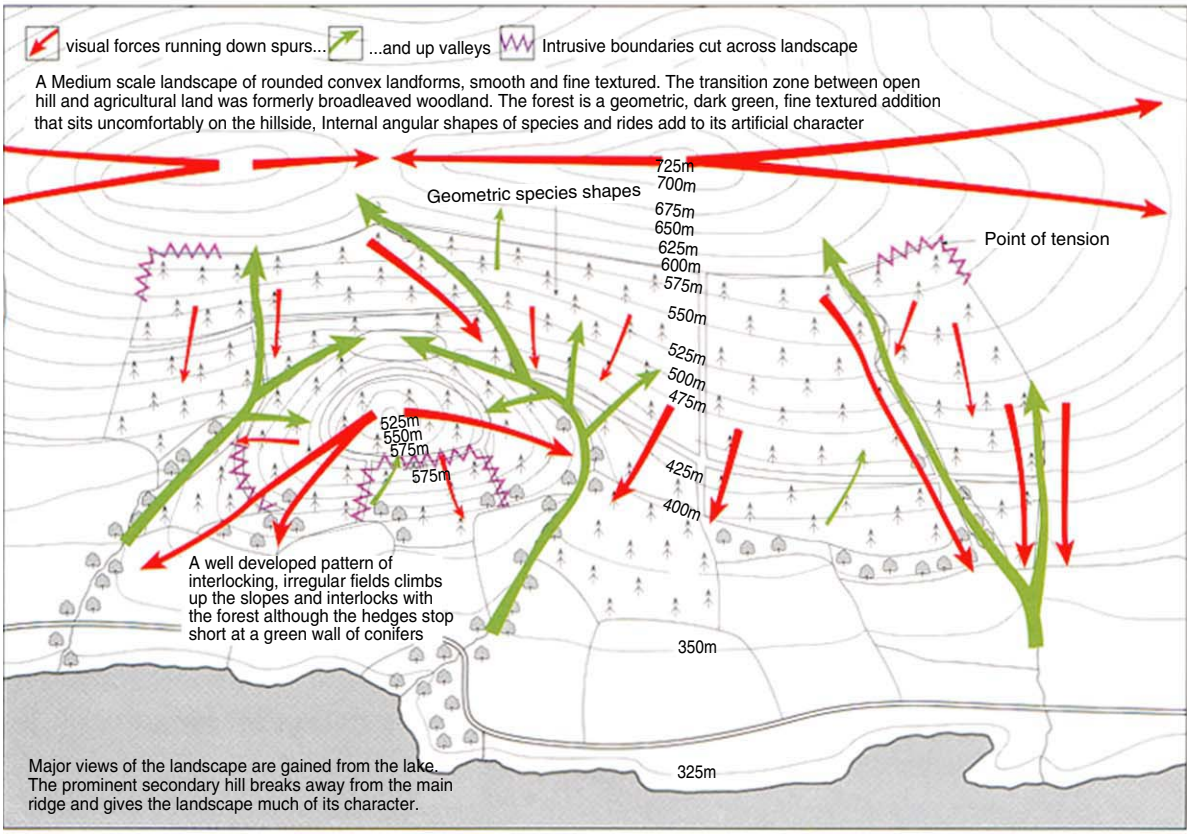
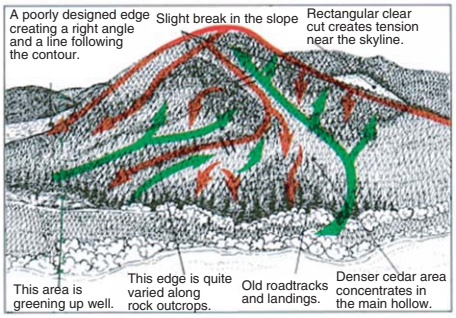


Figure 8 An example showing a detailed landscape character analysis, part of the forest design planning system. © Crown Copyright, reproduced with permission from the Forestry Commission.

A landscape of rounded landforms, mainly convex but with some useful valleys. Older logging varies between poorly designed and acceptable. Any logging should avoid the upper slopes where the hilltop caps should be retained at a sufficient scale (2/3 of the depth). The main valley may need to be retained for riparian protection purposes. Vancouver Island, Vancouver Forest Region.

The following examples demonstrate how units can be fitted into a range of different landscapes using sketches and photographs.



Landform and land feature analysis.

Two clear cuts are proposed and shown as their basic shapes, which are designed to reflect those in the landform-flowing and curvilinear. They are positioned asymmetrically, one bigger than the other. Implicit in their design is the possibility of further units and unfelled areas. To reduce the contrast, the edges should be thinned and stable trees left within the units toward the edges.

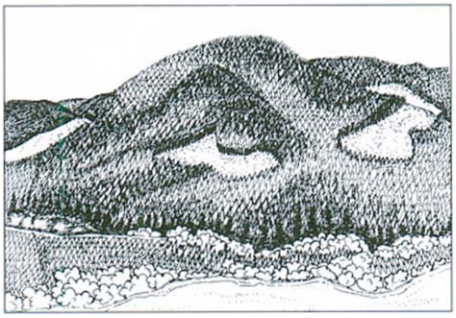


Figure 9 A cutblock design example from the British Columbia Visual Landscape Design Training Manual. From British Columbia Ministry of Forests.

in 1999 a monitoring project across the UK assessed the extent to which the upland conifer plantation forests had reached an acceptable standard according to the guidelines. The results were mixed but showed that most of the design plans would, over time, meet the standards; one of the problems is the long timescale of forest design implementation. Also in 1999 some evaluation of pilot forest designs was carried out in New Brunswick and Nova Scotia, Canada. These had been developed with public participation so it was possible to find out how well the communities thought that the designs were being implemented and what they thought of the processes used. The results were positive.

As yet, aesthetics has not been well integrated into systems of sustainability criteria and indicators as used in certification programs. There are now a large number of completed projects where forests are being managed for timber, visual landscape, biodiversity, and other resources in an integrated way, avoiding the trade-off problems between aesthetic and biodiversity values found in the earliest US Forest Service planning systems. These will not demonstrate fully their effectiveness in comparison to other systems for some years yet, although the application of adaptive management may help to uncover any problems fairly early on.

Conclusions and Trends

With the increased interest in biodiversity, sustainable forest management, and ecosystem management, it would seem that the impetus for visual resource management of forests has to some extent seen its period of popularity pass by, although it remains in routine use. In fact, while the VRM approach has seen little development since the 1995 revision of the US system, the proactive design approach has continued to develop and to be fairly widely applied in some countries.

The main areas of development have been in the approach to holistic or integrated forest landscape

design, where the design process as based on landscape architectural models has been refined to incorporate a wide range of objectives, including visual quality but especially aspects of applied landscape ecology.

The advent of GIS, computer aided design, sophisticated visualization methods (*see* **Landscape and Planning**: The Role of Visualization in Forest Planning), and computer modeling has enabled designers and managers to plan and design the visual resource far more effectively. While many studies of public perceptions and preferences for forest landscapes have been undertaken over the years, recent public preference studies have been used to calibrate design guidance (see above) but more such studies need to be done.

The use of landscape character criteria to develop local design guidance also means that visual landscape issues can be demonstrated to be important and that they can be incorporated into forest planning without serious conflict with other resources, without practical problems, or at unrealistic cost. With the increasing importance of community participation in forest planning, visual quality issues come to the fore once more, but this time require understanding of locally perceived landscape and aesthetic values and expectations for the forest.

See also: **Landscape and Planning**: Perceptions of Forest Landscapes; The Role of Visualization in Forest Planning; Visual Analysis of Forest Landscapes.

Further Reading

Anstey C, Thompson S, and Nichols K (1982) *Creative Forestry*. Wellington, New Zealand: New Zealand Forest Service.

Bell S (1993) *Elements of Visual Design in the Landscape*. London: E & F N Spon.

Bell S (1994) *Visual Landscape Design Training Manual*. Victoria, Canada: Ministry of Forests of British Columbia Recreation Branch.

Bell S (1998) *Forest Design Planning: A Guide to Good Practice*. Edinburgh, UK: Forestry Commission.

Bell S and Nikodemus O (2000) *Forest Landscape Planning and Design*. Riga: State Forest Service of Latvia (in Latvian).

Crowe S (1978) *The Landscape of Forests and Woods*. Forestry Commission Handbook no. 44. London: HMSO.

Forestry Authority (1994) *Forest Landscape Design Guidelines*, 2nd edn. London: HMSO.

Forestry Commission of Tasmania (1990) *A Manual for Forest Landscape Management*. Hobart, Australia: Forestry Commission of Tasmania.

Gustavsson R and Ingelog T (1994) *Det Nya Landskapet*. Jönköping, Sweden: Skogstyrelsen.

Hauninen E, Oulasemaa K, and Salpakivi-Salomaa P (1998) *Forest Landscape Management*. Helsinki: Forestry Development Centre Tapio.

Litton RB (1968) *Forest Landscape Description and Inventories*. US Department of Agriculture Forest Service Research Paper no. PSW-49. Washington, DC: US Department of Agriculture.

Lucas OWR (1991) *The Design of Forest Landscapes*. Oxford, UK: Oxford University Press.

Ministry of Forests, Forest Practices Branch (2001) *Visual Impact Assessment Guidebook*, 2nd edn. Victoria, Canada: Ministry of Forests, Forest Practices Branch.

Province of British Columbia (1981) *Forest Landscape Handbook*. Victoria, Canada: Ministry of Forests.

US Department of Agriculture Forest Service (1970) *National Forest Landscape Management*, vol 1. Washington, DC: US Department of Agriculture Forest Service.

US Department of Agriculture Forest Service (1995) *Landscape Aesthetics: A Handbook for Scenery Management*. Washington, DC: US Department of Agriculture Forest Service.

Perceptions of Nature by Indigenous Communities

P Maiteny, South Bank University, London, UK

Introduction

The purpose of this article is to provide an overview of how indigenous communities perceive and relate to the bio-ecological contexts of which they are part and on which they depend. The main message is that there is much more to learn from them than information about plant resources or methods to enhance Western-style conservation management. The forest is only one such context and it is possible to discern principles that also apply in others.

There are two possible approaches to take in this article. The first is to compare and contrast particular beliefs, values, and meanings that different peoples ascribe to their surroundings. This is analogous to drawing up inventories of species or habitat types that can then be used as resources to further existing purposes – be they commercial or for conservation – and management methods. However, this approach does little to challenge underlying assumptions or encourage learning from primary cultural perspectives. Einstein once said that problems cannot be solved through the same type of thinking as caused them in the first place. He was referring not to a need to accumulate greater quantities of information but to the need to see and analyze the situation in a