

Silvicultural Systems by John D. Matthews. Clarendon Press, Oxford. 1989. 284 pp. Stg£32.50 Hardback. ISBN 0-19-859491-7

Faced with forest destruction over the centuries foresters in central Europe drew on their accumulated experience to design systems of silvicultural management for the purpose of sustention and renewal. These silvicultural systems have been described by many authors including R. S. Troup whose well known text, published in 1928 and revised in 1952, is long out of print. This book by Professor Matthews is the most recent on the subject and will be welcome by students and foresters looking for a comprehensive up-to-date text. The book is divided into two parts; Part I provides theoretical background and covers approximately one quarter

of the text while Part II presents the silvicultural systems.

Part I, comprising Chapters 2 to 5, sets the scene for the readers study of silvicultural systems by providing an outline of the foundations on which the systems are based. Chapter 2 introduces the reader to forest ecology and genetics. The forest ecosystem is outlined and contrasted with clear felling which breaks the hydrological and nutrient cycles and interrupts the development of annual increment. The evolution of modern forestry in central Europe during the 18th century showed a tendency towards rigid methods of silviculture with regular crops of one species and rigid methods of management. Since the foresters task was to re-establish and expand a depleted resource these methods were appropriate for the time but it soon became apparent that there

were conditions of terrain, soil, and climate unsuited to the growth of pure regular stands of one species. The 19th century saw foresters moving towards more flexible methods of silviculture and management, more regular forms of forest stands and a conviction that mixtures were desirable. This in turn led to the evolution of the 'natural' approach to forestry based on the ecology of natural indigenous stands. The author maintains that the basic concept of the forest as an ecosystem is not forgotten but the emphasis has shifted to the development of techniques that increase production of a specified raw material for industry.

The advantage of mixtures and irregular stands are explained and numerous examples cited to illustrate the benefits of mixtures including the nursing effect of Japanese larch on Sitka spruce in Ireland and the suppression by beech of epicormic branches in the oak/beech mixtures of the Spessart.

In Chapter 3 the author describes the protective functions of managed forests. In mountainous regions the role of forests in protecting against avalanches, landslips, erosion and floods is well recognised and silvicultural systems have evolved to cater for this purpose. Forests on water catchments have sometimes led to controversy because of the high level of evapo-transpiration from foliage. It is accepted that the water yield from a forested catchment is often reduced but compensatory features are regularity of supply, with peak flows lower and later than from grass and a much higher water quality, low in suspended solids, nutrients and pesticides leached from the soil.

Forests also play a role in the conservation of wild plants and animals.

Even when the principal function of the forest is to produce timber, improvement of habitat for native wildlife is very often an associated function. The practice of sustained yield of timber provides a mosaic of stands, differing in area, age, height and canopy development which together form the ideal wildlife habitats. In regard to forests and the landscape the point is made that the visual impact of several silvicultural systems can be made more acceptable by considering the size, shape and arrangement of fellings. To the general public a clear cutting is usually regarded as forest destruction rather than a prelude to forest renewal.

Chapter 4 deals with the protection of forests against biotic and abiotic factors. Some good advice is proffered to help increase the resistance of forests to wind damage. Fellings that suddenly expose the interior of the stand to wind should be avoided as should large clearings and small scattered coupes within mature crops. As a general rule felling direction should be against the prevailing wind. Where snowfall is heavy an irregular crop will be less susceptible to snow damage than a regular crop. Protection against fire is best achieved by a mosaic of small stands of different species.

Protection of the forest against disease, insects and animals is very much a matter of prevention through good management practices. This is especially the case in protecting against damage by deer and the author describes how winter feeding will minimise damage and provide a revenue from venison, stalking and the sale of live animals.

Protection against air pollution is treated very briefly. Apart from listing the most important gaseous pollutants and mentioning their effects on Norway

spruce and Scots pine in Germany and Czechoslovakia there is little opportunity to develop the subject in a book on silvicultural systems.

In Chapter 5 the author summarises and comments on several topics in forest management from the viewpoint of silvicultural systems. The role of forest management is outlined and the reader is introduced to the division of the working plan area. The relationship between sustained yield and normal growing stock is explained in the context of yield regulation. Recognising that treatment of the growing stock is only a part of forest management the author moves on to describe harvesting systems and the planning and designing of forest road networks. This is followed by a short discourse on the influence of timber markets on silviculture, reminding the reader that the silvicultural treatment of managed forests depends greatly on the value in commerce of the timbers produced and on the specifications required by those who process and use the timbers. To quote Lord Bolton "no industry of any sort whatever can prosper if it consistently floods the market with second or third rate material. First quality timber can always command a fair price, while poor quality timber, except in times of great scarcity, is – and rightly so – a drug on the market". The Chapter concludes with guidelines on the design of forests and their social as distinct from their productive functions.

Part II (Chapters 6 to 20) deals with the silvicultural systems in practice, beginning with the simplest of all high forest systems, the clear cutting system. Clear cutting has been practised for many centuries, first with natural and then with artificial regeneration, but it

was systematised in its present form only at the beginning of the 19th century. There are many variations of the system. The form most widely used in these islands, clear cutting followed by planting, is treated at length by the author. The attendant operations of slash treatment, ground cultivation and drainage, weed control and supplementary nutrition are also described. Another form of artificial regeneration is by direct seeding, particularly aerial seeding, a method used extensively in North America for pine and Douglas fir.

Artificial regeneration with the aid of field crops was quite common in Europe at one time but it is now virtually obsolete there. It has, however, grown greatly in importance in tropical countries as a form of shifting cultivation. The so-called *taungya* plantations in Burma is probably the best example of regeneration by this method.

Clear cutting may be followed by successful natural regeneration, either from seed on the ground or disseminated from adjoining stands. The best known example of the former is in the Maritime pine forests on the coastal dunes of the Landes in South-western France. There are many modifications of the system to encourage regeneration from seed disseminated from outside, notably patch felling, strip-like clear cuttings, progressive fellings and felling in alternate strips. Each is described in turn and the author then summarises the advantages and disadvantages of the system. Although the system produces even-aged stands, it is pointed out that clear-cutting does not demand the growing of pure crops, as is sometimes alleged.

The Shelterwood Systems are dealt

with in Chapters 7 to 12. The first of these chapters provides an overview of what a shelterwood system entails emphasising that, in general, the system aims at natural regeneration in contrast to the clear cutting system which usually relies on artificial regeneration. The Uniform System is described in detail using a typical young even-aged crop of oak or beech as an example. This is followed through the stages of its life until it reaches maturity and is removed to make way for a new crop. Heights at which cleaning, thinning and selection of 'main-crop' trees occur are provided making it easier to visualise what takes place. The author traces crop development through the 'education' stage to the seeding, secondary and final fellings and establishment of the young crop. The rule that the silviculturist should 'follow the regeneration' is emphasised, so for broadleaves secondary fellings should take place when the leaves are present. Pursuit of regeneration can sometimes conflict with yield and the interrelationship between the two is explained in the context of periodic blocks with given rotations and regeneration periods. A good example of application of the system is provided for the oak forest of Belleme where it was introduced in 1856 on a 200 year rotation and eight regeneration periods of 25 years. This has been adhered to ever since. It is interesting to note that although the original application of the system is associated with Germany it is now most widely used in France where it is applied to regenerate 90 per cent of the oak and beech forests.

Other shelterwood systems, notably the Irregular Shelterwood System and the various strip systems either draw

on elements of the Uniform System or evolved directly from it. An experiment in the forest of Ae during the 1960s, when attempts were made to determine the applicability of the Group System to the regeneration of semi-mature Sitka spruce, makes interesting reading and illustrates the facility with which the species can regenerate. Foresters interested in the application of shelterwood systems over tracts of tropical moist forest will welcome the chapter on this topic which includes experiences in West Malaysia, Uganda and India. The system is based on the principles of the Uniform System in which the seeding felling consists of a general opening of the canopy by cutting climbers and progressively reducing the middle storey by felling, girdling or poisoning the unwanted trees.

The Selection System is largely confined to the mountains of the Vosges, Jura, Alps and the Black Forest range where it is highly regarded for its protective and visual amenity properties. Chapters 13 and 14 describe the single tree selection and group selection systems citing many examples of the latter system in Belgium and England where conversion from regular to irregular forest has taken place over the past few decades. Although the Selection System arose from a primitive form of selective cutting dating from early times it has evolved into a highly scientific method requiring a great deal of expertise.

Chapters 16 to 18 deal with the coppice systems. Simple coppice' is the oldest silvicultural system known and was widely practised up to the 19th century for fuelwood and small size material. Many countries have undertaken programmes of conversion to high

forest but there are still extensive areas remaining as in France where there are 5 million ha. The reader is provided with information on the species most suited to coppice as well as the cutting method, the most suitable season, the rotation and method of working. Certain modifications of the 'Simple coppice' have taken place and some are described in great detail. The basket willow coppice, which is an agricultural rather than forest crop, is widely known. Another form, short rotation coppice for energy, became prominent during the 70s and its development is recorded. *Eucalyptus* coppice is treated as a separate form and it is estimated that most of the 4 million ha of *Eucalyptus* in the world is managed as coppice with a common cutting sequence of four crops in 22 years. Although the coppice system is out of favour in Europe it is being widely used in developing countries and its importance is increasing as populations continue to rise.

The Coppice Selection System has long been applied in certain parts of Europe, although it is now less common than it used to be. In principle the working of the system is similar to the Selection System in high forest. Coppice with Standards was the principal system applied to oak in Britain up to the middle of the 19th century. The standards were much in demand for shipbuilding and the coppice provided firewood. With industrial development, more extensive use of coal and the introduction of iron in shipbuilding, the system has been in decline and considerable areas have been converted to high forest.

The process of conversion from one silvicultural system to another is detailed in Chapter 19. The methodology is de-

scribed and examples are given of different kinds of conversions which supplement those already provided in the chapters on clear cutting and group selection systems. Conversion usually follows forest degradation and is appropriate under certain conditions which are listed by the author. The main silvicultural techniques used in conversion are; improvement fellings, enrichment and replacement. The approach to each is explained particularly in relation to improvement and enrichment of tropical mixed forest.

The French 'conversion classique' approach will interest readers wishing to convert coppice with standards to uniform broadleaved high forest. Continuity of management over a long period is needed for success so it may be more applicable to State owned forests. A modification of the system involving conversion through intensive reservation is also an option.

The final Chapter provides an introduction to agro-forestry systems. Next to the chapter on coppice selection it is the shortest in the book and does little more than draw attention to the contribution that the silvicultural systems can make to agro-forestry systems. Two systems are mentioned; silvo-pastoral systems, of which the widely spaced Radiata pine system in New Zealand provides an example and agro-silvopastoral systems which is illustrated by a poplar growing undertaking at 8m spacing for 22 years.

The book provides one of the most comprehensive descriptions of silvicultural systems available in the English language. Although the systems are essentially central European in origin the underlying principles have been adapted to the practice of silviculture all over the world

and the adaptations have been successfully captured by the author. The publication will therefore be welcomed worldwide by both forestry students and practitioners. Since Troup's text on the subject is of limited availability in libraries, this book will be particularly welcome to students. Its well structured chapters and lucid, flowing style complemented by indented highlighting of essentials make it the ideal textbook.

For practising foresters the book provides a timely reminder that systems other than even-aged monocultures are possible and may well be more suitable in the long-term. It can certainly be argued that just as continental foresters of the last century found it necessary to diversify so today's foresters dealing with first generation plantations should consider the introduction of mixtures and shelterwood systems in the second rotation. While this may mean some sacrifice of short-term gains it will eventually lead to a more stable ecosystem providing for continuity of supply for present and future generations. Foresters who wish to choose this course will find the book invaluable.

It is inevitable that readers will wish to draw comparisons between the book and Troup's text of the same title. There are indeed many similarities. The French and German terminology used by Troup has been maintained and Spanish has been added. The format and style are similar as are many of the figures depicting the various systems and the practice of summarising the advantages and disadvantages of each system has been maintained.

It is a tribute to the author that he has retained many of the excellent features of Troup but this book is much more than just an up-to-date edition of that text. Part I alone would stamp this book as a separate entity but there are many other features such as the addition of the Tropical Shelterwood System and the inclusion of the alternate strip method in the Clear Felling System which gives the book an identity of its own. Yet it shares with Troup's text the feature of being an eminently readable and essentially practical book and this should ensure its wide acceptance.

Padraic M. Joyce.