

FORESTRY POLICY ON MULTIPLE USE FORESTRY IN EUROPE

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1. INTRODUCTION

A justified forest use is possible only when the essential characteristics of the forest are known and respected. It is quite obvious that the forest has often been used in a disputable way, not only in the past but also in recent times. Direct consequences of this situation were amongst others the loss of large areas of valuable forests and the appearance of degraded soils. Meanwhile the views on forest, forestry and forest use are continuously changing. At present, the forest is generally considered as an ecosystem, some elements of which are particularly important :

- the forest does not exclusively contain living beings but also all kinds of so called dead materials, such as soil, water and organic matter (including dead trees);
- the interaction between living and dead materials is extremely important;
- apart from trees, the forest community contains countless plants and animals;
- the system shows enormous dynamics; it is continuously exposed to all kinds of internal and external disturbances; developments are often unpredictable.

Such an approach of the forest also stresses concepts such as naturalness, equilibrium, stability and sustainability.

It cannot be denied that, in the past, forest use has insufficiently taken into account the essentials of the forest. Indeed in forestry there has always been a duality between two schools of thought :

1. The artificially directed forestry, which has reduced the complex forest ecosystem to simple monocultures and strives for the highest possible profit on short term.
2. The close-to-nature forestry, which tries to achieve its goals by means of a creating forests displaying to a large extent characteristics of natural forests.

The question should be raised as to what extent many of the existing forests can still be considered as real forests. They can grossly be characterised as follows :

- simplification of the forest ecosystems; elimination of natural regeneration,

homogeneous plantations on a large scale; use of exotics as well on suitable as on inappropriate sites;

- dense, closed stands; unfavourable growth conditions for ground flora and shrubs; accumulation of litter;
- short rotations; clearcuttings and mechanisation of logging causing soil compaction and prolonged recovery periods; violation of equilibria between climate, soil and soil biota;
- too high and unbalanced stock of game; harmful recreation practices.

Moreover, several forms of environmental pollution should be taken into consideration, such as air and soil pollution and alteration of the water economy. Therefore it is not so surprising that forest vitality is not optimal and that forest decline is a general phenomenon. It is clear that the whole society is responsible for that situation. In this respect, however, the forester and the forestry too carry a great responsibility.

The primary objective of forestry is forest conservation. This implies on the one hand a healthy forest and on the other hand a forest that produces goods and services that are necessary to the human society. The position of the forest, however, depends largely on the local circumstances :

- the site : the richer the forest, the more varied it is; forests on sensitive sites must be treated very carefully;
- the pressure of the population : the population density, as well as the social-economic development determine to a large extent the forest's character;
- the forest owner; tasks and needs of public and private forest owners are different; both parties have a different conception of terms such as sustainability and public interest.

2. CONTENTS AND CONCEPTS OF MULTIPLE USE FORESTRY

Placed in a historical perspective, it seems appropriate to raise an essential question: what exactly do we mean with the concept of "multiple use forestry" ? The practice of utilizing the forests in multiple ways has a long history (Hasel, 1971; Miegroet, 1982; Stridsberg, 1984; Brandl, 1987). Hasel distinguishes four stages in the forestry development :

- In a first stage of indirect forest use, the impact of the population on the forest

is still very limited.

- The second stage is characterised by direct forest use. People start to destroy the forest, either to give a different destination to the soil, or to cut large amounts of trees in order to use the wood.
- The stage of forest exploitation, which started in Europe in the middle of the 19th century, led to conceiving the wood as an industrial resource. The highest financial profit is the first objective.
- After 1945 the forestry stage has developed. It is characterised by the concern of forest conservation and the harmonious development of all forest functions.

2.1. Multiple use in the former agrarian society

Stridsberg (1984) describes the forest functions in the former European agrarian society. He stresses that the forest in this society played a secondary, but by no means a negligible role. The pasture area played a keyrole in the forest regions, especially for cattle-raising purposes. Crop-raising and a shifting cultivation through burning of forest land played a supplementary role. Furthermore the forest was a rich collecting ground for berries, mushrooms, moss and lichens, apart from roots, bark, resin, leaves and fruits. Forests were characterised by a sparse tree-vegetation caused by forest grazing, a dominance of broadleaved fruit bearing trees and an intensive harvest of leaves for fodder.

The importance of hunting obviously decreased with the development of the agrarian cultivation. In late medieval times it had become a pleasure occupation for king and noble.

Although in medieval society, wood harvesting was not such a dominating factor as it is today, it was already of great importance. The primary need was for fire wood and timber for household use such as house-building, fencing, making hay-racks, etc.

The commercial value of oak and some other broadleaved trees was noticed in medieval times already. As time went on, it was the timber for shipbuilding that made the oak so attractive to the state. Yet, coniferous saw-timber also played a considerable role in export. However, the most important forest product for the export sector was the charcoal, due to its importance for the mining industry.

Also tar, made solely from pine and mostly of roots, had in the 17th century a higher export value than wooden goods.

Stridsberg concludes that forest use in the agrarian age was really a very multiple use. In most cases it claimed a heavy labour input while yielding only a very limited output.

In the mid 19th century a very obvious transition occurred from this multiple forest use to timber harvesting. This was the real start of single use forestry. One of the

main features of the explosive growth during the so-called industrial revolution was the greatly improved communication network.

At the same time, the forest authorities preached rationing of the forest and investments in silviculture. Forestry had become a single use activity aiming at the production of raw material for the industry.

2.2. Multiple use in the U.S.A.

The concept of multiple use forestry, no doubt, emanates from the USA. According to Hultman (1984), the main reason for this is the non-existence of a "common right of access to land" in the USA. Especially after 1945 the rapid increase in outdoor recreation put a heavy pressure on the federal lands. Recreational use of the national forests tripled between 1948 and 1960 (McArdle, 1962).

The political basis for the multiple use ideas, however, had been laid much earlier. The forest administration Act of 1897 specified that the so-called Forest Reserves (the origin of today's National Forests) were established in order to "improve and protect the forests or for the purpose of securing favourable conditions of water flows, and to furnish a continuous supply of timber for the use and necessities of citizens of the United States". (Cliff, 1962). Where conflicting interests must be reconciled, the issue must always be decided from the standpoint of the greatest good of the majority in the long run.

In 1960, two months before the fifth World Forestry Congress debated in Seattle upon the theme "Multiple Use of Forest Land", a new Forest Law with the very name "Multiple Use Sustained Yield Act" had been passed in the U.S.A.

A clear-cut statement of the Multiple Use concept has been offered by King (1980): "Multiple use ... (is) ... the conscious and deliberate use of the land for the concurrent production of more than one good or service ..."

The central words in this definition are "conscious" and "deliberate". This way Hultman (1984) constitutes the basic criteria for multiple use forestry :

- a clear statement of objectives for each use;
- equal consideration of all uses (whether they can be measured in economic terms or not);
- careful coordination of uses;
- explicit descriptions of conflicts;
- a planning procedure that is logical, rational and open to inspection.

Some misunderstanding of King's definition could arise in the word "concurrent". It concerns the scale on which multiple use should be considered. A forestry policy, which on a national level might quite correctly be called "Multiple Use", could on a local level very well be seen as "single-use".

Gustavsson (1979) also refers to the risk of people interpreting the concept not primarily as the use of the same land for several purposes, but rather a small scale zoning of the landscape, where a certain use dominates in one area whereas a very different use can dominate in even an adjacent area. He stresses, however, that a key concept is "scale" and that the concept does not allow to let any demand be exclusive in large areas but rather requires that even in smaller areas several uses can co-exist and that the dominant use can change.

According to Cliff (1962), Mc Ardle (1962) and Hultman (1984), it should be stressed that multiple use is not a passive practice and that planning is necessary for the deliberate and careful integration of the various uses. In this respect, it is obvious that "forests" have many functions and can provide for many uses, whereas this fact does not prove the multiple use character of the "forestry".

2.3. Forest function doctrine in Europe

The basic concept of the forest function doctrine in Europe was laid by Dieterich (1953). He distinguished three basic function groups: production, protection and recreation. He does not use, however, the term "multiple use forestry".

A more extended, but somewhat confusing description of forest functions, is given by Hasel in 1971. He recognizes ten different forest function groups, but it is remarkable that the terms production and ecological function have not been taken into account.

Van Miegroet (1982), on the other hand, proposes four basic function groups:

1. The economic function group.
It contains all kinds of direct material yield (=ressource function).
2. The social function group.
It refers to all compensating effects of the forests with regard to the living and working area of the people.
3. The ecological function group.
It includes all environmentally regulating and protection functions, which are connected to the forest presence.
4. The cultural function group.
It covers all values with respect to science, nature conservation, landscape care,

and the conservation of the culture patrimony in general.

It should be noticed that the social function group mainly concerns "the recreation function". But it cannot be compared with the term "social forestry", used in developing countries. It is also remarkable that Van Miegroet classifies the nature conservation within the cultural function group and not within the ecological function group. It indicates that, in many cases, nature conservation is not directed towards the conservation of unspoilt nature, but towards the preservation of some cultural values.

Multiple use forestry in Europe is probably best developed in Denmark. Koch (1984) identifies the functions of the Danish forests as follows:

- wood production
- recreation
- hunting
- protection
- nature conservation
- grazing
- production of Christmas trees and decoration greenery
- water supply
- employment.

For each of these functions the forest area is classified into three classes of importance : high importance, medium importance and low importance. Different functions can all have high importance in the same area (e.g. wood production, hunting and recreation).

For some functions, the classification according to importance differs greatly between the different categories of forest owners:

- Areas with high importance for protection and employment are all publicly owned.
- The forest itself is protected in all publicly owned forest (medium importance of the protection function). This is not the case for all privately owned forest.
- The amount of employment in the bigger private forests is close to zero.
- The production of Christmas trees and the hunting function are predominant on privately owned forest land.

The ecological function of the forest is often mentioned in the framework of multiple use forestry. However, it remains unclear if such a terminology is correct (Lust, 1990). Indeed, the concept "function" refers to a task, an assignment. In this respect, one can clearly refer to economic, recreational, educational, cultural and

other forest functions, as in these cases it concerns specific human destinations. These are tasks particularly allocated to the forest, which are not primarily fulfilled by the forest ecosystem. Apart from this, there are the so-called ecological functions, which normally result from the forest presence and which are inherently related to the existence and functioning of the forest. In this respect, it is more appropriate to speak about the "ecological importance" of the forest, instead of the ecological function. But it cannot be denied that some ecological tasks can be assigned to specific forests, that for this reason these forests are treated in a special way, or that they are established on selected sites for that objective. It is obvious that the so-called ecological function of the forest clearly differs from the other function groups of the forest :

- each forest fulfills, to a lesser or a higher degree, several ecological functions;
- the society can stress or diminish the ecological function of some specific forests;
- at the same time other functions can also be emphasized.

Some nature conservational groups consider the ecological function of the forest almost exclusively as the protection of flora and fauna. The forest, however, has a much greater intrinsic value for the protection and regulation of the natural environment. It is also important to realize that well managed forests can have a greater ecological value than primary forests. Indeed, a justified forest treatment and management can prevent or limit the impact of natural disturbances, such as the decline of old forests.

The ecological function, no doubt, has to be considered as the most important forest function. In this respect, some basic points can be mentioned :

- The ecological importance can only be evaluated in function of time and space.
- It is very difficult to express the ecological value in utilitarian terms. As a matter of fact, this would be quite meaningless too. Money and profit are not the only and highest values in the society.
- The ecological importance of the forest is mainly assured by the conservation of the ecosystem forest.

The ecological value can be described concretely by a varying number of factors, such as:

1. Impact on global climate.

In recent years, special attention has been paid to the meaning of the forest in a "global climate change". Two points are specifically emphasized :

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- the increase of the CO₂ amount in the atmosphere due to fossil fuel burning and deforestation, leading to the greenhouse effect;
 - the capacity of the forest to absorb and store CO₂ and to mitigate global change.
2. Production of a huge biomass.
The fact that a forest produces large amounts of wood, apart from all kinds of other vegetation elements, has a great ecological importance. The presence of a high amount of biomass contributes to a large extent to the stability of forest ecosystems.
 3. Regulation of the water economy.
The thoroughly artificial alteration of the water economy in the course of civilization has to be considered as one of the most important interventions of mankind on the natural ecosystem. There is no doubt that drought, as a consequence of drainage and weather circumstances, can largely contribute to a loss of forest vitality.
 4. Protection of the soil from erosion.
The area of waste land, due to deforestation, is estimated more than 500 million hectares. The yearly deforestation in the tropical zone is nowadays estimated about 20 million hectares, causing tremendous erosion problems and losses of soil fertility.
 5. Habitat for flora and fauna.
Deforestation and short-rotation forestry have got a negative impact on the presence and the development of fauna and flora. Nature conservation, however, pays the greatest attention to the diversity and the richness of the flora and fauna. Sometimes, an exaggerated development of the fauna can endanger the forest.
 6. Impact on air quality.
The filtering capacity of the forest is generally considered to be very positive but it leads to an accumulation of pollutants in the forest floor and soil.
 7. Prevention of avalanches.
In this case, the best protective value is not delivered by the primary forests. On the contrary, fully artificially treated forests, especially selection forests, are much better able to prevent external disturbances.
 8. Creation of a noise screen.
Although the value of this function may not be overestimated, it can be of great importance in some circumstances.
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All these factors, each separately, have their own significance, but they should be evaluated especially in their interactions.

Next to the above mentioned, generally well known forest functions, it is still possible to indicate some specific points, e.g. the forest as symbolic environment, as described by Reunala (1984). This author stresses several intangible values, a.o. beauty, calm, religious feelings, etc. Part of these values can be called symbolic values.

- Forest as an extension of the self.
Familiar forests become parts of the family itself. They have personal value to the members of the family because they reflect memories of their past life experiences.
- Forest as a symbol of mother.
Psychological research has shown that our feelings towards the forest are like a child's feelings towards its mother. (Ougassy, 1970). According to some, the forest provides the feeling of protection, but according to others, the forest can be threatening and frightening. To the mother-forest one can project feelings that he was not able to express to his real mother as a child.
- Forest as an archetype.
It is good for anybody to be in contact with nature, trees and forests. Especially old trees and old, virgin forests give strong archetypical experiences. They reflect most powerfully the unknown in ourselves, our subconsciousness. This archetypical importance is one more reason to conserve some old trees and old forests within commercial forests and as separate wilderness areas (Reunala, 1984; Chevalier & Gheerbrant, 1973; Jung, 1953-1979).

Besides all this, the forest has particular, albeit mainly still unknown and insufficiently appreciated values, such as :

- future potential for human use : genetic reservoir, medicines;
- forest as a cultural resource and heritage.

3. CURRENT STRESSES OF MULTIPLE USE FORESTRY IN EUROPE

The stresses of multiple use forestry are generally related to time and space. So they are varying.

It cannot be denied that, since the middle of the 19th century, forestry in Europe was mainly directed towards wood production and profit for the forest owner. In recent decades, however, a sudden change in attitude has taken place. Indeed, the

highly urbanised society, where the urban population amounts to more than 90 %, started to develop an important need for outdoor recreation and contact with nature.

In a first phase increased leisure and well-being led to a strengthening of the recreational value of the forest. More recently, the overall environmental disturbance led to a renewed awareness of nature, and especially nature conservational values of the forest were stressed.

3.1. Some aspects of recreational functions of forests

An institutional fact of great importance for multiple use of forests is the common right of access to all forest land, regardless of ownership. In some countries (Finland, Norway, Sweden, Switzerland), this historical tradition allows free access and overnight camping even on private forest land and, for example, picking of berries and mushrooms (Saastamoinen et al., 1984; Schaer, 1986).

3.1.1. Recreational use of forests

There is a broad spectrum in recreational uses for forest areas. Next to the important questions about the extent of forest recreation and how to measure and evaluate it, one can ask why people use forests for their recreational activities and what factors make some forest preferable to others.

Forest recreational use can be measured by different variables : number of visitors, number of visits or number of visitor hours (Koch, 1978). In Denmark, which has a population density of 120 inhabitants per sq. km, where the forest land per capita is only 0.1 ha and where the public is allowed to enter private forests (> 5 ha) in daytime and on foot, Koch (1978) found that about 90% of the adult Danish population visit the forest at least once every year. This is a high percentage compared to other recreational activities. Indeed the percentage of the group visiting every year libraries, sport grounds, art exhibitions, theatres, evening schools or concert halls is much lower (40-10 %). About the same participation rate for forest recreation has been estimated in Norway (95%) and in Sweden (80-85%).

The "normal" Dane spends about 30 hours in the forest per year, distributed over 11 forest visits. The more prosperous social groups visit the forest more frequently, and that is also the case for people living close to a forest. Generally speaking the longer the travelling distance people have to arrive in the forest, the more seldom are their visits in the forest, and the longer the time they spend on each visit.

A little more than 2/3 of the visitor's last visit took place less than 10 km from their residence, and nearly 1/3 less than 2 km from their residence. Sievanen (1984) confirms, that the factors affecting participation rates are, in the first place, the socio-economic and age structure of the population (the demand factors) and in the second place the possibilities offered for outdoor recreation in the neighbourhood of one's home area (the factors of supply). For example the lighting of skiing routes

seems to be necessary for the effective use.

In the Netherlands, it is accepted that the attractiveness of a forest is mainly influenced by the following factors (Kuper, 1986):

- alternation in forest and open space;
- presence of avenue- and belt plantations;
- various road- and path patterns as to density and shape;
- a well marked relief;
- presence of specific open air recreational facilities;
- presence of other visitors;
- various stand compositions as to tree species and ages;
- presence of an understorey;
- presence of fauna.

Van den Berg and Coeterier (1980) mention the following "important motives to speak about nice forests":

- much variation as well in tree species as in strata, light-dark, different colours, light-shade;
- bent trees;
- untouched, not cultivated, natural, a bit rough, wild, no rows;
- big stems and old trees.

In Sweden, Skärbäck (1984) lists the following motives, that are most frequently mentioned:

- good accessibility of paths;
- orienteering;
- nature studies;
- jogging in forest;
- swimming.

This author also mention the motives of Swedish school teachers for visiting recreation areas : physical training, for example jogging (88%), nature environment (75%), winter activities (53%), accessibility (50%), education (47%) water activities (30%), other facility establishment outside the school-yard (25%), recreation (17%), excursion (10%).

In order to improve the recreational value of the city-forest Baden (in Switzerland), Schoop (1991) took the following measures :

- differentiation of road supply as to visitor's type;
- maintenance of a fitness-path;
- establishment and maintenance of an "eco-path / forest teaching path";

- particular management measures along one or more roads;
- purposeful and periodical information towards the population on forest treatment by means of press communications and forest excursions.

3.1.2. Evaluation of forest recreation

Although it is very difficult, and probably also meaningless, to assess the recreational value of a forest, several authors have tried it.

Speidel (in Riedesel, 1982), already calculated in 1976 that the recreational value of a forest in recreation areas averaged 41 DM/ha yearly. It is obvious that this value is much higher in typical recreation forests. Riedesel estimated this value in 1982 at 55 DM/ha.

Christensen (1984) attempted to establish a value for forest recreation by applying modified Clawson analyses to data collected from forest visitors in Denmark.

The method is based on the relationship between visit rates and travel costs. The primary unit of the calculations is kilometers. This way he estimated the monetary value on 2.07-4.14 US dollar per carborne visitor in forests of national importance. He concluded that in Denmark, where the annual number of forest visits has been estimated at 100-150 mill, the recreational value of forests is far above the value as a production factor of trees.

Bergen (1991) tried to compare the forest production function with the value of a series of "social functions" in Germany.

- The net value of the wood production in the former Federal Republic of Germany amounted in 1989 to an average of 274 DM/ha forest.
- The value of the forest recreation in the Südharz (11,564 ha), based on travelling expenses, was estimated at 675 DM/ha.
- Afforestation also contributes to a better living in adjacent zones. This is explained by the better microclimate, the better structured landscape and a diminished sound burden. The increase of the living value (in a zone of 67 ha around Göttingen) equals to 768 DM/ha forest for the living and to 139 DM/ha forest for the sound decrease. The increase of the value is calculated on the basis of the rent.
- Noticeable too is the contribution of afforestation to the increase of the agricultural production. This is due to the improvement of the microclimatological relations. The increase is estimated at 99 DM/ha forest.
- By far the most important function of the forest is its role concerning soil protection. A small area of 6 ha was taken as an example. The method is based on the alternative expenses which, without forest, are necessary for road protection to erosion. This way, the forest value is estimated at 2696 DM/ha

forest.

- Finally, the forest can also have an important negative value. Indeed it diminishes the value of adjacent recreational zones. Visitors experience the lengthening of the forest edge in the neighbourhood of bathing resorts as a negative evolution. The decrease, based on the diminished entrance fee, is estimated at 999 DM/ha.

This remarkable study of the Institute of Forest Economics of the University of Göttingen, allows to draw some important conclusions.

1. The overall value of a forest can be very high.
2. The ecological and the social values of a forest are much more important than the direct production values.
3. The forest has a much higher value for the society than for the forest owner himself.

With regard to forest recreation, the inevitable disturbance of the forest ecosystem should be pointed out. Particularly soil compaction is very dangerous and could lead to forest decline. Pflug (1982) also mentions the following dangers :

- a road system that is too dense disturbs the soil;
- disturbance of flora and fauna;
- supply of waste and car exhaust fumes, with negative impact on soil and air.

Pflug concludes that protection of the forest against the steadily increasing demand for recreational areas is vital. With regard to the protection of sensitive soils, plants and animals forest recreation is only justified on the roads.

3.2. Nature conservational value of forests

In the 1960's people's interest in what was happening to nature increased. The management methods used in forestry were eagerly discussed and criticized (Falk & Mörtnäs, 1984).

3.2.1. The concept of nature conservation

The steady developing concept of nature conservation is nowadays described by Sandri et al. (1990) as follows. It aims at the conservation of all native organisms and of their living communities in populations which are able to survive, and also at the conservation of natural, semi-natural and cultural historical values in the forest and the forest edges, which enrich and build the landscape.

In the Netherlands nature conservation particularly stresses the following criteria: diversity, naturalness and individuality. Diversity is aimed at in the appearance of species, living communities and ecosystems. Completeness of living communities and ecosystems is another objective. The absence of disturbance marks natural processes and excludes each form of active management (Anon, 1992).

The concepts of nature conservation are not new to forestry. Apart from its concern of reforestation and forest treatment, it already early practised nature conservation in a modern sense, at which economic sacrifices were made consciously. In this respect, Weber (1984) firstly refers to the conservation of wildgame, particularly of red deers and roedeers. Besides, attention was also paid to the protection of rare trees and plants and to bird protection, in particular to songbirds.

The concept of creating forests resembling natural forest, together with the striving for self-regulation, is not new either. It was already formulated by Karl Gayer in 1886 (Kirbach 1992). But with the exception of some private forests this concept was not widely elaborated. Nevertheless a close to nature forestry has been developed and recommended by several foresters (Dengler, 1944; Leibundgut, 1970). It aims at healthy, stable, mixed and well structured stands with species appropriate to the site (Lamerdin, 1988). This concept is to be considered as the natural basis for sustainable multiple use forestry. Unfortunately, it is practised on a too limited area.

In recent decades, the ecological requirements put to forestry, have strongly increased. According to Weber (1984), this is due to the following reasons :

- the forest area on a global scale is steadily decreasing (e.g. India 1854 = 57 %; 1980 = 16 % forest);
- in Europe too, the forest area continues to diminish in densely populated regions;
- the increasingly inhospitable character of our cities and industrial landscapes;
- the progressing decline of the ecological value of agrarian regions;
- the forest is the only ecosystem which is still more or less natural;
- people's desire to spend time in the forest is very great;
- the wish for "natural" forests, as a consequence of the uniformisation and the individualisation of our technical environment.

Therefore, Weber strongly pleads for a close to nature forestry. Nevertheless he warns for some exaggerations in the field of nature conservation.

1. Nature conservation represents only one forest function.
2. Time plays an important role in a forest's life. From a thicket, without much nature value, a valuable mature forest can develop.
3. In a short period of time, it is impossible to build up the ideal forest, characterized by the appropriate economic and ecological features.
4. Nature conservation against nature is not justified, unless in exceptional circumstances, where it concerns more protection of cultural monuments than nature conservation. A typical example is the Lüneburger heathland. It must be clear, however, that in similar cases it is really a matter of protection against nature.
5. Nature conservationists should be more worried about forest conservation and forest extension. They should not consider forestry as a basic enemy. Nature conservation and forestry should not be separated.

3.2.2. Conflicts between nature conservation and forestry

It cannot be denied that in the whole of Europe, whatever may be the current forestry situation, serious conflicts arise between forestry and nature conservation. The term conflict may be too strong in some regions, but at least a mutual distrust exists (Rohner, 1988).

In the course of discussions, the matter is represented in black and white, while in reality it concerns only some accents. How should trees be cut? By means of a motor saw or by a gale? How does forest regeneration occur? By a plant spade or by birds? Which tree may be planted, a native one or an exotic one?

From an analysis of the directives for nature conservation, it appears that nature conservation formulates in particular the following objections towards forestry (Otto, 1991; Falk & Mörtinä, 1984).

1. The hardwood forests, being in Europe the most occurring forest ecosystems, are very impoverished. It is estimated that their structure and species composition are only for 10 % semi-natural to natural.
2. Former valuable hardwood forests, namely coppice and coppice with standards, have been on a large scale converted into even-aged forests, with conifers and hardwood species, not suited to the site.
In this respect the notion "potential natural vegetation" is often used as a criterion for the evaluation of the forest situation. The content of this term is, however, very disputable. Waldenspuhl (1990) interprets it as the vegetation, that, based on the present site potential, appears without human intervention. However, he rejects this vision, as it only takes into account the site alterations

in the past, and not the prospective ones.

3. Wet sites were drained, due to which typical forest associations were disturbed or even destroyed.
Drainage has been a determining factor in the alteration of biotopes.
4. Valuable secondary biotopes were disturbed by afforestation. Typical examples are : heatherfields, nutrient poor pastures, wet valley-grounds with meadowlands.
5. Nature conservation aims at a prohibition of cuttings on an area which is as great as possible. In the beginning (around 1970) 1% of the forest area was the objective, but nowadays no less than 20 % is required. What will be claimed in the future ?
6. Afforestations are mainly wood plantations. They are different from a maize field only by a longer rotation period of 25 to 50 years. Advanced means, such as genetic manipulation, are used to achieve this goal; in most cases, however, they lead to a monoclonal forestry.
7. Stand treatment tends towards uniform and dense stands, limiting the development of natural flora and fauna. Naturalness of many sites is diminished by soil preparation, fertilization and the use of herbicides.
8. Final cuttings mainly boil down to large-scale clear cuttings. Logging and transport seriously damage the forest soil and the forest communities.
9. The progressing afforestation of already forest-rich regions. This way the border regions forest-field are deprived of their ecologically important functions.

3.2.3. Basics for a more close to nature forestry

Many foresters recognize that, generally speaking, nowadays both the forest and the forestry are insufficiently natural. There is, however, no doubt that forestry and wood production are necessary. The motives for this are summarized as follows by Zerle (1989), Pöppinghaus (1990) and Otto (1991).

- Many countries are obliged to import wood. The needs to wood and wooden products cannot be denied.
- The proposal to import even more wood is not justified. It is not allowed to complain over the destruction of the tropical forest and to reduce at the same time the wood production in one's own country.
- The need of wood will increase even more. The world population too will keep

growing. The standard of living should increase in the developing countries. Many, especially fossil, resources will be exhausted.

- Wood use can be an environmentally friendly activity. The waste can be recycled in the construction and the regeneration processes of the forest.
- The forest is a renewable resource. Harvest and production can be kept at the same level.
- Wood production is basically related to forest possession. Prohibition of wood cuttings puts the question of compensation.

Therefore, there are no reasons at all to combat forestry. Only the current forestry methods can be criticized. Forestry can and has to be practiced on a close to nature way, as many authors have already emphasized in the past. Nowadays, a lot of measures are recommended in order to increase nature values in the forest, without neglecting the wood production function.

1. The most important measure is the choice of tree species. Trees should be preferably indigenous or at least appropriate to the site. One should strive for species diversity. Secondary tree species and shrubs such as ash, maple, cherry, birch, lime, hornbeam, rowan, hazel and other species should be reassessed. The hardwood species rate should be increased (Hedén, 1984; Weber, 1984, Lamerdin, 1988; Rohner, 1988; Lust, 1990; Kirbach, 1991; Otto, 1991; Pflug, 1991; Schoop, 1991).

Discussion exists about the position of exotics. Their use is likely to be acceptable, at least when they are "appropriate to the site". But what does this term exactly mean? In this respect, Otto (1991) puts the following requirements to the tree species.

- The species should not deteriorate the soil; it means not only the root development in the mineral soil, but also the humus formation and decomposition.
- The species should not disperse diseases or contribute to other forms of liability.
- The species should not be threatened more than normally by abiotic and biotic risks.
- The species should allow for mixture, i.e. it should be made possible the ecological integration with native fauna and flora.
- Natural regeneration of the species should be possible.

- The species should be able to integrate in optimal, vertically structured stands.
 - The species should not prevent the successional developments of the indigenous species.
2. The silvicultural system too is of a great importance. Particularly the clear-cutting system disturbs the equilibrium of the forest ecosystem, with its soil, nutrients and living beings. This system is only characterised by the stabilization and aggradation phase, whereas the steady state phase of the nature forest ecosystem with specific plant and fauna species, is completely absent. With regard to nature conservation, a mosaic forest structure is to be recommended, with zones of different felling intensities. If clear cuttings are necessary, even the disturbance of the landscape should be taken in mind (Hedén, 1984; Weber, 1984; Rohner, 1988; Lust, 1990; Kirbach, 1991; Otto, 1991; Pflug, 1991).
 3. Natural regeneration has to be preferred over artificial plantations. This is done preferably under cover, on small areas and over a long period. Such systems disturb the forest ecosystem less, and moreover, they strongly enrich the forest. They prevent the appearance of monocultures. If artificial regeneration is necessary, it can be planted under cover. While marking trees for cutting, the individual maturity instead of stand maturity should be taken into consideration. The compatibility of similar exploitation systems with economic requirements has often been shown by Leibundgut (1986). (Heden, 1984; Lust, 1990; Kirbach, 1991; Otto, 1991).
 4. Still existing semi-natural forests should be preserved (Pflug, 1991). Oak woodlands should not be replaced by poplar plantations. Mixed hardwood forests should not be converted into seemingly more productive homogeneous conifer stands. Attention should be paid to old forest ecosystems with a particular nature conservational value. In this respect, coppice and coppice with standards are of great importance regarding to nature conservation (Lust, 1990).
 5. Treatment should consider the forest as a self regulating system (Pflug, 1991). It will carefully lead the natural, dynamic processes to the desired objective (Otto, 1991).
Mixed and good structured stands should be strived for, as well vertically as horizontally. Weber (1984) also stresses the great value of a high amount of biomass. Similar forests are characterised by a great stability and elasticity (Lust, 1990; Otto, 1991).
Strong thinnings promote the development of flora and shrubby vegetation. This way, the food supply for the fauna is rising as well (Lust, 1990).
Forest treatment should certainly not lead to the type of wood-field, that nowadays is dominating large areas (Kirbach, 1991).

6. Infrastructure operations should be reduced to a minimum and well thought over (Rohner, 1988; Lust, 1990; Pflug, 1991).
 - drainage should be avoided on floristic valuable sites, such as well forests and riparian forests;
 - construction of new roads and road paving are harmful for flora and fauna: destruction of flora, drainage by alongside brooks, migration difficulties.
7. The age factor should not be neglected. All age classes should be present. Short rotations, mainly directed towards current economic motives, should be left. One should aim at mature forests, with a high biomass and several developing phases. Some trees and stands should be allowed to grow very old. These units are also valuable in respect to the landscape (Hedén, 1984; Weber, 1984; Lust, 1990; Kirbach, 1991; Schoop, 1991).
8. Specific measures to the protection of fauna and flora should be taken. The forest is the main biotope for many animal and plant species. Rohner (1988) estimates that, in Switzerland, 60 to 70 % of all species are living in the forest. With regard to the island-theory forest dismemberment should be avoided: the greater the forests, the more species could be expected. All forest communities should be present on a sufficient area. Open places in the forest are often rich of flora elements and are favourable biotopes for wildgame. Sites with rare plants should be protected.

Wildgame leads to specific problems. It can severely damage the forests. One should aim at an equilibrium between game and forest. More natural forests have a greater carrying capacity for wildgame. Consideration should be shown to special terrain parts near mating areas which are important to birdlife (Falk & Mörtnäs, 1984; Lamerdin, 1988; Lust, 1990; Pflug, 1991).
9. The rate of dead wood should be increased. The standing as well as the lying necromass are important. Crown wood and bark should be left and decomposed on the spot. Old big tree bodies should be left standing or lying in the forest. Dead wood is not only valuable for the biological aspects of the forest, but also for the nutrient cycle (Lust, 1990; Schoop, 1991).
10. Forest edges have a special importance. Well structured edges, gradually built up, are highly evaluated by nature conservation. They also prevent problems with adjacent farmers. Native shrubs and trees of second and third size order are particularly appropriate (Rohner, 1988; Lust, 1990; Schoop, 1991).
11. Several authors also stress the value of specific biotopes:
 - well-regions, swamps, riparian forests, dry forests (Rohner, 1988; Lust, 1990);

- valley-grounds : certain valleys should be kept open; on the one hand because of scenic beauty and on the other hand because of biological values (Lamerdin, 1988);
 - cutting of hardwood in scots pine stands with orchids; construction of water places for amphibians; care for ant hills, etc. (Schoop, 1991);
 - consideration for waste land, paths and tourist roads (Falk & Mörtnäs, 1984); a special attention is required for land close to houses, lakes and streams (Hedén, 1984).
12. Under no circumstance, forest exploitation should thoroughly disturb the ecosystem. The use of heavy logging machines causes many problems, especially on sensitive soils. The system also leads to large scale practices. Use of horses reduces to a large extent damage to the ecosystem (Lust, 1990; Schoop, 1991).
 13. With reforestations as well as with afforestations the use of technical facilities should be reduced to a minimum (Hedén, 1984; Lust, 1990; Kirbach, 1991; Otto, 1991) :
 - strict reduction or an absolute prohibition to use herbicides and fertilisers;
 - soil preparation, and consequently deep cultivation ploughing, is not accepted in areas which are valuable for nature conservation.
 14. In special cases integral or directed forest reserves should be established. They should form a network, in which the different forest communities are sufficiently represented. They are useful for research and training and can stress some aspects of nature conservation (Hedén, 1984; Rohner, 1988; Lust, 1990; Otto, 1991; Schoop, 1991) Meanings differ about the rate of integral (total) forest reserves. The proposals range from 2% to 5 % (Schoop, 1991), 10% (Voegeli, 1988) and even much more.
 15. Isolated measures are insufficient in an ecosystem. It should be looked after an appropriate biotope. In most cases, this can primarily be reached by a close to nature forest management.

Lamerdin (1988) summarizes the new forest vision as follows: in his decision making, the forester should not only take into consideration growing stock, wood increment, felling quantity, wood yield, wood sale and wood prices, but he should pay more and more attention to the situation of the soil, the water and the air, to the presence of rare tree species and to tree species of second size order, to the shrub and herbal layer of the forest, to the treatment of the forest and stand edges,

to the protection of biotopes and species, to biotope mapping, to the protection of birds, ants and bees, to the natural forest communities, to the forest as an ecosystem, etc.

It is, however, obvious for a keen observer, evaluating critically the current forest situation, that the implementation of the above mentioned recommendations and demands, still requires much time and labour. As an example Otto refers to the situation of the regeneration in Niedersachsen:

- natural regeneration takes up 24 % of the area; this is already a favourable situation, though it is still far from the optimal situation;
- the artificial regeneration under cover, without clear cutting, takes up 43%; this already indicates a strong enrichment;
- 33 % of the area is still regenerated by large scale clearcuttings; these stands should still be converted.

Also Rohner (1988) strongly pleads for a more close to nature forestry. He formulates three wishes to the forest owners and to the foresters:

- that a more open dialogue should come about between all parties involved in forest use;
- that the forest should be considered as a natural space of life, that produces a.o. wood;
- that a more active collaboration should exist in the fight against the increasing environmental burden and the entailing threat to forests;

Finally, mention should be made in this respect of the "Pro Silva" movement, which was recently launched in several European countries (Slovenia, Greece, France, Germany, Belgium, the Netherlands, Norway, United Kingdom, Spain, Turkey, Switzerland, etc.) and which tries to reassess the forest and the forestry by promoting a close to nature forestry, as well in the publicly owned as in the privately owned forests.

4. FOREST POLICY ON MULTIPLE USE FORESTRY

As already mentioned, the central words in the definition of multiple use forestry are: "conscious" and "deliberate" (Hultman, 1984). It means that multiple use forestry should be directly recognized by the forest legislation and that it should be carried out by the forest owners.

4.1. Legal aspects of multiple use forestry

Forest legislation in Europe has been adapted step by step to the multiple use function of the forest. In the first place, the protective function of the forest has been stressed by regulations on clear cuttings and deforestations. Also, some measures to emphasize the nature conservational value of certain forests have been taken. The accessibility to the forest was also regulated. All this happened in the first place in publicly owned forests, but barely in privately owned forest, though the latter type dominates in area.

Even though the adaptation was carried out on a legal basis, the question of implementation can be raised. Certainly, the integration of forest recreation occurred without great problems. This has brought a large group of people in contact with the forest and led to an unmistakable reassessment of the forest. But the greatest criticism on the forest came from a small group of strongly conscious nature conservationists. The confrontation between foresters and nature conservationists was violent. Two groups of factors allow to explain this.

1. The greatest part of the foresters and of the forest owners radically denied the nature conservational value of the forest. The forest objective was wood production. The forest was considered as a wood factory. The notion sustainability was interpreted in the short term.
2. A monofunctional forest cannot be immediately adapted to the requirements of nature conservation. That will ask many decades. Besides, society insufficiently realizes it has to contribute financially to allow for the multiple use function of the forest, to the profit of all members of the society.

But in the 1960s people's interest into nature increased. Consequently, legislation and policy were adapted, though often without important alterations in practice. In this respect, Sweden is a typical example. In 1975, as a result of a quickly increasing concern on nature policy, an additional paragraph was introduced in the Forestry Act: "Consideration should be shown for the interests of nature conservation." Consequently regulations were introduced on various operations, such as final fellings, establishment of stands, stand treatment, logging, transport and chemical use. Consideration should be shown in areas close to paths and roads, on waste land and small terrain parts, near mating areas important to birdlife, for rare plants and close to tourist roads (Stridsberg, 1984).

Notwithstanding these honourable objectives and regulations, Hultman (1984), taking in mind the basic criteria for multiple use forestry, concludes that multiple use forestry does not exist in Sweden.

A good example of legal recognition of multiple use forestry is contained in the recent Flemish Forest Decree (1990). Here multiple use forestry is emphasized in many articles and chapters:

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- the objective of the decree is to regulate the conservation, the protection, the establishment and the management of the forests (art.2);
 - the forest can "simultaneously" fulfil different functions, viz. economic, social educational, scientific, ecological, flora and fauna managing functions as well as protection functions (art.5);
 - the five main functions are elaborated in specific chapters (art.8-30).
1. Three conditions are coupled with the economic function of the forest :
 - it may not threaten the existence of the forest;
 - it should be based on the forest as a renewable resource;
 - it may not hinder the other forest functions.
 2. The main characteristics of the social and educational functions are:
 - all publicly owned forests are principally accessible to the public; privately owned forests, on the other hand, are principally not accessible;
 - forests are only accessible on the existing roads and by foot;
 - forest recreation should not lead to any damage to the forest;
 - accessibility of the forest can be granted.
 3. Protection forests are recognized due to their specific importance:
 - as water protection zone;
 - in regions sensitive to erosion;
 - their role in the regulation of water courses, climate and water treatment;
 - forests in the neighbourhood of enterprises burdening the environment.
 4. The regulations with regard to the ecological function only concern the publicly owned forests. The management of the public forests has to take into consideration the following objective:
 - the conservation or the recovery of the natural flora and fauna;
 - the promotion of the native tree species or species suited to the site;
 - the promotion of the natural regeneration;
 - the promotion of the ecological equilibrium;
 - the promotion of mixed and uneven aged stands;
 5. The forest reserves are coupled with the scientific function. Forest reserves can have different objectives :
 - the release of growth and development;
 - the conservation or achievement of forest plant communities, forest stand

types and growth forms.

Forest reserves have to fulfil preferably a scientific function with respect to forestry.

4.2. Separation of the forest functions

As already mentioned, the question can be raised as to the spacial significance of multiple use forestry:

- should the principles of multiple use forestry be applied on each level of the area?
- does multiple use forestry mean that the functions can be separated in space, that certain forests are monofunctional, but that the whole of all parts is multifunctional?

In practice, this discussion appears meaningless. Each forest is multifunctional, though the objectives of the forestry can be monofunctional.

In reality, forestry can be divided, albeit strongly schematized, into three directions of thought :

- single use forestry : only one forest function is considered, mainly wood production;
- multiple use forestry : different functions are consciously and simultaneously stressed;
- dominant use forestry : one function is strongly stressed, whereas one or more other functions are slightly considered.

It is obvious that the dominant use forestry theoretically belongs to multiple use forestry, but that the accents of the secondary functions are relatively minimal.

Otto (1991), as well as many other authors, is fully opposed to a separation of the forest functions. He describes the world forestry situation as follows :

- In different European countries, such as Great-Britain, Scandinavia and Spain, but particularly in overseas regions such as the U.S.A., Canada, New-Zealand, forestry is practised in a far-going technological way, resulting in a system of wood plantations. These countries think they fulfil the ecological requirements of forestry, at the same time creating even more national parks and recreation areas.
- Particularly in Central Europe, but also partly in Western and Southern Europe,

a close to nature forestry is practised and promoted.

Otto is basically opposed to the separation of forest functions, because Germany (F.R.G.) is much too small to justify a separation of forest functions. According to Otto, the basic ideas can be summarized as follows:

1. The more wood plantations are strived for, the more the pressure for total reserves will increase.
2. The more nature conservationists aim at the withdrawal of large forest areas from exploitation, the more urgent the need will be to intensify wood production in other areas.
3. From an ecological point of view, such a separation of forest functions will lead to globally negative consequences, as the effect of the island theory will increase.

Separation of forest functions is only justified in a limited number of forests, namely in those which are treated as total forest reserves. Forestry is not practised here, but the forest reserves are multifunctional forests.

In the Netherlands "The long Term Plan Forestry" (1984-85) pays due attention to the different functions which are attributed to the forest. Finally 42 "forest target types" were described, divided over three groups:

- multiple forest target types (types 1 to 22): directed towards wood production, nature conservation and recreation;
- nature conservational forest target types (types 23 to 37): directed towards nature;
- short rotation forest target types (types 38 to 42): monofunctionally directed towards wood production; it concerns objectives types existing of pure homogeneous softwood stands of exotic tree species.

It is obvious that the optimal and steady implementation of a multiple use forestry is not so simple. As to the integration of the forest functions, Sprich and Waldenspuhl (1991) express the following considerations.

1. No country can afford to abandon the forestry use of its forests.
2. Protection of the species and biotopes equals ecosystem protection. This means that the forest management may not threaten none of the regulation mechanisms.

3. The combination of wood production and ecosystem protection inevitably requires a maximum practice close to nature forestry.
4. The optimal combination of ecosystem protection and forest use also requires a common responsibility instead of a divided competence. The collaboration of experts from different disciplines is required.
5. Foresters have to comply to ever more stringent rules. They should be prepared to permanent training.
6. The principles of multiple use forestry have to be applied immediately in the publicly-owned forests. However, the situation is not the same in the privately owned forests. Here it is absolutely necessary to compensate the owners for the multiple services produced by their forests.
7. The public has to be informed on the objective and the content of the forest operations which will be carried out.

4.3. Instruments for a multiple use forestry

It is not sufficient to have a good forest legislation. It must also be implemented in practice. To this effect, special instruments are needed.

1. The best instruments to influence the forest owner and the forester are information and advisory work (Falk & Mörtnäs, 1984; Hultman, 1984):
 - extensive personnel training of the forest administration and of all forest workers;
 - publishing books and pamphlets on outdoor recreation and forestry, on flora and fauna preservation in forestry, on preservation of ancient culture in forestry, on recommendations concerning forestry and hunting, on environmental care in forestry, etc.
2. Forest administrations should be provided with specialists to plan for and manage outdoor recreation, nature conservation, interpretation, etc. It is no longer acceptable that all functions are to be handled by "The Omnipotent Forester", as was already stated by Behan in 1966.
3. Much research should be carried out to develop sound planning methods, especially on how to integrate intangible values (Hultman, 1984).
4. Mutual distrust between foresters and nature conservationists should be taken away. It is our duty to strive for the best possible collaboration (Rohner, 1988).

5. Multiple use forestry need a specific planning.

It is not unfair to say that in the past the forest management plans were often not much more than timber management plans. It seems obvious, however, that in the future more emphasis is to be laid on the development of operable planning systems and procedures for multiple use forestry. Also, the involvement of various interest groups and the public to the forest planning should be considered (Saastamoinen et al;1984).

In Germany, forest function-mapping was started in 1975. Special attention was paid to forests with a protective function or with a recreational function (Spahl, 1991).

Detailed planning also exists in Sweden. All the domains of the Swedish Forest Service were classified in five land-use classes. For the different classes detailed land use plans in the form of working plans, disposal and management plans, and extraction plans were made (Hedén, 1984). The two main land-use classes are :

- I Forest land with timber production as the main use. This class makes up the main part of the forest land area.
- II Forest land where special consideration is to be given to nature conservation and recreational activities.

Even if timber production is the main use within land-use class I, the possibilities for nature conservation, wildlife management and outdoor recreation should always be considered. Close to houses, roads, lakes and streams special attention is required. Single trees, groves and bushes should be left. In areas that are highly frequented by the public, it may be advisable to choose regeneration by means of seed trees. Deep cultivation ploughing and the use of pesticides should be restricted. In connection with forest fertilization, a strip 50 m wide should be left alongside lakes, major watercourses, private lots and areas which supply fresh water.

For class II, some examples of divergencies from the normal silviculture program are:

- a prolonged rotation period can be accepted;
- the clear cut areas shall be planned in such a way that the scenic beauty is disturbed as little as possible;
- when cutting is performed with subsequent planting, a number of big, beautiful trees should be left standing;
- variation in tree species is recommended and a greater proportion of hardwood can be accepted;

- deep cultivation ploughing is not accepted

It is obvious that all these recommendations and regulations will contribute to a better multiple use forestry. According to Hultmann (1984), however, it remains to be seen whether they are sufficient to confirm that the practice of Swedish forestry really corresponds to a multiple use forestry.

As already mentioned, Denmark might be the country with the best forestry planning and where the principle of multiple use forestry is realised in practice

5. CONCLUSIONS

Multiple use forestry is a term dating from the 20th century and more particularly from the last decades. It was already applied in the former agrarian communities. But in the mid 19th century, the forest has been converted into a wood factory and from that time on single use forestry dominated. Real forests, viz. more or less natural forests or little disturbed forest ecosystems, have now become very rare.

Multiple use forestry can be defined as "the conscious and deliberate use of the forest for the concurrent production of more than one good or service".

Forests always fulfil a multiple use function. Forestry, on the other hand, does not. It can be directed consciously towards one single function.

It is obvious that wood production is not the most important function of forestry. Although it is meaningless to express in financial terms the indirectly economic forest functions, it can be shown that their value is many times larger than the material production.

In today's Europe multiple use forestry stresses the following three items in particular : wood production, recreation and nature conservation.

Wood production will continue to be very important. But the other functions, no doubt, will be even more stressed.

Integration of recreation in the forest does not lead to big problems. In private forests, however, hunting can be an objection. Recreation can be harmful for the forest and nature conservation.

The stressing of nature conservation in forests is a recent phenomenon. It has led to great conflicts between foresters and nature conservationists. The latter especially criticized the following points: the disappearance of the natural forest, the artificial characteristics of the present forest, the felling and regeneration methods, the use of all kinds of technical facilities, etc.

Meanwhile, many foresters and nature conservationists already agree on the general future forest type, on the multiple use function of forestry in future and on a great number of measures which can be taken to practise a more close to nature forestry. The following points are mentioned most often : choice of tree species, felling and regeneration methods, forest treatment, fauna and flora, diversity, self

regulating processes, dead wood, natural stands, conservation of specific biotopes, logging, use of facilities, creation of forest reserves, etc.

Multiple use forestry can only reach its objective, if an appropriate forest policy is pursued. Multiple use forestry should be recognized, promoted and regulated by forest legislation.

It is important, unless in exceptional circumstances, not to separate the forest functions in space. Multiple use forestry should be practised on the smallest scale. As a matter of fact, some functions can be more stressed in space and time.

The most important instruments for the implementation of multiple use forestry are: information, advice, permanent training, a multidisciplinary forest administration, collaboration between several interest groups, planning and research.

Perhaps the recommendation made on the Fifth World Forestry Congress in 1961 can still be repeated in 1992 :

"The congress calls all governments to study, develop, and encourage sound concepts of multiple use management as a means of providing optimum satisfaction of human needs from forest and related land; and urges the various Nations of the World to accelerate the exchange of information on their experiences and conclusions in the development of their multiple use programs".

In the meantime, the accent of multiple use forestry has changed from outdoor recreation in 1961 to nature conservation in 1992.

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