

Management strategies on territories with special status of protection in the Czech Republic

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ABSTRACT: About 15% of the area of the Czech Republic is classified as territories with special status of protection, most of which is covered with forests. At present, at the time of integration of the country into the European structures, an increase in the area of such territories by approximately 20% is expected. The territories show significant variation of protection objectives, management restrictions, profound differentiation in natural conditions, structure of ownership and different levels of damage, especially that caused by anthropogenic pressure. This situation requires the formulation of long-term management strategies. The problem can be solved in the following successive steps: formulation of variants and alternatives of management strategies based on a retrospective analysis of forest development; prognosis of the forest condition development after application of the individual management strategies on the basis of growth and development simulations; addition of technological and economical bases; selection of optimal variants and alternatives from the viewpoint of the fulfilment of the owner's management goals, in accordance with the principles of forest policy and from the viewpoint of the fulfilment of the protection objective formulated for a specific territory with special status of protection. A set of methods for following the above-mentioned steps is specified in the presented contribution.

Keywords: protected areas; forests; management strategies; growth and development simulations

In the Czech Republic, territories with the special statute of protection include about 15% of the country area predominating part being formed by forest regions. At present in the time of integration of the CR into European structures, increase in the area of these regions by about 20% is expected (SIMON et al. 2003). The regions are characterized by considerable heterogeneity of the objectives of protection, management limitations, marked differentiation of natural conditions, ownership structure and various level of damage particularly due to overall anthropogenic impacts. These factors require objectification of the management strategy formulation with a necessary long-term prognostic level (PRIMACK et al. 2001). The problems can be studied in the following steps:

- determination of the protection objective;
- formulation of variants and alternatives of management strategies resulting from the retrospective analysis of the forest development;
- relation to technological and economic bases;
- selection of optimum variants and alternatives from the viewpoint of fulfilling management objectives according to principles of forest policy and from the viewpoint of accomplishing the objective of protection formulated for a particular region with the special statute of protection;
- prognosis of the development of forest conditions in applying particular strategies based on growth and development simulations as a control criterion.

The study of particular steps (problem fields) requires to use an integrated set of methods (study of the analytical base) and a synthesis resulting in a particular strategy.

FORMULATION OF THE PROTECTION OBJECTIVE

The aim of protection is the concentrated expression of management objectives. It expresses the picture and structure of an ecosystem in gradual time steps. It can range in marginal limits of the protection of the spontaneous uncontrolled ecosystem development (protection of processes) with the total elimination of the production role of forests up to, e.g. the mosaic protection of a plant species where economic activities do not have to be virtually reduced in the majority of a region. In general, it is possible to say that as much specially protected regions as many differentiated objectives of protection can exist.

OPTIMIZATION PRINCIPLES OF MANAGEMENT STRATEGIES

The condition of forests is generally the result of cultural, economic and political development. A basic requirement for permanent benefits is a necessity to preserve production potential and permanent existence of forests (MÍČAL, PETŘÍČEK et al. 1999). In forests on

areas with a special statute of protection the use of the system of sustainable management only is not sufficient. The function of these areas is actually to preserve natural values or to improve present condition of their anthropogenically affected environment by means of differentiated close-to-nature care or close-to-nature management of forest ecosystems. It is the case of using spontaneous processes with the goal-directed reduction of additional energy inputs into biological processes. In contrast to sustainable forest management, close-to-nature ways of care put considerable emphasis on autochthonous stands, i.e. not only on species but also on ecotype structure as well as on the natural and spatial structure in fulfilling the whole spectrum of non-wood-producing functions.

It is evident that in the choice of management strategies schematic procedures cannot be used and, on the contrary, the basic feature is variability and plasticity. Economic principles are reduced. From the aspect of principles mentioned above it is possible to use theoretical and practical criteria to check the fulfilment of protection objectives.

Theoretical criteria

From theoretical criteria, the most important are as follows:

- ecological stability, i.e. the potential of a forest ecosystem to be preserved under conditions of the effects of external factors,
- biodiversity, i.e. diversity within species and between particular species and the total diversity of an ecosystem,
- ecosystem productivity which is the result of the flow and dynamics of factors such as thermal energy, light, water and nutrients in forest ecosystems. The ratio of these factors determines if the ecosystem productivity increases, maintains or decreases. The fulfilment of ecological and environmental functions corresponds to a certain degree to these trends.

Practical criteria

Practical criteria are as follows:

- species composition of the ecosystem tree component which is a basic precondition to declare a close-to-nature forest. From the viewpoint of the species diversity of a forest, the fulfilment of species composition criteria can be considered if main species are present in a number, health condition and stage capable to ensure their prosperous development, i.e. production and reproduction including non-wood-producing functions of the forest;
- age structure of forest stands which has to be assessed in larger forest units. To direct management measures minimally towards forest normality and gradually up to natural age structure;
- spatial structure of forest stands which can be assessed similarly as age structure and within possibilities to direct the structure towards the natural texture of a forest;

- health condition and vitality of forest stands which can be generally evaluated from the aspect of potential possibilities to fulfil wood-producing and non-wood-producing functions of forests.

In the context of ecological principles and criteria mentioned above, it is necessary to mention the problem of applying the wood-producing function of forests.

The fulfilment of the production function of forests can be understood as the removal of wood mass (logging) from the forest environment usually for the purpose of their commercial use. The activity can be implemented in all stages of the forest development. Positive economic effects are usually supposed. Intensity of using the production function can range in extreme positions from an individual selection with the minimum volume of harvested timber per ha up to the use of clear felling. As a quite extreme position is to keep the forest to its natural development without any intervention. Then, however, we cannot speak about the use of the wood-producing function.

In forests with the special statute of protection, in affecting the forest and forest environment, thus also in fulfilling the wood-producing function of forests, it is necessary to favour objectives of ensuring and stabilization of the ecological function of forest ecosystems in agreement with differentiated objectives of protection and management of their use. In fulfilling the objectives, the use of the wood-producing function is often understood as an antagonistic negative factor.

This attitude is not, however, correct because it is necessary to admit that special management in particularly protected regions has to take into account also silvicultural and regeneration measures (to ensure protection objectives) where the production function is used. It is evident that the use of the production function of forests in regions with the special statute of protection brings risks to achieve the protection objectives. The risk has to be evaluated and according to possibilities also quantified. Primarily, it is, however, necessary to determine variants of technologies which can be used in the implementation of management principles according to determined protection objectives.

TECHNOLOGICAL ASPECTS OF MANAGEMENT STRATEGIES

Similarly as in the selection of management strategy (silvicultural practices) differentiated approach is necessary, it is not possible to propose the only universal model solution in the choice of technologies and, therefore, we have to develop a separate technological typification which must correspond to the following requirements:

- minimization of damage to soil surface by the passage of machines and in skidding operations with respect to potential erosion;
- minimization of soil compaction;
- minimization of the risk of the natural environment contamination;

- reduced disturbance of the root system of existing trees, decrease in the extent of mechanical damage to above-ground parts of trees;
- minimization of damage to the herb and shrub layers.

It is necessary to state that the use of any technological variant brings always a certain damage to the natural environment and thus it brings risks for the fulfilment of protection objectives.

RISKS FOR THE IMPLEMENTATION OF A MANAGEMENT STRATEGY

A risk for the practical realization of a management strategy from the viewpoint of achieving the protection objective can be dealt with in the following steps:

Risk degree (SR) – basic value 1–100

Potential limitation for achieving (or maintaining) the protection objective and its extent

0	none	risk factor has no effects on the protection objective	1
1	small	in fulfilling the effect of a risk factor the objective of protection is not endangered and its attainment is not worsened	10
2	medium	in fulfilling the effect of a risk factor the objective of protection is not endangered, however, its attainment is worsened	20
3	large	in fulfilling the effect of a risk factor the objective of protection is endangered, its achievement is difficult but realistic	50
4	very large	in fulfilling the effect of a risk factor the objective of protection is endangered, its attainment is often unrealistic	80
5	extreme	the fulfilment of risk factor effects cannot be prevented, attainment of protection objectives is unrealistic	100

A conception is also introduced of the global risk of irreversible changes of the destruction of a forest ecosystem:

Fulfilling the risk (NR) – weight 1–10

1	minimal, zero	weight	1
2	realistic, unpredictable	weight	3
3	realistic, significant	weight	7
4	sure	weight	10

Effects of fulfilling the risk (UNR) – weight 1–10

time aspects of the effect of fulfilling the risk from the viewpoint of maintaining (renewing) the protection objective

1	short-term	weight	1
2	temporary	weight	5
3	permanent	weight	10

Quantification of risks (KN)

Quantification of a particular risk

$$KN_i = (SR \cdot NR \cdot UNR) + KNR$$

KNR – coefficient of an unpredictable risk – (0–100)

Quantification of the total risk (KCR) of a technology:

$$KCR = a \cdot b \cdot c \sum_{i=1}^n KN_i$$

where: a – coefficient of the potential infringement of an optimum logging and hauling technology (1–10),

b – coefficient of the protection regime degree in relation to zones of protection grading (1–4),

c – coefficient of the degree of naturalness of forest stands (2–10).

The use of technologies from the viewpoint of fulfilling the protection objective:

- acceptable (utilizable),
- problematic,
- unacceptable (inadvisable).

CRITERIA OF FULFILLING THE PROTECTION OBJECTIVE IN USING SPECIAL MANAGEMENT BASED ON THE FOREST GROWTH AND DEVELOPMENT SIMULATION

A basic moment is to assess those management strategies only (or their variants and alternatives) which are classified as acceptable in evaluating risks of implementation. Thus, we fulfilled a condition that the strategy could be used in a territory with a special statute of protection. Moreover, we proceed from a condition that intentions of protection objectives will be fulfilled. To corroborate factors mentioned above it is suitable to use control mechanisms the basic element of which is mathematical modelling, e.g. on the basis of visual representation of the growth and development simulation of selected model areas (in larger areas if the area cannot be analysed as a whole). Thanks to the simulation it is possible to expect that from the actual condition of a forest (under the given context of natural conditions) on the basis of given and specified management strategy it will determine and provide visual representation of the forest condition for determined time steps with the quantification of particularly following attributes:

- changes in the structure and texture of stands;
- changes in the species composition of stands and expression of the age structure;
- recording the stand disintegration and the origin and development of a new stand by natural regeneration.

As a comparative standard serves an analysis of the same structure for the variant of spontaneous development (often used for the protection objective – forest ecosystem development free of any silvicultural measures and protection of natural developmental processes). At present, the technology is elaborated within the preparation of a Central European, locally calibrated growth simulator (SIMON et al. 2004).

ECONOMIC ASPECTS OF MANAGEMENT STRATEGIES

A strategy accepted on the basis of given criteria does not mean, however, its practical feasibility. If we leave out the question of technological equipment the economic sphere is fundamental. Introduction of special management strategies in the given area (which will be at least doubled with respect to our integration into European structures) which is in interest of a state and not of the property owner who is logically limited, is a costly business and financial flows depend on actual social and economic conditions. The conditions are generally valid. Based on these aspects it is necessary to carry out stratification of the area with a special statute of protection. Here, a basic criterion is uniqueness of the region and processes particularly from supra-regional aspects. The stratification serves at the beginning of studying the suggested scheme, for the question to determine the protection objectives enlarged by social obligation with reflection in legislation.

CONCLUSION

The problem of variant alternatives of management strategies in the Czech Republic is traditionally studied in a long-term context springing from the Central European forestry school. Elaboration of strategies for areas with a special statute of protection in the context of increased interest and problems of the environment are intensively dealt with and worked out in many regions.

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Strategie obhospodařování oblastí České republiky se zvláštním statutem ochrany

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ABSTRAKT: Přibližně 15 % rozlohy České republiky je klasifikováno jako oblasti se zvláštním statutem ochrany přírody, které většinou pokrývají lesní porosty. V souvislosti s probíhající integrací země do struktur Evropské unie je očekáván nárůst plošného podílu chráněných území na zhruba 20 %. Jednotlivé oblasti se od sebe významně liší důvody ochrany, hospodářskými limity, pestrostí přírodních podmínek, strukturou vlastnických poměrů a různou mírou poškození, způsobovanou především antropogenním tlakem na ekosystémy. Z této situace pak vyplývá požadavek na formulaci dlouhodobých strategií managementu. Problematika se řeší v několika následujících krocích: formulace variantních a alternativních řešení strategií managementu, založených na retrospektivních analýzách vývoje lesa; prognózování vývoje lesních poměrů po aplikaci konkrétních hospodářských strategií, založených na růstových a vývojových simulacích; doplnění o technologické a ekonomické zásady; výběr optimálních variant a alternativ z hlediska naplnění hospodářských cílů vlastníků ve smyslu principů lesnické politiky a současného splnění požadavků ochrany přírody všech konkrétních území se zvláštním statutem. V příspěvku je specifikován soubor metod uvedených postupných kroků.

Klíčová slova: chráněná území; lesy; hospodářské strategie; růstové a vývojové simulace

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