

Contents

Introduction

Study objectives

Stage of the knowledge

1. Prescription for choose and managing cuttings for natural regeneration
2. Ecological conditions necessary for the regeneration of Norway Spruce
3. Improving the stability of Norway spruce stands to disturbing factors
4. Techniques and working methods used in forest harvesting
5. Optimum width of cutting areas and recurrence with narrow shelterwood strips
6. Management of stands affected by disturbing factors

Study area

Results

A. Natural regeneration of Norway spruce in the border of stands

1. Treatments applied in spruce stands in the period 1975-1985
2. Treatments proposed to be applied in spruce stands in the period 1987-1996
3. Dynamic of the natural regeneration in relation with different site and stand conditions
 - 3.1. Relations between the composition of pre-harvestable stands and harvestable stands with spruce and the composition of natural regeneration
 - 3.2. Research on the fructification of Norway spruce in 1985
 - 3.3. The influence of site and stand characteristics on spruce regeneration
 - 3.4. Microclimatic research on the border of stand for different orientations
 - 3.5. Research on the influence of lighting degree on the installment, mentainment and growth of spruce seedlings
 - 3.6. The influence of the border of stand on the installing and mantaining seedlings from the natural regeneration
 - 3.6.1. Regeneration on the border of stand in experimental plots traited by strip clearcutting
 - 3.6.2. Regeneration on the border of stand in experimental plots traited by narrow shelterwood strips cuttings
4. Research on the site preparation for the succes of natural regeneration in Norway spruce stand
 - 4.1. Removal of litter-fall and vegetation
 - 4.2. Removal of harvesting debris and the superficial mobilization of soil
 - 4.3. Covering of soil by debris from the harvesting process
 - 4.4. Treatments against vegetation with Roundup
 - 4.5. Site preparation in bedding

- 4.6. Fencing of natural regeneration areas
- 5. Influence of grazing and game on the natural regeneration of Norway spruce
- 6. Research on the optimum width of strips (clearcuts on the border of stand)
- 7. Effects of the harvesting technologies on the natural regeneration of Norway spruce
 - 7.1. Effects of the gathering of wood on the soil
 - 7.2. Rationalization proposals of actual techniques of getting and gathering wood
 - 7.2.1. Rationalization of techniques of tree cutting. Device for controlled tree cutting
 - 7.2.2. Rationalization of gathering techniques in forest harvesting areas. Mobile bridge for the crossing of swampy areas
 - 7.3. Rationalization of gathering works

B. Natural regeneration in Norway spruce stands damaged by disturbant factors

- 1. Main disturbing factors which determine the lighting of stands and their influence on the stands dynamic
- 2. Analysis of site factors and structure parameters on natural regeneration in damaged stands by disturbing factors
 - 2.1. Influence of site type
 - 2.2. Influence of soil type
 - 2.3. Influence of forest type
 - 2.4. Influence of altitude
 - 2.5. Influence of exposition of slope
 - 2.6. Influence of litter
 - 2.7. Influence of relief forms
 - 2.8. Influence of slope inclination
 - 2.9. Influence of stand age
 - 2.10. Influence of management type after socio-economic targets
 - 2.11. Influence of seedling age
 - 2.12. Influence of the treatment type
- 3. Spatial analysis of the elements implicated in the structural modifications connected with evolution of regeneration
 - 3.1. Statistical analysis of the elements which induce structural modifications connected with evolution of regeneration
 - 3.2. Spatial distribution of seedlings
 - 3.3. Analysis of the interaction of site and stand factors on natural regeneration
- 4. Gaps morphometrie and seedling growth
- 5. Temporal modifications of stand structure

C. Natural regeneration of Norway spruce in timberline

- 1. Natural regeneration under the canopy
- 2. Natural regeneration in gaps produced by disturbant factors
 - 2.1. Characteristics of gaps
 - 2.2. Floristic aspects
 - 2.3. Forest practices aspects
- 3. Biochemical relations between the main species implicated in the process of the regeneration in timberline forests
- 4. The growth in height of seedlings in the natural regeneration at timberline

Technical recommendations for forest practices

1. Organization of the cuttings plan in the case of the treatments based on natural regeneration on the border of stands
 - 1.1. Criteria for the choose of treatments based on natural regeneration on the border of stands
 - 1.2. Organization of the cuttings plan in the case of shelter trips in the border of stands
 - 1.2.1. Scheme for estimation of the number of strips and the length of regeneration period
 - 1.2.2. Estimation of the number of succesions strips
 - 1.2.3. Estimations of the area and volume which will be cutted in the case of strip shelterwoods cuts in border of stands
 - 1.4. Management of the regeneration by the application of the treatments based on natural regeneration on the border of stands
2. Regeneration of the stands damaged by disturbant factors
 - 2.4. Numerical method for characterisation of the natural regeneration
 - 2.5. Decisional process in management of natural regeneration in stands affected by the disturbant factors
 - 2.6. Special prescription relating to the management of natural regeneration in stands damaged by the disturbant factors
 - 2.6.1. Site preparation for the succes of natural regeneration
 - 2.6.2. Artificial planting in unregenerated gaps
 - 2.6.3. Improvement works in natural regenerated areas

Conclusions

References

Summary