

1. Projektrubrik:

Alternative harvest methods, establishment and height growth of natural regeneration in different experiments with partial cuttings

Huvudsökande:

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2. Sammanfattning:

I forskningsprojekt studerades hur självföryngringar i barrskog etableras och växer beroende på olika skogsskötselåtgärder i flera långsiktiga fältförsök på SLU. Projektets syfte var att ge privata och offentliga skogsägare ett bättre underlag för att kunna fatta beslut om man vill ställa om till hyggesfritt skogsbruk. Mogna bestånd på frisk mark med minst 500 småplantor jämt fördelat per hektar är ofta lämpligt för måldiameterhuggning (måldiameter = 35 eller 40 cm bhd t.ex.), särskilt om föryngringsperioden är flera decennier långt och innebär 2-3 måldiameterhuggningar. I flerskiktad skog hade markberedning en negativ effekt på skugga-toleranta trädslag som gran och rekommenderas därför inte som vid skärmställning i enskiktad, likåldrig skog. Pga av trädslagfördelning i alla analyserade försök förväntas att gran har största chanser att utveckla stora träd i nästa beståndsgenerationen.

Som en del av projektet tog man fram en tysk metod för snabb föryngringsinventering anpassad för svensk förhållande. Om man vet metoden och beståndgränser, tar det en timme att räkna hur många småplantor finns per ha, hur jämtfördelat de står, och vilken höjd- och trädslagsfördelning de har. Metoden är även lämpligt att bedöma betesdryck på ett objektivet sätt så att jägaren skulle komma till ett lika resultat. Klavning av träd på en representativ beståndsyta för att använda grov diameterfördelning och Heureka Bestandsvis är ett annat viktigt verktyg för att uppskatta tidpunkten av nästa ingrepp och ekonomi. Forskningen fortsätter med ett projekt som vill kvantificera hur beståndsålder, beståndsstruktur, ståndort och skötselåtgärder påverkar etablering av nya föryngringsplantor.

3. Resultat:

(As stated in the application:) A summary of the observed rates of establishment, height growth and mortality of natural regeneration under different shelter conditions was provided in a research article published in the Canadian Journal of Forest Research (Table 5 and 6 in the attached article, appendix 1).

Unfortunately, access and explanation of data structure of original regeneration records was delayed for several experiments, hence they had to be excluded from more detailed analyses in order to proceed according to the time schedule. For example, only an overview of the natural regeneration records made 3 of the 9 Swedish single tree selection experiments could be used. While a general description of the regeneration process was obtained from literature and additional information was provided by the project partner, no original records of height measurements and seedling numbers were delivered from the sites in Jämtland and Lappland. A disappointing result was the finding that seedlings were planted in all plots overall treatments in the shelterwood trial across Sweden (SKS and SLU) and the Naturkultur trial (SLU). This was not mentioned in the literature. More important, it foils any attempt to follow the development of natural regeneration when annual height growth exceeds 2-3 cm 4-5 years after tree harvest. Depending on the accessibility of data, the original regeneration data from the target diameter and gap cutting experiments in Eriksköp and Rogberga in southern Sweden were analyzed in detail with two main results: 1) 500 seedlings per ha in mature conifer-dominated stands provide sufficient potential to regenerate these stands sufficiently, if the regeneration period with continued target diameter harvest operations exceeds 2-3 decades. Soil preparation was expected to be a required measure to assure sufficient regeneration on the studied sites, but this was not the case. In contrary, the soil scarification had a negative effect on the establishment of late-successional tree species like spruce, beech and oak (see the manuscript written for the special issue announced at the 8th IUFRO Conference on Forest Vegetation Management in Halmstad, appendix 2). One result that could not be achieved

The project developed the concept and tools to enhance stand assessments made by forest managers to estimate possible stand developments in the future. A manual for a simple survey method for forest managers was written to relate stand-specific regeneration conditions to the scientific results of this project and other regeneration studies, after training and application with Swedish forest students and forest managers (see the manual, appendix 3). The initial regeneration conditions of a particular managed stand are crucial to assess the stand development for future periods longer than 3-5 decades ahead. A rough diameter distribution and Heureka Standwise/Beståndsvi provide the information needed to assess economy and development of the mature trees for the next 2-3 decades, from a Swedish forest manager's perspective. However, the estimates can derive up to 10-40% depending on single stands and forest structure. Forecasts for more than one simulated partial cutting in heterogeneously structured stands are very unreliable. After all, this project was very important for alternative silvicultural methods as it allowed developing a concept and the tools to assess future management possibilities stand-specifically in close collaboration with any type of forest owner.

(Additional results:) Natural regeneration was re-measured in two additional experiments (Rogberga, 2 sites of the conversion experiment in Jämtland). Four Master theses were produced on the topic.

4. Kommunikation:

- Rogberga outdoor posters (appendix 4)
- SNS/EFINORD Workshop on natural regeneration in Umeå (15 participants)
- SNS/EFINORD joint proposal writing to build a natural regeneration establishment model
- PhD course 2014 on CCF and natural regeneration in Umeå (10 participants)
- 1 h contribution in Eriksköp during the CCF excursion in southern Sweden 2014 (100 participants)
- Oak under pine excursion (25 participants)
- Excursion in Göteborg (22 participants)
- Teaching forest students how to approach the broad topic, case studies, field exercises and methods to advice forest owners with special goals (60 students)
- Contact and capacity building with interested forest managers (Sveaskog, Gothenburg, Linköping, Hushållningssällskapet), i.e. joint field visits or information evenings with potential customers and town representatives
- Two research articles (see the article in appendix 1 and Puettmann et al. 2015. Silvicultural alternatives to conventional even-aged forest management - what limits global adoption? Forest Ecosystems 2: 8)
- Popular-science/debate article and webpage with Ulrika (article in progress)

5. Komplementering:

1. Publicerad artikel i tidskrift "Canadian Journal of Forest Research"
2. Manuskript för tidskrift "Forests"
3. Handbok för inventering av beståndsförnygring
4. Outdoor posters in Rogberga