Skötsel av ekblandskogar: naturvårdsgallring och respons hos träd och buskar

Management of oak-rich mixed forests: conservation-oriented thinning and response of trees and shrubs

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Opponent är Professor Per Milberg, Institutionen för fysik, kemi och biologi, Linköpings Universitet.

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Abstract
During the last century Swedish forestry has intensified with large-scale forest plantations, especially with Norway spruce (*Picea abies*), and the use of clear-cutting, which have influenced biodiversity negatively. Efforts to conserve biodiversity include legal protection of forest and voluntary set-asides, mainly managed through minimal intervention (passive management). Oaks (*Quercus* spp.) formerly grew to a large extent in open habitats, such as woodland pastures. Abandonment of such woodland pastures led to many closed-canopy mixed forests. Conservation-oriented thinning is a type of active management, with the aim to favour large oaks (*Quercus robur* / *Q. petraea*) and associated species. In this thesis, I investigate whether and how conservation-oriented thinning favoured oak regeneration, and I also examine the effects on other woody species, in comparison with minimal intervention and other factors, in 25 oak-rich mixed forests in southern Sweden.

Conservation-oriented thinning, compared to minimal intervention, increased the density of trees and shrubs in the understory with 500 %. Sprouting, mainly from shrubs, dominated the regrowth. Shrubs (e.g. hazel *Corylus avellana*, alder buckthorn *Frangula alnus*, and honeysuckle *Lonicera xylosteum*) produced many fast-growing sprouts, while the regrowth of trees was produced both through sprouting (e.g. aspen *Populus tremula*, rowan *Sorbus aucuparia*, and lime *Tilia cordata*) and through seedlings (e.g. birch *Betula* spp., oak *Quercus* spp., and willow *Salix caprea*). The survival of (cut) stumps differed among species, forming a continuum of responses from species where most survived and produced sprouts (e.g. hazel, hawthorn *Crataegus* spp., and lime), to the other extreme where only a small percentage of the stumps survived and produced sprouts (e.g. Norway maple *Acer platanoides*, birch, beech *Fagus sylvatica*). Shade-tolerance also influenced the response, and more shade-tolerant species sprouted to a higher extent than less shade-tolerant species, due to many remaining trees in the canopy after conservation-oriented thinning, reducing light availability in the understory. Knowledge about species composition of trees and shrubs before treatment can give an indication about the response after partial cutting.

Browsing reduced the growth of deciduous trees, especially oaks, to a greater extent than shrubs and Norway spruce. Protection against ungulate browsers improved the regeneration of oak, although very few saplings reached above breast height (130 cm) after 10 years. Fences also increased the growth of other trees and shrubs, which probably reduced the growth of oak. Regeneration of Norway spruce increased after conservation-oriented thinning, particularly at sites with more than 35 fertile spruces per hectare nearby. At sites with fewer fertile Norway spruces, broadleaved trees made up a larger proportion of the canopy, and here the competition from fast growing shrubs and broadleaved trees in the understory may have reduced spruce regeneration.

In summary, conservation-oriented thinning increased oak regeneration (stems above 130 cm) by 600 % compared to minimal intervention, but the height of oak saplings and other broadleaved trees were reduced by browsing ungulates. Shrubs seem to benefit more from the increased light levels, indicating competition in the understory. Hence, conservation-oriented thinning may favour oak if combined with protection against browsing and repeated partial cutting of competing species.