UNIVERSITY OF GOTHENBURG

Publications DEPARTMENT OF BIOLOGICAL AND ENVIRONMENTAL SCIENCES

Here we present publications connected to the Swedish Oak Project and other forest conservation research, in reverse chronological order. Click on a title to open a PDF of the article (some articles are accessed through ResearchGate). At the bottom of the site is a list of doctoral theses conducted within the project.

Journal articles

Strict reserves, IUCN classification, and the use of reserves for scientific research: a comment on Schultze et al. (2014) (ResearchGate)
Frank Götmark, Keith Kirby, Michael B. Usher
Biodiversity and Conservation 24: 3621-3625, 2015
Keywords: Other forest conservation research, Opinion piece, Conservation management
In this reply to an earlier article, the authors highlight the importance of having scientific research be one of the criteria by which new nature reserves are created, especially in woodland. This will allow valuable, long-term, experimental research evaluating the effects of different types of conservation management.

Exclosures can favour natural regeneration of oak after conservation-oriented thinning in mixed forests in Sweden: a 10-year study (ResearchGate)
Jenny Leonardsson, Magnus Löf, Frank Götmark
Forest Ecology and Management 354: 1-9, 2015
Keywords: Research on Oak Project sites, Browsing, Bushes, Oaks, Regeneration, Conservation thinning, Forest dynamics, Trees
In order to evaluate the effect of ungulate browsing on the regeneration of oak after conservation cutting and to test a possible management method, a number of exclosures were put up in 13 oak-rich mixed forests in southern Sweden. 10 years after this, the occurrence and growth of woody plants was measured in the exclosures, showing that oaks over approximately half a metre in height were more common in the exclosures than outside, but that other broadleaved tree species and shrubs had benefitted more and could out-compete the oaks. The results seem to show that continual management is necessary to ensure the regeneration of oaks in these forests, even inside exclosures.

Conservation Thinning in Secondary Forest: Negative but Mild Effect on Land Molluscs in Closed-Canopy Mixed Oak Forest in Sweden (ResearchGate)
Birte Rancka, Ted von Proschwitz, Kristoffer Hylander, Frank Götmark
PLoS ONE 10, 2015
Keywords: Research on Oak Project sites, Light exposure, Conservation thinning, Snails and slugs
The effect of conservation cutting on terrestrial snails and slugs was examined in 25 oak-rich mixed forests in southern Sweden. This species group is sensitive to desiccation and disturbances, and the results showed that the species richness had decreased and that most species had been affected negatively. However, the effect was relatively mild, and conservation cutting should be compatible with a maintained species richness of snails and

slugs over a longer time period.

Differential survival and growth of stumps in 14 woody species after conservation thinning in mixed oak-rich temperate forests (ResearchGate)
Jenny Leonardsson, Frank Götmark
European Journal of Forestry Research 134: 199-209, 2015
Keywords: Research on Oak Project sites, Bushes, Oaks, Regeneration, Conservation thinning, Forest dynamics, Conservation management, Trees
The response of different tree and shrub species to cutting was examined after conservation cutting in 25 oak-rich mixed forests in southern Sweden. The highest rates of survival were found in hazel and lime, and the lowest rates in birch and beech, and surprisingly no correlation was found between trunk diameter and survival, meaning large and small trees had similar rates of survival. The results are useful in predicting the effect of cutting in different types of forests.

Regeneration of oaks (Quercus robur/Q. petraea) and three other tree species during long-term succession - after catastrophic disturbance (windthrow)
Frank Götmark, Charliene Kiffer
Plant Ecology 215: 1067-1080, 2014
Keywords: Related forest conservation research, Dead wood, Oaks, Regeneration, Forest dynamics, Trees
In 1969, a planted spruce forest in southwestern Sweden was felled by windthrow and logging, and after the area was left to develop freely, a deciduous forest grew up which was examined in this study. Birch, rowan and beech dominated in the forest; dead wood production was high; and the amount of oak was lower than in the surrounding area, but still not negligible. Oaks seem to be able to survive in forests in early succession stages, and the long-term persistence of oak in temperate forests is probably due to its long life span, ecological flexibility and resistance to disturbances.

Retaining trees for conservation at clearcutting has increased structural diversity in young Swedish production forests
Nic Kruys, Jonas Fridman, Frank Götmark, Per Simonsson, Lena Gustafsson
Forest Ecology and Management 304: 312-321, 2013
Keywords: Other forest conservation research, Dead wood, Forest dynamics, Conservation management, Trees
With the help of data from the Swedish National Forest Inventory, the effects of 25 years of tree retention at clearcuttings in Sweden were examined. During the period 1997-2007 the amount of dead wood in young stands increased dramatically, and retained living trees also increased the last few decades. The results indicate a positive effect of the retention of trees at clearcuttings, but the amount of dead wood in young stands is still relatively low compared to older, mature stands.

Habitat management alternatives for conservation forests in the temperate zone: Review, synthesis, and implications
Frank Götmark
Forest Ecology and Management 306: 292-307, 2013
Keywords: Research on Oak Project sites, Conservation thinning, Forest dynamics, Conservation management
In this literature review, Frank Götmark gives a summary of the current knowledge regarding management of temperate forests with conservation values, and four management alternatives are discussed: minimal intervention, traditional management, non-traditional management in the form of for example conservation thinning, and species management. A combination of management alternatives may be used, and when methods aiming to recreate a specific habitat are used other methods should be considered as well, as there is seldom one "right" kind of forest. All management alternatives need to be

experimentally evaluated, in long-term studies.

Partial cutting can enhance epiphyte conservation in temperate oak-rich forests
Björn Nordén, Heidi Paltto, Christina Claesson, Frank Götmark
Forest Ecology and Management 270: 35-44, 2012
Keywords: Research on Oak Project sites, Biofuel and other harvesting, Oaks, Lichens, Light exposure, Mosses, Conservation thinning, Conservation management
The effects of conservation cutting on lichens and mosses growing on oaks was studied in 24 oak-rich mixed forests in southern Sweden. A positive effect of cutting was seen on both lichens and, to a lesser extent, mosses. Careful conservation cutting in closed-canopy oak-rich forests may thus benefit these species groups in the short run.

Shrubs protect oak seedlings against ungulate browsing in temperate broadleaved forests of conservation interest: A field experiment
Anna M. Jensen, Frank Götmark, Magnus Löf
Forest Ecology and Management 266: 187-193, 2012
Keywords: Research on Oak Project sites, Browsing, Bushes, Oaks, Regeneration, Forest dynamics, Conservation management
Survival of oak saplings after growing with or without surrounding shrubs after conservation thinning was studied in 10 oak-rich mixed forests in southern Sweden. Plants protected by shrubs turned out to have been browsed 20 percentage points less than those that grew up in the open, but a few years after the thinning, mortality increased among the saplings due to competition from the shrubs. The results indicate that protection by shrubs can reduce early browsing on oak saplings and thus benefit oak regeneration.

How we improved a landscape study of species richness of beetles in woodland key habitats, and how model output can be improved
Frank Götmark, Emil Åsegård, Niklas Franc
Forest Ecology and Management 262: 2297-2305, 2011
Keywords: Research on Oak Project sites, Landscape aspects, Species of conservation concern, Beetles
In this follow-up to a previous study concerning which local and landscape factors influence the species richness of wood-inhabiting beetles living on oak, the species group was sampled on the original 21 oak-rich mixed forest sites in southern Sweden, and on an additional 11 new oak-rich sites with a larger ecological variation. In a comparison between the species richness of wood-inhabiting and red listed beetle species and a number of environmental factors, both local and landscape factors turned out to be important for species richness; local amounts of dead wood was the most important factor for wood-inhabiting beetles, and the amount of forest with conservation values in the surrounding landscape was the most important factor for red listed species. A two-stage, follow-up experimental design like this one can clearly be useful when studying species-rich groups such as beetles.

Development of Secondary Woodland in Oak Wood Pastures Reduces the Richness of Rare Epiphytic Lichens
Heidi Paltto, Anna Nordberg, Björn Nordén, Tord Snäll
PLoS ONE 6, 2011
Keywords: Related forest conservation research, Browsing, Oaks, Lichens, Species of conservation concern
Red listed lichen species growing on old oaks were studied in Östergötland in Sweden, and the occurrence of these was compared with the degree of overgrowth around the oaks. 52 oaks with varying degrees of overgrowth were studied, and the results showed clearly that the number of red listed species increase with openness around the oak. It is thus important for the survival of these lichen species that vegetation around old oaks is cleared.

Factors influencing presence-absence of oak (Quercus spp.) seedlings after

conservation-oriented partial cutting of high forests in Sweden (ResearchGate)
Frank Götmark, Kaitlin M. Schott, Anna M. Jensen
Scandinavian Journal of Forest Research 26: 136-145, 2011
Keywords: Research on Oak Project sites, Bushes, Oaks, Regeneration, Conservation thinning, Forest dynamics
Regeneration of oak after conservation thinning was studied in 11 oak-rich mixed forests in southern Sweden. A high ground layer of herbaceous and woody plants had a negative effect on regeneration, whilst high soil moisture had a positive effect. Oak plants protected by e.g. shrubs had a lower survival rate, but those that survived grew taller on average.

Multispecies and multiscale conservation planning: Setting quantitative targets for red-listed lichens on ancient oaks (ResearchGate)
Heidi Paltto, Ingrid Thomasson, Björn Nordén
Conservation Biology 24: 758-768, 2010
Keywords: Related forest conservation research, Oaks, Landscape aspects, Lichens, Species of conservation concern
Lichens growing on giant oaks were studied on 50 such oaks in Östergötland, and the effect of the number of other giant oaks in the surrounding landscape on the lichen flora was analysed. Three out of the five studied lichen species were affected by the number of giant oaks on the smaller scale, 500 metres from the tree, and the two other species were affected on a larger scale, from 500 metres to 7 kilometres. In conserving the lichen flora on giant oaks, it is thus important to prioritise landscapes where the occurrence of such oaks is high.

Education and advice contribute to increased density of conservation trees, but not saplings, in young forest in Sweden
Frank Götmark, Jonas Fridman, Göran Kempe
Journal of Environmental Management 90: 1081-1088, 2009
Keywords: Related forest conservation research, Oaks, Regeneration, Conservation management, Social aspects, Trees
With the help of data from the Swedish National Forest Inventory, the effect of the counselling given to forest owners regarding regeneration and retention of broadleaved trees was examined. Between the periods 1983-1987 and 1998-2002 there was no discernible positive effect on the number of broadleaved saplings, however, the number of larger, broadleaved conservation trees increased. The results indicate that conservation counselling and education for forest owners can have a positive effect in some cases.

Conflicts in conservation: woodland key habitats, authorities, and private forest owners in Sweden (ResearchGate)
Frank Götmark
Scandinavian Journal of Forest Research 24: 504-514, 2009
Keywords: Other forest conservation research, Conservation management, Social aspects
In a questionnaire-based survey of conflicts between forest owners and the government over woodland key habitats, factors that could predict conflicts were identified. Age turned out to be the most important factor, and forest owners involved in conflicts were on average younger (54 years) than the rest (62 years). A possible explanation is that younger forest owners are more economically dependent on their forests than older owners.

Experiments for alternative management of forest reserves: effects of partial cutting on stem growth and mortality of large oaks (Quercus robur/Q. petraea)
Frank Götmark
Canadian Journal of Forest Research 39: 1322-1330, 2009
Keywords: Research on Oak Project sites, Oaks, Conservation thinning, Conservation management
The growth and survival of large oaks was measured before and after conservation cutting

in 25 oak-rich mixed forests in southern Sweden. On average, the oaks in cut plots had a 23% increased growth compared to uncut reference plots, but there was no difference on several of the sites, and on one site a number of large oaks had died after the cutting, but not in the reference plot. The conclusion is that cutting around large oaks is generally beneficial to their growth, but the results may vary.

Oak woodland restoration: testing the effects on biodiversity of mycetophilids in southern Sweden

Bjørn Økland, Frank Götmark, Björn Nordén
Biodiversity and Conservation 17: 2599-2616, 2008
Keywords: Research on Oak Project sites, Biofuel and other harvesting, Conservation thinning, Fungus gnats
The poorly researched species group fungus gnats was sampled before and after conservation thinning in 15 closed-canopy oak-rich mixed forests in southern Sweden, and the effect of the thinning on the species richness of these was evaluated. In total, 14 600 individuals of 286 species were sampled, and the results indicated a small to negligible effect of the conservation thinning.

Partial cutting reduces species richness of fungi on woody debris

Björn Nordén, Frank Götmark, Martin Ryberg, Heidi Paltto, Johan Allmér
Canadian Journal of Forest Research 38: 1807-1816, 2008
Keywords: Research on Oak Project sites, Dead wood, Oaks, Species of conservation concern, Conservation thinning, Conservation management, Fungi
The effect of conservation thinning on wood-inhabiting fungi living on thin and coarse dead wood was examined in 21 closed-canopy oak-rich forests in southern Sweden. The species richness of both basidiomycetes and ascomycetes decreased after thinning, and total species richness decreased on thin dead wood but not on coarse dead wood. The results indicate that even careful conservation thinning may have an adverse effect on wood-inhabiting fungi, especially on thin dead wood, and that, as a suggestion, 30% of the forest area should be kept from thinning.

Partial cutting as a conservation alternative for oak Quercus spp. forest – response of bryophytes and lichens on dead wood

Heidi Paltto, Björn Nordén, Frank Götmark
Forest Ecology and Management 256: 536-547, 2008
Keywords: Research on Oak Project sites, Dead wood, Oaks, Lichens, Mosses, Species of conservation concern, Conservation thinning
The effect of conservation thinning on mosses and lichens living on dead wood in the form of logs and stumps was examined in 15 closed-canopy oak-rich mixed forests in southern Sweden. After thinning, the species composition shifted towards a more drought-tolerant flora, and the species richness of lichens on stumps increased while the species richness of mosses decreased somewhat. The mild or neutral effects of the thinning indicate that careful conservation thinning is compatible with conservation of the moss and lichen flora on dead wood.

Openness in management: hands-off vs partial cutting in conservation forests, and the response of beetles

Niklas Franc, Frank Götmark
Biological Conservation 141: 2310-2321, 2008
Keywords: Research on Oak Project sites, Dead wood, Oaks, Light exposure, Conservation thinning, Species of conservation concern, Beetles, Conservation management, Herbaceous plants
Through extensive sampling in 22 oak-rich mixed forests in southern Sweden, the effect of conservation thinning on wood-inhabiting and plant-eating beetles was evaluated. Beetles were sampled before and after thinning, and in total 59 000 individuals of 1174 species

were collected. Both wood-inhabiting beetles on oak and plant-eating beetles increased by approximately 35% after thinning, and this indicates that species richness of both groups may be benefitted short-term by opening up closed-canopy forests.

Are small sedentary species affected by habitat fragmentation? Local vs landscape factors predicting richness and composition of land molluscs in Swedish conservation forests

Frank Götmark, Ted von Proschwitz, Niklas Franc
Journal of Biogeography 35: 1062-1076, 2008
Keywords: Research on Oak Project sites, Landscape aspects, Light exposure, Snails and slugs
In order to study how local factors and the surrounding landscape affects snails and slugs, the species richness of these was related to a number of factors in 25 oak-rich mixed forests in southern Sweden. The local factors "pH in soil" and "presence of boulders" were the most important factors, but the amount of deciduous forest and forests with conservation values in the surrounding landscape also had an effect on species richness. Even if snails and slugs are more dependent on local factors than most other species groups, these results indicate that landscape factors cannot be ignored in conservation management concerning the group.

Annotated checklist of fungus gnats from Sweden (Diptera: Bolitophilidae, Diadocidiidae, Ditomyiidae, Keroplatidae and Mycetophilidae) (ResearchGate)

Jostein Kjærandsen, Kjell Hedmark, Olavi Kurina, Alexei Polevoi, Bjørn Økland, Frank Götmark
Insect Systematics and Evolution Supplements 65: 1-128, 2007
Keywords: Research on Oak Project sites, Landscape aspects, Fungus gnats
A checklist of all species of fungus gnats found in Sweden is presented, with occurrence data for every species. 137 species are reported as new to the country, and an additional 36 species as new to science, bringing the sum total of species occurring in Sweden up to 722.

Careful partial harvesting in conservation stands and retention of large oaks favour oak regeneration

Frank Götmark
Biological Conservation 140: 349-358, 2007
Keywords: Research on Oak Project sites, Oaks, Regeneration, Light exposure, Conservation thinning, Conservation management
The regeneration and survival of oak plants after conservation thinning was studied in 25 oak-rich mixed forests in southern Sweden. The frequency of small plants, and the survival and growth of plants that had been marked and followed before and after thinning, was higher in thinned plots than in reference plots. Survival and growth also had a positive correlation with canopy openness around the plant, and these results indicate that conservation thinning in closed-canopy oak forests may benefit regeneration of oaks.

Standing or downed dead trees – does it matter for saproxylic beetles in temperate oak-rich forest?

Niklas Franc
Canadian Journal of Forest Research 37: 2494-2507, 2007
Keywords: Research on Oak Project sites, Dead wood, Oaks, Species of conservation concern, Beetles
The difference in species richness of wood-inhabiting beetles between logs and standing dead wood of oak was studied in 13 oak-rich mixed forests in southern Sweden. The results showed that logs were a more species rich substrate than the standing dead wood, but that the composition of species differed between the two substrates. Thus, it is appropriate to create not just standing dead wood but also logs in conservation forestry.

Indicators of biodiversity, what do they indicate? Lessons for conservation of cryptogams in oak-rich forest

Björn Nordén, Heidi Paltto, Frank Götmark, Kjell Wallin

Biological Conservation 135: 369-379, 2007

Keywords: Research on Oak Project sites, Dead wood, Lichens, Mosses, Species of conservation concern, Fungi

In order to see whether the two groups correlate, the number of red listed species and the number of indicator species of mosses and lichens were compared, and both were compared to total species richness of mosses and lichens, in 25 oak-rich mixed forests in southern Sweden. The number of indicator species was correlated with the number of red listed deciduous specialist lichen species and with the total species richness of lichens and wood-inhabiting fungi, and the number of red listed lichen species was correlated with the total species richness of deciduous specialist lichen species. The results show that the presence of indicator species of these particular species groups do not necessarily indicate the presence of red listed species, but might better be seen as indicating areas with generally high conservation values.

Factors and scales potentially important for saproxylic beetles in temperate mixed oak forest

Niklas Franc, Frank Götmark, Bjørn Økland, Björn Nordén, Heidi Paltto

Biological Conservation 135: 86-98, 2007

Keywords: Research on Oak Project sites, Dead wood, Landscape aspects, Species of conservation concern, Beetles

In order to study which factors influence the species richness of wood-inhabiting and red listed beetles, the occurrence of this group was compared to various local and landscape factors in 21 oak-rich mixed forests in southern Sweden. Two important factors that turned out to be determining the species richness of both wood-inhabiting and red listed beetles was the amount of oak-rich forests with conservation values and the amount of dead wood in the surrounding landscape. This is useful knowledge for conservation management and planning with regards to this species group, as it indicates that focus should be put on areas with high concentrations of suitable habitat.

At which spatial and temporal scales does landscape context affect local density of Red Data Book and Indicator species?

Heidi Paltto, Björn Nordén, Frank Götmark, Niklas Franc

Biological Conservation 133: 442-454, 2006

Keywords: Research on Oak Project sites, Dead wood, Landscape aspects, Lichens, Mosses, Species of conservation concern, Fungi, Herbaceous plants

The relationship between the occurence of red listed species of vascular plants, mosses, lichens and wood-inhabiting fungi and various local and landscape factors was examined in 22 oak-rich mixed forests in southern Sweden. The number of red listed species increased with the amount of "noble" deciduous or deciduous forest in the surrounding landscape, and vascular plants and fungi were more species-rich on sites where the proportion of suitable habitat was high 120 years ago, indicating a delayed response to land use change. Conservation work concerning many species in temperate deciduous forests may suitably be done on a scale of around 5 kilometres.

What about the regeneration of oaks in the Swedish forests? (The oak – history, ecology and management)

Frank Götmark

Rapport Naturvårdsverket, 2006

Keywords: Research on Oak Project sites, Browsing, Oaks, Regeneration, Landscape aspects, Conservation thinning, Forest dynamics, Conservation management, Trees

The results from two studies concerning the regeneration of oak are here summarily presented. The first study, concerning where in the landscape oaks regenerate, shows that

even if oaks are significantly more likely to regenerate in broadleaved forests, the regeneration of oak in Sweden is numerically most common in coniferous forests. The second study, within the Oak Project, shows that conservation thinning can be a way of benefitting oak regeneration in closed-canopy oak-rich forests.

New species of Moristroma (Ascomycetes) and phylogenetic position of the genus (ResearchGate)
Björn Nordén, Stellan Sunhede, Ellen Larsson
Mycological Progress 4: 325-332, 2005
Keywords: Research on Oak Project sites, Dead wood, Oaks, Fungi
Two species of ascomycetes are described as new to science, one from the south of Sweden and one from Japan. The species were found growing on exposed heartwood of oak branches, and besides descriptions and illustrations of the morphology of the species, the article also provides an overview of their systematics.

Broadleaved tree species in conifer-dominated forestry: regeneration and limitation of saplings in southern Sweden
Frank Götmark, Jonas Fridman, Göran Kempe, Björn Nordén
Forest Ecology and Management 214: 142-157, 2005
Keywords: Related forest conservation research, Oaks, Regeneration, Forest dynamics, Trees
The density of broadleaved saplings was quantified for a variety of forest types in the south of Sweden. The regeneration of beech, lime and ash was primarily confined to "noble" broadleaved forests, whilst regeneration of birch, rowan and oak was more successful in conifer-dominated stands. The results indicate that relatively cost-effective management methods could benefit the regeneration of several broadleaved tree species in conifer-dominated production stands, leading to mixed-species stands beneficial to both forestry and nature conservation.

Browsing damage on broadleaved trees in semi-natural temperate forest in Sweden, with a focus on oak regeneration
Frank Götmark, Åsa Berglund, Kerstin Wiklander
Scandinavian Journal of Forest Research 20: 223-234, 2005
Keywords: Research on Oak Project sites, Browsing, Oaks, Regeneration, Forest dynamics, Trees
A study was made of the degree of browsing on small trees of different broadleaved species on 25 oak-rich sites in southern Sweden. The results indicate that oak is the tree species most often grazed by ungulates, followed by ash, and the degree of browsing is correlated with the amount of shelter for ungulates in the nearby area. Oaks are also negatively affected by competition from other tree species for light, and in order to ensure the regeneration of oak in closed-canopy mixed forests, active management in the form of e.g. exclosures or conservation cutting may be necessary.

Evaluating partial cutting in broadleaved temperate forest under strong experimental control: short-term effects on herbaceous plants
Frank Götmark, Heidi Paltto, Björn Nordén, Elin Götmark
Forest Ecology and Management 214: 124-141, 2005
Keywords: Research on Oak Project sites, Light exposure, Conservation thinning, Herbaceous plants
The effect of conservation cutting on herbaceous plants was evaluated on six closed-canopy oak-rich sites in southern Sweden, the summer after cutting. The species richness of herbaceous plants increased with on average 18% after cutting, and the species turnover between years was large. The results showed no negative effects of conservation cutting on herbaceous plants, although some disturbance sensitive woodland species may be negatively affected when the forest is opened up. Thus, a variation in stand structure and

management measures is to be recommended.

Regional diversity of mycetophilids (Diptera: Sciaroidea) in Scandinavian temperate forests

Bjørn Økland, Frank Götmark, Björn Nordén, Niklas Franc, Olavi Kurina, Alexei Polevoi
Biological Conservation 121: 9-20, 2005
Keywords: Research on Oak Project sites, Landscape aspects, Conservation thinning, Fungus gnats
In order to explore the habitat requirements of the poorly understood species group fungus gnats, the species richness of these was inventoried at 15 oak-rich sites in southern Sweden, and later related to a number of local environmental variables and landscape factors. The amount of precipitation and the amount of nearby mixed forest with conservation values was positively correlated with species richness, and in a comparison with similar studies done in northern Sweden, boreal forests turned out to be more species rich than the southern boreonemoral forests. The results indicate that some conservation efforts thought to benefit other species groups, such as conservation cutting and removal of Norway spruce, may negatively affect species richness of fungus gnats.

Reinforcement capacity of potential buffer zones: Forest structure and conservation values around forest reserves in southern Sweden

Maria Thorell, Frank Götmark
Forest Ecology and Management 21.2: 333-345, 2005
Keywords: Other forest conservation research, Bushes, Dead wood, Landscape aspects, Species of conservation concern, Conservation management, Trees, Herbaceous plants
The relative conservation value of areas adjacent to forest-dominated nature reserves without buffer zones was measured in southern Sweden, in order to evaluate the degree to which reserves are isolated in the surrounding landscape. Basic indicators of conservation value, such as the proportion of broadleaved deciduous forest and the amount of large living trees and dead wood, decreased in a gradient from the reserve borders, with relatively high values within a potential buffer zone of 200 metres. Reserves with higher conservation values also had surroundings with higher values, and the results indicate that forest-dominated nature reserves cannot be automatically assumed to be isolated, but that official protection of buffer zones is to be recommended to ensure the preservation of the values in the future.

Fungus gnats (Diptera: Sciaroidea excl. Sciaridae) in the Swedish boreonemoral forests (ResearchGate)

Olavi Kurina, Alexei Polevoi, Frank Götmark, Bjørn Økland, Niklas Franc, Björn Nordén, Kjell Hedmark
Studia Dipterologica 11: 471-488, 2004
Keywords: Research on Oak Project sites, Fungus gnats
An overview of fungus gnats collected on 17 of the oak-rich Swedish Oak project sites in southern Sweden in 2001 and 2002 is given. A total of 9999 individuals were collected, identified to 250 species, of which 76 new to Sweden. A complete species list with recording data is provided.

Dead wood in semi-natural temperate broadleaf woodland: contribution of coarse and fine dead wood, attached dead wood and stumps

Björn Nordén, Frank Götmark, Marie Tönnberg, Martin Ryberg
Forest Ecology and Management 194: 235-248, 2004
Keywords: Research on Oak Project sites, Biofuel and other harvesting, Dead wood, Oaks, Trees
Dead wood in forests is an important substrate for biological diversity, but often only coarse dead wood is surveyed in conservation inventories. In this study dead wood over 1 centimetre in diameter was measured, including standing and downed dead wood and dead

wood attached to trees, on 25 oak-rich sites in southern Sweden. The amount of fine dead wood made up about half the total dead wood volume and did not correlate with the amount of coarse dead wood, indicating that inventories that only measure coarse dead wood may overlook a large part of the total dead wood on a site.

Relative importance of coarse and fine woody debris for the diversity of wood-inhabiting fungi in temperate broadleaf forests
Björn Nordén, Martin Ryberg, Frank Götmark, Bettina Olausson
Biological Conservation 117: 1-10, 2004
Keywords: Research on Oak Project sites, Dead wood, Fungi
In order to study the relative importance of fine and coarse dead wood for wood-inhabiting fungi, the species richness of fungi on dead wood was measured in 25 oak-rich mixed forests in southern Sweden. The species richness of wood-inhabiting fungi per volume dead wood and forest area was higher for fine than for coarse dead wood, and especially the ascomycetes exhibited significantly higher species richness on the fine dead wood. It is therefore important for the biodiversity of wood-inhabiting fungi that a range of size-classes of dead wood is present in a forest.

Size of nature reserves: densities of large trees and dead wood indicate high value of small conservation forests in southern Sweden
Frank Götmark, Maria Thorell
Biodiversity and Conservation 12: 1271-1285, 2003
Keywords: Other forest conservation research, Dead wood, Landscape aspects, Conservation management
The relative conservation values in large nature reserves and small woodland key habitats were examined. The small woodland key habitats had a generally higher degree of structures such as large trees and lying dead wood than the nature reserves. The results indicate that despite the problems concerning edge effects, small forests with conservation values are probably important for biodiversity in a fragmented woodland landscape.

Buffer zones for forest reserves: opinions of land owners and conservation value of their forest around nature reserves in southern Sweden
Frank Götmark, Helena Söderlundh, Maria Thorell
Biodiversity and Conservation 9: 1377-1390, 2000
Keywords: Övrig skoglig naturvårdsforskning, Conservation management, Social aspects
33 small private forest owners were interviewed regarding their attitudes toward nature reserves being expanded onto their land. Most of the forest owners viewed the issue as negative, and would not want their land to become nature reserves or buffer zones without compensation, but with economic compensation about half said they would consider accepting it. Generally, older forest owners had land with higher conservation values, but they also thought, to a higher degree than younger forest owners, that the responsibility for nature conservation fell on the government rather than on private land owners.

Doctoral theses

Management of Oak-Rich Mixed Forests (Abstract)
Jenny Leonardsson
University of Gothenburg, 2015
Keywords: Research on Oak Project sites, Browsing, Biofuel and other harvesting, Bushes, Oaks, Regeneration, Light exposure, Conservation thinning, Forest dynamics, Conservation management, Trees
This doctoral thesis by Jenny Leonardsson concerns management of closed-canopy oak-rich mixed forests with the help of conservation cutting, and was conducted within the Oak Project. The results show, among other things, that conservation cutting leads to a large increase in the amount of shrubs and trees in the undergrowth, and that oak regeneration is benefitted by exclosures but that other, competing species are benefitted more.

Effects of facilitation and competition on oak seedlings
Anna M. Jensen
Sveriges lantbruksuniversitet Alnarp, 2011
Keywords: Research on Oak Project sites, Browsing, Bushes, Oaks, Regeneration, Light exposure, Conservation thinning, Forest dynamics, Conservation management, Trees
This doctoral thesis by Anna Monrad Jensen concerns regeneration of oak, and was conducted partly within the Oak Project at the University of Gothenburg. The results show, among other things, that grazing on saplings of oak after conservation thinning is reduced if they grow protected by shrubs, but that the positive effect is strongest the first few years after cutting as competition from shrubs, primarily for light, increases with time.

Oak-rich Temperate Forest: Conservation Ecology of Cryptogams and Vascular Plants at Local and Landscape Level
Heidi Paltto
University of Gothenburg, 2008
Keywords: Research on Oak Project sites, Dead wood, Oaks, Landscape aspects, Lichens, Mosses, Conservation thinning, Species of conservation concern, Fungi, Herbaceous plants
This doctoral thesis by Heidi Paltto concerns mosses, lichens, wood-inhabiting fungi and herbaceous vascular plants in oak forests, and was conducted within the Oak Project at the University of Gothenburg. The results show, among other things, that mosses and lichens in closed-canopy oak-rich mixed forests are dependent on a larger landscape of surrounding deciduous forests than vascular plants and wood-inhabiting fungi are; that the number of species of vascular plants and wood-inhabiting lichens increases after careful conservation thinning; and that the number of indicator species in a forest is not correlated with the number of red listed species.

Conservation ecology of forest invertebrates, especially saproxylic beetles, in temperate successional oak-rich forests
Niklas Franc
University of Gothenburg, 2007
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This doctoral thesis by Niklas Franc concerns wood-inhabiting beetles in oak-rich mixed forests, and was conducted within the Oak Project at the University of Gothenburg. The results show, among other things, that the species richness of wood-inhabiting beetles is generally higher on logs than on standing dead wood of oak; that the amount of dead wood and forests with conservation values in the surrounding landscape is important for the species richness of the group, and that a careful outtake of biofuel in the form of conservation thinning can benefit both wood-inhabiting oak beetles and plant-eating beetles.