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**Effects of afforestation on**  
**ecosystems, landscape and rural**  
**development**

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**Icewoods**

**Project introduction**

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In this presentation the structure of the ICEWOODS project will be described. In Iceland it is foreseen that afforestation programs will increase in the near future. These programs are subsidized by governmental funding and are practised mostly by farmers and other landowners. There are ongoing debates on what effects afforestation will have on biodiversity and the ecosystem overall, as well as on landscape. To answer some of the questions that have been raised the ICEWOODS project was started in 2002 to investigate biodiversity and forest production. The project is run in cooperation with the Icelandic Institute of Natural History, Icelandic Forest Research, Agricultural University of Iceland and regional afforestation programmes.

The main objective of ICEWOODS is to study changes in species composition and population densities of birds, soil invertebrates, insects, vascular plants and fungi, and changes in carbon cycling that occur following afforestation. In the present study two study sites, in eastern and western part of Iceland were selected. At each site there are stands of

conifer plantations and native Birch as well as open heathland. The forest stands are of different age and are compared to study changes following afforestation. In the East there are 5 stands of Siberian larch, 2 stands of Birch and open heathland for comparison. In the West there are 4 stands of Sitka spruce, 3 stands of Lodgepole pine, 3 stands of Birch and open heathland. Together these four tree species account for about 80% of the annual afforestation in Iceland.

## **Icewoods**

### **Changes in ground vegetation following afforestation**

Ásrún Elmarsdóttir & Borgþór Magnússon  
Icelandic institute of Natural History

The main results on the effects of afforestation on ground vegetation in conifer plantations (Siberian larch, Sitka spruce and Lodgepole pine) in Iceland are covered in the presentation. A comparison to the vegetation of native Birch (*Betula pubescens*) forests and open heathlands will be made.

The results showed that there was a difference in ground vegetation between the two study sites. However, similar changes occurred at both sites in ground vegetation following afforestation, which are correlated with the age of the forest, density of trees and light at the forest floor. Species richness was highest in open heathland and the younger forests. Lowest species richness was encountered in the oldest forests where light at the forest floor was limited. The results show that the abundance of species adapted to open heathland decreases in the old forest stands while shade tolerant species become more common in the vegetation.

The results from both study sites indicate that species richness is higher in the native Birch forests compared with the conifer plantations. Total number of species (vascular plants, mosses and lichens) found in the Birch forests was 42 – 84 but 25 – 45 in the older conifer plantations. This difference between the birch and the conifers is likely due to the height and density of the trees. The conifer trees are much higher than the native Birch and therefore less light reaches the ground in very dense conifer plantations. By managing the forest stands, e.g. thinning, it is possible to affect their species richness and species composition.

## **Effects of afforestation on ground living arthropods and gastropods in Iceland**

Erling Ólafsson & María Ingimarsdóttir  
Icelandic Institute of Natural History

Most invertebrate species have specialised ecological requirements. Thus they respond quickly to habitat changes. This study, a part of the ICEWOODS project, focuses on the effects of afforestation on ground living invertebrates. The groups considered are insects, myriapods, arachnids and snails.

To obtain data on age-related dynamics in faunal development afforestation, sites of different age were sampled. Sites with Siberian larch and birch in East Iceland and Sitka spruce, lodge pole pine and birch in West Iceland. In both regions open heath land sites were included in the study for comparison. In each research field 50 m long transects were randomly placed, five transects in each field. Two pitfall traps from each transect are being processed.

Preliminary results show marked age-related changes on faunal structures. Faunal changes can also be related to tree species, the different species having various effects on the underlying environmental conditions. Also regional differences are noted, the eastern fauna being in some extent different from the western fauna.

## **Birds and afforestation in Iceland**

Ólafur K. Nielsen, Gudmundur A. Gudmundsson, & Kristinn H. Skarphédinsson,  
Icelandic Institute of Natural History

The birch *Betula pubescens* is the only native tree species forming woodlands in Iceland. Dozens of other tree species have been imported and ambitious plans call for afforestation of several thousands km<sup>2</sup> of open vegetated country. This may have effect on several upland and wetland bird species as considerable portion of some of the west Palaearctic shorebird populations breed in Iceland. The effect of afforestation on the avifauna was studied in East Iceland in 2002 and 2003 by comparing species composition, diversity, density and biomass in five different types of habitats: (1) open country; (2) larch stands, age 7-12 years; (3) larch stands, age 17-23 years; (4) larch stands, age 33-47 years; and (5) birch forest, age 90+ years. Fourteen bird species were recorded and seven were classified as "open country species", four as "generalists" and three as "forest species". Densities and biomass were highest during the first stage of afforestation (larch-1) and species diversity was lowest during the thicket stage (larch-2). Open country birds had all disappeared at the thicket stage (larch-2). Origin of the bird fauna in the larch stands was local, both generalists (4 species) and birch forest birds (2 species), and forest birds from abroad (1 species). The results are compared with preliminary data from W-Iceland.

## **Fungi in larch and birch woodlands of different age in Eastern Iceland**

Guðríður Gyða Eyjólfsdóttir  
Icelandic Institute of Natural History

Based on fungi collected in middle of August 2003 and middle of September 2004 in the ICEWOODS experimental plots in Fljótsdalshérað Eastern Iceland, the species composition of fungi for each plot was established. There were eight plots, one was heath land without trees, five Siberian larch plots with the youngest (L1) 15 and the oldest (L5) 55 years of age, and two birch plots one young (B1, 25 years of age) but the other old (B2, 96 years of age).

The old birch plot (B2) had the highest number of species but the young birch (B1), the two oldest (L4, L5) and the second youngest (L2) larch plots were medium but lowest number of species were in the heath land (M), the youngest (L1) and third youngest (L3) larch plots.

Available substrates or host species for ectomycorrhizal fungi and parasitic fungi accounted for much of the difference in species composition of fungi present in each plot.

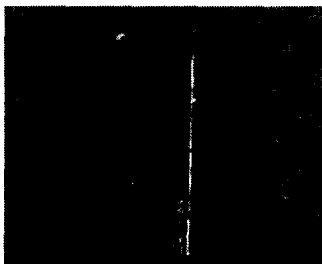
Several species of fungi were recorded for the first time in Iceland in this study.



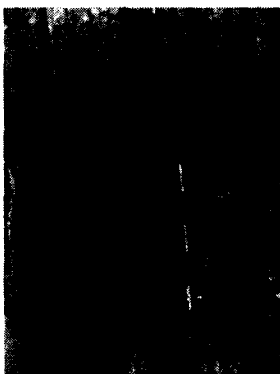
EFST Á BAUGI



Ásrún Elmarsdóttir



Mællireitur lagður út í mólendi í Mjóanesi á Fljótsdalshéraði (M1), dæmi um viðmiðunarland sem tekið er til skógræktar. Hér sem annarsstaðar á landinu er mólendið mjög tegundaríkt. Ríkjandi tegundir eru holtasóley, bláberjalyng, stinnastör, slíðrastör, móasef, túnvingull og gulmaðra. Ljósm. ÁE, 2002.



Fimmtíu ára lerkiskógur á Hallormsstað (L5). Skógurinn hefur verið grisjaður og er allfjölbreyttur og gróskumikill blómgróður í skógarbotni. Meðal ríkjandi tegunda eru hrútaberjalyng, vallelfting, brennisóley, slíðrastör, hálingresi og vallarsveifgras. Ljósm. Borgþór Magnússon, 2002.



NÁTTÚRUFRAEÐISTOFNUN ÍSLANDS

- EFST Á BAUGI
- YFIRLIT
- STARFSEMI NÍ
- UM NÍ
- BÓKASAFN
- ÚTGÁFA
- SÝNINGAR
- STARFSMENN

## HRAFNAPING Á HLEMMI

Síðasta fræðsluerindi vorsins á Náttúrufræðistofnun verður 20. apríl n.k. kl. 12.15 í sal Möguleikhússins á Hlemmi

Ásrún Elmarsdóttir, plöntuvistfræðingur á Náttúrufræðistofnun flytur erindi sem hún nefnir:

## SKÓGVIST

### – áhrif skógræktar á gróðurfar

Skógrækt er ung og vaxandi atvinnugrein hér á landi og áhugamál fjölda fólks. Líklegt er að uppvaxandi skógar muni á næstu áratugum hafa áhrif á lífríki og ásynd láglandissvæða. Talsverðar umræður og deilur hafa orðið á undanföllum árum um skógrækt í landinu og áhrif hennar. Þar hefur m.a. komið fram að fremur takmarkaðar rannsóknir hafa farið fram á vistfræðilegum áhrifum skógræktar hér á landi.

### Rannsóknaverkefnið SKÓGVIST

Til að leita svara við spurningum sem upp hafa komið var árið 2002 hafð rannsóknaverkefnið SKÓGVIST í samstarfi Náttúrufræðistofnunar Íslands, Skógræktar ríkisins og Landbúnaðarháskóla Íslands. Markmið verkefnisins var að kanna þær breytingar sem verða á lífríki, kolefnishringrás og á jarðvegi mólendis við skógrækt og þegar birkiskógur vex upp við sjálfsáningu. Rannsóknirnar fóru fram á Fljótsdalshéraði á Austurlandi og í Skorradal og Norðurárdal á Vesturlandi. Mælingar voru gerðar í mólendi og í birki-, lerki-, sitkagreni- og stafafuruskógum á mismuandi aldri og framvindustigum. Í erindinu verða í fyrsta sinn kynntar niðurstöður úr gróðurrannsóknnum á báðum svæðunum.

### Mólendi og ungskógar eru tegundaríkari

#### en gamlir skógar

Niðurstöður sýna að nokkur munur er á gróðurfari mólendis og skóga á milli Austurlands og Vesturlands. Hann má rekja til flórumunar milli þessara landshluta en hefur lítið með skógrækt að gera. Á báðum svæðum komu hins vegar fram miklar og sambærilegar breytingar á gróðurfari sem eru nátengdar aldri og þéttleika skóganna. Tegundir voru flestar í mólendi og ungum skógarteigum (línurit) en þeim fækkaði eftir því sem skógarnir hækkuðu og þéttust. Þar sem skógar vaxa upp láta bersvæðategundir undan síga en skuggapolnar kjarr- og skógartegundir nema land eða auka hlutdeild sína í gróðri.

### Er gróður fjölbreyttari í birkiskógum en barrskógum?

Niðurstöður bæði frá Austurlandi og Vesturlandi benda til að háplönufloa birkiskóga sé tegundaríkari en floa sem verður ríkjandi í gömlum teigum af lerki, greni og furu. Í birkiskógum fundust að meðaltali 20 – 30 tegundir í hverjum reit, en í barrlundunum var meðalfjöldi allsstaðar innan við 20 tegundir. Af barrtrjánnum var flóran tegundaríkust undir lerkinu. Fátæklegust var flóran í 45 ára gömlum furulundi í Skorradal en þar voru að meðaltali 8 tegundir í hverjum reit (línurit). Þessi



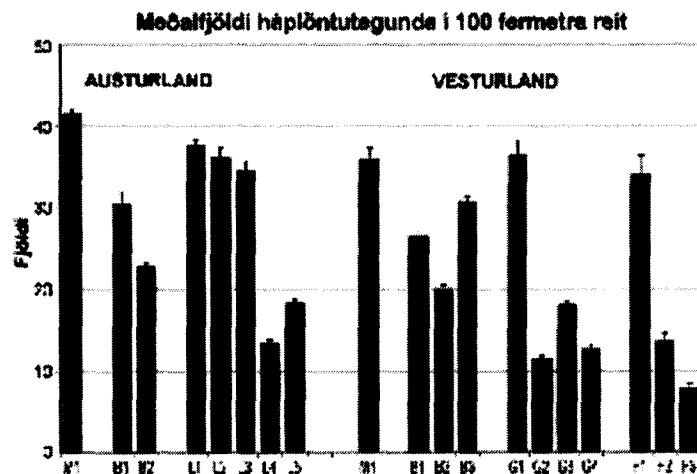
Ungur og opinn sitkagreniteigur (G1) á Fitjum í Skorradal. Tegundaríkur grasmói með krossmöðru í blóma, trén eru ekki farin að hafa áhrif á undirgróðurinn. Ljós. ÁE, 2004.

munur á flóru birkiskóga og barrskóga stafar líklega einkum af því að barrtegundirnar eru hávaxnari en birkið og verður meiri skuggi undir þeim í þéttum, ógrisjuðum skógum. Barrtegundirnar, einkum greni og fura sem eru sígrænar, hafa því meiri áhrif á umhverfi sitt en birkið.

Þegar skógi er plantað í opið land þarf að ígrunda vel markmið skógræktarinnar. Má þar nefna að ekki fer alltaf saman skógur sem nýta á til útivistar og skógur sem er gróðursettur til framleiðslu á timbri. Huga verður að náttúrufari lands sem taka á til skógræktar, tegundavali og hvernig hirða á um skóginn þegar hann vex upp. Með auknum upplýsingum og skilningi á þeim breytingum sem verða þegar skógur vex upp af skóglausu landi verður hægt að stýra betur framvindu í skógunum. Niðurstöður SKÓGVISTAR-verkefnisins sýna að með grísjun skóganna má hafa mikil áhrif á framvindu og fjölbreytileika botngróðurs þeirra.



Mællireitur í 45 ára gömlum, þéttum furuteig (F3) á Stálpastöðum í Skorradal, uppkvastaður en ógrisjaður skógur. Hér er lítil birta á skógarbotni og gróður gisinn og tegundir fáar. Undir trjánnum er ló af skógarmosum en af háplöntum eru það helst blágresi, hrútaberjalyng, vallefthing, bugðupunktur og slíðrastör sem hjara í skugganum. Ljós. ÁE, 2004.



Niðurstöður um meðalfjölda háplöntutegunda í reit ( $\pm$  staðalskekka,  $n=5$ ) í mólendi (M) og birki- (B), lerkí- (L), greni- (G) og furuskógum (F) á Austurlandi og Vesturlandi. Birkiskógar á Austurlandi voru 20 ára gamall sjálfsáinn skógur (B1) og gamalfriðaður skógur frá 1907 (B2), en á Vesturlandi lágvaxnir kjarrskógar í Skorradal og Norðurárdal (B1 og B2) og hávaxnari skógur að Vatnshorni í Skorradal (B3). Lerkiteigar voru 10–50 ára gamlir (L1–L5), greniteigar 9–43 ára (G1–G4) og furuteigar 14 – 45 ára gamlir (F1–F3).

Áhrif skógræktar á fuglalíf

Sjá kynningu á erindi Ólafs Karls Nielsens fuglafræðings á Hrafnæpingi í febrúar 2004.



Mællireitur í gömlum birkiskógi að Vatnshorni í Skorradal (B3). Í skógarbotni er gróskumikill og fjölbreyttur gróður, en meðal ríkjandi tegunda eru blágresi, hrútaberjalyng, fjallidalafíll, túnsúra, krossmaðra, ilmreyr, slíðrastör og vallefthing. Ljós.: ÁE, 2004.

Fræðsluerindi Náttúrufræðistofnunar eru opin öllum.