Forestry in a Treeless Land

Forestry in a Treeless Land - Fourth edition, 2013
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Among the first things that visitors to Iceland usually notice are that it is not as warm as where they came from and there is a lack of forests in the landscape. Logically, they connect these two facts and come to the conclusion that Iceland is too cold for forests. This impression is often reinforced when they see the "forests" of low-growing and crooked native birch. However, over a century of forestry has proven that this is not the case, that it is past land-use and not climate that explains the treeless landscape. In fact, forests grow as well in Iceland as they do in parts of the world where forestry is a major industry.

Forest history

Fossil evidence indicates that Iceland was generally forested during the mid to late Tertiary (5-15 million years ago), with tree genera including *Sequoia, Magnolia*, *Sassafras, Pterocarya* and many others, indicating that the climate was warm-temperate. Beech (*Fagus sp.*) forests seem to have been very common. By the late Pliocene, shortly before the onset of Pleistocene glaciations, boreal-type forests predominated including *Pinus, Picea, Abies, Larix, Betula* and *Alnus*, indicative of a cooler climate.

With succeeding glaciations, the Icelandic flora became ever more species-poor. *Pinus* survived the first few glacial periods up to about 1.1 million years ago and fossil evidence of *Alnus* is found during interglacials to about 500,000 years ago. The only forest forming tree species to return to the present interglacial is downy birch (*Betula pubescens*). Other native tree species found in Icelandic forests are rowan (*Sorbus aucuparia*), which is uncommon, and the extremely rare aspen (*Populus tremula*) found naturally in only 6 locations, along with abundant tea-leaved willow (*Salix phylicifolia*), which is usually a shrub but occasionally reaches tree size.

At the time of human settlement about 1140 years ago, birch forest and woodland covered 25-40% of Iceland's land area. The relatively tall (to 15 m) birch forests of sheltered valleys graded to birch and willow scrub toward the coast, on exposed sites and in wetland areas and to willow tundra at high elevations.

As in agrarian societies everywhere, the settlers began by cutting down the forests and burning scrubland to create fields and grazing land. Sheep were important as a source of wool from the outset, but by 1300 they had become a staple source of food for Icelanders as well. At the same time, the Catholic Church (also the political power at the time) started obtaining woodland remnants, a clear indication that they had become a rare and valuable resource. Sheep grazing prevented regeneration of the birchwoods after cutting and the area of woodland continued to decline. A cooling climate (the little ice age) is sometimes cited as a possible cause for woodland decline as are volcanic eruptions and other types of disturbance, but on closer inspection they can not explain the overall deforestation that took place. Cooling temperatures might have lowered tree line elevation, but they do not explain deforestation of the lowlands, where temperatures have been sufficient for birchwoods throughout historical times. Natural disturbance is sporadic and limited in area and thus cannot account for the permanent destruction of 95% of the original forest cover.

Traditional forest use

The birchwoods were important as a source of fuelwood, building material and livestock fodder, but the most important forest product was charcoal, needed to smelt iron and make iron tools. The need for charcoal was alleviated in the latter half of the 19th century, when steel tools and farming implements began to be imported. However, wood was used for fuel until as late as the 1940s, both for cooking and heating the new wood frame and concrete houses, which were colder than the sod homes that Icelanders lived in before. Thus, deforestation did not end in Iceland until the middle of the 20th century.

The extent of Icelandic birchwoods probably reached a post-glacial minimum of less than 1% of total land area cover around 1950, perhaps even less than as 0.5%. Even though economic, technical and agricultural development alleviated the need to utilise birch for fuel by the mid 20th century, increases in sheep numbers and high levels of summer grazing continue to prevent natural extension of woodlands outside of protected areas to this day.

Today, birchwoods are not economically important as a source of wood or fodder, although over 200 tonnes of fireplace logs are produced annually. Some birch forests are popular recreation areas and they are recognised as being important from an ecological perspective as remnants of an ecosystem that once covered much of Iceland. They also act as sources of forest-related plants, animals and fungi to colonise afforestation areas.

Birch is now felled sustainably for production of fireplace logs. Note the overgrown charcoal pit in the foreground, evidence that the forest was utilised as long as 1100 years ago.

Forestry

Beginnings and protection 1899-1950

Organised forestry is considered to have started in Iceland in 1899 with the planting of the Pine Stand at Thingvellir. Three Danes; merchant marine captain Carl H. Ryder who perceived the problems inherent in having no forest resource, forestry professor Carl V. Prytz who provided expertise and Christian E. Flensborg, a young forester who did most of the work, were instrumental in initiating forestry efforts in Iceland and lobbying the parliament to adopt a forestry and soil conservation act. It was adopted in 1907 and the Iceland Forest Service (IFS) was established in 1908.

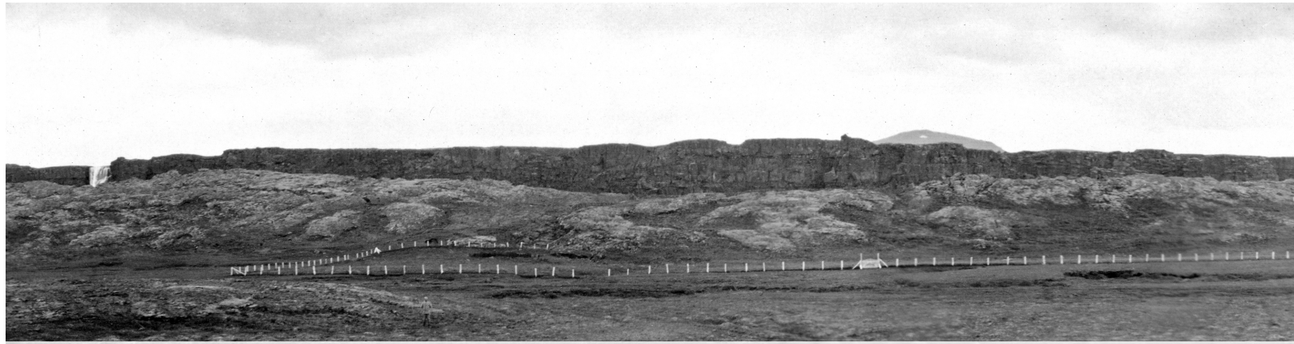
After an early phase of experiments with exotic tree species, forestry efforts largely focussed on protecting birch forest remnants during the first half of the 20th century, with several forest areas being acquired by the IFS for that purpose. They, along with more recently acquired afforestation areas comprise the National Forest system today. Protection entailed enclosing the woodland areas in a fence to exclude sheep, a practice still necessary today for all afforestation areas, due to uncontrolled summer grazing.

Gaining experience with planting 1950-1990

Since about 1950, emphasis has been on afforestation through planting trees. Planting by forestry societies and the IFS increased greatly during the 1950's, reaching over 1.5 million seedlings per year during 1960-'62. The principal species planted were exotic conifers: *Picea abies, Picea sitchensis, Pinus sylvestris, Pinus contorta* and *Larix sibirica*. Planting declined after 1963 and remained at 500,000 to 1 million seedlings annually to 1989. From 1950 to 1990, a great deal of experience was gained through experimenting with different exotic species and provenances. It soon became clear that scientific research was essential to progress in identifying the best species and provenances and developing afforestation methods. The IFS initiated research and established a research station in 1967 with aid from Norway.

Increased afforestation 1990-2009

Afforestation through planting increased again to roughly 4 million seedlings annually throughout most of the 1990s, reaching a high of about 6 million seedlings per year during 2007-2009. Planting of native birch increased proportionate to the total, comprising as much as 30% of seedlings planted in some years. *Larix sukaczewii* (*syn. L. sibirica var. sukaczewii*) was planted to roughly the same extent and planting of *Picea sitchensis* increased as older stands showed very good growth.



The „Pine Stand" enclosure at Thingvellir five years after the first planting.

Photo: Christian E. Flensborg, 1904.

The crash 2009

Public funding for forestry reached a maximum in 2005, after which it started to wane slightly in real terms (rated against inflation). After the financial crisis of 2008-2009, funding for forestry was cut drastically. In real terms, public funding for forestry in 2013 was only half of what it was 2005. This resulted in a drastic reduction in planting, down to about 3.5 million seedlings in 2012. Among the consequences were tree nurseries going out of business and educated foresters moving abroad to find work.

On the other hand, the collapse of the Icelandic Krona meant that wood imports became much more expensive, providing opportunities for greater use of domestic wood. Plantations from the 1950s-´70s were in need of thinning and had been for some time. Now for the first time there was a possibility that thinning could be economically sustainable. Thinning and timber sales by the IFS increased greatly in 2009, again in 2010 and are set to increase even more in 2013. Since Forestry in a Treeless Land was last updated in early 2009, timber production from thinnings has become a major activity within the Icelandic forestry sector.

Historically, there have been three relatively short-lived upswings in forestry in Iceland with longer periods of less activity in between. The upswings were the beginnings of forestry 1899-1908, the beginnings of planting 1950-1963 and the recent increase in afforestation 1990-2009. The causes of the current decline are partly financial and partly social, both of which translate into less political support for forestry. If history is any indication, we are in the early years of a period of less forestry activity that could last 30-40 years. However, Iceland now has a developing commercial forest resource that is already starting to generate significant income. That income should spur interest in investing in forestry, hopefully resulting in a shorter downswing.

The „Pine Stand" at Thingvellir seen from a different angle and over a century later.

The forestry sector

The Icelandic ministerial structure went through major reshuffling in 2007 and again in 2012. In two steps, responsibility for forestry was moved from the Ministry of Agriculture to the Ministry of Environment and Resources. The future effects of this change are uncertain. However, the splitting of the public forestry sector that has taken place during the past 20 years, for political expediency rather than rationality, is still in effect.

The IFS

The Iceland Forest Service (IFS) was established according to the forestry and soil conservation act of 1907. It is the state forestry authority in Iceland and is under the Ministry of Environment and Resources. The IFS manages the National Forests, totalling about 7000 ha or 5% of Icelandic forests and woodlands. The majority of forest and woodland area within the National Forests is protected native birch woodland, but there are also cultivated forests of various species, experimental forests and arboreta. All National Forests are open to the public year-round and some are among the most visited outdoor recreation areas in Iceland. Their status with respect to outdoor recreation varies from barely accessible wilderness to considerably developed, with marked footpaths, picnic areas and campgrounds. The National Forests employ a full-time staff of around 30 people.

Between 1950 and 1990 the main emphasis of the IFS was on afforestation through planting. The IFS planted roughly half the trees planted in Iceland up to 1990, mostly on Forest Service lands. To this end, the IFS built and ran as many as six tree nurseries in various parts of Iceland. After 1990, seedling production was gradually privatised and other actors took the lead in planting. Tree planting is now a relatively minor part of IFS activities but continues at a rate of 20-50 hectares per year.

Besides planting, the IFS promoted increased woodland area through direct seeding and self seeding of birch. Most IFS enclosures were established around remnants of birch-woods where natural regeneration was usually abundant. For example, the area of birch cover within the original Hallormsstaður National Forest enclosure increased by 130 ha from 1906 to 1995 without birch being planted and in spite of 200 ha being converted to conifer forest. The total extension of birch within the enclosure was around 330 ha in 90 years, or an average of 3.7 ha per year, more than doubling the original forest area.

Iceland Forest Research, located at Mógilsá near Reykjavik, is the research division of the IFS. Traditionally, species and provenance trials along with research on seedling production and establishment have been the mainstay of forest research in Iceland and they are still important. In recent years however, ecology has become an increasingly important field of study with a wide range of topics being looked at, including carbon and nutrient cycles, insect pests and pathogens and the effects of afforestation on plant and animal communities. Forest inventory has also increased in importance, not the least due to the need for knowledge about carbon stocks and sequestration. Other recent research topics include growth and yield studies and social aspects of forestry. For the majority of research projects, emphasis is placed on them being directly applicable to forest management planning and practice. Iceland Forest Research has a professional staff of 15.

Forestry extension and education is another function of the IFS. As an example, over 30 primary schools have become Forest Schools through a project

headed by the IFS to integrate aspects of forests and forestry into all parts of the school curriculum. Each of these schools has adopted a forest stand within walking distance of the school that serves as an extra "classroom". Another example of extension is working with the National Planning Agency and local governments to give forestry an appropriate status in planning on various levels.

Forestry Societies

The Icelandic Forestry Association (IFA) was formed in 1930 and is an umbrella organisation for 57 local forestry societies. These are non-governmental volunteer organisations of people interested in afforestation. Their efforts are mostly concentrated around towns and villages, but some own quite large tracts of forest land and some of the oldest cultivated forests originally grown on treeless land belong to forestry societies.

Since 1990, forestry societies have been the main actors in the Land Reclamation Forest project, originally a co-operative project between the IFA, the IFS and the Soil Conservation Service but now by contract between the IFA and the Ministry of Environment and Resources. This project has been responsible for 10-30% of annual planting in Iceland. The aim is to afforest eroded or degraded land and 40-75% of seedlings planted annually have been native birch. Besides the Land Reclamation Forests project, local forestry societies are mostly concerned with managing forests and woodlands for outdoor recreation, some grow Christmas trees and some have small tree nurseries.

The IFA publishes the journal Icelandic Forestry, which comes out in two volumes annually. It is the main forestry publication in Iceland and contains a mix of scientific papers and more general articles. They also offer short courses in forestry related subjects, an annual lecture series and forests walks aimed at increasing public knowledge of and interest in forestry. The IFA has roughly 7000 members, or about 2% of the Icelandic population, making it by far the largest environmental NGO in Iceland.

Over 30 schools use forests as extra classrooms to enrich the learning experience.

Regional Afforestation Projects

From its limited beginnings as a pilot project by the IFS on four farms in 1970, state supported afforestation on farms has grown to become the main channel for afforestation activity in Iceland. In 1984, the original pilot project evolved into a grants scheme run by the IFS, where farms located within the best areas for afforestation were eligible to participate and the only goal was establishment of plantations for wood production. Funding was always in short supply and only about 70 farms participated during the 16 years that the grants scheme was in effect, most with small land areas devoted to afforestation.

Starting with Héraðsskógar in 1990, five Regional Afforestation Projects (RAPs) were established to cover all of Iceland. They are "mini-agencies" under the Ministry of Environment and Resources and their function is to manage the state grants scheme for afforestation on farms, each in its own region of the country. The RAPs took over from the IFS grants scheme one-by-one. Why this form was considered better than simply increasing funding to the existing grants scheme is unclear, but it did result in increased funding for afforestation on farms.

The RAPs make contracts with landowners, draw up afforestation plans, co-ordinate seedling production and distribution, provide education and extension services (usually in co-operation with the Agricultural University and the IFS) and distribute the grants. The oldest

RAP (Héraðsskógar) has recently been developing methodology and providing grants for spacing and thinning, mostly of young larch stands.

Each farm afforestation grant covers 97% of establishment costs, including fencing, roads, site preparation, planting and the first thinning. It is the individual landowner who owns the resulting forest and bears all legal responsibility. The landowners also usually do the planting, thereby receiving part of the grant as compensation for work. A forest-farmer afforesting a large tract of land can earn what amounts to as much as 2-3 months wages per year. The five RAPs were responsible for roughly 75% of planting in Iceland in 2011.

The Forest Owners Association

The Icelandic Forest Owners Association (FOA) was formed in 1998 as a union to represent the views and concerns of forest owners. It has a membership of over 700, consisting mostly of forest owners participating in the RAPs. The FOA has a volunteer board of directors, a very small budget, one part-time employee and no permanent headquarters. Outreach, in the form of meetings, conferences and publication of the magazine Við Skógareigendur (We Forest Owners), is an increasing part of FOA activities.

Cultivated forests are becoming more common on farms.

The Agricultural University

Forestry education at the Agricultural University of Iceland

The Agricultural University of Iceland, with its main campus at Hvanneyri in West Iceland, started a forestry degree programme in 2004. This marked the first time that university level education in forestry was offered in Iceland and was a milestone for Icelandic forestry. The first foresters with an Icelandic BSc in forestry graduated in spring 2007 and the first MSc degree was awarded in autumn of 2008.

Hekluskógar (Hekla forests)

A very large area north, west and south of the volcano Hekla consists mostly of desertified land at fairly low elevation. It was wooded for the most part at the time of settlement, but the forests were felled and grazing along with blowing volcanic ash caused severe erosion. Volcanic ash is not only a problem immediately after an eruption, since in an open landscape it is blown back and forth for years and can be the source of dust storms for decades. In the shelter of a forest however, the ash quickly settles and becomes covered by vegetation.

An ambitious effort to reclaim forest and woodland around Hekla was initiated in 2005. The aim is to afforest up to 100,000 hectares of land, primarily with native birch, in the hope of reducing disturbance from future eruptions of Hekla. The Hekluskógar project is a joint effort of the Soil Conservation Service and the IFS.

The beginnings of forest industry

Icelanders use the same amount of forest products per capita as other nations with a comparable standard of living, but they are almost all imported due to Iceland's very small forest resource. However, there are niche markets that can be supplied with wood from selection felling in the largest birch forests and thinning in plantations of various species. Examples include:

- Birch fireplace logs
- Fuelwood for heating buildings in non-geothermal areas
- Larch fenceposts
- Birch, larch and other species for handicrafts
- Larch and spruce lumber in small quantities

- Spruce poles for fish drying racks
- Spruce and pine shavings for bedding for livestock.
- Wood chips used in footpaths, as mulch, etc.

It is perhaps inappropriate to use the term forest industry in Iceland, but there are several small businesses that use wood from Icelandic forests in their production. As the forest resource grows and more wood from thinnings in plantations becomes available, these businesses and others will be able to rely on domestic sources of wood rather than imports to an increasing extent.

Elkem operates a large ferrosilicate smelter at Grundartangi in SW Iceland. A source of carbon is required in the smelting process, which was previously met by imported coke. In 2010, a trial run was made using wood from Icelandic forests as a carbon source. The outcome was so good that Elkem decided to switch to wood as their primary carbon source, thereby decreasing the amount of fossil carbon used, which is good from a climate-change mitigation perspective. In 2012, Elkem contracted with the IFS to provide wood chips from Icelandic forests for the next 10 years at a price that will more or less cover the costs of thinning, transport and chipping. This will result in a greatly needed increase in thinning of middle-aged stands in both the National Forests and forests owned by others. The Icelandic forest resource can not yet provide all the carbon needed in the smelting process, but a sizeable and increasing proportion.

Wood from thinning of a 50-year-old Sitka spruce forest destined for chipping.

Afforestation objectives

In general, Icelandic afforestation is planned and cultivated forests managed with multiple-use objectives. These objectives can best be described based on the three principle aspects of forest sustainability: economic (wood production, non-wood products), ecological (ecosystem processes, habitats, wildlife, soil and water conservation, shelter, sequestering CO2) and social (recreation, spiritual, public health).

In forest planning and management, greater emphasis is often placed on one or two of these functions and less emphasis on others, without ignoring them entirely however. Within the RAPs, the majority of afforestation plans to date emphasize timber production as a primary goal, the main timber species being *Larix sukaczewii, Picea sitchensis, Pinus contorta* and *Populus trichocarpa*.

The management goal for the greatest area within the National Forests (IFS lands) is simply protection of native forest and woodland ecosystems. Because the IFS was first to plant extensive areas with productive conifers, it is now the main timber producer in Iceland as well. In large areas, emphasis is on soil erosion control, reclamation of productivity and in some cases ecological restoration, where *Betula pubescens* plays a major role.

The realisation is increasing that urban and peri-urban forestry serves very important social and health-related functions. Forestry societies have been most active in this regard, placing emphasis on opening forests to the public. Two forest areas originally cultivated on treeless land in the 1950's and 60's, one near Reykjavik and the other near Akureyri, annually receive over 400,000 visits, well over the entire population of Iceland.

Outdoor recreation is one of the most important benefits of forests, especially in a treeless land.

Forestry Legislation

Laws pertaining to forestry reflect the fact that forests form a very small part of the Icelandic landscape, the main policy points being that existing forests should be protected and afforestation of treeless land is encouraged. To this end, the IFS also has a mandate to educate and advise the public in forestry matters, which requires research. These goals have been in effect since the first Forestry Act of 1907. The goal of increasing forest cover through afforestation is re-affirmed in the Regional Afforestation Projects Act of 2006, where for the first time a concrete goal of 5% forest and woodland cover of lowlands is set.

In recent years, checks have been put into place regarding certain aspects of forestry through the Planning Act, the Environmental Impact Assessment Act and a regulation regarding use of exotic plant species. These legal instruments are the results of EU directives; in other words not the result of a perceived need within Iceland to put checks on forestry, although forestry in Iceland as elsewhere is not without its detractors. At this writing, proposed changes to the Environmental Impact Assessment Act, again due to EU directives, and the Nature Conservation Act are likely to place further costs on afforestation at a time when funding has effectively been cut in half.

A new forestry strategy

In November 2006, the minister of agriculture (the minister responsible for forestry at the time) presented the director of the IFS with a mandate to formulate a forestry strategy for Iceland. The strategy should cover all aspects of forestry and be in accordance with other official goals, f.ex. sustainable development, legislation and international agreements. The director put together a team of experts to formulate the strategy. Forestry policy in Iceland existed in bits and pieces; in legislation, plans on various scales, international agreements and other documents, but not as a coherent strategy. The aim was to produce a single document that would serve both to sharpen and update forestry goals and to inform the public as to what those goals were.

Influenced principally by outcomes of the Ministerial Conferences for the Protection of Forests in Europe (Forest Europe) and a recent forestry strategy for Scotland, the team developed a draft strategy that was then sent out to stakeholders both inside and outside the forestry sector for review. The draft was also circulated on the Web and anyone interested was invited to comment. A total of 41 individuals, organisations and agencies commented on the draft, after which it changed a great deal. Finally, the strategy was presented to the minister of environment and resources (the minister now responsible for forestry) in January 2013.

The strategy is divided into five main areas of emphasis:

- Building up a forest resource
- Forest utilisation, value and innovation
- Society, access and health
- Environmental quality and biodiversity
- Climate change

Under each of these headings are goals and means to achieve them. Included among these goals are:

- That at least 12% of Iceland be afforested by the year 2100 through both planting and natural forest extension
- To develop sustainable forest utilisation and forest industry
- To improve public access to forests and increase the recognition and role of forests in public health
- To increase the role of afforestation in soil and water conservation, enhancement of biodiversity and amelioration of the environment.
- To enhance the role of forests as carbon sinks and to adapt forestry to climate change

The main tool for achieving these goals will be the National Forest Programme. In order to be effective, it must be based in law, be developed and updated regularly and have a great deal of public and political support.

So, how is it going?

Over a century of forestry activity in Iceland has yielded several positive developments. We prevented the destruction of the last remnants of natural forests. We gained experience in forest management and cultivation of a number of tree species. We gained scientifically based knowledge of the best provenances to use, where to plant them and how to get them to live and grow. We have a great deal of knowledge and experience with afforestation of treeless land. We are beginning to develop a real multiple-use forest resource. Without a doubt, the most important outcome is that there has been a change in attitude of the Icelandic people. A century ago, most Icelanders had never seen a tree. Sixty years ago, few Icelanders believed that trees of any size to speak of could grow in Iceland. Planting trees was the harmless hobby of a few eccentrics, but forests for timber production were out of the question. Today, forestry for timber production, land reclamation and amenity is being carried out by thousands of people all over Iceland.

As cultivated forests get older and a growing number of them are becoming noticeable in the landscape, it has become obvious to most that a forest resource is developing in Iceland; still small but growing in area. The trees are growing well too. Spacing of young stands has become common and commercial thinning is increasing from year to year. Realisation is increasing of the importance of forests for outdoor recreation,

especially around urban areas, resulting in increased emphasis on developing and maintaining the social functions of forests. Last but not least, afforestation is by far the best means to reclaim and rehabilitate the abundance of eroded and degraded land that characterises much of the Icelandic landscape, changing it to productive and functioning ecosystems, providing habitats for a great variety of life and mitigating climate change in the process.

There are of course still some detractors. They point to potential loss of scenery, nature conservation concerns and a variety of other reasons for being against afforestation. Some even still think that trees can not grow in Iceland, but couch it in terms of forestry not being economically viable. The concerns are usually sincere on the part of the people who hold them and some have merit, at least on a local scale in specific places, but any potential negative impacts of afforestation must be balanced against the positive outcomes. For this reason, good forest planning and management are no less important in Iceland than in countries where forests form a much larger part of the landscape.

In a Sitka spruce stand at Kirkjubæjarklaustur. The tallest trees are 25 m tall.

The good growth of several tree species has probably been most important in changing people's attitude towards forestry. Several exotic species, including *Picea abies, P. engelmannii, P. glauca, Pinus cembra/sibirica, P. sylvestris, Abies lasiocarpa, Betula pendula, Larix decidua* and *Pseudotsuga menziesii* have all reached between 18 and 22 m in height. Besides the native birch, the major species used in forestry are *Larix sukaczewii, Picea sitchensis, Pinus contorta* and *Populus trichocarpa*. They have all reached at least 22 m in height and show mean annual increments ranging from 5 to 15 m3/ha/yr. Both P*opulus trichocarpa* and *Picea sitchensis* have reached 25 m in height. Based on growth curves, *Larix sukaczewii* and *Pinus contorta* will certainly reach 25 m height on good sites by age 100 years and *Picea sitchensis* and P*opulus trichocarpa* at least 30m. In addition to these, roughly 150 species of trees and large shrubs are in regular cultivation in forestry, shelterbelts or for amenity.

The total area of forest and woodland in Iceland has probably doubled, possibly tripled, since 1950. Whether this should be considered a large or small increase depends on the comparison. It is large in comparison to the woodland area in 1950, but very small indeed compared to Iceland's land area and to the woodland area at the time of settlement. Native birch woodlands have expanded through natural regeneration within fenced areas but much less in areas not specifically protected from grazing. Thus, natural expansion of birchwoods has been very limited and will continue to be so as long as the tradition of uncontrolled sheep grazing continues.

For several reasons, planting has not resulted in large land areas being afforested either, compared to the area of potential forest land in Iceland. Up to the mid 1980s, land was not available for afforestation because of competition by other land

use, especially grazing. Forest establishment is expensive and few individuals have the financial resources to invest in afforesting large tracts of land. Planting by forestry societies was always constrained by lack of money as was planting by the IFS. Afforestation grants to farmers were first offered in the early 1970s but were extremely limited until the 1990s. Due to these constraints, afforestation of relatively large areas has only started within the last 20 years or so.

Iceland has a very small population (320,000) compared to the area of the country (103,000 km^2, of which at least 40,000 km^2 can potentially be afforested). In other words, there are fewer taxpayers per km^2 of land than in neighbouring countries with a similar deforestation/afforestation history such as Denmark, the UK and Ireland. For this reason alone, afforestation through planting, as a proportion of total land area, will likely continue to proceed slowly. Total afforestation planting has been on the order of 1000-1500 ha per year during most of the last 22 years. At that rate, it takes at least 70 years to plant trees on 1% of Iceland's land area.

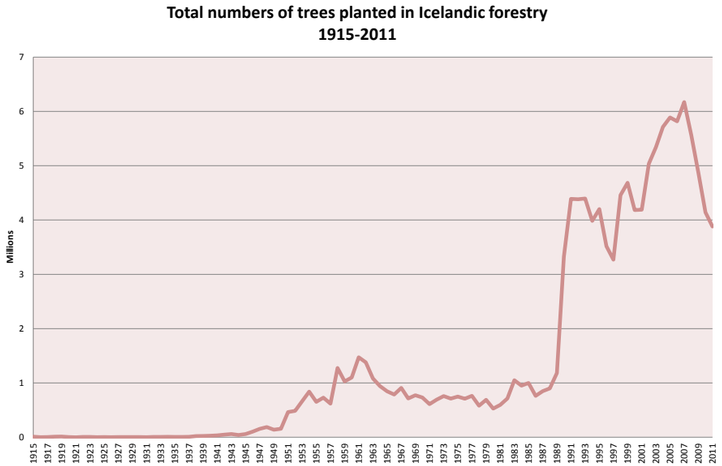
Since 2008, funding for forestry has been cut in half in real terms, resulting in a proportionately similar reduction in total planting. At the same time, the need for spacing (pre-commercial thinning) is increasing as well as demand for better infrastructure as regards access to the forests (forest roads). Among other effects of downsizing forestry are a greater emphasis by the IFS on increasing other income, such as from timber sales, and proportionately less emphasis on afforestation for land reclamation, erosion control and amenity and less money for research. The dream of afforesting a significant part of Iceland seems more distant now than it did a few years ago.

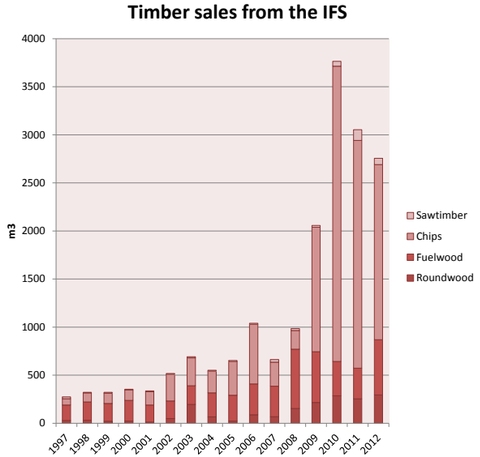
In a treeless land, developing a forest resource is obviously beneficial, a no-brainer as some would say. From a historical perspective, it can be seen as rebuilding a resource that was lost and doing it in a way that meets society's current needs. From an ecological perspective, it is a way of reclaiming biological productivity, preventing soil erosion, enhancing ecosystem resilience and much more. From an economic perspective, it can be a way of meeting certain needs in a sustainable manner and decreasing dependence on imports. But developing such a resource requires investment that will not be repaid within a person´s lifetime. Therefore, it is appropriate that society as a whole make the investment. It is after all not the individual forest owner who will reap most of the benefits, but society, in the form of jobs, better health, fewer dust storms, better water quality and much much more. For today´s society to invest in afforestation that will benefit our grandchildren is the very definition of sustainability.

Society primarily funds what it does through paying taxes, with the government appropriating them. In order to get society to invest in forestry, a widespread understanding of the benefits is required, but mostly it is vital for forestry to have political support, which is currently lacking. The job ahead for the Icelandic forestry sector is to regain political support for forestry.

Icelandic forestry by the numbers 2012

The following table and figures include some of the latest available numerical statistics with respect to Icelandic forestry. They were provided by Arnór Snorrason, project leader for forest inventory at Iceland Forest Research, Einar Gunnarsson at the Icelandic Forestry Association and the author.





Native birch forest and woodland cover	1.150 km^2
Cultivated forest cover	380 km^2
Total forest and woodland cover	1.530 km^2 (1.5% of Iceland)
Trees planted 2012 (est.)	3.5 million (~1.000 ha)
Carbon sequestration in forests planted after 1990	200.000 tonnes CO^2 per year
Timber sales from the IFS 2012	2.755 m^3
Total growing stock (2010 estimate)	1.190.000 m^3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