



The two-day indoor sessions of the HealGenCAR conference were followed by excursions to the Punkaharju research forests and south-eastern Finland. Here, Seppo Ruotsalainen is presenting an international Scots pine trial on realised genetic gains comparing Finnish, Swedish and Latvian seed orchard materials. Photo: Teijo Nikkanen.

Can genetics save our forests from pests and pathogens?

Climate change and globalisation increase the risk of new pests and pathogens establishing in the Nordic forests. The challenges of using tree breeding to combat such threats were the focus of the first conference arranged by the SNS-supported network HealGenCAR.

The conference was held in Punkaharju, Finland, 7-9 June 2016. A total of 44 participants represented forest research institutions from Finland, Sweden, Denmark, Norway, Iceland, Estonia and Latvia.

Presentations at the conference covered a wide range of topics from descriptions of different pathosystems and pest-host interactions in Nordic forestry, to natural variation in trees' resistance, and the possibilities for resistance breeding. Several risks to forest health related to climate change and globalisation were recognized;

other presentations addressed how forest management and changes in land use may affect these risks.

Tree breeding is one tool

– Tree breeding is one tool to solve at least some of the problems. But, to be able to take appropriate actions we need to have proper knowledge of host-pest and pathogen-environment interactions. A key issue for this is state of the art phenotyping in combination with the multiple stresses that trees may be subjected to, says Tuija Aronen, coordinator of HealGenCAR.

HealGenCAR (a virtual Centre of Advanced Research in Forest Health and Forest Genetics to Enhance Bioeconomy) was launched with the aim of developing and implementing good practice and management of forest genetic resources, as well as pest and disease management (see

News & Views No. 3, 2016). The CAR thus brings together expertise in genetics, pathology and entomology.

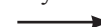
Many of the presentations can be downloaded from the CAR webpage (SNS webpage, search for HealGenCAR).

Contact: Tuija Aronen,
tuija.aronen@luke.fi

Shortcuts from the conference

Complex interactions

Christer Björkman talked about plant resistance in the light of global change. The tritrophic interaction between the plant, the herbivore and its natural enemies makes the outcome of a warmer climate difficult to predict. Global change also affects plant growth, and thus plant defences, both in positive and negative ways.





Although we fear new insects, most harm is made by the common native pest species: (from left) *Ips typographus* (photo Udo Schmidt), *Tomicus piniperda* (photo Forestry images), *Hylobius abietis* (photo Siga), *Lymantria monacha* (photo vitaman), *Neodiprion sertifer* (photo Pere Igor), *Dendroctonus micans* may now be added to the list (photo Udo Schmidt). All photos published under Common Creative License.

Shortcuts continued

Fear of new pest insects

The western conifer seed bug *Leptoglossus occidentalis* has been reported from several places in central Europe but also in Sweden and Denmark. The species we really fear, however, are the emerald ash borer (*Agrilus planipennis*), the Asian longhorned beetle (*Anoplophora spp.*), the four-eyed fir bark beetle (*Polygraphus proximus*) and, of course, the pine wood nematode (*Bursaphelenchus xylophilus*).



Anoplophora chinensis, one of the species of Asian longhorned beetles that may become a threat. Photo: Paolo Gibellini, Wikipedia commons.

“The Five Big” may become six

There has been media focus on new species crossing borders as a result of international trade or naturally as a result of a warmer climate. Even so, most harm is inflicted by native pest species. Hans Peter Ravn reviewed the damage caused by “the five big” insects: spruce bark beetle (*Ips typographus*), pine shoot beetle (*Tomicus piniperda*), pine weevil (*Hylobius abietis*), nun moth (*Lymantria monacha*) and European pine sawfly (*Neodiprion sertifer*). A sixth species could also be added – great spruce bark beetle (*Dendroctonus micans*), of which

there have been some major outbreaks over the years, and which has now been found to colonise Norway spruce.

Risk of Asian invasives

The risk of damage caused by Asian invasive forest pathogens is highest among deciduous tree species found only in Europe (i.e. broadleaved forests in temperate and Mediterranean regions), and the risk is lowest among coniferous species that are also present in East Asia (i.e. boreal forests in Europe).

Defence compounds in pine heartwood

The stilbenes are a group of antioxidant compounds in trees which play an important role in plant defence. In Scots pine, the main stilbene in the heartwood is pinosylvin. Anni Harju described a large variation between individual stems, and also noted that stilbene concentration is strongly correlated with wood decay resistance. Methods for measuring stilbenes in heartwood are being tested and evaluated. Both Near Infrared Spectroscopy and Gas chromatography show that stilbenes have high heritability and a high coefficient of variation in pine heartwood.

The first meeting with HealGenCAR, led by Tuija Aronen. Photo: Teijo Nikkanen.



Plant trade license suggested

The number of alien pathogens found in European countries has grown exponentially during the last 200 years, and trade has been the most common pathway – more than 70% since the 1980s. There is strong opposition in the WTO to trade restrictions, and so new non-restrictive solutions are needed. Jarkko Hantula and his colleagues have suggested an international plant trade license, obligatory to all actors in the international plant trade. A license fee, added to the plant price, should be used to pay compensation for damage caused to third parties.

Pine weevil damage also after stump extraction

The pine weevil is the most harmful pest affecting forest regeneration in Europe. Heli Viiri showed results from stump harvesting experiments, and it looks as if pine weevil damage is barely affected by extraction. When most stumps are removed, there are still enough roots to attract the pine weevil to the clear cut area.



Awareness of climate change is seldom implemented in guidelines and strategic documents, according to a survey conducted by NordGen Forest. Photo from Pixabay (CC).

Nordic forestry aware of climate change, but needs to take action

Nordic institutions have an important role in translating knowledge and facilitating research communication, not least in the context of climate change. This was one of the conclusions drawn from a survey conducted by NordGen Forest about climate change presented to the Nordic Ministers at their meeting in Åbo in June 2016.

The survey took the form of a questionnaire sent to 153 private and public actors in the forest sector in Denmark, Norway, Sweden and Finland. The results from the 40% who responded showed a strong awareness of climate change. Most of the respondents agreed that climate change will affect future forestry. It will lead to more disturbances, but also to increased forest growth.

Lack of implementation

However, this awareness is not apparent in strategic documents and guidelines. Measures to mitigate climate change, for example using forests as a carbon sink, were clearly more frequently highlighted than

measures to adapt the forest to the new climate.

Forest ecosystems are generally robust but there is concern that the pace of climate change will exceed the adaptability of many forest trees. Decisions about reforestation made today will have consequences for a whole rotation, 80 or so years. There is currently much research into both the climatic adaptation of forest trees and the need to assist the movement of trees as the climate changes.

Risk-reducing measures could be to use more exotic trees and to plant mixtures of different species. However, the survey responses to suggestion of increased use of exotics showed as many disagreeing as agreeing about the measure. The variation can partly be explained by different practices in the Nordic countries. Denmark, for example, relies heavily on foreign tree species, while they are hardly used at all in Finland.

Lack of consensus

Many of the respondents requested more and better scientific information. The messages from researchers are sometimes confusing and conflicting,

and there is a lack of consensus about how forestry should adapt.

NordGen Forest drew the conclusion that they, along with SNS and EFINORD, have an important role in the process of translating research and helping with information exchange between science and practice. Network activities, conferences, newsletters and articles in forestry journals provide important tools for this information exchange.

A Policy Briefing with the main results from the survey can be downloaded from www.nordgen.org/forest



Seed Vault, Svalbard. Photo Mari Tefre.

About NordGen

NordGen (the Nordic Genetic Resource Center) is a Nordic organisation dedicated to the safeguarding and sustainable use of plants, farm animals and forests. It was established in 2008 continuing a long-time cooperation within the Nordic Gene Bank, the Nordic Gene Bank Farm Animals and the Nordic Council for Forest Reproductive Materials. NordGen is financed mainly by the Nordic Council of Ministers.

The three units work very differently. **NordGen Plants** has an operational role in conserving cultivated plants and their wild relatives from the Nordic countries. The Svalbard Global Seed Vault is a store for many of the seeds. **NordGen Farm Animals** is a service and knowledge centre for the management of farm animal genetic resources. For example, they maintain and update the Nordic and Baltic farm animal breed register. **NordGen Forest** serves as a meeting place and provides information about forest genetic resources. The operational gene conservation is however undertaken at a national level.

More information: www.nordgen.org

NordGen Forest raises awareness of genetic resources

Connecting people and disseminating scientific knowledge on forest genetic resources: these are two of the main duties of NordGen Forest, a body under the Nordic Genetic Resource Center and the Nordic Council of Ministers.

- We strive to raise political awareness of the important roles our genetic resources have in sustainable forestry in the Nordic countries, says Kjersti Bakkebo Fjellstad, leader of NordGen Forest.

A hub

NordGen Forest serves as a hub for issues in the fields of forest genetics and genetic resources, supply of seeds and plants, and regeneration methods. The main goal is to contribute to the establishment of the best possible Nordic forests for the future.

The operational conservation of forest resources is undertaken by organisations in each country. NordGen Forest instead has a role as a meeting place for discussing common Nordic challenges and solutions, and to create a network for people involved in the issues. In that sense, NordGen Forest differs from NordGen Plant, which has a responsibility for coordinating the conservation of cultivated plants (see previous page).

There is, however, some coordinating work on the conservation of forest seeds underway.

-NordGen Forest initiated a project for back-up storage of seeds

on Svalbard, says Kjersti Bakkebo Fjellstad. The work started at a meeting with the Nordic forest ministers in Selfoss in 2008. In February 2015 the first seeds from Norway spruce and Scots pine were stored here in the presence of the forest ministers from Denmark, Norway and Sweden.

Two sections

NordGen Forest has two sections, each with members from all Nordic countries. The *NordGen Forest Regeneration Council* exchanges information on seed, plants and regeneration issues, and the *Working Group on Genetic Resources* facilitates cooperation in conservation and use of forest genetic resources.

The Council seeks to increase the availability of suitable forest reproductive material and to promote successful forest regeneration. Publicly available country-specific reports on supply, research and policies are delivered twice a year. The Working Group has an important role as an interface between the national and European levels.

- Both of these sections bring together researchers, practitioners and managers, and they facilitate the flow of scientific information and know-how between them, says Kjersti Bakkebo Fjellstad.

What's up now?

- We work continuously with climate adaptation. One example is the survey we presented in June (see previous



Kjersti Bakkebo Fjellstad: "The main goal of NordGen Forest is to contribute to the establishment of the best possible Nordic forests for the future". Photo Lars Sandved Dalen.

page). This work demonstrated the need for better information and practical guidelines for adaptation to a warmer climate. This demand is also in line with the mission of NordGen Forest.

One of the measures to reduce risks and enhance adaptation could be to mix species to a higher extent than today.

- In September, we will be holding a Nordic conference in Växjö in southern Sweden on this issue. The title is "Growing mixed forests – waste or value for the future?". We hope to see many participants at the conference.

Contact: Senior adviser Kjersti Bakkebo Fjellstad, kjersti.fjellstad@nordgen.org.

Contact News & Views

Write to the editor:
Mats Hannerz,
Silvinformation AB
mats.hannerz@silvinformation.se

More info about SNS:

www.nordicforestresearch.org

News & Views is a newsletter from SNS containing short, popularized articles covering Nordic forest research and forestry. Articles presenting SNS-supported activities are prioritized. The newsletter is published eight times per year, and is available for download from the SNS and Scandinavian Journal of Forest Research websites.



News & Views is edited and produced by Mats Hannerz, Silvinformation AB
mats.hannerz@silvinformation.se