

Annual report for SNS Centre of Advanced Research (CAR)

Submit the annual report to sns@slu.se by 24:00 CET, 1st of March at the latest.
 The report should not exceed 2000 words (including words in the template).

Please adjust the box size according to the length of your answer.

1. Project title:	HealGenCAR
2. Reporting year:	2018

3. Project coordinator:	Tuija Aronen
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Address:	Natural Resources Institute Finland Finlandiantie 18, FI-58450 Punkaharju, Finland

Activities during the reporting year:

4. Project status

- Does the project develop according to the plans?
- Describe the activities during the reporting year.

- HealGenCAR has developed in 2018 mainly according to the realization plan. The only exception was that the workshop on "QPCR and barcode assays" planned to be organized in Norway had to be cancelled due to lack of personnel resources at NIBIO to realize this event. The financing reserved for this workshop was transferred to support 2019 activities
- In 2018, the second HealGenCAR conference "Clonal forestry and breeding for resistance to pests and pathogens" was held at Höör, Sweden, 12.-14. June, and based on the outcomes of the conference we wrote our second policy brief. Conference participants included not only researchers, but also representatives of forest industries and national authorities, as well as PhD students. The core group had three meetings, and allocated resources to applied activities that will take place in 2019. The HealGenCAR web-pages were updated. Scientific research on the field of HealGenCAR was active and produced many publications in 2018.

5. List the published outputs during the reporting year (peer-reviewed articles, other publications):

Selected peer-reviewed articles on HealGenCAR field:

Adamson, K., Mullett, M.S., Solheim, H., Barnes, I., Müller, M.M., Hantula, J., Vuorinen, M., Kacergius, A., Markovskaja, S., Musolin, D., Davydenko, K., Keča, N., Ligi, K., Priedite, R.D. Millberg, H. & Drenkhan, R. 2018: Looking for relationship between the populations of *Dothistroma septosporum* in northern Europe and Asia. *Fungal Genet. Biol.* 110, 15-25; doi: 10.1016/j.fgb.2017.12.001.

Ahtikoski, Anssi; Haapanen, Matti; Hynynen, Jari; Karhu, Jouni; Kärkkäinen, Katri. 2018. Genetically improved reforestation stock provides simultaneous benefits for growers and a sawmill, a case study in Finland. *Scandinavian Journal of Forest Research*:

Andersson Gull B., Persson T., Fedorkov A., Mullin T.J. 2018. Longitudinal differences in Scots pine shoot elongation. *Silva Fennica* vol. 52 no. 5 article id 10040. 12 p. <https://doi.org/10.14214/sf.10040>.

Botella, L. & Hantula, J. 2018. Description, distribution and relevance of viruses of the forest pathogen *Gremmeniella abietina*. *Viruses* 2018, 10, 654; doi:10.3390/v10110654.

Chen, ZQ Lunden, K Karlsson, B Vos, I Olson, A Lundqvist, SO Stenlid, J Wu, HX Gil, MRG Elfstrand, M.2018.

- Early selection for resistance to *Heterobasidion parviporum* in Norway spruce is not likely to adversely affect growth and wood quality traits in late-age performance. *European Journal of Forest Research* 137: 517-525
- Desprez-Loustau, ML, Massot, M, Toigo, M, Fort, T, Kaya, AGA, Boberg, J, Braun, U, Capdevielle, X, Cech, T, Chandelier, A, Christova, P, Corcobado, T, Dogmus, T, Dutech, C, Fabreguettes, O, d'Arcier, JF, Gross, A, Jung, MH, Iturrutxa, E, Jung, T, Junker, C, Kiss, L, Kostov, K, Lehtijarvi, A, Lyubenova, A, Marcais, B, Oliva, J, Oskay, F, Pastircak, M, Pastircakova, K, Piou, D, Saint-Jean, G, Sallafranque, A, Slavov, S, Stenlid, J, Talgo, V, Takamatsu, S, Tack, AJM. 2018. From leaf to continent: The multi-scale distribution of an invasive cryptic pathogen complex on oak. *Fungal Ecology*. 36:39-50. DOI: 10.1016/j.funeco.2018.08.001
- Hamberg, L. & Hantula, J. 2018. Tree size as a determinant of recovery of birch (*Betula pendula* and *B. pubescens*) and grey alder (*Alnus incana*) trees after cutting and fungal infection by *Chondrostereum purpureum*. *Biol. Contr.* 126, 83-89; doi: 10.1016/j.biocontrol.2018.07.015.
- Hamberg, L., De la Bastide, P, Hintz, W., Shamoun, S.F., Brandtberg, M. & Hantula, J. 2018. Interfertility and genetic variability among European and North American isolates of the basidiomycete fungus *Chondrostereum purpureum*. *Fungal Biol.* 122, 659-667; doi: 10.1016/j.funbio.2018.03.009.
- Hyder, R., Piri, T., Hantula, J., Nuorteva, H. & Vainio, E.J. 2018. Distribution of viruses inhabiting *Heterobasidion annosum* in a pine-dominated forest plot in southern Finland. *Micr. Ecol.* 75, 622-630; doi: 10.1007/s00248-017-1027-6.
- Hytönen, Jyrki; Beuker, Egbert; Viherä-Aarnio, Anneli. 2018. Clonal variation in basic density, moisture content and heating value of wood, bark and branches in hybrid aspen. *Silva Fennica* 52 2: 15.
- Kaitera, J., Kauppila, T. & Hantula, J. 2018. New alternate hosts for *Cronartium* spp.: *Odontites*, *Euphrasia*, *Rhinanthus* and *Papaver*. *For. Path.* 6, e12466, doi: 10.1111/efp.12466.
- Kimberley, T. Davis; Callaway, Ragan M.; Fajardo, Alex; Pauchard, Aníbal; Nuñez, Martin A.; Brooker, Rob W.; Maxwell, Bruce D.; Dimarco, Romina D.; Peltzer, Duane A.; Mason, Bill; Ruotsalainen, Seppo; McIntosh, Anne C. S.; Pakeman, Robin J.; Smith, Alyssa Laney; Gundale, Michael J. 2018. Severity of impacts of an introduced species corresponds with regional eco-evolutionary experience. *Ecography* 42: 11.
- Klapwijk, MJ, Boberg, J, Bergh, J, Bishop, K, Björkman, C, Ellison D, Felton, A, Lidskog, R, Lundmark, T, Keskitalo, ECH, Sonesson, J, Nordin, A, Nordström, E-M, Stenlid J, Mårald E. 2018. Capturing complexity: Forests, decision-making and climate change. *Global Environmental Change* 52:238-247.
- Kosawang C, Amby DB, Bussaban B, McKinney LV, Xu J, Kjær ED, Collinge DB, Nielsen LR. 2018. Fungal communities associated with species of *Fraxinus* tolerant to ash dieback, and their potential for biological control. *Fungal Biology* 122.2:110-120.
- Levkoev, Eino; Mehtätalo, Lauri; Luostarinen, Katri; Pulkkinen, Pertti; Zhigunov, Anatoly; Peltola, Heli. 2018. Development of height growth and frost hardiness for one-year-old Norway spruce seedlings in greenhouse conditions in response to elevated temperature and atmospheric CO₂ concentration. *Silva Fennica* 52 3: 15 p..
- Marčiulyrienė, D, Davydenko, K, Stenlid, J, Shabunin D, Cleary M. 2018. *Fraxinus excelsior* seed is not a probable introduction pathway for *Hymenoscyphus fraxineus*. *Forest Pathology* 10.1111/efp.12392
- Mukrimin, Mukrimin; Kovalchuk, Andriy; Neves, Leandro Gomide; Jaber, Emad H. A.; Haapanen, Matti; Kirst, Matias; Asiegbo, Fred. 2018. Genome-Wide Exon-Capture Approach Identifies Genetic Variants of Norway Spruce Genes Associated With Susceptibility to *Heterobasidion parviporum* Infection. *Frontiers in Plant Science*:
- Muñoz-Adalia, E.J., Diez, J.J., Fernández, M.M., Hantula, J. & Vainio, E.J. 2018. Characterization of small RNAs originating from mitoviruses infecting the conifer pathogen *Fusarium circinatum*. *Arch.Virol.* 163, 1009-1018; doi: 10.1007/s00705-018-3712-2.
- Poimala, A., Werres, S., Pennanen, T. & Hantula, J. 2018. First report of alder *Phytophthora* closely related to *P. uniformis* on an *Alnus glutinosa* seedling in Finland. *Plant Dis.* 102, 454; doi: 10.1094/PDIS-03-17-0322-PDN.

Redondo, MA Boberg, J Stenlid, J Oliva, J. 2018. Functional traits associated with the establishment of introduced *Phytophthora* spp. in Swedish forests. *Journal of Applied Ecology* DOI: 10.1111/1365-2664.13068

Tikkinen, Mikko; Varis, Salla; Aronen, Tuija. 2018. Development of Somatic Embryo Maturation and Growing Techniques of Norway Spruce Emblings towards Large-Scale Field Testing. *Forests* 9 6: 325.

Tikkinen, Mikko; Varis, Salla; Peltola, Heli; Aronen, Tuija. 2018. Improved germination conditions for Norway spruce somatic cotyledonary embryos increased survival and height growth of emblings. *Trees*: 1-16.

Tuomivirta, T.T. & Hantula, J. 2018. High-resolution melting analysis allows fast and accurate differentiation of the three *Melampsorium* species occurring on *Alnus*. *For. Path.*, e12391; doi: 10.1111/efp.12391.

Vainio, E.J., Jurvansuu, J., Hyder, R., Kashif, M., Piri, T., Tuomivirta, T., Poimala, A., Xu, P., Mäkelä, S., Nitisa, D. & Hantula, J. 2018. Heterobasidion Partitivirus 13 Mediates Severe Growth Debilitation and Major Alterations in the Gene Expression of a Fungal Forest Pathogen. *J. Virol.* 92, e01744-17; doi: 10.1128/JVI.01744-17.

Varis, Salla; Klimaszewska, Krystyna; Aronen, Tuija. 2018. Somatic Embryogenesis and Plant Regeneration From Primordial Shoot Explants of *Picea abies* (L.) H. Karst. *Somatic Trees. Frontiers in Plant Science* 9: 8 p..

Villari C, Dowkiw A, Enderle R, Ghasemkhani M, Kirisits T, Kjær ED, Marčiulyrienė D, McKinney LV, Metzler B, Muñoz F, Nielsen LR, Pliūra A, Stener L-G, Suchockas V, Rodriguez-Saona L, Bonello P, Cleary M. 2018. Advanced spectroscopy-based phenotyping offers a potential solution to the ash dieback epidemic, *Scientific Reports* 8.

6. List other practical outputs during the reporting year (websites, policy recommendations, conferences, scientific meetings, large-scale project applications, research training etc.)

- Policy brief "How can we prepare Nordic forests for the future?" was prepared in 2018, and published 15.1.2019
- HealGenCAR web-pages were updated
- Outputs of the research work supported by HealGenCAR on ash dieback and emerald ash borer was presented at October 1-4, 2018 at the OECD, PREPSYS conference by H-P Ravn.
- Financing for Tandem ForestValues SOMAGENO project (collaboration between Luke, Finland and SLU, Sweden, 2019-20) obtained from KSLA, Sweden; application greatly benefited connections made and strengthened via HealGenCAR. Further more, international collaboration on vegetative propagation of conifers via somatic embryogenesis was also extended on European level, with both Luke and SLU research groups being involved in ERA-NET Forest Value project MULTIFOREVER (coord. by FCBA, France, 2019-2021) that also obtained financing.

Economic report

7. Received grant from SNS for the reporting year (SEK):

450 000,00

8. Transfer of SNS funds to project partners

Country	Partner organization	Sum (SEK)
Denmark	University of Copenhagen	31 680,00
Finland	Luke	179 769,00
Sweden	Skogforsk	103 952,64
Sweden	SLU	24 055,68
Norway		

Iceland	Skogreakt	2 840,64
Other countries (specify)		
Total SUM		342 297,96

9. Costs

	SNS funding	External funds*	Total*
Travel and hotel	43 813,86		
Meeting costs	154 714,67		
Consumables			
Salary	131 494,18		
Communication	10 560,00		
Other costs (national coordination costs)	21 120,00		
Total SUM (SEK)	361 702,71	131 541 000	131 902 700

* If possible, provide details otherwise summarize the total sum for external funds and total.

Optional: Comments to the economic overview:

Exchange rate used 1 EUR = 10,56 SEK. This is the exchange rate for the received grant.

External funds are partly estimated, since data was available only for Sweden and Finland. For the same reason, details could not be provided.

In addition to the payments to the partners (point 8) payments of travel expenses were made to one invited keynote speaker of the Höör conference (Irene Barnes, South Africa, 11 602,48 SEK) and to three participating students: Jing Xu 4 581,67 SEK, Rajiv Chaudhary 2 125,09 SEK and Hernan Davio Capador-Barreto 1 095,49 SEK.


From the grant received from SNS, around 88 000 SEK was saved, mainly due to cancelled workshop in Norway and some bills that were not received by the end of the year 2018. This sum, as well as savings from the previous year, will be used for HealGenCAR activities in 2019-20.

I hereby declare that the above statements are true to the best of my knowledge


Main applicant's signature, place and date


.....
Tuija Aronen


Natural Resources Institute Finland
(Institution)


.....
(Day / Month / Year)

Signature of the head of the main applicant's research institution


.....
(Signature)

Natural Resources Institute Finland
(Institution)


.....
(Day / Month / Year)

Leena Paavilainen, Vice President
(Printed name, function)

Second applicant's signature, place and date

.....
(Signature)

.....
(Institution)

.....
(Day / Month / Year)

Third applicant's signature, place and date

.....
(Signature)

.....
(Institution)

.....
(Day / Month / Year)

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..... Natural Resources Institute Finland
Tuija Aronen (Institution) (Day / Month / Year)

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..... Natural Resources Institute Finland
(Signature) (Institution) (Day / Month / Year)

Leena Paavilainen, Head of Unit "Production Systems"
(Printed name, function)

Second applicant's signature, place and date

Torgny Persson *Siksforsk* *26/02/2019*
(Signature) (Institution) (Day / Month / Year)

Third applicant's signature, place and date

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(Signature) (Institution) (Day / Month / Year)

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Leena Paavilainen, Head of Unit "Production Systems"
(Printed name, function)

Second applicant's signature, place and date

 SLU 26/02/2019
.....
(Signature) (Institution) (Day / Month / Year)
JAN STENROOS

Third applicant's signature, place and date

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(Signature) (Institution) (Day / Month / Year)

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(Printed name, function)

Second applicant's signature, place and date



Igor Yakovlev

..... Norwegian Institute of Bioeconomy Research 26.02.2019...
(Signature) (Institution) (Day / Month / Year)

Third applicant's signature, place and date

.....
(Signature) (Institution) (Day / Month / Year)

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(Signature) (Institution) (Day / Month / Year)

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(Printed name, function)

Second applicant's signature, place and date

.....
(Signature) (Institution) (Day / Month / Year)

Third applicant's signature, place and date

Jens R. Nielsen University of Copenhagen 27/2/2019
(Signature) (Institution) (Day / Month / Year)

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Tuija Aronen (Institution) (Day / Month / Year)

Signature of the head of the main applicant's research institution

..... Natural Resources Institute Finland
(Signature) (Institution) (Day / Month / Year)

Leena Paavilainen, Vice President
(Printed name, function)

Second applicant's signature, place and date

Audís Sveinsson Icelandic For. Serv. 27.2.2019
.....
(Signature) (Institution) (Day / Month / Year)

Third applicant's signature, place and date

.....
(Signature) (Institution) (Day / Month / Year)