

## Annual report for SNS research projects

Submit the report to [sns@slu.se](mailto:sns@slu.se) by 24:00 CET, 1<sup>st</sup> of March, 2021 and 2021, 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:  | Assessing the role of climate factors in association with spread of invasive Phytophthora species in forests and from urban landscapes |
| 2. Reporting year: | 2017                                                                                                                                   |

|                         |                                                                    |
|-------------------------|--------------------------------------------------------------------|
| 3. Project coordinator: | Michelle Cleary                                                    |
| Email:                  | <a href="mailto:Michelle.Cleary@slu.se">Michelle.Cleary@slu.se</a> |
| Address:                | SLU, Sydsvensk Skogsvetenskap                                      |

### Activities during the reporting year:

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| <p>4. Project status</p> <p>a) Does the project develop according to the plans?<br/>b) Describe the activities during the reporting year</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p>The project has developed according to plans and amendment reported in 2016-2017 annual report.</p> <p><u>Activities related to subproject 1:</u> mapping the distribution and diversity of Phytophthora species affecting host trees in various countries continues alongside other research endeavors, cofinanced by participating country partners.</p> <p>In <b>Norway</b>, soil samples were tested from garden waste deposited by rivers and forest edges for the presence of Phytophthora spp. Isolates will be sequenced. The results are aimed for a peer reviewed paper together with results from sampling that will be carried out in June this year from the official site for composting garden waste in Oslo.</p> <p>In <b>Sweden</b>, baiting, isolation and DNA analysis of samples continues from various forest and urban sites, and nurseries. Citizen science platform established for engaging the public to report diseased trees.</p> <p>In <b>Finland</b>, continued work of maintenance and preservation of the Phytophthora collection; collaboration with the University of Eastern Finland to study the wood/plant distillates against tree pathogens including Phytophthora. The first set of distillates has been tested and some of them (from hemp, spruce and pine) have been chosen for further analysis. Among other studies, the distillates will be applied in a birch/<i>Phytophthora cactorum</i> study. New funding, to support SNS project comes from H2020 research funding for Dr. Eeva Vainio (in collaboration with Jarkko Hantula) on Phytophthora viruses.</p> <p>In <b>Denmark</b>, preparations were made for a <i>Phytophthora</i> survey in beech during the growth season of 2018, using the National Forest Inventory teams. Bark samples from trees with symptoms will be tested with Diagnostic Kits in situ, and positive samples will be taken to the laboratory and DNA extracted via bait. <i>Phytophthora</i> species will be determined with q-PCR. A bachelor project developed maps of potential <i>P. ramorum</i> sites in Denmark using climate data for temperature and precipitation, and data on the distribution of <i>Larix</i> sp. and registration of <i>Rhododendron</i> sp. in nature. A Danish IPM manual for management of <i>Phytophthora</i> in forests is being developed and should be ready by the end of 2018.</p> <p><u>Activities related to subproject 2:</u> During 2017, we prepared 112 soil samples collected from forests and parks in the participating countries where birch and alder may be affected by Phytophthora, for sequencing. DNA was extracted prepped samples for sequencing. These samples were sequenced using 3rd generation sequencing technologies (PacBio platform).</p> |

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

**Peer-reviewed articles:**

Cleary, M., Blomquist, M., Vetukuri R.R., Böhlenius, H., Witzell, J. 2017. Susceptibility of common tree species in Sweden to *Phytophthora cambivora*, *P. plurivora* and *P. cactorum*. *Pathology* 47: n/a, e12329. doi:10.1111/efp.12329.

Grenville-Briggs, L-J., Kushwaha, S.K., Cleary, M.R., Witzell, J., Chawade, A., Savenkov, E., Whisson, S.C., Vetukuri, R.R. 2017. Draft Genome of the Oomycete pathogen *Phytophthora cactorum* Strain LV007 isolated from European Beech (*Fagus sylvatica*) *Genom Data* 12: 155–156. DOI: 10.1016/j.gdata.2017.05.010.

Poimala, A.; Werres, S.; Pennanen, T.; & Hantula, J. 2018. First Report of Alder *Phytophthora* Closely Related to *P. uniformis* on *Alnus glutinosa* Seedlings in Finland. *Plant Disease* 102: 454.

Redondo, M.A., Boberg, J., Stenlid, J. & Oliva, J. (2017). Functional traits associated with the establishment of introduced *Phytophthora* spp. In northern forests. *Journal of Applied Ecology*. Doi: 10.1111/1365-2664.13068.

Redondo, M.A., Boberg, J., Stenlid, J. & Oliva, J. Contrasting distribution patterns between aquatic and terrestrial *Phytophthora* species along a climatic gradient are linked to functional traits. (submitted).

**Other publications:**

Witzell, J. and Cleary, M. 2017. Hantering av *Phytophthora* i sydsvenska lövskogar. SLU, Institutionen för sydsvensk skogsvetenskap. Alnarp 2017

Andersen, C.G. 2018. Risk Assessment of Spread and Establishment of *Phytophthora ramorum* in Danish Forests and Woodlands. Bachelor thesis, Institut for Geovidenskab og Naturforvaltning, Københavns Universitet. [In Danish with English Abstract and figure legends]

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

**Conference Presentations:**

Cleary, M., Witzell, J. 2017. "Citizen Science helps to combat invasive *Phytophthora* diseases in southern Sweden" in the session 'Early detection and monitoring of invasive forest pests and pathogens with citizen science'. IUFRO 125th Anniversary Congress, All Division 7 – Forest Health meeting. Freiburg, Germany, 19-22 September, 2017.

Redondo, M.A. Boberg, J. Stenlid, J. Oliva, J. Traits associated with the establishment of *Phytophthora* in Scandinavia. IUFRO Working Party S07-02-09 *Phytophthora* in Forests and Natural Ecosystems, Hanoi-Sapa Vietnam, 18 - 25 March 2017

Redondo, M.A., Boberg, J. Stenlid, J. Oliva, J. Monitoring *Phytophthora* species in river systems in Sweden by high throughput sequencing, IUFRO Working Party S07-02-09 *Phytophthora* in Forests and Natural Ecosystems, Hanoi-Sapa Vietnam, 18 - 25 March 2017

Blomquist, M., Witzell, J., Cleary, M. *Phytophthora* affecting protected beech forests across Southern Sweden. IUFRO Working Party S07-02-09 *Phytophthora* in Forests and Natural Ecosystems, Hanoi-Sapa Vietnam, 18 - 25 March 2017

**Websites:**

Swedish Citizen Science platform for *Phytophthora* research: <http://phytophthora.se/>

**Other extension work:**

Johanna Witzell presented *Phytophthora* project work in Sweden during 5 invited presentations with stakeholders/associations/practitioners, 4 invited field excursions/inspections, 3 educational seminars, and through Citizen Science initiatives.

**Popular science articles:**

"*Phytophthora* - ett snabbt växande hot mot svensk skog" [http://www.mynewsdesk.com/se/sveriges\\_lantbruksuniversitet\\_slu/pressreleases/phytophthora-ett-snabbt-vaexande-hot-mot-svensk-skog-1938186](http://www.mynewsdesk.com/se/sveriges_lantbruksuniversitet_slu/pressreleases/phytophthora-ett-snabbt-vaexande-hot-mot-svensk-skog-1938186)

"*Phytophthora* – ett snabbt växande hot mot svensk skog" <https://www.forskning.se/2017/04/28/phytophthora->

[ett-snabbt-vaxande-hot-mot-svensk-skog/](#)

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

313,000 SEK

## 8. Actual costs

|                        | SNS funding      | External funds | Total |
|------------------------|------------------|----------------|-------|
| Travel and hotel       |                  |                |       |
| Meeting costs          |                  |                |       |
| Consumables            | 12,585.24        |                |       |
| Salary                 |                  |                |       |
| Communication          |                  |                |       |
| Other costs (specify)  |                  |                |       |
| <b>Total SUM (SEK)</b> | <b>12,585.24</b> |                |       |

## 9. Transfer of SNS funds to project partners

| Country                   | Partner organization     | Sum (SEK)      |
|---------------------------|--------------------------|----------------|
| Denmark                   | University of Copenhagen | 33,000         |
| Finland                   | LUKE                     | 75,000         |
| Sweden                    |                          |                |
| Norway                    | NIBIO                    | 75,000         |
| Iceland                   |                          |                |
| Other countries (specify) |                          |                |
| <b>Total SUM</b>          |                          | <b>183,000</b> |

## Comments to the economic overview:


Country allocations according to budget to be used for activities (subproject 1). Consumables related to lab materials for Subproject 2.

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

Main applicant's signature, place and date

 ..... SLU Sidsveast Skogsvetenskap ..... 27/9/2018  
(Signature) (Institution) (Day / Month / Year)

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

 ..... SLU - ESS ..... 27/09/2018  
(Signature) (Institution) (Day / Month / Year)

VILIS BRUKAS, head of department  
(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)