Conference and abstract book

15TH EUROPEAN HEATHLANDS NETWORK WORKSHOP

EHW 2017

Lowland heaths under pressure: *challenges in ecological restoration*

Aug 20 - 25/26 | **2017**

Nijmegen | Dwingeloo | The Netherlands

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Colofon

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European Heathlands Network Workshop 2017
20.08.-26.08.2017 Nijmegen | Dwingeloo |The Netherlands

- Bargerveen Foundation
- Staatsbosbeheer / State forestry Service
- Radboud University Nijmegen
- Unie van Bosgroepen
- B-WARE research centre

Editor:
Joost Vogels

Design:
Lian Hendrickx, www.lianinline.nl

Citation guideline:
15th European Heathlands Network Workshop (2017).
Conference and abstract Book.
Editor: J.J. Vogels. Nijmegen.
98 pag.

Photos:
Cover - Jap Smits

Sponsors and affiliates

The organizing committee would like to express their gratitude to the Provinces of Drenthe and Gelderland for their donations for organizing the workshop and the Dutch O+BN Program / VBNE for their donation for the layout and printing expenses of the conference book and excursion guide.
Staatsbosbeer kindly donated the workshop promotion material.

Furthermore, we wish to thank the management organizations Natuurmonumenten and Foundation National Park Hoge Veluwe for offering their heathland reserves as the stage for our field excursions.

provincie Gelderland

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o+bn

Natuurmonumenten

STICHTING HET NATIONALE PARK
DE HOGE VELUWE

vereniging van
bos- en natuurterreineigenaren
VBNE

A word of welcome

Dear participants,

We welcome you all to the 15th anniversary edition of the European Heathlands Workshop!

In the spirit of the European Heathlands Network, a broad palette of researchers, site managers and policy makers from 10 European countries decided to join the workshop. All of them are surely excited as ever to share their knowledge and experiences in the ecology, conservation, restoration and management of our European heathland landscapes.

We, the organizers, are also looking forward to show you a selection of our Dutch heathland reserves, and cannot wait to show you a selection of heathland habitats, field experiments, restoration projects and management practises.

We also provided the participants the opportunity to extend their stay in the Netherlands for one day, in order to visit the *Bargerveen* ombrotrophic bog reserve, one of the few remaining living sphagnum bogs that remain in our country.

We hope you will enjoy your stay in the Netherlands and experience a fruitful and informative workshop!

On behalf of the organizing committee,

Joost Vogels

A word of welcome from the Chair of the Network

When French and British heathland ecologists met in Brittany in July 1979, and decided afterwards that it would be a good idea to organize a real European workshop on heathlands in Aberdeen, Scotland three years later, they would not have realized that this was the start of a very successful tradition that lasts until today. In the course of 35 years, 15 international workshops were organized in the main heathland areas of Europe. They generated a continuous, open exchange of ideas and knowledge that builds our common understanding of heathlands and ensured that expertise is distributed and passed on. So, the 15th European Heathland Workshop in The Netherlands, August 2017, is not only a further successful meeting of heathland loving managers and scientists, it is also an anniversary of a network that we may be proud of.

Looking back at all these meetings, we see elements of tradition as well as of evolution. Bringing people together with different backgrounds and of different disciplines is one such a constant. Especially in man-made lowland heath this is essential to better understand the real nature and functioning of this ecosystem. The workshops stimulate dialogue between practical management, scientific research and conservation policy, and hence add a lot to collaboration and bridging the gap between worlds that are frequently far apart. As such, it seems to be entirely logical that natural and cultural or societal processes of the heathland are studied and managed in an integrative way. Thus, long before it became a new scientific model, the European Heathland Workshops recognized the heathlands as a socio-ecological system and promoted its integrated study.
During the workshops, and especially the extensive field trips, attention is always paid to the history, composition, dynamics and functioning of the regional heathland types. Understanding the effects of different management measures on the viability of heathlands is a recurrent theme.

Analysing the impact of environmental pressures on heathland and assessing the effectiveness of mitigating or counteracting measures have also been a major topic of the workshops. The focus changed a little, from the effects of desiccation and acidification at the beginning to the damage caused by excessive nitrogen deposition more recently. Gradually, the impacts on the heathland communities were better understood by broadening the systems studied. In former workshops shifts in dominance of plant species and performance of *Calluna* and *Erica* were discussed, today detailed studies of changing balances in soil chemistry and soil communities are presented. This evolution is largely driven by the importance of heathland restoration, another major issue of recent workshops. In many regions enlarging the area of heathland seems to be the only strategy to maintain its characteristic communities. Quite often, this means that highly fertile former agricultural land has to be converted into a nutrient poor habitat, a process that requires far-reaching measures that affect the entire ecosystem. To turn this into a success, practical experience and a thorough understanding of the ecosystem processes involved and of the land use history and the landscape ecological context, have to be combined. And thus, close collaboration between managers and researchers is indispensable.

The site visits and contributions during the workshops so far, made one thing very clear: although the lowland heath represents a particular and unique landscape type in Europe, with a common ecological functioning and a similar development, the impact of land use (change), environmental stressors and management measures differs considerably along the north-south gradient. It is obvious that a tailored regional approach is needed to preserve this common European cultural heritage. What works in one situation does not guarantee success elsewhere, especially when climate change is taken into account. The determining effect of the local situation has to be acknowledged. So, a viable knowledge network and community of practice is needed more than ever to promote collaboration and mutual learning. The European Heathlands Network and its workshops may fulfil this task.

Geert De Blust

Organization

The 15th European heathland workshop is organized by a group of organizations all active in the field of (heathland) ecology, restoration management, management planning and/or protection. In this field, our organizations often work in close collaboration with each other. Therefore, we decided to join forces in organizing the Dutch edition of the EHW. Here we present ourselves and our organizations.

THE ORGANIZING COMMITTEE

Joost Vogels

Joost completed his biology study at the Radboud University Nijmegen in 2005, and is employed since 2007 at the Bargerveen Foundation, currently as senior scientist. He is also guest employee / PhD candidate at the department of Animal Ecology and Physiology of the Radboud University Nijmegen. As a field ecologist by profession and heart, his interests are manifold, ranging from arachnology, landscape ecology, historical ecology and archaeology, soil biochemistry and minerology. In his scientific career he tries to combine these interests in unravelling the complex interplay between soil minerology, soil-chemistry, plant diversity and quality and animal diversity of European heathlands, in the context of global change. Before and during the workshop, he carries the main responsibility for the workshop's general organization.

Eva Remke

Eva completed her biology study at the University of Greifswald, Germany, in 2003. She completed her PhD on the subject atmospheric nitrogen deposition on dry, coastal dune grasslands in 2010 at the Radboud University, Nijmegen. Eva is senior ecologist at Bargerveen Foundation. Her major interests are in the field of landscape ecology and "nature conversation": how do systems function and how can we convince human kind to preserve them? Often, the major leap is not about how to restore a landscape, but how to get it done with all relevant stakeholders. As an experienced nature conservationist in different European as well as African countries, she fully realizes how important cross-border knowledge transfer is, taking cultural differences into account. During the workshop, she is involved in the general organization.

Ella de Hullu

Ella completed her biology study at Utrecht University in 1979 and completed her PhD in 1985 at the Rijksuniversiteit Groningen. Her career then followed a directorate path, with State forestry service and the environmental departments at the former ministry of agriculture, nature and food quality as former employees. Since 2009, she is the Director of the Bargerveen Foundation. During the workshop, she is involved in the general organization, and she will also be the first person to speak to if you are experiencing problems or have any important questions.

Jap Smits

Jap Smits started his career in 1979 as a junior forester at State Forestry Service. Nowadays, he is site manager, specialized in heathland ecology at State Forestry Service, and acts as a spokesperson and inspiration for site managers throughout the country. He is chair of the insect-management working group of the Dutch Entomological Society. The heathland reserve *Strabrechtse Heide* is his muse, and inspired him to develop several out-of-the-box and inventive management practices in heathland landscapes. He is co-author of the book *"Heidebeheer – moderne methoden in een eeuwenoud landschap"* (Heathland management, modern methods in a centuries-old landscape). During the workshop, he will be the press spokesperson and is responsible for all dissemination activities to the broader public. During the field excursions, he will surely give valuable contributions to any questions about heathland management.

Henk Siepel

Henk completed his biology study at Utrecht University in 1984. In 1994 he defended his PhD on 'Structure and function of soil micro-arthropods' at Wageningen University. In 2005 he was appointed as full professor in applied animal ecology at the Radboud University Nijmegen, where he could renew his focus on his scientific work on the applications of life-history tactics in nature management and restoration. During the workshop, he is responsible for the scientific program.

Maaike Weijters

Maaike Weijters studied Biology at Utrecht University and is working for B-WARE research centre since 2007, currently as project manager /researcher. She works mainly on restoration projects, such as heathlands, *Nardo-Galion* grasslands and Belgian brook valley systems. She is also involved in the development of novel restoration methods like soil inoculation, addition of Rock dust to restore soil minerals and soil buffering manipulation on former agricultural fields. During the workshop, she will arrange the Dwingelderveld excursion and will assist in many other aspect of the workshop when needed.

Andre Jansen

Andre defended his PhD in 1985 at the *Rijksuniversiteit Groningen* in the specialty hydro-ecology and vegetation science. He has worked since then as ecologist and eco-hydrologist for several employers. Since 2005 he works as an expert hydro-ecologist at the *Unie van Bosgroepen*. He is chair of the expert group "wet sand landscape" of the O+BN programme for nature restoration and involved in many research and restoration projects in The Netherlands and abroad. He is co-author of the Landscape Ecological Systems Analysis guide, a novel multilevel approach helpful in developing sound management planning and practice based on local, regional as well as historical ecological factors. During the workshop, he will be responsible for all wet aspects of the field excursions. If Andre is wearing boots, you should too!

Our organizations

Bargerveen foundation
The Bargerveen Foundation is a non-profit organization who works on sustainable restoration and conservation of nature. We develop ecological knowledge and translate it to the practice of ecosystem restoration in order to improve the management of nature protected areas. In close cooperation with nature reserve managers we deliver specialized monitoring, ecological analyses on a landscape scale and applied research e.g. management experiments or effect studies on nature management. This approach provides important and new insights for the management and policy of nature.

Radboud University Nijmegen – Dept. of Animal Ecology and Physiology
The Animal Ecology and Physiology department of the Radboud University Nijmegen addresses multiple levels of biological organization, from molecule to organism, from individual to population and community. We focus on fish stress adaptation and calcium physiology, but also on how ecophysiological trade-offs interact with the environment and impact population dynamics and macroevolutionary processes.

B-ware research centre
B-WARE Research Centre is a spin-off company of the Department of Aquatic Ecology & Environmental Biology, embedded in the Institute for Water and Wetland Research (IWWR) of the Radboud University in Nijmegen. We conduct applied and fundamental scientific research focusing on biogeochemical and ecological processes that determine water and soil quality, biodiversity, and ecosystem functioning.

Staatsbosbeheer (State Forestry Service)
Staatsbosbeheer is commissioned by the Dutch government to strengthen the position of nature in the Netherlands. As a leading national public body and as land owner and manager of a sizeable amount of nature reserves we work to conserve and develop the Netherlands' characteristic green heritage. Together with society, we are committed to ensuring that current and future generations are able to experience the many essential values of nature, balanced with sustainable use of our protected areas.

Unie van Bosgroepen (Union of Forestry Groups)
Unie van Bosgroepen plays an advisory as well as a caretaking role in the management of forestry and nature reserves of their members, mainly private landowners in the possession of forest and/or nature. Their work field aims at all aspects of management, from initial management planning to the final execution. In order to streamline nature management of their members, they employ a broad workforce of varying expertise, ranging from process managers, field ecologists, hydrologists to management planners and policy officers.

Stichting Bargerveen
for ecosystem restoration

Unie van Bosgroepen

Radboud University

B ware
RESEARCH CENTRE

staatsbosbeheer

Important information

EMERGENCY TELEPHONE NUMBER

The emergency telephone number in the Netherlands is following EU standards and is accessible by calling 112

INTERNAL EMERGENCY PHONE NUMBERS

In case of non-life-threatening emergencies, please call one of the following numbers of the organizing committee, through the following order:
Ella de Hullu: +31(0)6 452 670 70
Eva Remke: +31 (0)6 472 807 37
Joost Vogels: +31(0)6 472 806 85

FIELD EXCURSION FIRST AID

Jap Smits will be the field excursion first aid medic: +31(0)6 549 134 89

HOTEL PHONE NUMBERS

Hotel Molenhoek (Nijmegen part of the workshop): +31 (0)24 358 0155
Hotel de Borken (Dwingeloo part of the workshop): +31 (0)347 750 474

SUMMARIZED TRAVEL INFORMATION

Arrival

You can reach Nijmegen by public traffic by train and through three airports: Amsterdam/Schiphol airport, Eindhoven airport and Düsseldorf/ Weeze airport. Choice of any of these airports may depend on the possible (direct) flights to and from your home country, note however that the easiest transportation route from and to the airport is via Schiphol.

Personal transport from Nijmegen railway station to the van der Valk Hotel Molenhoek can be organized by the organizing committee, but this is only applicable to persons with disabilities and/or for people arriving at an unfeasible point in time. We encourage the participants to travel to the conference location by public transport. If you are unable to do so and are in need of transportation, please contact us by mail (info@ehw2017.nl).

Departure

Bus transportation from the conference location in Dwingeloo to the nearest connecting railway station (Meppel) will be organized by the workshop. From this railway station, you can travel to the airport of your choice.

See chapter 5 in the conference and abstract book for detailed travel info!

Accommodations

The first part of the workshop (Aug 20th till 23rd) will be held near the University of Nijmegen, where most of the oral and poster presentations will take place. Our place place of residence is located in the nearby village Molenhoek, at "Hotel Molenhoek" (Fig 1). An overview picture of the railway station, university and hotel location is given in Fig 2, and a map of the University campus with locations of the workshop can be found in Fig 3.

The second part of the workshop (Aug 23rd till 26th) will be held in the small village of Lhee, near the village of Dwingeloo. Our place of residence is "Hotel De Borken"(Fig 4), where the final presentation session will take place as well. At the final evening of the regular program (Thursday , Aug 25th), we will have an informal meetup at nearby "Café de Bospub", also located on the map.

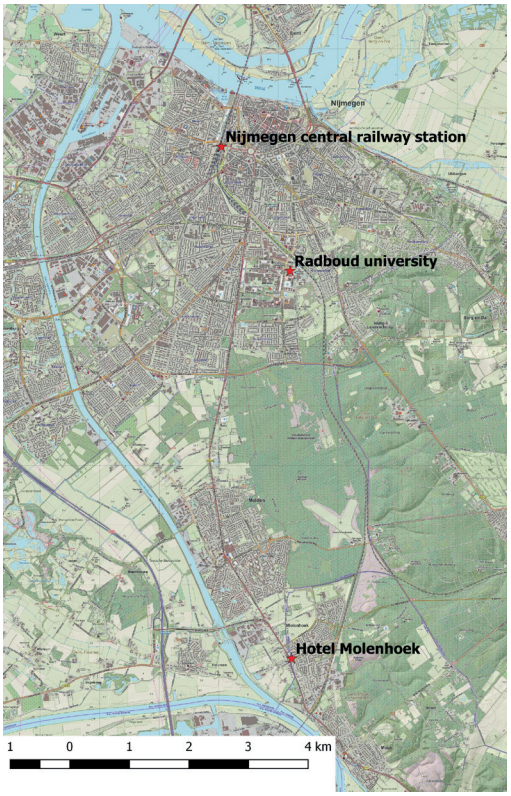
IMPORTANT ADDRESSES:

Huygens building – Radboud University Nijmegen
Heyendaalseweg 135
6525 AJ Nijmegen
Phone: +31(0)24 365 2661

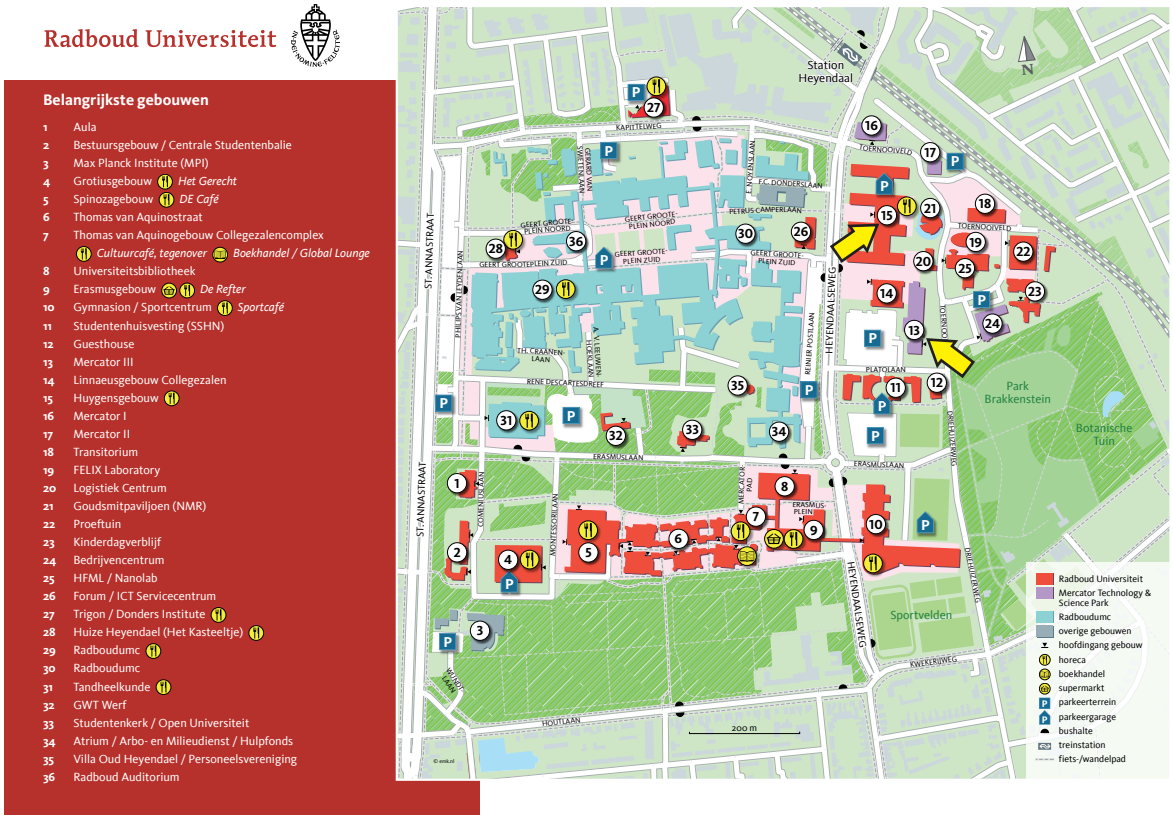
Hotel Molenhoek - Nijmegen
Rijksweg 1
6584 AA Molenhoek
Phone: +31 (0)24 358 0155
Mail: molenhoek@valk.com
https://www.hoteldemolenhoek.nl/en

Landhotel De Borken - Dwingeloo
Lhee 76
7991 PJ Dwingeloo
Phone: +31 (0)347 750 474
E-mail: info@hoteldeborken.nl
http://www.hoteldeborken.nl/en/

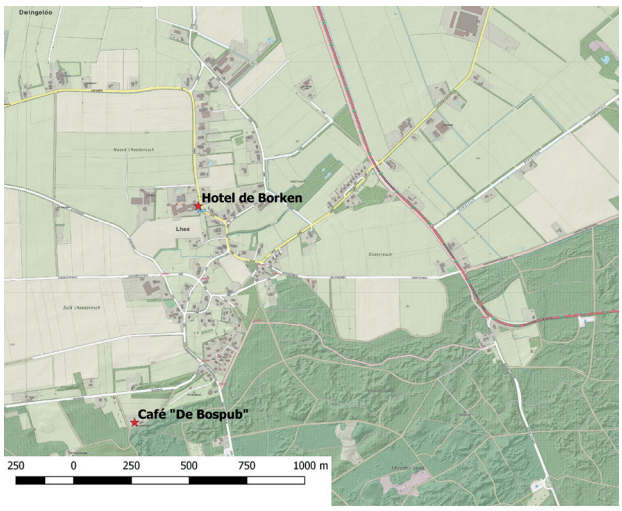
• **Fig 1** • Location of "Hotel Molenhoek" in the town of Molenhoek.



• **Fig 2** • Location of the railway station, University and Hotel Molenhoek.



• **Fig 3** • Map of the Radboud University Campus. The oral presentations will be held in the Huygens building, number 15 on the map, the lunch will be held in the Natuurplaza section of the Mercator III building, number 13 on the map.



• **Fig 4** • Location of Hotel de Borken in the small village of Lhee, and Café "De Bospub".

Travel information

ARRIVAL

The arrival date for the Heathland workshop is on Sunday, Aug 20th 2017. You are welcome from 15:00 hours onwards, remember though that on this day we will only have dinner and an evening excursion after dinner on the program. During the workshop you will be transferred to the north of the country, where the second part of the workshop will take place. Departure is therefore different from arrival and listed below.

You can reach Nijmegen by public traffic through three airports: Amsterdam/Schiphol airport, Eindhoven airport and Dusseldorf/Weeze airport. Choice of any of these may depend on the possible (direct) flights from your home country. **However, by far the easiest travel option is via Schiphol airport, as all other options leave you with quite a long journey back to the airport.**

You will be mainly traveling by train to the hotel. We give some explanation time tables in the text, additional time tables may be found at: http://www.ns.nl/reisplanner-v2/index.shtml

Arrival at Amsterdam/Schiphol airport.

You can take a direct train to **Nijmegen central station** (at platform 3), which takes 1.5 hours, departure times are at every half hour (14:00, 14:30 etc). At **Nijmegen station** (arrival at platform 4a) you change trains to **Mook Molenhoek** (direction **Roermond**, platform 1b) at 16.08, 16.38, etc. (every half hour) and go out at the second stop **Mook Molenhoek**. From there you walk 12 minutes to the hotel (see Fig 1). Total travel costs: € 20,50.

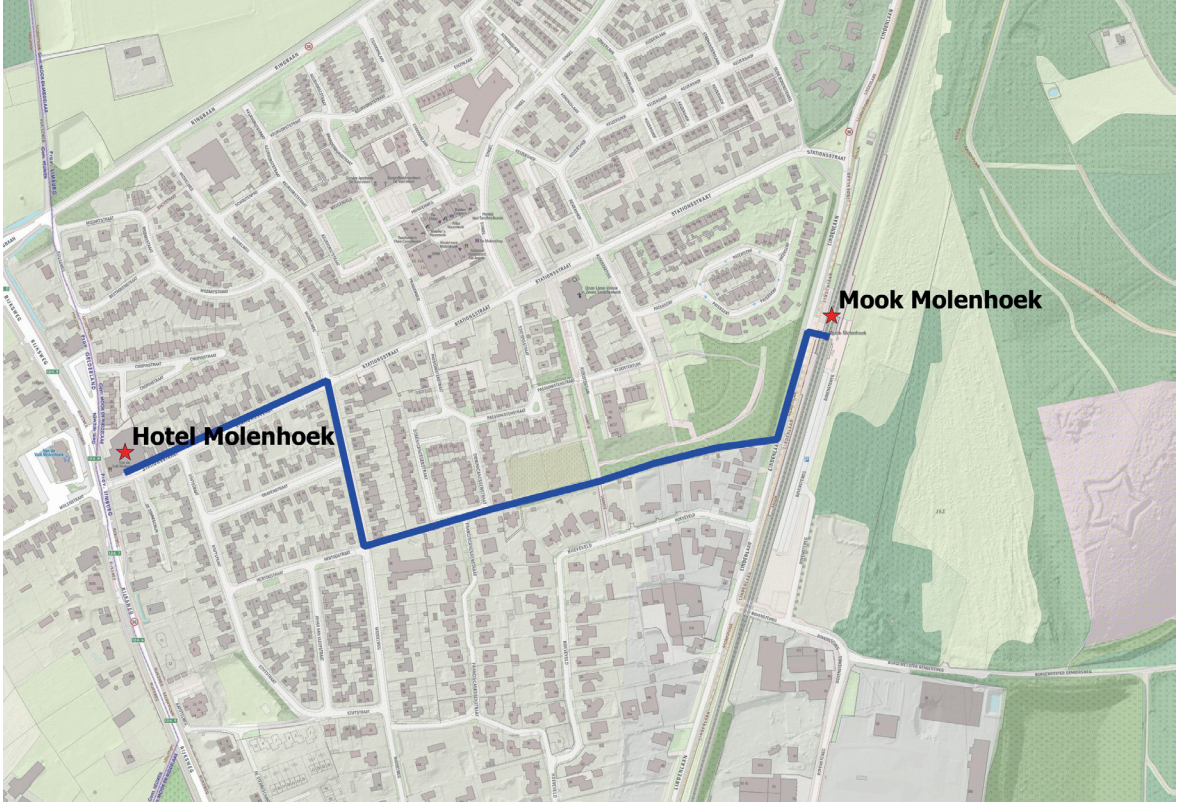
Arrival at Eindhoven airport

You take the shuttle bus (400 or 401) to Eindhoven railway station. You can buy a ticket from the bus driver at a price of € 3,75.

At the railway station, take the train to **Amsterdam central station** at platform 5. You will leave this train after 20 minutes of travel in **'s Hertogenbosch**. Departure times: 14:02, 14:32, etc. (every half hour). In **'s Hertogenbosch**, leave the train and change trains to **Nijmegen central station**. Walk from platform 4b (arrival platform) to departure platform 3b (**Other side of platform, 3 minutes time to change**), and board the train to **Zwolle**. (departure times: 14:32, 15:02 every half hour). You will arrive in **Nijmegen** at platform 3b. Change trains again here, walk (9 minutes time to change) to platform 1b for the train heading to **Roermond** (departure time: 15:08; 15:38, etc.) and leave this train at the second stop, **Mook Molenhoek.** The whole trip takes 1.25 hours in total. Additional time tables may be found at: http://www.ns.nl/reisplanner-v2/index.shtml From the **Mook Molenhoek** railway station you walk 12 minutes to the hotel (see Fig 1). Total travel costs: € 18,98

Arrival at Düsseldorf/Weeze airport (D)

Nijmegen is close to the German border. You can take a shuttle bus from the airport to the **railway station of Nijmegen** see: http://www.airport-weeze-shuttle.de/ Take note that this shuttle goes only four times a day (at 10.00h, 14.00h, 17.30h and 23.30h), it takes 45 minutes driving. Prices are given after booking. The return shuttle from **Nijmegen railway station** goes only three times a day (04.00h, 11.00h and 15.00h). From Nijmegen railway station you can take a bus (line 83) to the hotel in **Mook Molenhoek**, or the train platform 1b, direction **Roermond** at 16:08, 16:38 etc. Leave the train at the second stop at station **Mook-Molenhoek**. From there, you walk 12 minutes to the hotel (see Fig 1).



• **Fig 1** • Walking route from Mook Molenhoek railway station to Hotel Molenhoek (12 minute walk).

DEPARTURE

Departure from the symposium at Aug 25th or Aug 26th when you take part in the extra excursions. **We will arrange transport to the nearest railway station Meppel.** From there you can travel to the airport of your choice.

To Schiphol airport:

Departure from **Meppel** railway station to **Schiphol airport**, which takes 1.5 hour, departure times: 10:56h (at every full hour a direct train leaves, at every half hour a train leaves to **Zwolle**, where you have to switch trains. Additional time tables may be found at: http://www.ns.nl/reisplanner-v2/index.shtml. Costs: € 21.70

To Eindhoven airport:

Departure from **Meppel** railway station to **Eindhoven railway station**, which takes 2.5hours, departure times: 10:17 and 10.56h (repeating every hour). You have to change trains twice: first at **Zwolle** (arrival at either platform 14 (10:17) or platform 3a (10:56). Here take the train to **Rotterdam** at platform 5a, 15 minutes time to change), leave this train at **Utrecht central station** at platform 8, and board the the train to **Eindhoven** (direction **Heerlen**, departure at platform 18; 12 minutes time to change trains). At **Eindhoven** station take the shuttle bus 400 or 401 to the airport. You can buy a ticket from the bus driver at a price of € 3,75. Costs: € 18,98.

To Dusseldorf/Weeze airport:

Departure from **Meppel** railway station to **Nijmegen**, which takes 1 hours and 40 minutes. Departure times: 10:17h and 10.56h (repeating every hour, You have to change trains once in **Zwolle**: arrival at platform 3a (10:17 train) or 14 (10:56 train). Take the train to **Roosendaal** at platform 10 (11 minutes to change trains). Costs: € 19.60 plus the shuttle bus from **Nijmegen** to **Weeze airport**, but note that this shuttle leaves only at three moments, of which only 15.00h is feasible! You will arrive at the airport then around 16.00h given no traffic jams.

TICKETS

The easiest way to buy a train ticket is in advance on the internet: https://www.ns.nl/producten/en/s/enkele-reis

Single ticket: select the date, the departure station – either **Schiphol airport, Eindhoven or Nijmegen** for arrival schedule, use **Meppel** as departure station. Destination station at arrival is **Mook Molenhoek**, at departure the train station suited best for your airport (**Schiphol airport, Eindhoven or Nijmegen**). Choose number of passengers and fill out for every passenger the initials, surname and e-mail address and an e-ticket will be send to you by mail after completion of payment.

Workshop programme

For a fully detailed programme schedule, see the table further down this chapter and the presentation programme schedules in chapter 9.

SHORT PROGRAMME SUMMARY

Sunday Aug 20th | Arrival | Evening excursion

15:00-22:00 Arrival & check in at Van der Valk hotel Molenhoek, near Nijmegen

17:30-18:30 Dinner

19:30-21:00 Evening excursion at Heumense schans heathland area

Monday Aug 21th | Presentations | Conference dinner

7:00-8:00 Breakfast

8:00-9:00 Boarding of bus and travel time between hotel and University

9:00-9:20 Opening by chair and word of welcome by the organization committee

9:20-12:30 Oral session 1: Ecology of heathlands

12:30-13:30 Lunch

13:30-14:50 Poster Session

15:00-17:20 Oral session 2: Historical aspects of heathland ecology and management

17:20-18:00 Boarding of bus and travel time between University and hotel

19:00-21:00 Conference dinner

Tuesday aug 22nd | Presentations | Excursion | Film evening

7:00-8:00 Breakfast

8:00-9:00 Boarding of bus and travel time between hotel and University

9:00-12:30 Oral session 3: Restoration management in heathlands

12:30-13:30 Bus travel from university to Hatertse vennen

13:30-18:30 Field excursion Hatertse Vennen, including return to Hotel

19:00-20:30 Dinner

20:30-21:30 Film evening: The Hidden World of the Strabrechtse Heide

Wednesday aug 23rd | Excursions | Transfer to Dwingeloo

7:00-8:00	Breakfast
8:00-9:10	Boarding of bus and travel to Hoge Veluwe
9:10-14:00	Field excursion National Park The Hoge Veluwe (including field lunch break)
14:00-15:30	Bus travel
15:30-17:30	Field excursion Stroothuizen
17:30-19:00	Bus travel to Dwingeloo – Hotel de Borken
19:30-21:00	Dinner

Thursday aug 24th | Presentations | Excursion | Pulsars 'n Galaxies | Informal evening

7:00-8:30	Breakfast
8:30-12:00	Oral session 4: Large-scaled ecological restoration of heathlands
12:00-13:00	Lunch at Hotel de Borken
13:00-16:30	Field excursion Dwingelderveld | Noordenveld
16:30-17:30	Visit to Dwingeloo Radio Telescope
18:30-20:00	Dinner
20:30-24:00	Informal closure of workshop at Café de bospup

Friday aug 25th | Concluding session | Farewell | Plus programme excursion

7:00-8:20	Breakfast
8:20-10:00	Concluding session
10:30-11:30	Farewell and departure to Meppel railway station of non plus programme participants
11:30-12:30	Lunch at Hotel de Borken
12:30-18:30	Excursion to Bargerveen ombrotrophic bog

Saturday aug 26th | Departure

7:00-9:30	Breakfast and departure to Meppel railway station

DETAILED PROGRAMME TABLE

Programme Table 15th European Heathlands Workshop | Nijmegen-Dwingeloo | The Netherlands	
Opening and concluding session	Side programme
Scientific programme	Travel, check in, farewell, etc
Excursions	Plus programme
Lunch, coffee and dinner	

Timeframe	Sunday Aug 20th	Monday Aug 21th	Tuesday Aug 22nd	Wednesday Aug 23rd	Thursday Aug 24th	Friday 25th	Saturday 26th	Timeframe
8:00 - 8:10		Boarding of bus	Boarding of Bus	Boarding of bus	A bit of well deserved extra sleep	A bit of well deserved extra sleep	Farewell and departure of plus programme participants, with transfer to Meppel railway station	8:00 - 8:10
8:10 - 8:20				Bus Travel Molenhoek - National Park The Hoge Veluwe				8:10 - 8:20
8:20 - 8:30		Bus travel Molenhoek - Huygens	Bus travel Molenhoek - Huygens		**Start oral session 4:** Keynote lecture 4.1 van Diggelen	Concluding scientific session: Siepel		8:20 - 8:30
8:30 - 8:40								8:30 - 8:40
8:40 - 8:50						35 years of EHW: de Smidt		8:40 - 8:50
8:50 - 9:00		walk to huygens building	walk to huygens building					8:50 - 9:00
9:00 - 9:10		**Opening address by chair**	**Start oral session 3:** Keynote 3.1 - Härdtle			Next meeting: de Blust		9:00 - 9:10
9:10 - 9:20		**Welcome by organisers**			Oral 4.2: Weijters			9:10 - 9:20
9:20 - 9:30								9:20 - 9:30
9:30 - 9:40		**Start oral session 1:** Keynote 1.1 - Calvo			Oral 4.3: Vermeulen	Closing discussion		9:30 - 9:40
9:40 - 9:50			Oral 3.2: WallisdeVries					9:40 - 9:50
9:50 - 10:00					Oral 4.4: Loeb			9:50 - 10:00
10:00 - 10:10		Oral 1.2: Diaz	Oral 3.3: Hopf			Coffee Break		10:00 - 10:10
10:10 - 10:20					Coffee Break			10:10 - 10:20
10:20 - 10:30		Oral 1.3: Fagundez	Oral 3.4: Vogels					10:20 - 10:30
10:30 - 10:40						Farewell and departure of leaving participants, with transfer to Meppel railway station		10:30 - 10:40
10:40 - 10:50		Coffee Break	Coffee Break		Oral 4.5: Naedts			10:40 - 10:50
10:50 - 11:00								10:50 - 11:00
11:00 - 11:10					Oral 4.6: Panter			11:00 - 11:10
11:10 - 11:20		Oral 1.4: Nielsen	Oral 3.5: Velle	Field excursion National Park The Hoge Veluwe, including lunch break in the field				11:10 - 11:20
11:20 - 11:30					Oral 4.7: Taylor			11:20 - 11:30
11:30 - 11:40		Oral 1.5: Schellenberg	Oral 3.6: Alonso			Lunch at hotel de Borken		11:30 - 11:40
11:40 - 11:50					Oral 4.8: Dekker			11:40 - 11:50
11:50 - 12:00		Oral 1.6: Dictus	Oral 3.7: Wiersinga					11:50 - 12:00
12:00 - 12:10								12:00 - 12:10
12:10 - 12:20		Oral 1.7: Nienartowicz	Oral 3.8: van der Veen		Lunch at hotel de Borken			12:10 - 12:20
12:20 - 12:30								12:20 - 12:30
12:30 - 12:40		Lunch at Natuurplaza Mercator III	walking back to bus			Plus programme: field excursion Bargerveen		12:30 - 12:40
12:40 - 12:50			Bus Travel Huygens-Hatertse Vennen, packed lunch time					12:40 - 12:50
12:50 - 13:00								12:50 - 13:00
13:00 - 13:10								13:00 - 13:10
13:10 - 13:20								13:10 - 13:20
13:20 - 13:30								13:20 - 13:30
13:30 - 13:40		**Poster session at Natuurplaza Mercator III**	Field excursion Hatertse Vennen		Field excursion Dwingelderveld and Noordenveld			13:30 - 13:40
13:40 - 13:50								13:40 - 13:50
13:50 - 14:00								13:50 - 14:00
14:00 - 14:10				Bus travel NPHV - Stroothuizen				14:00 - 14:10
14:10 - 14:20								14:10 - 14:20
14:20 - 14:30								14:20 - 14:30
14:30 - 14:40								14:30 - 14:40
14:40 - 14:50								14:40 - 14:50
14:50 - 15:00		walking back to Huygens						14:50 - 15:00
15:00 - 15:10	Arrival and check in	**Start oral session 2:** Keynote 2.1 - Spek						15:00 - 15:10
15:10 - 15:20								15:10 - 15:20
15:20 - 15:30				Field excursion Stroothuizen				15:20 - 15:30
15:30 - 15:40								15:30 - 15:40
15:40 - 15:50		Keynote 2.2 - Vandvik						15:40 - 15:50
15:50 - 16:00								15:50 - 16:00
16:00 - 16:10								16:00 - 16:10
16:10 - 16:20								16:10 - 16:20
16:20 - 16:30		Oral 2.3 - Bastiaens			Visit to Dwingelderveld Radio Telescope			16:20 - 16:30
16:30 - 16:40								16:30 - 16:40
16:40 - 16:50		Oral 2.4 - Holmelund						16:40 - 16:50
16:50 - 17:00								16:50 - 17:00
17:00 - 17:10		Oral 2.5 woestenburg						17:00 - 17:10
17:10 - 17:20								17:10 - 17:20
17:20 - 17:30		walking back to bus						17:20 - 17:30
17:30 - 17:40	Dinner	Bus travel Huygens-Molenhoek		Bus Travel Stroothuizen - Hotel de Borken	Bike travel back to hotel de Borken			17:30 - 17:40
17:40 - 17:50								17:40 - 17:50
17:50 - 18:00								17:50 - 18:00
18:00 - 18:10		Rest and refreshment time	Bus Travel to Molenhoek		Rest and refreshment time			18:00 - 18:10
18:10 - 18:20								18:10 - 18:20
18:20 - 18:30								18:20 - 18:30
18:30 - 18:40			Rest and refreshment time		Dinner	Rest and refreshment time		18:30 - 18:40
18:40 - 18:50	Rest and refreshment time							18:40 - 18:50
18:50 - 19:00								18:50 - 19:00
19:00 - 19:10		Conference dinner	Dinner	Rest and refreshment time		Dinner		19:00 - 19:10
19:10 - 19:20								19:10 - 19:20
19:20 - 19:30								19:20 - 19:30
19:30 - 19:40	Evening excursion Mookerheide and Heumense Schans			Dinner				19:30 - 19:40
19:40 - 19:50								19:40 - 19:50
19:50 - 20:00								19:50 - 20:00
20:00 - 20:10					Rest and refreshment time			20:00 - 20:10
20:10 - 20:20								20:10 - 20:20
20:20 - 20:30								20:20 - 20:30
20:30 - 20:40			Film: The hidden world of the Strabrechtse Heide		Informal closure of the workshop at Café the Bospup (closes at 0:00h)	Informal part		20:30 - 20:40
20:40 - 20:50								20:40 - 20:50
20:50 - 21:00								20:50 - 21:00
21:00 - 21:10	Informal part	Informal part		Informal part				21:00 - 21:10
21:10 - 21:20								21:10 - 21:20
21:20 - 21:30								21:20 - 21:30
21:30 - 21:40			Informal part					21:30 - 21:40
21:40 - 21:50								21:40 - 21:50
21:50 - 22:00								21:50 - 22:00
22:00 - -								22:00 - -

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Scientific programme

KEYNOTE SPEAKERS

Leonor Calvo

Dra. Leonor Calvo Galván is a Professor in Ecology, specialized in the study of plant communities of shrub and heathland landscapes, as well as forest ecosystems, in northern Spain. Through her position at the University of León and her collaborations with researchers across Europe, she has become a reference investigator and leading expert on the responses of heathland cultural landscapes to traditional management practices (e.g., fire, grazing) and current land use changes (including increased nitrogen deposition). She has extensive experience in studying the functioning of the heathland ecosystem and its recovery after perturbation. She is the PI of several research projects focused on structure and functioning of heathlands.

Theo Spek

Prof.dr.ir. Theo Spek (1963) is a full professor of Landscape History at the University of Groningen since 2010. He finished his masters and PhD at Wageningen Agricultural University (The Netherlands). After that he worked as a project and programme leader at the Dutch Soil Survey, Alterra, the National Heritage Agency and the University of Groningen. Since 2010 he is a full professor of Landscape History at the University of Groningen, where he founded the interdisciplinary and transdisciplinary Centre for Landscape Studies. In his research he combines methods and theories from the natural sciences, humanities and spatial sciences into an interdisciplinary and transdisciplinary approach of the past, present and future of cultural landscapes.
The Centre for Landscape Studies aims at scientific education (one year master course and two year research master course in landscape history), fundamental landscape research as well as the valorisation and transfer of knowledge towards citizens, practioners and governments.

Vigdis Vandvik

Vigdis Vandvik is Professor at the Ecological and Environmental Change Research Group at the University of Bergen, Norway. She is a community ecologist interested in how natural and human drivers affect populations, communities and ecosystems at different spatial and temporal scales. Her research falls into three broad categories:

- How do dispersal and niche processes interact to shape the patterns in diversity that we observe in nature?
- How does environmental change affect various aspects of plant regeneration, and how do these effects scale across levels of organization from physiology via populations to communities?
- What are the effects of human land-use regimes, past and present, on terrestrial ecosystems?

She studies these topics by a combination of field and laboratory experiments and field observations. Through her own research projects and collaborations in Norway, Europe, the US, Uganda, Nepal and China she has the opportunity to explore these questions in different regions, study systems, and by using different methods.

Werner Härdtle

Werner Härdtle is a full professor in Ecology, Landscape Ecology and Nature Conservation at the University of Lüneburg since 1997. He has a wide experience in vegetation and soil ecological research. Research priorities are heathland ecology and forest ecology, and previous research addressed the impacts of atmospheric nitrogen deposition and climate change on ecosystem functioning and biodiversity patterns. Moreover, he is interested in interaction processes of global change drivers, and how these interaction processes might affect the functioning of ecosystems such as heaths or forests. Recent research has also focused on relationships between biodiversity patterns and ecosystem processes, with a particular focus on nutrient cycles and balances. Werner Härdtle was PI of several heathland research projects which analysed the impacts of nitrogen deposition on biodiversity and ecosystem functioning, and the potential of management measures to mitigate effects of global change drivers on heathland ecosystems.

Ruurd (Rudy) van Diggelen

Rudy van Diggelen worked on the restoration of ecosystems since the start of his career at the University of Groningen (The Netherlands). His focus lies on wetlands as well as dry ecosystems. For almost 10 years he is now associate professor at the University of Antwerp (Belgium). Within dry ecosystems his is interested in how to transform former intensively used agricultural areas into nature areas e.g. heathlands. Furthermore he does research on the effects of management measures on the soil (fauna). One of his recent publications looks at the effects of top soil removals on soil fauna and soil characteristics.

Opening and oral session 1:

Ecology of heathlands

MONDAY AUG 21 2017 | 9:00–12:30 | RADBOUD UNIVERSITY NIJMEGEN

Schedule

9:00-9:10 **Geert de Blust**
Opening address of the chair of the EHW

9:10-9:20 **Joost Vogels**
Word of welcome from the organizing committee

Keynote lecture session 1

9:20-10:00: **Leonor Calvo, Javier Calvo, Angela Taboada, Jose Manuel Fernández Guisuraga & Elena Marcos**
Heathlands in the Cantabrian mountain range: structural and functional singularities

Oral presentations

10:00-10:20 **Anita Diaz, Franklin L, Brown M, Harvey A, Bailey L & Rickard K.**
Causes and consequences of differential attack by Heather beetle Lochmaea suturalis at a landscape scale

10:20-10:40 **Jaime Fagúndez**
Biotic and abiotic factors that shape the Erica mackayana wet heathlands in Galicia, NW Spain

10:40-11:10 **Coffee Break**

Oral presentations (continued)

11:10-11:30 **Knud Erik Nielsen, Amaia Irizar, Lars Peter Nielsen, Søren M. Kristiansen, Christian Damgaard, Martin Holmstrup, Asger R. Petersen & Morten Strandberg**
In situ pH measurements reveal extremely low pH in heathland soil – does nature (and science) ignore a tipping point?

11:30-11:50 **Jenny Schellenberg**
North German Lowland heath: vegetation structures and dynamics

11:50-12:10 **Chris Dictus**
"De Maten" - A unique heathland gem in a densely populated country

12:10-12:30 **Andrzej Nienartowicz, Dariusz Kaminski, Mieczyslaw Kunz, Edyta Adamska, Jerzy Holc, Miłosz Deptula, Anna Filbrandt-Czaja, Agnieszka Piernik, Anna Lewandowska-Czarnecka & Silvio Vilgia**
Arctostaphylo-Callunetum R.Tx. et Prsg 1940 in Poland: distribution, variability and active protection

HEATHLANDS IN THE CANTABRIAN MOUNTAIN RANGE: STRUCTURAL AND FUNCTIONAL SINGULARITIES

Leonor Calvo[1], Javier Calvo, Angela Taboada, Jose Manuel Fernández Guisuraga & Elena Marcos*

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Abstract:
In the Iberian Peninsula, heathlands dominated by *Calluna vulgaris* are restricted to the Cantabrian Mountains (North-Western Spain), where they represent the southern-most distribution limit of this ecosystem type in Europe. These Cantabrian heathlands are considered as a biodiversity hotspot, hosting a wide variety of species, many of them being endemic. There are different factors explaining such high biodiversity: (1) its geographical location laying on the boundary between the Atlantic/Eurosiberian and the Mediterranean biogeographical regions, where significant changes to species diversity are expected to occur in the face of global change; and (2) the traditional management carried out for centuries (based on grazing, cutting and burning) promoted the spatial occurrence of these semi-natural habitats, which provided an important number of ecosystem services for human well-being such as pastures for livestock breeding, biomass fuel, and food products, amongst others. However, during the last decades, the loss of this traditional management and the promotion of new land covers (coniferous plantations) have negatively affected their conservation.

At the same time, heathlands in the Cantabrian Mountains are expected to be highly sensitive to environment alteration, as they are situated at the southern limit of the ecosystems distribution range, and, thus, constitute the perfect scenario to investigate the effects of global change on this type of ecosystem in Europe. In this context, the Heathlands' Research Team from the University of León (NW Spain) has accomplished several studies (1) to identify the particular structure of the Calluna-heathland vegetation as compared with other types of heathlands and shrublands in the Cantabrian mountain range, and (2) to evaluate the effects of common perturbations in this montane area, including recurrent burning, cutting and the increase in atmospheric nitrogen depositions, on the structural and functional characteristics of these heathlands. In this keynote lecture we will summarize the main results obtained in these studies.

This study was financed by the following projects: (1) REN2003-05432/GLO; (2) LE039A05; (3) LE021A08 and (4) LEO39A09.

NOTES:

CAUSES AND CONSEQUENCES OF DIFFERENTIAL ATTACK BY HEATHER BEETLE *LOCHMAEA SUTURALIS* AT A LANDSCAPE SCALE

Anita Diaz[1], L. Franklin, M. Brown, A. Harvey, L. Bailey & K. Rickard*

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Abstract:
Heathlands offer important habitats for declining wild pollinator insects as well as an economic opportunity for heather honey production. This study evaluated factors affecting the vulnerability of lowland heath to damage by herbivory by Heather beetle *Lochmaea suturalis* and the subsequent impact on the interaction between Bumble bees (*Bombus* spp.) and Honey bees (*Apis mellifera*) foraging on ericaceous flowers. Findings are set in the context of past conservation management practice on the sites and related to future potential decisions for managing heathland mosaics to conserve pollinator biodiversity and plant-pollinator relationships. The research asked three questions: (1) do wet and dry heaths of different ages vary in the extent to which they are attacked by *L. suturalis*?, (2) what is the impact of Heather beetle on the flowering success and vegetative regeneration of different ericaceous species? and (3) what is the impact of *L. suturalis* on floral resource availability for foraging Bumble bees and Honey bees? These questions were tested at a landscape scale across the Purbeck Heaths, Dorset, UK in 60 random sites each measuring 20m x 20m that varied in maturity and whether they were wet or dry. We found that *L. suturalis* affected all heath types but had most impact on older stage heaths which also showed least recovery. *Calluna vulgaris* was by far the most damaged ericaceous species in terms of vegetative growth, flowering and subsequent recovery. Foraging by both *Bombus* spp. and *A. mellifera* was reduced by *L. suturalis* attack particularly in late in summer when *A. mellifera* is very dependent on *Calluna vulgaris* and in early summer where both genera compete for reduced availability of ericaceous flowers. We conclude that the immediate and long term impact of *L. suturalis* on pollinators is greatest where heathland consists of stands dominated by mature *Calluna vulgaris* and propose that impact may be mitigated by maintain a landscape mosaic of heathland and other habitats including a high abundance of early successional stages heathland.

NOTES:

BIOTIC AND ABIOTIC FACTORS THAT SHAPE THE *ERICA MACKAYANA* WET HEATHLANDS IN GALICIA, NW SPAIN

Jaime Fagúndez[1*]

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Keywords: plant diversity, management, herbivory, vegetation structure

Abstract:
In the northern mountains of Galicia, in NW Spain, the oceanic climate and organic soils have shaped a special heathland type, dominated by the endemic *Erica mackayana* and *Ulex gallii*. The traditional use of this habitat is the extensive grazing by different herbivores including one of the main remaining population of Atlantic wild ponies. The equilibrium of the different biotic and abiotic factors related to plant richness and diversity, species dominance and vegetation vertical structure has been explored in eighteen *E. mackayana* heathland sites. Increasing levels of grazing, especially by cattle, affected species richness and diversity, mainly of rare (endemic or restricted) species. However, the lowest levels of plant diversity correspond to abandoned sites with no grazing. Temperature and precipitation had a low influence in vegetation, while soil parameters such as levels of exchangeable cations or percentage of organic matter have a moderate impact on community composition. The vertical structure of vegetation shows a complex model of species interactions based on competition and herbivore density. The species assemblage is conditioned by management, soil type and species competition, but these effects are scale-dependent. Conservation of this particular heathland type must consider management as a determinant factor in shaping the community, but also in the ecological interactions and synergistic effects between them.

NOTES:

IN SITU PH MEASUREMENTS REVEAL EXTREMELY LOW PH IN HEATHLAND SOIL – DOES NATURE (AND SCIENCE) IGNORE A TIPPING POINT?

Knud Erik Nielsen[1], Amaia Irizar[1], Lars Peter Nielsen[2], Søren M. Kristiansen[3], Christian Damgaard[1], Martin Holmstrup[1], Asger R. Petersen[3] & Morten Strandberg[1]*

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Abstract:
One of the single most informative chemical properties for organisms in soils is the pH value. However, the standard procedure to measure pH in the laboratory involves many preparative manipulations. All standard procedures involve sampling, sorting, drying, sieving and crunching, rewetting and shaking before measurement in the laboratory. Beside these steps, there is a large variety of analytical procedures concerning choice of buffer solutions, ratio of water to soil in the suspension, effects of different dilutions, shaking time, etc.

Recent technical development of robust calomel-type electrodes has made in situ pH measurements possible, becoming a much faster, simpler and direct method for pH determination in soil. Due to its advantages against the laboratory measurements and its increasing potential to be used in soil science and ecology, the primary objective of this study is to answer the basic question of what the real pH in soil is and to discuss possible causes and consequences of the discrepancy.

We measured pH in situ in the toporganic soil horizons of a Calluna heathland and a pine forest and found values between 2.6 and 3.2. This was 0.5 to 0.8 units lower than concurrent laboratory pH measurements in the same samples. pH below 3 reflects a tipping point to the iron buffer. However, vegetation cover was dense and the diversity of invertebrates in the investigated soil was high, indicating widespread ability to maintain neutral internal pH despite the extremely low surrounding soil pH. Nature seems to ignore this tipping point. We propose that the higher pH recorded by standard laboratory methods could partly be caused by buffering from soil biota mobilized through drying, grinding and rewetting of soil samples, whereas the in situ pH reflects the correct level of acidification.

The finding of a difference between the in situ and the laboratory-measured pH raises questions about the interpretation of pH measurements. Carbon sequestration, decomposition, mineralization and respiration are important processes in terrestrial ecosystems that are influenced by pH. Likewise, metal mobility and speciation, physiological and ecological pH thresholds and tolerance ranges, availability of nutrients and toxic compounds are always defined by laboratory measurements without even being aware that significant differences could exist in comparison to the correct soil pH.

NOTES:

NORTH GERMAN LOWLAND HEATH: VEGETATION STRUCTURES AND DYNAMICS

Jenny Schellenberg[1*]

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Keywords: heather, vitality, succession, plant age structures, growth phases

Abstract:
Atlantic and subcontinental heathlands in North German Lowlands vary greatly in plant composition and structure, dependent on climate, landscape history, age of heather plants, succession stage and recent management. When attempting to assess heathland health, a deeper understanding of the key species heather, *Calluna vulgaris*, is crucial. Vegetation composition, stand structures, vitality of heather plants and local management activities were sampled on 352 plots in 19 heathland areas in the North German lowlands.

The stage of life cycle is generally used as an indicator of heathland dynamics and vitality, but the results show that vitality and age of stands cannot simply be inferred from the growth phase.

Management is found to be the dominating factor controlling heather and heathland vitality. Various management approaches, such as grazing, mowing, burning, and sod-cutting, aim to rejuvenate heather and to reset an early life cycle stage, but Calluna regeneration strongly responds to type and intensity of management. Vegetation composition and structural diversity are also subject to management, as regeneration of many heathland species depends to a great extent on disturbance intensity and frequency. Many stands were found to exhibit unbalanced age structure with lack of young plants as a result of management fostering only resprouting, not seeding capacity, of plants. While proper reproduction of heather is a precondition for long-term dominance of Calluna, germination and establishment of young plants require specific conditions, including favourable weather and suitable management.

With clearer understanding of susceptibility patterns of Calluna plants in each part of its life cycle, it is possible to reliably assess the vitality status of heather stands and their regenerative potential, an essential precondition for long-term preservation of North-German lowland heath under conditions of past and present land-use changes and future climate change.

NOTES:

"DE MATEN" - A UNIQUE HEATHLAND GEM IN A DENSELY POPULATED COUNTRY

Chris Dictus[1*]

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Abstract:
De Maten is one of the oldest nature reserves in management by Natuurpunt, the largest private nature management organisation in Flanders. It is a heathland mosaic with a chain of ponds running through it which results in a unique combination of nature values protected on a European level, in the field of avifauna (i.a. Great and Little Bittern), herpetofauna (i.a. Spadefoot Toad, Natterjack Toad and Moor Frog) and vegetations.

The presentation will focus on the nature values of this special reserve varying from wet heathland (H4010), dry heathland (H4030) and Nardus grasslands (H6230) to inland dune habitats (H2310 & H2330) on a small scale around the open water habitats (H3110 & H3130). The presentation will also highlight the historical background of the region as well as management and environmental challenges of the reserve in a densely populated region as Flanders.

NOTES:

ARCTOSTAPHYLO-CALLUNETUM R.TX. ET PRSG 1940 IN POLAND: DISTRIBUTION, VARIABILITY AND ACTIVE PROTECTION

Andrzej Nienartowicz[1], Dariusz Kaminski[1], Mieczyslaw Kunz[2], Edyta Adamska[1], Jerzy Holc[3], Miłosz Deptula[1], Anna Filbrandt-Czaja[1], Agnieszka Piernik[1], Anna Lewandowska-Czarnecka[1] & Silvio Vilgia[4]*

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[4]Parthenope Parthenope - University of Naples, Department of Science and Technology, Centro Direzionale - Isola C4, 80143 Napoli, Italy

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Abstract:
Numerical classification and ordination were performed on 270 Polish relevés representing plant communities of the *Arctostaphylo-Callunetum* association, and compared with the results obtained by the Braun-Blanquet method. One conclusion was that *Arctostaphylo-Callunetum* is a pioneer association and its phytocoenoses are transformed in the process of succession into communities of the *Pohlio-Callunetum*. The greatest threats to both types are afforestation and spontaneous succession towards forest communities.

The replacement of heaths by forest was recorded in the Torun Basin study area, where extensive heathlands used to occur. The study area was used by the army as an artillery range. In 2014, the area was designated as a Natura 2000 protected site and hence military trainings became less intense, and more attention is focused on ecological processes.

As a consequence of decreasing disturbance events caused by military use, the afforested area has increased in the study area. The extent of these changes was assessed along a chronosequence of topographic maps from 1973–2014.

As the maintenance of heaths consists in the removal of saplings and older trees, we have joined the local forest management staff to develop a plan for cutting of trees and distribution of harvested timber. For all human activities carried out on the heaths, both economic and conservational, a diagram of emergy flows (sensu H.T. Odum, 1996) in the studied ecological-socio-economic system was prepared. The diagram covers many forms of human activity (eg. military use, timber harvesting, honey production, mushrooms and illegal scrap-metal gathering, sports events and historical events) and serves as a starting point for the evaluation of natural capital and ecosystem services. We believe that this method of assessment of functioning and sustainability of the ecological system (e.g. Viglia et al., 2013), could become the basis for building a powerful tool to help environmental policy and decision-making.

NOTES:

Poster session

MONDAY AUG 21 2017 | 13:30–14:50 | RADBOUD UNIVERSITY NIJMEGEN

Schedule

For each poster, there are 5 minutes reserved for the presenting author to introduce the audience with the contents of their poster, followed by 5 minutes of discussion directly after the poster presentation. Additionally, there is time reserved for the participants to inform themselves with the detailed contents of the posters and for personal discussions on the topics of the posters with the author(s).

Posters presentations (in alphabetical order of the first author):

Jaime Fagúndez & Carlos V. Muñoz-Barcia
Historical changes in the Erica mackayana heathland cover in Galicia, NW Spain

Alexander Lovegrove, Anita Diaz, Paul Evans & Adrian Newton
The Ecology of Cranesmoor: Over 50 years of change in a Peatland Environment

Alexander Lovegrove, Phillipa Gillingham, Mark Brisbane, Adrian Newton, John Stewart & Anita Diaz
Heathland management at the local and landscape scale; a SWOT analysis of the perspective of multiple stakeholders

Elena Marcos, Javier Calvo-Fernández, Ángela **Taboada, Andreas Fichtner, Werner Härdtle & Leonor Calvo**
Resistance of southern montane heathlands to different nitrogen loads

Liv Guri Velle, Kristine Grimsrud, Eystein Jansen, Hanna Lee, Stefan Sobolowski, Endre Tvinnereim & Vigdis Vandvik
Hidden costs of implementing afforestation as a climate mitigation strategy: A comprehensive assessment of direct and indirect impacts

David C. Walmsley, Estève Boutaud, Andreas Koopmann, Dirk Mertens, Jelena Schulze, Andreas Schuldt, Uta Steinhardt, Jana Twarok, Mathias Zimmermann and Werner Härdtle
Securing the Ecosystem Services and Biodiversity of Extensively Managed Cultural Landscapes – The EcoCult Project

NOTES:

HISTORICAL CHANGES IN THE *ERICA MACKAYANA* HEATHLAND COVER IN GALICIA, NW SPAIN

Jaime Fagúndez[1] & Carlos V. Muñoz-Barcia*

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Keywords: habitat loss, land use change, socio-economic changes, orthophotography

Abstract:
The general trend of land use changes related to heathland loss has extensively been recorded throughout Western Europe. Different spatial and temporal scales have shown a similar decline of dramatic losses of up to ninety percent of the original heathland cover. Addressing this tendency implies the use of historical sources, which must be reliable and accurate. In Galicia, north-west Spain, large areas are still covered by different heathland types, but these are disappearing and substituted by plantations and improved grasslands. We have documented the transformation process of northern Galicia wet heaths of *Erica mackayana* using aerial photographs covering sixty years on eighteen heathland areas at two different spatial scales (one-kilometre and four-kilometres diameter circles), two time lags starting in the 1950s and two land-use classification systems (broad, with five classes, fine, with 15 classes). By means of interpreting orthophotographs and GIS tools, land use changes were quantified and fragmentation and cover of heathlands was analysed. An important loss of heathland cover was observed, but we found a high variation between sites. Tree plantations have increased its cover the most, followed by deciduous autochthonous forests and improved grasslands. The decrease in heathland cover shows that the trend of the habitat decline in Europe is also taking place in Galicia. Therefore, it is necessary to establish measures for the conservation of these ecosystems related to the traditional uses, to counteract the negative effects of land use intensification.

NOTES:

THE ECOLOGY OF CRANESMOOR: OVER 50 YEARS OF CHANGE IN A PEATLAND ENVIRONMENT

Alexander Lovegrove[1], Anita Diaz, Paul Evans & Adrian Newton*

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Keywords: peatlands; vegetation; long-term change; wetlands

Abstract:
Long-term studies are important in ecology; monitoring vegetation change in habitats over many decades can help us to understand past changes and future trends in the environment. A valuable study by Newbould (1960) mapped a mosaic of wet heathland and mire vegetation on Cranesmoor bog, New Forest: an important location for paleoecology and our understanding of valley mire habitats. This baseline map and vegetation record provides a detailed description of this location and was one of the first intensive studies of this habitat in the UK. However, how the community has changed since then is poorly known. Here we replicate Newbould's original study and produce maps demonstrating the change in abundance of several important species. We show that many of the recorded distributions have changed, with some rare species including *Rhynchospora fusca* and *Lycopodiella inundata* dramatically declining. These declines are suspected to be related to nitrogen enrichment and the closure of vegetation, particularly around bog pools. There was little evidence suggesting a loss of species owing to water loss or drainage, with many hygrophilous species expanding or maintaining their range. These results add evidence to other studies identifying the negative impact of nitrogen enrichment on peatland environments, but also show that the cessation of some traditional management practices (i.e. peat cutting) may also have had negative influences on biodiversity value. Because of the large timescales between the original study and the present survey, this work contributes to our understanding long-term changes in peatland ecosystems. We anticipate that our study will contribute to future monitoring efforts in this protected area, and help to identify future management techniques that can safeguard biodiversity in these valuable ecosystems.

NOTES:

HEATHLAND MANAGEMENT AT THE LOCAL AND LANDSCAPE SCALE; A SWOT ANALYSIS OF THE PERSPECTIVE OF MULTIPLE STAKEHOLDERS

Alexander Lovegrove[1], Phillipa Gillingham, Mark Brisbane, Adrian Newton, John Stewart & Anita Diaz

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[*]Corresponding author: alovegrove@bournemouth.ac.uk

Keywords: lowland heathland, management, environmental policy, expert survey

Abstract:
Management of heathlands is necessary for their continued survival, but there are many existing and future challenges that will need to be overcome for successful conservation work. Management approaches and concerns may also vary over different scales, which could influence how heathlands respond to particular threats. We used a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) to investigate what managers considered to be the most important issues they face and to investigate whether these change over different spatial scales and for specific interests. We surveyed a number of stakeholders working with lowland heaths in the UK, including those with direct responsibility for individual heathland sites, and those (together with specialist experts) that worked on wider landscapes. Our results suggest that managers feel they have well-established techniques, and conservation organisations are increasingly adept at working together as clear strengths. In terms of weaknesses, fragmentation of existing heathlands and high levels of external pressure were considered to complicate management practice, in addition to difficulty in undertaking monitoring programmes. Engagement with the public was seen as a key opportunity for gaining support for conservation efforts, as were more holistic management approaches, perhaps accounting for the management of archaeological features and recreation activity as part of a landscape management approach. The main threats to conservation efforts were considered by our respondents to be a weakening of both funding and statutory protection, which could undermine much of the existing management work currently taking place. The results from this survey are intended to help aid scientists in targeting research where it may be most relevant, and therefore influential, to heathland practitioners and managers. For future research we intend to expand the geographical scope to study whether similar concerns are expressed across European heaths.

NOTES:

RESISTANCE OF SOUTHERN MONTANE HEATHLANDS TO DIFFERENT NITROGEN LOADS

Elena Marcos[1], Javier Calvo-Fernández, Ángela Taboada, Andreas Fichtner, Werner Härdtle, Leonor Calvo*

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Abstract:
Elevated nitrogen (N) inputs into terrestrial ecosystems generally cause harmful effects to the ecosystems' health. The magnitude of these effects mainly depends on the N sensitivity of each ecosystem type. Particularly, the ecosystems adapted to low levels of N availability (low N status) such as montane heathland systems are more vulnerable to increased atmospheric N depositions. Furthermore, the life-cycle stage of the heathland vegetation might influence its susceptibility to N loading. Thus, it is possible that young stands may be more vulnerable to enhanced N availability at lower N loads compared to mature stands. The N critical load is a valuable tool to assess the heathland resistance to changes in N availability. The present study aimed to determine the N critical load for montane *Calluna vulgaris*-heathlands located at their southern-most distribution limit at two Calluna life-cycle stages: young- and mature-phase. We experimentally simulated five levels of N fertilization treatments (0, 10, 20 and 50 kg $N{\cdot}ha^{-1}{\cdot}yr^{-1}$ for 3 years, and 56 kg $N{\cdot}ha^{-1}{\cdot}yr^{-1}$ for 10 years) in each heathland age. We performed critical load estimations based on significant N-related changes in heathland vegetation composition and structure, as well as in heathland functioning through several ecosystem response variables. We estimated that significant changes are produced at 14.6 kg $N{\cdot}ha^{-1}{\cdot}yr^{-1}$, such as vascular life forms cover, soil extracellular enzymatic activities, and Calluna flowering and shoot N content. In contrast, high chronic loads (>50 kg $N{\cdot}ha^{-1}{\cdot}yr^{-1}$, >10 years) are required to alter vegetation composition and soil chemical properties, indicating the resistance of these montane heathlands to change.

This study was financed by the following projects: (1) REN2003-05432/GLO; (2) LE039A05; (3) LE021A08 and (4) LEO39A09.

NOTES:

HIDDEN COSTS OF IMPLEMENTING AFFORESTATION AS A CLIMATE MITIGATION STRATEGY: A COMPREHENSIVE ASSESSMENT OF DIRECT AND INDIRECT IMPACTS

Liv Guri Velle[1], Kristine Grimsrud[2], Eystein Jansen[3], Hanna Lee[3], Stefan Sobolowski[3], Endre Tvinnereim[4] & Vigdis Vandvik[5]*

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[3]Uni Research Climate, Bjerknes Centre for Climate Research, Bergen, Norway

[4]Uni Research Rokkansenter, Bergen, Norway

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Keywords: Abandoned heathlands, afforestation, policy measure, carbon binding

Abstract:
Until now, we have learned that planting trees could only provide benefits to our nature and society. More and more recent research results show that this depends on land management. The role of new forests in mitigating and managing climate change has been recognized since the early policy discussions from the carbon uptake by trees. In Norway, extensive planting of trees in open landscapes, including unmanaged and abandoned Atlantic heathlands, has been suggested as an important policy measure and as a result this method is considered the 4th most viable method in the suggested climate mitigation plan. The effects and merits of afforestation have been highly debated both in the scientific community and in the public as the impact assessments have not yet moved beyond simple back-of-the-envelope calculation of carbon binding capacity by aboveground biomass. HiddenCosts is based on the realization that the current policy for afforestation as a climate mitigation strategy is based on incomplete knowledge and needs more rigorous evaluation in the full range of direct and indirect effects and costs vs. the realistic alternative landscape management scenarios. It is of vital importance that the full costs and benefits of afforestation vs. these realistic alternative management scenarios are rigorously assessed. Such an assessment is also time-sensitive due to the ongoing pilot projects, where trees are already being planted along the Norwegian coast. We will apply a multidisciplinary approach by (1) integrating Earth System and regional climate modelling, (2) in situ observations of biodiversity, ecosystem structure, and carbon storage, and (3) public valuation and ecosystem services analysis to gain more holistic understanding of the effects (both costs and benefits) of afforestation, continued management, and natural succession in the open lowland landscapes of Norway. We also plan to combine information gained from the project research topics to synthesize and communicate effectively with relevant stakeholders and the public to find a better way of land management.

NOTES:

SECURING THE ECOSYSTEM SERVICES AND BIODIVERSITY OF EXTENSIVELY MANAGED CULTURAL LANDSCAPES – THE ECOCULT PROJECT

David C. Walmsley[1], Estève Boutaud[1], Andreas Koopmann[2], Dirk Mertens[2], Jelena Schulze[1], Andreas Schuldt[3], Uta Steinhardt[4], Jana Twarok[4], Mathias Zimmermann[2] & Werner Härdtle[1]*

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Keywords: ecosystem services, cultural landscapes, management, restitutive restoration, global change

Abstract:
In our poster we showcase the interdisciplinary EcoCult project which started in 2016 and runs until 2022. In this interdisciplinary 'network' project an operational partner (Stiftung Naturschutzpark Lüneburger Heide) and research partners (Eberswalde University for Sustainable Development, Leuphana University Lüneburg) cooperate in order to assess the potential of novel and adaptive management and restitutive restoration practices developed to counteract factors threatening heathland landscapes such as habitat fragmentation, nutrient input and climate change.

In field experiments within the Lüneburger Heath region in northern Germany we intend to quantitatively and qualitatively assess multiple ecosystem services and the concurrent biodiversity supported by such cultural landscapes. In addition, a multi-perspective approach will be used to get an understanding of all the immaterial benefits that human beings draw from their natural surroundings (cultural ecosystem services). To this end, methods typically used in the social and cultural sciences will be applied as well as GIS-supported processes. This will result in propositions of how cultural ecosystem services and the quality of life are related thus forming the basis for a social legitimisation of measures aimed at the protection of the natural environment.

Concomitantly, all practices will be evaluated based on their economic viability, their legal conformity (in terms of conservational planning) as well as their public acceptance and, therefore, ultimately their applicability and transferability within the study region and beyond.

This project is co-funded by the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) and the Federal Ministry of Education and Research within the joint framework "Research on the Implementation of the National Biodiversity Strategy" and within the BMUB also via the federal programme on Biological Diversity.

NOTES:

Oral session 2:

Historical aspects of heathland ecology and management

MONDAY AUG 21 2017 | 15:00–17:20 | RADBOUD UNIVERSITY NIJMEGEN

Keynote lectures session 2

15:00-15:40: Theo Spek
The cultural biography of heathlands: long-term transformation and regional diversification of society, economy and landscape in the Pleistocene Netherlands (1800 BC – 1900 AD)

15:40-16:20 Vigdis Vandvik
A burning issue: Ecological and evolutionary imprints of climate and land-use in coastal heathlands

Oral presentations

16:20-16:40 Jan Bastiaens & Erwin Meylemans
LIDAR as a tool for unravelling the (pre)history of former and nowadays heathlands in Flanders (Belgium) and the implications for their management

16:40-17:00 Annette Rosengaard Holmelund
Revitalizing Øster Lem Heath nearby Ringkøbing Denmark

17:00-17:20 Martin Woestenburg
The Heathland farm combines nature conservation with food production

NOTES:

KEYNOTE: THE CULTURAL BIOGRAPHY OF HEATHLANDS: LONG-TERM TRANSFORMATION AND REGIONAL DIVERSIFICATION OF SOCIETY, ECONOMY AND LANDSCAPE IN THE PLEISTOCENE NETHERLANDS (1800 BC – 1900 AD)

Theo Spek[1*]

[1]*University of Groningen, Centre for Landscape Studies, PO Box 716, NL-9700 AS Groningen, The Netherlands*

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Abstract:
Heathlands have played a decisive role in the formation of Dutch Pleistocene sandy landscapes since the Bronze Age. The fascinating long-term history of these semi-natural landscapes can only be unravelled by a combination of pedological, palaeoecological, archaeological, historical and toponymical research. Based on several decades of multidisciplinary research it is possible to develop a rather detailed picture of the long-term development of heathland societies, economies and landscapes during the last three and a half millennia. Which specific periods of continuity and change can be distinguished on this long time scale? And, what factors largely determined the most prominent transformations of these systems as well as their regional diversification? Interesting side tracks of this cultural biography will be the etymology and toponymics of medieval heathlands, the age and genesis of the historic *plaggen* manuring system and the differences in vegetation structure and ecology of medieval compared to early modern heathlands.

NOTES:

KEYNOTE: A BURNING ISSUE: ECOLOGICAL AND EVOLUTIONARY IMPRINTS OF CLIMATE AND LAND-USE IN COASTAL HEATHLANDS

Vigdis Vandvik[1]

[1]*Department of Biology, University of Bergen, Norway*

[*]*Corresponding author: vigdis.vandvik@bio.uib.no*

Abstract:
50 years after "The silent spring" and as the global temperature is increasing at an alarming rate it is uncontroversial that humans have strong, and often negative, impacts on natural ecosystems. However, the debate is often polarized into a 'people vs. nature' dichotomy, and fails to acknowledge that aspects of nature that we value are also partly shaped by human imprints. The coastal heathlands of North-West Europe is one example of landscapes that have emerged under, and are shaped by, strong anthropogenic forcing. These heathlands have been continuously managed by traditional burning and grazing regimes for up to 6000 years, and support characteristic ecosystems and biodiversity.

Understanding the ecology and evolutionary biology of the heathlands requires understanding of how the interplay between natural and anthropogenic forcing has shaped heathland ecosystems and their flora and fauna through history. We combine different methods, such as palaeoecological reconstructions, landscape ecology and germination ecophysiology, to explore the roles of climate and land-use in shaping heathland ecology and evolutionary biology.

In contrast to the often stated 'biotic homogenization' paradigm, we find that the species colonizing heathlands after fire are not widespread generalists, but a characteristic set of relatively narrow-range species representing a characteristic subset of the local and regional flora. The traditional heathland management, such as grazing and management burning, thus contributes significantly to the biodiversity of the heathland landscape across a range of spatial and temporal scales. We also demonstrate that past human manipulation of coastal heathland fire-regimes have triggered evolution of smoke-responsive seed germination in the keystone species *Calluna vulgaris*. Such evolutionary imprints of (pre)historic anthropogenic impacts are severely understudied, and research is urgently needed to inform decision-making in conservation science and ecosystem management.

Acknowledgments: Liv Guri Velle, Inger Elisabeth Måren, Peter Emil Kaland, Ann Norderhaug, Samson L. Øpstad, Liv S. Nilsen, Matt I. Daws, Joachim Töpper, Einar Heegaard, Sigird S. Bruvoll, Lyngheinettverket, The Norwegian Research Council.

NOTES:

LIDAR AS A TOOL FOR UNRAVELLING THE (PRE)HISTORY OF FORMER AND PRESENT HEATHLANDS IN FLANDERS (BELGIUM) AND THE IMPLICATIONS FOR THEIR MANAGEMENT

Jan Bastiaens[1] & Erwin Meylemans[1]*

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Keywords: LIDAR, topography, long-term history, heritage management, Flanders (Belgium)

Abstract:
The digital terrain model of Flanders, based on high resolution LIDAR data, reveals the (pre)history of former and present heathlands in the Belgian Campine as never seen before, or even unknown before. This is due to the fact that some of the detected features are too large, too subtle or too complex to be recognized in the field with the naked eye. The features detected comprise periglacial polygons, Celtic fields, grave mounds, aeolian structures, old tracks, military earthworks etc, originating from the Weichselian glaciation period till very recent. Sometimes the stability in natural and anthropogenic topography, over millennia, is striking and surprising. There is no doubt about the scientific and historical value. The relics offer insight in the (pre)history of former and present heathlands, and provoke new stories to be told.

The relics urge heritage researchers and managers to think about the assessment and management of new phenomena and of phenomena suddenly less rare than previously thought. But the biggest challenge lies in the interplay between heritage and nature and in their integration. The features detected add a new layer to the heathlands and aid in building support for heathland conservation, but the management of heathlands poses a threat to some 'wrinkles of time', such as periglacial polygons and Celtic fields, characterized by a subtle topography. Sod-cutting is harmful, let alone the conversion of pine woodland into heathland. But the golden mean between heritage conservation and nature conservation is within reach.

NOTES:

REVITALIZING ØSTER LEM HEATH NEARBY RINGKØBING DK

Annette Rosengaard Holmelund[1*]

[1]*Sheep and Goat Consult, Engskovgård 38, 8541, Skødstrup, Denmark*

[*]*Corresponding author: Annette@hyrdetimer.dk*

Keywords: burning, shepherd, sheep grazing, Heathland restoration, *Molinia caerulea*

Abstract:
The Danish Cultural Heritage Agency, "Kulturarvsstyrelsen" ran in 2011 a project: 'The Danish Prehistory in the Landscape'. The aim of the project was to renovate and improve the access to a number of prehistoric relics, Øster Lem Heath in western Jutland, amongst others. Here, a large amount of fields and dike field borders from the Iron Age are well preserved. Sheep grazing after burning was the recommended management method.

In March 2016, burning of 25 ha heathland mainly covered by *Molinia caerulea* was done by National Forestry, led by Øster Lem Heath manager Christian Hollesen

Sheep and Goat Consult has a 4 year contract to run the nature conservation. Sheep for grazing the area was rented and grazing has taken place since May 2016. The nature conservation is funded by "15. Juni Fonden" and the Ministry of Agriculture fund it as a normal nature area.

We will discuss our economical and practical considerations managing heathland where water and power on location is unavailable. We will show how to use different temporary fencing systems in public areas with no access of heavy machines or tractors. Time consumption and practical problems are discussed.

It is concluded that burning followed by herded sheep grazing is a very useful method. After 1 year of grazing many orchids and other heather plants recolonized. However, *Molinia* fighting and heather establishment takes years especially if burning is too weak and the areas grown over by *Molinia* are too wet.

NOTES:

THE HEATHLAND FARM COMBINES NATURE CONSERVATION WITH FOOD PRODUCTION

Martin Woestenburg[1*],

[1]*freelance landscape journalist and consultant*

[*]*Corresponding author: martin@woestenburg.nl*

Keywords: heathland Farm, food production, heathland agriculture, heath management

Abstract:
For the management of the 23,440-hectare Naturschutzpark Lüneburger Heide (Germany) the nature managers of the Verein Naturschutzpark deliberately chose the traditional heathland farm system. 15-20 people use 2,200 sheep, 300 goats, 30 horses and 80 head of cattle to manage approximately 5,200 hectares of moorland, 450 ha of arable fields, 400 ha of meadows and 40 ha of carp ponds. In the Netherlands the Federation of Heathland Farms has been working to 'translate' the Lüneburger model on 15-20 locations.

The Heathland Farm is a combination of nature conservation and food production, reintroducing traditional mixed farming and communal land use and resource management in a period when nature and agriculture are very much separate aspects of policy and culture in the Netherlands. It begins by re-establishing the nutrient cycle of traditional European heathland farming, but expands into economic, social and cultural cycles with new structures of physical, biological, economic, social and cultural organisation, and new types of exchange of knowledge and experience, possibly even mimicking the traditional relationship of master and journeyman.

The Federation of Heathland Farms is 'reinventing' the traditional heathland farm system under present-day conditions as a system recovery and an integrated landscape management that combines nature conservation with food production. During the presentation we will show why and how the Lüneburger model is an inspiration and what the differences are between the German and the Dutch practice, using several pilot projects in the Netherlands as an example to focus on the ways how nature conservation and food production can be combined.

NOTES:

Oral session 3:

Restoration management in heathlands

TUESDAY AUG 22 2017 | 09:00–12:30 | RADBOUD UNIVERSITY NIJMEGEN

Keynote lecture session 3

09.00-09:40 **Werner Härdtle**
Restoration of heathland ecosystems – opportunities and ecological constraints

Oral presentations

09:40-10:00 **Michiel F. WallisDeVries**
Contrasting responses of insect communities to grazing intensity in lowland heathlands

10:00-10:20 **Anne Hopf & Gert Rosenthal**
Establishment of pioneer trees under grazing and different cutting measures in the Oranienbaumer Heide

10:20-10:40 **Joost Vogels, M.J. Weijters, R. Bobbink, H. Bergsma, H. Siepel, B. Van der Riet & E. Verbaarschot-Bohnen**
Restoring depleted soil minerals to stop biodiversity loss in dry heathlands?

10.40-11:10 **Coffee Break**

11:10-11:30 **Liv Guri Velle, Siri Haugum, Torgrim Log, Pål Thorvaldse, Gunnar Thuestad & Vigdis Vandvik**
New perspectives on heathland management under influence of extreme winter droughts

11:30-11:50 **Isabel Alonso & E. Hewins**
Agri-environment scheme impact on improving the condition of lowland heathland in England

11:50-12:10 **Wim Wiersinga**
The Dutch OBN program on research and knowledge transfer on heathlands restoration

12:10-12:30 **Marianne van der Veen**
The role of provinces in Nature policies in the Netherlands

NOTES:

KEYNOTE: RESTORATION OF HEATHLAND ECOSYSTEMS – OPPORTUNITIES AND ECOLOGICAL CONSTRAINTS

Werner Härdtle[1*]

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Keywords: critical loads, ecosystem functioning, heathland management, nutrient cycling, population dynamics

Abstract:
European heathland area has declined drastically in the course of the 20th century, mainly attributable to agricultural intensification, abandonment and inputs of artificial fertilizer. More recently, drivers of global change such as climate change and atmospheric nitrogen deposition affected the quality of habitats, with consequences for ecosystem functioning and biodiversity patterns. As a consequence, the protection and restoration of European heathlands became an important issue, especially in areas where heathlands are recognized as landscapes of outstanding cultural and natural value. Heathland restoration pursues two core objectives, (1) to return degraded areas to some historical state, and (2) to counteract the current impacts of global change to facilitate a long-term preservation of heathlands and the biodiversity they host.

In recent decades, many research projects addressed the opportunities and perspectives of techniques that are currently applied for the restoration of degraded heathland sites. In this context, measures such as topsoil removal, sod transplanting as well as the adaptation of traditional management (e.g. grazing) have been evaluated with regard to their potential to improve habitat quality and to stabilize populations of threatened species. However, restoration measures are often confronted with both abiotic and biotic constraints. Atmospheric nitrogen deposition, for example, has multiple effects on ecosystem functions, affects a wide range of biological processes and may interact with climate change. Biotic constraints are often related to the dispersal power of target species, the longevity of soil seed banks or the genetic erosion of small populations in fragmented landscapes.

This talk attempts to summarize the most recent research findings on the restoration of heathland ecosystems, and the opportunities and constraints of the restoration measures currently applied. The talk will also address challenges in heathland restoration resulting from the broad environmental gradients (climate, soil conditions) that are typical of heathlands within their European range.

NOTES:

CONTRASTING RESPONSES OF INSECT COMMUNITIES TO GRAZING INTENSITY IN LOWLAND HEATHLANDS

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Keywords: grazing, heathlands, biodiversity, insects, butterflies, grasshoppers

Abstract:
Grazing at low stocking rates is often recommended for the preservation of the characteristic biodiversity of open landscapes. However, the fine-tuning of grazing management still lacks a good evidence base. This is particularly true for insect communities, as available evidence indicates that these are more vulnerable to grazing than plant communities. The outcome, however, may be expected to differ between insect species. Here, I focus on the impact of different grazing intensities on insect communities in lowland heathlands in the Netherlands. Species responses to grazing intensity were investigated across a range of insect groups (butterflies, day-active moths, grasshoppers, and ants) on 16 field from livestock-grazed and ungrazed locations. We hypothesized that species from early successional stages would benefit from grazing whereas late-successional species would suffer from grazing. Species responses to grazing indeed contrasted between early and late successional species. Variation in species responses were strongly linked to grazing intensity and soil moisture, reflecting species-specific niches in relation to vegetation structure and microclimate. I compare these findings with the results from a study on wild herbivore impacts.

NOTES:

ESTABLISHMENT OF PIONEER TREES UNDER GRAZING AND DIFFERENT CUTTING MEASURES IN THE ORANIENBAUMER HEIDE

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Keywords: large herbivores, pioneer trees, sapling browsing, shoot removal measures

Abstract:
Abandonment of military practices in the "Oranienbaumer Heide" resulted in the overgrowth of open habitats by trees or tall grasses. To restore and preserve the open FFH habitat types of "European dry heaths" and "Xeric sand calcareous grasslands" a year-round low-intensity grazing project was implemented. In this context, the question arose how extensive grazing by cattle and horses impacts the initial succession processes of germination and early establishment of trees considering the given habitat.

To achieve this, the current developmental stage of the main tree species and the grazing effects by the herbivores was recorded. Besides this, it was investigated whether horses and cattle significantly increase damage on young birches, pines and aspen and thereby hinder progressive succession towards pioneer forests. This was done by comparing browsing effects and growth parameters of the three species in permanent plots within the pasture with plots in exclosures keeping horses and cattle out but not game animals. Finally, the effect of shoot removal measures was monitored for birch stumps for three seasons.

The results suggest that despite the grazing there is mainly progressive succession of pioneer tree stands. Furthermore, the browsing effect on birch and pine was similar within the pasture and the exclosures, indicating that cattle and horses are hardly browsing these tree species, whereas for calcareous grasslands aspen was more strongly damaged in the pasture. Concerning the regrowth of birch stump shoots it could be shown that removing the shoots in the first summer after felling the trees as well as strong browsing of the shoots during vegetation period had a detrimental effect on shoot regrowth.

Therefore, it can be concluded that extensive grazing is not sufficient to slow down tree encroachment, which means that continuous mechanical removal of trees appears to be inevitable to maintain open heathland area.

NOTES:

RESTORING DEPLETED SOIL MINERALS TO STOP BIODIVERSITY LOSS IN DRY HEATHLANDS?

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Abstract:
Heathlands in the Netherlands are under high environmental pressure. In the Netherlands, acidifying deposition, (mainly by SO_x, NO_x and NH_y) has been very high in the past and N deposition is still in high exceedance of critical deposition levels for heathlands. Soil acidification alters many important soil biochemical properties such as the leaching of soil acid buffering cations, increasing aluminium availability, hampering nitrification, and increasing soil ammonium concentrations. These deposition mediated changes have been repeatedly linked to a decrease in heathland biodiversity, from soil biota, bryophytes to vascular plants and fauna. Recent studies indicate that next to increased leaching of buffering cations, the mineral source of these cations is also decreasing at a much faster pace in Dutch Pleistocene soils, due to acidification induced increased mineral weathering rates. Natural soil weathering rates are approximately 25 $Kg{\cdot}ha{\cdot}yr^{-1}$. In the Netherlands. This has been increased up to 250 $Kg{\cdot}ha{\cdot}yr^{-1}$, resulting in a man-induced loss of about 10-50% since the industrial revolution of the soils capacity to release buffering nutrients (Ca, K, Mg) to the soil exchange complex. These results implicate that restoration of the soil base saturation (exchangeable pool) by liming alone is often not sufficient, restoration of the mineral fraction of the soils buffering capacity should also be taken into account.

In the Netherlands, experiments are conducted with the addition of minerals by means of application of finely ground igneous rocks (rock dust) on dry heathland vegetation types (H4030; H6230; H2130; H2110). Preliminary results seem promising. Rock dust addition showed no short-term negative impact on vegetation and fauna, resulted in lowered concentration of available aluminium and in some cases, increased the base saturation of the soil within two to three years after application. In this presentation we will introduce the theory and logic behind rock dust application in nature restoration, give an overview of the experiments and present first results.

NOTES:

NEW PERSPECTIVES ON HEATHLAND MANAGEMENT UNDER INFLUENCE OF EXTREME WINTER DROUGHTS

Liv Guri Velle[1], Siri Haugum[2], Torgrim Log[3], Pål Thorvaldsen[4], Gunnar Thuestad[3] & Vigdis Vandvik[2]

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Keywords: vegetation dynamics, climate change, land-use change, Calluna dieback

Abstract:
Changes in land-use and climate represent major threats to Atlantic heathlands, and extreme climatic events, such as droughts, are likely to increase in frequency and intensity in the future. This is of particular relevance for nature management and conservation, as extreme events are expected to have system-wide impacts on species and ecosystems. During the winter of 2014 an intense drought combined with low temperatures resulted in a massive dieback of *Calluna vulgaris* in the Norwegian heathlands, and two severe heathland wildfires occurred. With this as a background, a new Norwegian research project: Land use management to ensure ecosystem service delivery under new societal and environmental pressures in heathlands (LandPress) were initiated. LandPress combines observational data on ecosystem responses and resilience after the 2014 event with targeted experiments, one of them the International Drought Experiment, integrating our project into an international context. Drought impacts in mature Calluna-stands is investigated along a 650-km latitudinal gradient in Norway. Our first results indicate more drought damage in northern heathlands than in southern. Healthy Calluna was only observed in scattered patches with more suitable micro-climate, and, interestingly, in some areas regenerating after recent prescribed management burning. Moreover, drying experiments to learn how quickly Calluna plants dry up at 20°C and 50% relative humidity from rain-wet conditions showed that old Calluna stands represents a severe fire risk within two days. Young and more vigorous plants in the building phase (6–15 years old), as well as freeze drought damaged (typically some dead small branches), old but still live plants, showed different drying characteristics and dried more slowly. LandPress interlaces five work packages, exploring the impact of land-use change in combination with extreme climatic events in terms of vegetation change, ecosystem resilience, ecosystem services provisioning, sustainability, and evidence-based management and fire risk prevention.

NOTES:

AGRI-ENVIRONMENT SCHEME IMPACT ON IMPROVING THE CONDITION OF LOWLAND HEATHLAND IN ENGLAND

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Keywords: environmental stewardship, favourable condition, designated sites, grazing

Abstract:
Lowland Heathland is the priority habitat for conservation with the largest number of priority species associated with it in the UK. Since 2006, the Higher Level Stewardship (HLS) agri-environment scheme has been the main funding source for heathland management and restoration in England.

A project was set up in 2015 to assess the effectiveness of the heathland options in HLS in meeting favourable condition on lowland heathland. Samples were drawn from protected sites (Sites of Special Scientific Interest (SSSI)) and non-SSSI. A total of 143 sites containing 155 stands were surveyed in 2016 using Common Standards for Monitoring methodology. Surveyors also noted signs of management, and other habitat features including south-facing slopes, microtopographic features, signs of ground-nesting invertebrates and edge habitats.

HLS heathland options brought in more positive management for many sites, resulting in detectable changes in the vegetation, and increased levels of bare ground. However, no site was found to pass all the attribute targets in any sample. Both SSSIs and non-SSSIs, with and without HLS options, showed positive and negative trends in vegetation structure and composition, although slightly more stands improved in condition (i.e. passed more targets) in the HLS stands compared to the stands outside. Pass-rates were lowest for dwarf-shrub structure and undisturbed bare ground, which are the features of most value for heathland priority species. SSSI stands were generally in better condition than non-SSSI stands. Some sites had been in the agreement for a short time (under two years), so the impact of positive management was not yet apparent.

Heathland stands that were grazed had more attributes that passed their targets. Grazing had a positive influence on the diversity of dwarf-shrubs, graminoids and positive indicator species, and for trees/scrub cover. On the other hand, there was little obvious impact of grazing on vegetation structure in either sample.

NOTES:

THE DUTCH OBN PROGRAM ON RESEARCH AND KNOWLEDGE TRANSFER ON HEATHLANDS RESTORATION

Wiersinga, W. A.[1*]

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Abstract:
During the 20th century scientific evidence for the role of acidification, eutrophication, nitrogen deposition and desiccation in the strong decline of the biodiversity of Dutch heathlands, inland drift sand dunes and dry grasslands and woods became eminent.

As a response in 1990 the Dutch government initiated a 'survival-program' to reduce emission levels (sulphur and nitrogen) and diminish desiccation, combined with a budget (until 2010) to mitigate effects on ecosystems. A network of scientists and nature-managers focused on the supervision of these measures. This 'Knowledge Network for Restoration and Management of Nature' became the major drive behind the successful restoration of ecosystems by intermingling research, monitoring and practice to transform scientific insights into practical effective measures.

Since 2008 this network has a broad focus on Natura 2000 network, threatened or invasive species and nature management in relation to nitrogen deposition, wood harvesting and risks of wildfire. The 12 Dutch Provinces and the Ministry of Economic Affairs provide an annual budget for research and communication.

The knowledge network consist of eight expert teams based on the biogeographical landscapes that occur in the Netherlands such as dunes, dry and wet sandy areas with heathlands. In these expert teams, site managers, researchers and policy makers cooperate to formulate landscape-specific questions and supervise research projects aimed at solving ecosystem restoration and management problems.

OBN research on heathlands shifted attention the last 10 years from the effects of restoration measures on nitrogen amounts, recovering heath vegetation, nutrient balance, soil buffering and fauna:

a) burning, sod-cutting and lime addition;
b) extensive or intensive grazing;
c) extensive agricultural fields;
d) rock dusting;
e) extensive management.

A combination of methods disseminates the knowledge: reports, articles, brochures, leaflets, symposiums etc.; all available at www.natuurkennis.nl. Specific brochures are dedicated to restoration of heathland habitats: drift sands, Northern Wheatear *(Oenanthe oenanthe)*, typical for drift sands and dunes, dry heathlands and woods.

NOTES:

THE ROLE OF PROVINCES IN NATURE POLICIES IN THE NETHERLANDS

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This presentation deals with the responsibilities of provinces in the Netherlands concerning Nature policies. Provinces are responsible for the development and management of the National Nature Network, for the drawing up and execution of Management plans for Natura 2000 areas, as well as the National Programme on nitrogen deposition. Moreover, they are responsible for measures for endangered species and the agri-environment scheme. The provinces seek for a more intense relationship between society, economy and nature or biodiversity. The presentation will point out how these responsibilities are carried out. With these actions, 65% of biodiversity goals will be met in 2027. To reach a higher percentage, environmental conditions should be improved. This demands for a change in agriculture, and more biodiversity measures outside the National Nature Network. At the moment, provinces discuss this with the national government.

NOTES:

Oral session 4:

Large-scaled ecological restoration of heathlands

THURSDAY AUG 24 2017 | 8:30–12:00 | RADBOUD UNIVERSITY NIJMEGEN

Keynote lecture session 4

08:30-09:10 **Van Diggelen, R., Van der Bij, A.U., Aggenbach, C., Frouz, J., Bobbink, R., Weijters, M., Harris, J. & Pawlett, M.**
Restoring heathlands from agricultural meadows: possibilities and constraints

Oral presentations

09.10-09:30 **M. J. Weijters, R.Bobbink, R. Van Diggelen, A.U Van Der Bij, J. Frouz, J. Harris & M. Pawlett**
Heathland restoration on former agricultural soils: Tackling bottlenecks

09:30-09:50 **H.J.W. Vermeulen, R. van Klink, K. van der Laaken & A. Woldering**
The effect of different soil treatments for heathland regeneration on the carabid fauna after topsoil removal

09:50-10:10 **Roos Loeb, Arrie van der Bij, Roland Bobbink, Jan Frouz, Joost Vogels, Petra Benetková & Rudy van Diggelen**
Development of dry Nardo-Galion grassland on former agricultural land

10:10-10:40 **Coffee Break**

10.40-11:00 **Frederik Naedts**
LIFE Visbeek: large scale restoration of a small scale heathland

11:00-11:20 **Chris Panter, Hannah Mossman, Scott Pedley & Paul Dolman**
Biodiversity Audit Approach for heathland conservation: impact and future research

11:20-11:40 **Toby Taylor**
Opportunities from sand gravel extraction in the UK

11:40-12:00 **Hans Dekker**
The role of the province of Drenthe in nature conservation with special reference to heathlands

NOTES:

KEYNOTE: RESTORING HEATHLANDS FROM AGRICULTURAL MEADOWS: POSSIBILITIES AND CONSTRAINTS

Van Diggelen, R.[1], Van der Bij, A.U.[1], Aggenbach, C.[1], Frouz, J.[2], Bobbink, R.[3], Weijters, M.[3], Harris, J.[4] & Pawlett, M.[4]*

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Abstract:
The contribution will focus on different techniques to convert agricultural fields into nutrient-poor systems such as heathlands. 'Classical' techniques include mowing and grazing with large herbivores. Such techniques work reasonably well when the starting situation is not too nutrient-rich but take extremely long when the starting situation is very nutrient-rich. In such case more drastic techniques are to be preferred. Under such conditions topsoil removal is a widely applied technique to remove nutrients which resembles sod cutting in historic heathlands. Apart from vegetation it also affects also the composition of the soil community and thereby decomposition and nutrient cycling. Differences in soil community composition between oligotrophic and eutrophic grasslands, are known but it is not clear how these differences affect the function of the whole ecosystem.

We compare the effects of topsoil removal on vegetation and soil community development, soil chemistry, nutrient cycling and decomposition in two time sequences: with and without topsoil removal. The knowledge gained is applied in an experiment to quickly restore heathlands from agricultural fields.

NOTES:

HEATHLAND RESTORATION ON FORMER AGRICULTURAL SOILS: TACKLING BOTTLENECKS

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Abstract:
Heathlands are under pressure in North Western Europe and especially in the densely populated Netherlands. Main problems are loss of area and fragmentation by land use changes and eutrophication and acidification caused by high nitrogen deposition rates. One method in heathland restoration is extending the area of heathlands on former agricultural soils. The main advantage is that these soils have been limed in the past, resulting in well buffered soil conditions. Bottlenecks are high nutrient levels, too much soil buffering, dispersal of plant species and, becoming more and more obvious, a mismatch between the former agricultural, bacteria driven soil community and the targeted heathland soil community which is mainly fungi dominated. In the Noordenveld, a former agricultural area of approximately 200 ha in the Dwingelderveld heathland reserve, the nutrient rich topsoil has been removed in order to restore wet and dry heathlands (30-40 cm). Here two experimental sites were installed (2011), where the effect of addition of lime and elemental sulphur was tested (in order to create a gradient in soil buffering, and development of the targeted plant- and soil community by the addition of fresh hay (plants) and sod-cuttings (plants + soil community) from the nearby target heathlands. The aim of the two experiments is to stimulate the development of species rich dry and wet heathlands on former agricultural soils. The development of the soil buffering and nutrient status has since been followed on a yearly base, as well as the development of the plant community. In 2011 and 2012 the soil community has been measured.

The results of six years of development of the soil chemistry and vegetation in the experimental sites will be presented and linked with the first-year results of the soil community measurements.

NOTES:

THE EFFECT OF DIFFERENT SOIL TREATMENTS FOR HEATHLAND REGENERATION ON THE CARABID FAUNA AFTER TOPSOIL REMOVAL

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Keywords: heathland regeneration, heathland community, topsoil removal, heathland management measures, carabid fauna

Abstract:
In the middle of the National Park Dwingelderveld, an area of nature consisting of at least 1700 ha of wet heathland, there was an arable enclave Noordenveld of about 200 ha in size. In 2011 the arable character of this area was wiped out by more than 60 cm of topsoil removal. This is in general one of the measures to increase the area of heathland. In the beginning of 2012 at Noordenveld only a sterile bare sandy area was left. To find the fastest way to regenerate the ecological most complete heathland communities in 4 experimental areas of about 45 x 45 m several different treatments and combinations of treatments were executed. Two of those areas were located at wet a site and two at dry one. Each area was divided in 9 equal sized experimental plots in which different combinations of measures were taken. Those measures consisted of abiotic: doing nothing, adding acid, add lime and biotic: doing nothing, adding plant material gained from a nearby heathland and adding sod-cuts from a nearby heathland. In the centre of each plot 1 pitfall trap, filled with 4% formaldehyde solution, was placed for 4 periods of 3 weeks spread over the year from early spring of 2012 up till now the sampling took place.

Results so far indicate that acidification is the worst method for regenerating heathland communities. Liming gives rise to the highest biodiversity in Carabid species. Spreading out heather cuttings or even better heather sod-cuts leads to the fastest way of restoring heathland communities, regarding the Carabid fauna. Probably the combination of spreading out heather sod-cuts, combined with liming, leads to the most desirable results as far as heathland management is concerned.

NOTES:

DEVELOPMENT OF DRY *NARDO-GALION* GRASSLAND ON FORMER AGRICULTURAL LAND

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Abstract:

Dry *Violion caninae* grasslands, historically a common plant community in the heathland landscape, are highly under pressure in the Netherlands due to continuing soil acidification by nitrogen deposition. As a result, many characteristic plant species of this community have become scarce. However, as a Natura 2000 priority habitat (H6230), quality improvement as well as expansion of its area are necessary in the Netherlands. Because of the acidified soil conditions in most nature reserves with this habitat, expansion of this dry community is more likely outside these reserves, on former agricultural lands. Their soils are hardly influenced by acidification because liming is a common agricultural practice on these Dutch sandy areas. Constraints for the restoration of dry Violion grasslands on former agricultural lands are, (1) the high nutrient concentrations, (2) the absence of typical plants and animal species, and (3) a strongly changed soil biota community. These constraints have led to an incomplete development of dry Violion grasslands on former agricultural lands in many Dutch areas, in which most characteristic plant species are absent.

In this study we investigated the effects of the addition of fresh hay, seeds and soil material as restoration measures in three sites just after topsoil removal from 2011 to 2016. Soil inoculation was performed in three ways: as soil crumbs, as small sods and as a slurry. The development of the vegetation, the soil microbial community and the soil fauna has been quantified in the 5-years experimental period. Next to these experiments we also studied the effects of hay and seed addition and inoculation with soil crumbs at locations with a restricted development after one or two decades.

After five years, our results show a large effect of fresh hay addition. Without the addition of hay from well-developed donor sites, none of the experimental sites showed a development towards a typical Violion community. With fresh hay addition, the vegetation of the sites developed much more in the direction of this kind of grassland. Hay addition also led to more diverse communities of ants and bugs (Heteroptera). Of the three ways of soil addition, addition of soil crumbs had the highest effect on the development of both vegetation, nematode community and bacteria:fungi ratio, although results differed per investigated site. The effects of additional soil inoculation were, however, clearly smaller than the effects of fresh hay addition on its own. To put these additional measures into practice after topsoil removal, the effects of the measures should be weighed up against the availability of the required materials, and especially of soil from the rare well-developed donor sites in nature reserves. Moreover, for the return of certain characteristic rare plant species, addition of viable seeds is necessary, because they are not present or viable in hay of most donor sites.

NOTES:

LIFE VISBEEK: LARGE SCALED RESTORATION OF A SMALL SCALED HEATHLAND

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Abstract:
The Visbeek valley is a unique area in Belgium due to the small scaled gradient from a brook valley to the surrounding heathlands. The loamy sand soils and mineral rich seepage once made the area famous for its species rich heaths (H4010 & H4030), Molinia meadows (H6410), Nardus grasslands (H6230) and Mesotrophic waters (H3130). However, intensified land use led to serious decrease of these habitats to only a few hectares.

With support of the European Commission's LIFE fund Natuurpunt initiated a large scaled project in 2010 to restore these habitats. Starting with a few hectares, a handful of historical observations and some oral history we tried to restore heathlands, natural grasslands and mesotrophic waters to a moderate state of conservation.

The preparatory research with soil and groundwater analyses was essential to allocate the potential restoration sites and methods. This resulted in a mix of different restoration measures as topsoil removal, tree removal and renaturalization of former recreation ponds, a typical Flemish phenomenon. Thanks to the presence of relict populations, seed banks, valuable soils, hay transfer and after LIFE management we were able to push the development of the target habitats in the good direction.

Two years after the project end in 2015 we are very proud about the result. Not only is the total restored surface on a landscape level impressive. Nine target plant species recolonized the area, 15 expanded their populations and of five we could maintain the population. The effects on fauna, e.g. birds, reptiles and invertebrates are also promising. Supporting one of the two native populations of Viper (*Vipera berus*) in Flanders, the Visbeek valley has become a good home again for this enigmatic heathland species.

NOTES:

BIODIVERSITY AUDIT APPROACH FOR HEATHLAND CONSERVATION: IMPACT AND FUTURE RESEARCH

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Keywords: Breckland, biodiversity audit, landscape scale, flagship species, connectivity

Abstract:
The Breckland region is ca. 1000 km^2 of dry heathland located in the Eastern England and includes a mix of grass-heath, coniferous plantation and arable land. In 2010 we conducted a biodiversity audit of Breckland, collating almost a million records for just under 13,000 species. The approach identified 2,097 priority species of conservation importance, either nationally designated or regionally distinct. These species, mostly invertebrates and plants, were coded for their requirements for different habitats, but also small scale processes and structures (e.g. bare ground, short swards, flower-rich areas, etc.) to form guilds.

Findings of the audit were to highlight the relative importance of different small-scale processes and management actions which can deliver these, irrespective of habitat. Species of dry, open habitats comprised 32% of all priority species, and 61% of regionally distinct species. Of those associated with dry, open habitats we were able to show that grazing alone maintained the habitat for 14% of the species – sheep grazing is the main traditional grazing management on many 'heath' sites. The inclusion of ungrazed areas and physical disturbance in management could provide for 64% of all priority species catered for by dry, open conditions. This finding highlighted the importance of physical disturbance and challenged some current views of the conservation mechanisms on heaths. This provided evidence to support a number of conservation projects being pursued by organisations, which are discussed.

Since the audit was completed the species guilds approach has been used to consider the importance of Eurasian Stone Curlew (*Burhinus oedicnemus*) as a flagship species. We quantified the number of other species that the habitat creation for the single species could deliver and this has been important for organisations in securing further funding for conservation management. Using the audit data, ongoing research is examining how we can enhance connectivity of heathland species within coniferous woodland.

NOTES:

OPPORTUNITIES FROM SAND GRAVEL EXTRACTION IN THE UK

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Abstract:
The East Devon Pebblebed Heaths, SSSI, SPA & SAC site within the East Devon AONB, all these designations can lead to confrontation between different organisations.

By working with the RSPB in the area we have been keen to grasp any biodiversity opportunities that occur. Aggregate Industries part of the Lafarge Holmic group, hold the rights to the bulk of the mineral rights on the free draining sands and gravels in the area. The conflict between nature conservation organisations planning authorities and mineral companies need not be seen as a barrier but for the best opportunities to be maximised. This is where organisations such as the MPA can assist in positive dialog.

After a recent withdrawal of the planning permission to part of the designated site, Aggregate Industries started to explore smaller local freehold reserves.

The focus of this talk is on the opportunities that arose from our involvement in the development of this new site and then following on through the restoration of the site and the conservation outputs that have been achieved.

Working with different partners across the area we hope to be able to deliver a first class nature reserve catering for a wide range of wildlife and delivering good public access on a landscape scale.

NOTES:

THE ROLE OF THE PROVINCE OF DRENTHE IN NATURE CONSERVATION WITH SPECIAL REFERENCE TO HEATHLANDS

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Abstract:
None submitted

NOTES:

THE EUROPEAN HEATHLANDS NETWORK

The European Heathlands Network has been established to enable all persons involved or interested in ecological research, conservation of wildlife, and in policy formulation and implementation in relation to European heathlands to meet, to stimulate discussion, to promote communication, to further the understanding of heathland ecosystems and to disseminate information as widely as possible.