Newsletter 27

Eijkelkamp Agrisearch Equipment

Geijkt Nieuws

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All it takes for environmental research

Eijkelkamp Agrisearch Equipment

Wetlands: an introduction

Wetlands - they have existed for ages. Nevertheless, they receive relatively little attention, certainly now when wetlands are becoming increasingly important. In fact, this theme has never before been covered in Geijkt Nieuws. And we thought it was high time we changed this.

Wetlands are found where land meets water. Now, you may think, "Oh, a wetland is the same as a swamp", but this is not the case. A swamp is usually extremely boggy ground, while the soil of a wetland can alternate between dry and wet.

Numerous biotope types in close proximity to each other make wetlands extremely rich in plants and animals. The numbers of plant and animal species in watery wildlife areas are comparable with the numbers on coral reefs and in tropical jungles. Conserving wetlands means protecting numerous (endangered) species.

Wetlands can also prevent rivers from overflowing, as they can take up and discharge a lot of water. In fact, wetlands act as a water buffer. At high water, they can flood and absorb substantial amounts of water, thereby reducing the risk of flooding downriver. As wetlands are channelled and drained, the water flows a lot quicker to the sea. The buffer action is lost and the water supply is endangered.

In dry periods, wetlands act as freshwater reservoirs. Water that flows into the wetlands at high water is as a rule retained in subterranean water layers and natural river systems. The water that is absorbed is then released very slowly in dribs and drabs, often in a pure state.

Moreover, wetlands have a big economic value, usually for the local population. Besides ensuring that there are a lot of fish, which are the most important source of protein in certain parts of the world, in the rivers, large rivers also leave behind fertile mud when they flood naturally each year. If this no longer occurs, the poor farmers must often purchase costly fertilisers, as the land's fertility is reduced.

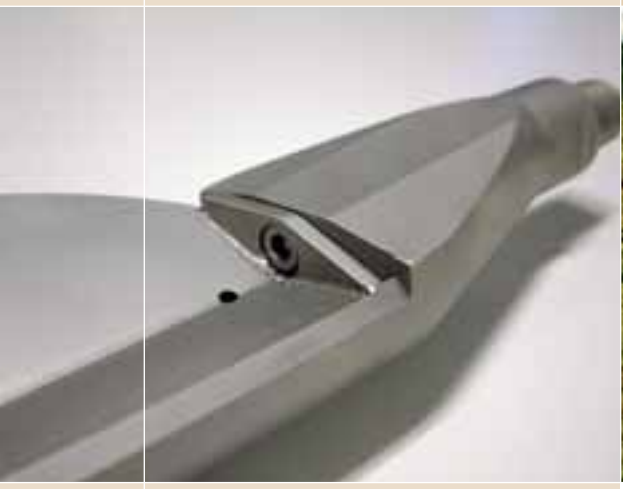
Fortunately, worldwide many wetlands are protected under the Ramsar Convention. This is an international agreement regarding wetlands that are internationally valued. The agreement was signed on 2 February 1971, which makes it the oldest international multilateral agreement regarding environmental protection. The mission statement of the Ramsar Convention is: "The conservation and wise use of all wetlands through local, regional and national actions and international cooperation, as a contribution towards achieving sustainable development throughout the world."

It should be clear then that wetlands not only fulfil an important function in nature throughout the whole world, they are also often beautiful landscapes that are worth more than just a visit. Varieties of ecotourism are being developed and travels to wetlands are being organised in cooperation with the WWF at an increasing number of places.

Sources: http://nl.wikipedia.org, 2007. http://www.wnf.nl, 2007.

One can find (large) wetlands in the following regions:

- *The Winnipeg Lake (North America)*
- *Hudson Bay, south (North America)*
- *Central Africa*
- *Central South America*
- *Golf of Mexico, north*
- *Islands in Oceania*
- *Russia, north*



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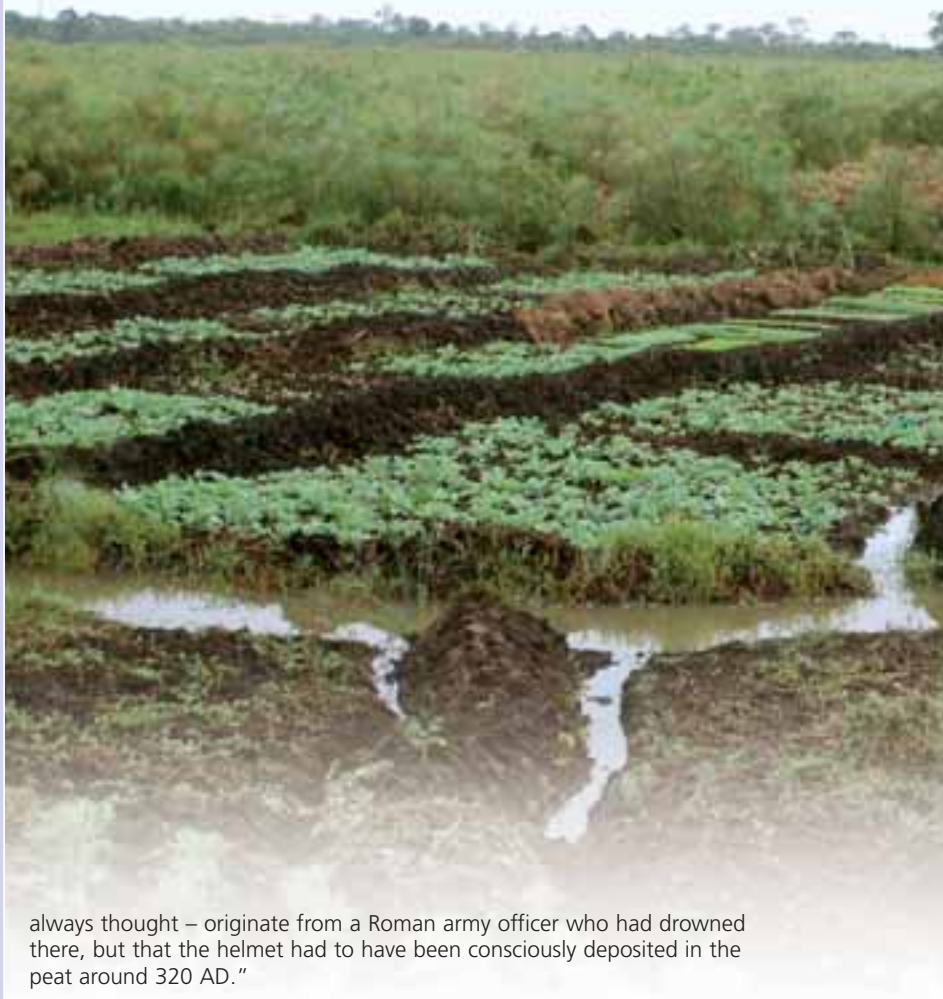
Passion for peat

An interview with Hans Joosten

"What I am about to say will be difficult for translators to translate," laughs Hans Joosten in answer to the question about what he finds so interesting about wetlands. "'Veen' is what I find interesting," he continues. "Interestingly, in Dutch we use the same word – 'veen'– to describe a type of landscape and a material that forms there. A 'veen' (English: 'peatland') is a landscape in which 'veen' (English: 'peat') is formed. I am interested in everything to do with 'veen', in both senses of the word."



Dr Hans Joosten was born and bred in the Peel, a peatland area in the southeast of the Netherlands. For the last ten years he has worked at the university of Greifswald, a town in East Germany. There he leads the work group 'Mire and Paleoecology', which conducts research around the world into peat and peatlands.

In most ecosystems, dead plant material is quickly broken down by bacteria and fungi. In wetlands, where the water is at around ground level the whole year round, the dead plant materials do not entirely break down because of a lack of oxygen and the material that forms accumulates as 'peat'. Over thousands of years, this can result in a peat layer that is many metres thick.

Landscapes with a peat layer of more than 30 cm thick cover approximately 4 million km^2 of the earth's land surface while thinner peat layers cover another 5–10 million km^2. Sixty percent of all peatland is found in just four large countries: Russia, Canada, the USA and – indeed – Indonesia. "You can find peatland in most countries," says Hans Joosten, "Last year, we did some peat coring in Iran." No peat has yet been found in Libya, Somalia, Saudi Arabia, Yemen, Oman, Jordan and Turkmenistan. "'We should go there on holiday, so that we would not have to tag along and visit peatlands the whole time...' said my youngest daughter."

Peatlands contain information about the past that is stored in layer after layer of peat. From this, one can determine from what plants the peat was formed and therefore what plants grew there in the past. Other materials that found their way into the peat are also preserved forever. For example, corpses or archaeological objects, which have been found in many European peatlands. "Last year, we were able to show that a gold helmet that was found near Helenaveen (NL) in 1910, did not – as was always thought – originate from a Roman army officer who had drowned there, but that the helmet had to have been consciously deposited in the peat around 320 AD."

Pollen grains and plant remains are very important for paleoecology, the science that studies the history of ecosystems. Every year, many thousands are deposited per square centimetre in the peat and they become part of the peat as it accumulates. "By studying the micro-fossils at various depths in the peat, we can determine what plant species grew there in the past (and in what quantities!) and even what plant species grew at some distance from the peatlands. From this, we can determine, for example, the climatic changes that occurred and determine the past influence of people on the landscape," says Hans. The trick is to extract the peat samples from the layers of peat without disturbing them and in their original position. "People's eyes pop when they see you retrieve peat layer by layer from the ground with a peat drill and they suddenly realise that they are staring at thousands of years of history. And we can often immediately say something in the field about how the landscape changed over the centuries – based on changes in the plant composition, the degree of humification or the amount of sand or clay in the peat."

"In most countries around the world, people do not have any idea what "peat" is. A soil, a geological layer, yes. But what it is really about only becomes apparent after you have dug up the centuries-old plant remains that are still recognisable. Then you understand that a "peatland is not a fossilised soil, but a growing landscape, a giant living organism that is many thousands of years old." Hans and his students take samples from peatlands all over the world. "As an ecologist, hydrologist or soil scientist, you cannot get the full picture if you do not know how a peatland is built up." He has stationed peat augers (mainly Eijkelkamp) at many places: in Northeast China, in Tibet, in West Siberia, in Georgia, even at the uttermost part of the world: Tierra del Fuego. "This means we do not have to lug drilling equipment around with us all over the world. And the local peatland

researchers can also use them."

The thick layers of plant material in its soil means that peatland contains – and this is also not sufficiently known – an awful lot of carbon, much more than any other ecosystem. Hans explains: "In the debate on climate, everyone is always talking about forests and tropical jungles. It is forgotten that peatlands, although they only cover three percent of the earth's surface, contain just as much carbon as all the terrestrial biomass put together and even twice as much as all the forests on the planet. An average peatland contains five times as much carbon per hectare as a tropical rainforest!"

In the temperate regions of Europe, America and Asia, the majority of peatlands have been drained. Most of them are used for agriculture; some are dug up for fuel or to be used as a substrate for market gardening. And an increasing amount has already been abandoned and lies fallow. Drainage means air can get into the peat and it is quickly broken down. This is why large parts of the Netherlands now lie below sea level; centuries of drainage have caused the oxidation of many metres of peat and the surface has dropped; this process is still going on. "Peatlands are real carbon bombs," says Hans Joosten. "For as long as you leave them alone, nothing happens and they absorb CO2 every year. But if you drain them, the carbon is quickly released. Here in NE Germany, over the last 30 years as much peat has disappeared, because of agricultural use, as was accumulated in almost 3000 years." Worldwide, drained peatlands are currently responsible for 3 gigatons of CO2 emissions per year, equivalent to twenty percent of the total emissions of all the developed countries. Almost half of these emissions are the result of peatland fires in SE Asia...

"And so it is disconcerting that little attention is given to peat in the debate on climate change. But this is fortunately beginning to change," believes Hans Joosten. As secretary-general of the International Mire Conservation Group (www.imcg.net), the world organisation of peatland conservationists, he attended last November the climate conference in Nairobi to ask for attention for the role of peat. "Soil scientists had assured me that there was no peatland in Kenya," he laughs. "But only just outside Nairobi, we found the first peatland: indeed drained for small-scale gardening."

Manufacturing a primitive peat auger on the streets of Nyeri (Kenia)

"I didn't have a peat auger with me – I often don't have an auger with me when I go to a congress –, but I quickly had one made on the street. With this primitive thing, we took a lot of samples that day in the Aberdare Mountains. And, of course, we took peat samples with us to the world climate congress, so that the delegates could actually see and feel what it is all about."

After Nairobi, Hans went directly on to Tierra del Fuego, the southernmost tip of Argentina. A region that is extremely rich in extraordinary, virgin peatland. "It's great to be out in the field drilling!" Hans' eyes are glowing. "We have worked there for years and currently have two Eijkelkamp augers there. A story in itself: a student reported in panic that he had twisted a peat sampler crooked. I am familiar with that problem. This often occurs with students who are too enthusiastic and too forceful (or perhaps clumsy). In 2003, I had the same thing happen to me during a Siberian winter expedition with two Russian tanketkas (small tanks) in the largest peatland in the world. And I knew what the solution was: take a Russian tank, secure the point between the caterpillar track and twist the auger back again (You can also use something else instead of a Russian tank.) My student however had in the meantime written an angry letter to Eijkelkamp telling them he was left there standing at the tip of world with a ruined peat sampler. And what do you think happened: Eijkelkamp immediately sent an updated version of the auger so as not to hinder the progress of the research. That's what I call service. And now we have two there!"

Hans Joosten is looking forward to his next expedition to Tierra del Fuego. The most eastern part of the island of Isla Grande is an almost inaccessible wilderness full of virgin peatland and primeval forests, hundreds of thousands of hectares without roads or paths. This paradise is threatened by tree felling and uncontrolled peat excavation along the new roads that were laid in recent years along the edge of this region. "Here urgent steps must be taken to prevent all this natural beauty from being lost. The government is considering designating this region a conservation area and asked us for support. In March, we hope to move into the region: with 6–7 men and 10 horses. And with a peat auger on my back. As my students say: "To boldly core where nobody has cored before!"

PRODUCT NEWS

High-quality PVC Monitoring Well

As no other, Eijkelkamp Agrisearch Equipment knows the importance of a good monitoring well. Indeed, the monitoring well forms the basis of the research. Eijkelkamp also sells certified monitoring wells that satisfy a stringent directive of KIWA (BRL-K561). This directive was incorporated by SIKB into the protocols for environmental research.

The monitoring wells can be divided into two categories:
- metal-free PVC monitoring wells;
- PE monitoring wells.

For the production of our high-quality PVC monitoring well, all aspects are considered. The monitoring well is made with an entirely organic stabiliser, so that no contamination can occur. The monitoring well comprises no lead-containing materials or heavy metals and can be used for all types of organic and inorganic analysis. Moreover, it is provided with watertight sleeve joints, for which no glue is needed. A robust, thin monitoring well of high quality is the result.

When using monitoring wells it is important that one is conscious of the quality aspects and the composition of the material. Unfortunately, it still occurs that monitoring wells are made that do not satisfy the above-mentioned stringent requirements. Of course, at Eijkelkamp you can be assured that we only supply materials of the highest quality.

e+ SOIL MCT sensors:
a real-life example

e+ SOIL MCT sensors are intelligent sensors that measure and monitor parameters such as soil moisture, conductivity and temperature. The number of MCT sensors that are purchased from Eijkelkamp Agrisearch Equipment is growing each year. The sensors can be used in numerous ways, so we thought it would be interesting to allow one of our customers to speak on the way in which they use this device. We spoke with Mr Verhagen, managing director at Cobra boomadviseurs, who works as a tree consultant and VRT chartered surveyor.

Can you say what Cobra boomadviseurs does exactly as a company?
"Cobra boomadviseurs is an independent technical tree consultancy that is specialised in various disciplines in which trees are central. We assess stability problems and growth disorders or offer our expertise and perform appraisals when trees have been damaged or have caused damage or when there is a judicial dispute. Drafting policy documents, setting up improvement projects and providing specialists (on a project basis) to fill gaps in the customer's workforce also falls within the scope of our work. For urban reconstruction or laying new green structures, we can facilitate the screening and, if necessary, modify the design and the associated implementation plan. We can also check whether contractors are fulfilling the result obligations stipulated in the plans."

For what purpose does Cobra boomadviseurs use the equipment of Eijkelkamp Agrisearch Equipment?
"Trees in our urban environment are under increasing pressure, as are our forests that are drying out or even becoming waterlogged. Indeed, our (urban) trees are becoming increasingly more important, as they are forced to share their living environment with an increasing number of users. Through man's doing, trees are damaged and become vulnerable to all kinds of attack. To protect trees sustainably, up-to-date knowledge and reliable data on our tree stock is needed. Besides this specific knowledge, research tools and reliable equipment are essential for us. Basic hand tools, such as soil augers and gouge augers, are purchased from Eijkelkamp Agrisearch Equipment. Our staff also have the Eijkelkamp ergonomic soil auger and a special boring set for sampling tree roots and undisturbed soil samples. In addition, the Penetrograph is a valuable tool for us for measuring the degree of compaction of the soil."

Can you give an example of a project in which Eijkelkamp equipment was used?
"One of the main activities of Cobra boomadviseurs is setting up a so-called Trees Effect Analysis and managing and monitoring construction projects. It becomes apparent again and again that people have an insufficient insight into the dangers of draining land. Trees dry out and die off or have conditional problems because insufficient moisture is available. To map the impact of draining the land of groundwater on the availability of soil moisture for the trees, we have searched for suitable systems. We have already worked with the Watermark, which is suitable for measuring the suction power in young trees or in a plant-breeding situation, but this is not suitable for adult trees. This system is also labour intensive for our projects. Monitoring wells show how the groundwater level fluctuates, but give no information on the availability of soil moisture for the trees and with this an indication of the risk of drying out."

How did you determine which equipment would be the best for the measurements that you wanted to perform?
"Together with Harm Winkelhorst of Eijkelkamp Agrisearch Equipment, we looked at which systems were available in the market to monitor the available soil moisture next to trees on construction sites. The points of departure used were the advantages and disadvantages, the suitability and, of course, the costs. The e-SENSE system with telemetry was expensive, but was simply the most suitable. In 2006, we purchased several sets (field modem with three sensors) that were placed at various (construction) sites around the country. Besides being used to measure soil moisture, one system has been deployed to monitor the degree of salinisation and fluctuations in soil temperature at three levels adjacent to a secondary road in the Province of Noord-Brabant over a two-year period."

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Can you tell me anything else about the functionality of e-SENSE with telemetry?
"We further developed the e-SENSE system, particularly with respect to data accessibility and processing. Many customers appreciate that they can access the measured data real-time, as do other parties such as building contractors, water suppliers or local residents. Every hour the e-SENSE systems that we installed measure the available soil moisture, and possibly the EC value and/or soil temperature. This data is sent, as desired, every 24, 48 or 72 hours to our server and is made available for viewing on our webpage at www.CobraBoomadviseurs.nl.

The interpretation of the collected measurements is different for each situation. The soil type and pF, groundwater level drop, duration of water drainage, age, quality and vulnerability of the trees, etc., are all important for determining when the damage caused by drying out will occur. For that matter, it appears that both trees on a groundwater profile and on a retained water profile are seriously damaged by removing groundwater. This is in contrast to what is often taught! If there is a threat of drying out, we can, if desired, take action to ensure that the trees receive water by facilitating their irrigation using a remotely-controlled automatic water irrigation system."

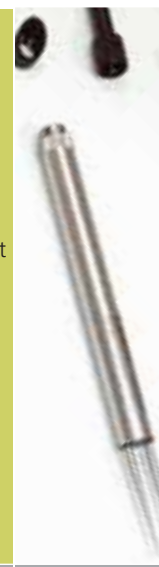
What are your experiences with e-SENSE? Are you satisfied with the system?
"Our experiences to date with the system have been positive ones. It is a robust system that has proven its worth as far as we are concerned. Because it is waterproof and can be buried in the ground it is not prone to vandalism. The position of the sensors and modem must in contrast be well recognisable for the contractor. It should be said that sound knowledge of the sensors is needed to set, place and manage them. In addition, one must have a knowledge of ground and pF-curves to be able to interpret the measuring data. Eijkelkamp also provides courses to enable applying the system as efficiently as possible."

What are your future plans regarding the use of Eijkelkamp equipment?
"In the new year, Cobra boomadviseurs will purchase a number of further systems to be able to serve our customers satisfactorily. In addition, the remote management of waterings will be further developed. Every situation requires a different approach, so we will focus on several different methodologies. Of course, Eijkelkamp will be closely involved in this. To summarise, using e-SENSE with telemetry can prevent many problems or nip them in the bud. The timely detection of possible drying-out damage is crucial if trees are to be lastingly conserved."

Use of e+ SOIL MCT sensors in Wetlands

e+ SOIL MCT sensors measure soil moisture. In combination with the e-SENSE telemetry system, one can detect directly whether changes have occurred in the soil moisture level. If drying-out occurs in wetlands, this can be detected at an early stage, possible through automatically generated alarm messages, so that measures can be taken in time.

Besides soil moisture, conductivity and temperature are also measured using the MCT. Changes in these can indicate, for example, soil pollution or salinisation. To conserve our natural world, e+ SOIL MCT sensors are ideal for use in wetlands.



ETC NEWS

Well begun is half done!

Wetlands can only be conserved if people can live there in harmony with the animals, plants and water. Many people depend on wetlands for their daily needs. To conserve wetland environments and take the right decisions, a sound knowledge of the environment is essential. For this, a lot of research will have to be done in the future.

Eijkelkamp Training & Consultancy can support you in this where it concerns monitoring water or environmental soil research. We can advise you on the options in a project's preliminary phase. In addition, we can train your people on-site so that they know what to do, why they do it and how they must do it. If you would like more information, please contact us by sending an e-mail to etc@eijkelkamp.com.

Divers in Ruunasoo

A contribution by Mr. Sake van der Schaaf
Hydrologist / Lecturer (Wageningen University, the Netherlands)

Ruunasoo is a relatively small raised bog in Southwest Estonia. It lies a few meters above its surroundings and shows a pronounced margin slope to the surrounding so-called lagg zone, where bog water and water from the surrounding mineral soil meet and mix. This presence of two water types may create special vegetation transitions. The bog is about 2.2 km long and at most 800 m wide. The relatively small width of the bog implies a small distance between the bog margin and the internal water divide. Hence the bog's water reservoir may empty relatively quickly during dry periods, depending on different internal conditions. This makes the bog more sensitive to minor hydrological changes than larger bog systems.

Drainage of the lagg around 1900 has destroyed much, but not all, of its vegetation. Plans for lagg restoration are under development. However, also the margin zone of the bog itself has become drier. Although an Estonian bog always has some pine trees, the tree density on the margins has increased and other tree species such as birch and spruce have invaded. Pine forest seems to invade the bog and to become denser gradually. An increased tree density on the bog means more shading and more evapotranspiration and hence less favorable growth conditions for the natural bog vegetation. The question is, whether this development is only caused by the drainage of the lagg or also by internal changes in the bog itself. Research is needed to answer the question and thus to find out, which measures would be useful to restore the bog's hydrological system. Such measures could include drain-blocking and tree cutting, either selective or full clear-cutting.

Financial means for research are limited, but in 2006 it was possible to obtain some instrumentation. It consisted of a basic meteorological station with a recording rain gauge and wet and dry bulb temperature and eight Divers®, including two BaroDivers. The choice for Divers was largely based on experience in Endla Nature Reserve in Eastern Estonia, where Wageningen University operates a network of twelve Divers. The two BaroDivers will operate synchronously, thus providing more security in the data acquisition system and a more accurate atmospheric pressure reference than would be possible with a single instrument. The other six Divers were installed in different positions both on top and at the bottom of the margin slope. They were installed in narrow tubes with a filter between 50 and 100 cm. To prevent the levels of the tube tops from changing by Mooratmung (the phenomenon of a fluctuating surface level caused by changing water levels in the peat), the tubes were given a length below the perforation that allowed them to be anchored in the deepest peat. The tubes were not pre-drilled, but pushed down by hand. At all locations, two identical tubes were installed, allowing hand measurements without the necessity of opening the Diver tube.

Tube set installed on the bog

Tube set in lagg remnant

The research plan included the study of effects of drain-blocking and clear-cutting. The small number of Divers did not allow separating the effects in a one- or two-year test. Hence a step-by-step approach was adopted. It includes one and perhaps two years of measuring in the unchanged situation, to obtain information on the situation without measures. Then in the spring of the first test year, clear-cutting in a zone of 50 meters on both sides of one set of two Divers and drain blocking at the other set will be done. In the spring of the next year, the set of measures will be completed by drain-blocking at the first Diver set and clear-cutting at the second. The other two Divers are meant as reference instruments and remain in unchanged conditions, one on the bog in invaded forest and the other in a lagg remnant. An additional denser network of manually observed wells with an irregular observation frequency will provide additional data.

Hopefully the installed equipment will provide the information needed to restore the bog's hydrological system. Then Ruunasoo will remain to be the beautiful area it has been for many years.

"Raised bog":Peatland that has gradually grown above the level of the surrounding (ground)water and hence solely depends on rainwater. This creates nutrient-poor conditions. The water table lies close to the surface. The combination of the high water level and the poor availability of nutrients cause extreme conditions to which relatively few plant species are able to adapt.

COLOPHON

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