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ChangeHabitats2

Newsletter January 2013

News from the European Natura 2000 front
International IAPP cooperation

Dear Colleagues, Friends and Readers!

Welcome to our January Newsletter. During the last year we had extensive field mapping campaigns in Hungary and Germany, five days of flight for collecting airborne laser data, and intensive work on data processing. We also successfully passed our Midterm Review and are looking forward to further two exciting years.

A Natura 2000 Summer School in our Research Site in the Uckermark north of Berlin introduced students and professionals into Habitat Directive and Field mapping.

In each newsletter we will introduce two consortium partners and their work in detail. For this edition, we have selected two scientists, **Werner Mücke** from Institute of Photogrammetry and Remote Sensing, TU Vienna, conducting research in geometric reconstruction, physical interpretation and 3D data management of laser scanning data.

The second expert is **Anke Schroiff** from YGGDRASILDiemer Berlin, expert in Natura 2000 Management monitoring and field work.

Both partners have completed intensive field mapping and data processing tasks during the summer and present their latest scientific findings.

Events in summer 2012

Secondments undertaken:

WHO	OBJECTIVES
• *From YGG2 to UODEB*	*FFH Directive Implementation/GIS*
• *From TUW_EUFS to YGG1*	*PMO and Financial Issues*
• *From UODEB to YGG2*	*Field work FFH Implementation*
• *From TUW_IPF to YGG2*	*Habitat Directive – Dead wood issues*
• *From UODEB to YGG2*	*Field Work, FFH Directive Habitat From*
• *From TUW_IPF to VITUKI*	*Water Shed Management*
• *From TUW_IPF to VITUKI / ATMO*	*Data Management, Data Quality*
• *From VITUKI to TUBAF*	*Hydrobiology, Habitat Mapping*
• *From YGG1 to TUWEUFS*	*Project Management*
• *From YGG2 to TUBAF*	*Field Work Habitat Directive*
• *From ATMO to TUWIPF*	*IT Work on Project Website*
• *From TUWIPF to Riegl*	*Processing Airborne Laser Scanning Data*

Flights undertaken by Riegl:

1. Uckermark: March 2012
2. Debrecen - Nagyerdö: March and July 2012
3. Tisza-tó: March and July 2012
4. Püspökladány, Ágota-puszta: March 2012
5. Sopron - Soproni-hegység: March 2012

Correspondent field work undertaken in:

1. Uckermark: July 2012
2. Debrecen - Nagyerdö: March and July 2012
3. Tisza-tó: May to September 2012
4. Püspökladány, Ágota-puszta: May & June 2012
5. Sopron - Soproni-hegység: May & September 2012

Natura 2000 Summer School by YGGDRASILDiemer in Uckermark:

16 highly motivated participants received excellent training in EU directives and habitat mapping

Dissemination in conferences:

- SilviLaser 2012. September 16-19, 2012, Vancouver (Canada)
- 10th Seminar on Remote Sensing and GIS applications in Forest Engineering, October 15 – 18, 2012, Curitiba-Paraná (Brazil)
- ForestSat Conference, September 11 – 14, 2012, Corvallis, Oregon (USA)
- General Assembly of the European Geosciences Union. April 22-27, 2012, Vienna (Austria)
- International Scientific Conference on Sustainable Development & Ecological Footprint. March 26-27, 2012, University of West Hungary, Sopron (Hungary)
- International Symposium on Aquatic Plants, August 27-31, 2012, Poznan (Poland)

Anke Schroiff

Anke has been awarded her Title of Diplom-Ingenieurin in Environmental Protection and Spatial Planning - specialized on nature conservation and landscape management (TU Dresden) in 2004

1999 – 2006 scientific assistant at TU Dresden and TU Bergakademie Freiberg → main tasks in teaching (botany, field ecology, nature conservation), but also local and regional projects with respect to nature conservation objectives

2007 further courses → Specialist for Geographical Information Systems (GIS)

Since 2006 on behalf of YGGDRASILDiemer work on Data collection and mapping in projects with respect to nature conservation issues for different customers and authorities, Natura 2000 mapping and assessment

Anke has immense experience in the mapping, evaluation and GIS application of large Natura 2000 areas and has been working on FFH topics for many years. With her long standing carrier in the academic field as well as in the commercial world, she is able to bring together the objectives and topics of both academic and commercial demands.

Werner Mücke

Werner has studied Surveying and Geoinformation at the Vienna University of Technology. During his studies and after graduation, he is employed at the Institute of Photogrammetry and Remote Sensing at Vienna University of Technology.

His field is creating and processing of digital terrain models from Laser scanning data, filing and administration of topographic and geodata, and application of aerial laser scanning to vegetation analysis.

As of February 2009 he is preparing his PhD thesis on laser scanning and its application to habitat evaluation.

Just Dead Wood?
Assessment of a structural feature of forest habitats in the *ChangeHabitats2* project

Anke Schroiff

Deadwood and nature conservation

Most people are fascinated by pictures of virgin forests with their old trees, multifaceted structures and a lot of deadwood (Fig. 1). Unfortunately we can not see them in Central Europe any more. Our usually managed forests consist mainly of one or few tree species in the same – mostly young or middle old - age class. Old and dying or dead trees are virtually missing. They are threatened by forestry management.

But deadwood is an important component of forest ecosystems on which many forest living organisms depend (Lassauce et al. 2011). Deadwood is a key component of biodiversity in European forests since mainly saprophyllic beetles, bryophytes, lichens and fungi account for a considerable part of forest biodiversity (Humphrey at al. 2004, Paillet et al. 2010). These taxa depend on or utilize dead wood as a source of food or shelter (Christensen et al. 2005). Quantity and quality of deadwood is one of the key factors for their occurrence (Paillet et al. 2010). The amount of deadwood is an important indicator for sustainability plus evaluating and monitoring biodiversity (Christensen et al. 2005, Humphrey at al. 2004). The quality of deadwood in the stand (dimension, tree species, decomposition state, exposure to sunlight), the temporal and spatial continuity of deadwood and the composition of the surrounding landscape influence biological diversity (Lassauce et al. 2011).

Figure 1 Dead beech (*Fagus sylvatica*), Foto: B. Déak

Deadwood in Natura 2000

According to the Natura 2000 directive the conservation status for each Natura 2000 habitat has to be evaluated with regard to structures, species and (anthropogenic) disturbances. Besides the growth categories of the living trees, their spatial distribution and the presence of habitat trees (living trees with microhabitats), deadwood is an important component of the structure assessment in forests. The methods and criteria for the evaluation are however quite diverse between different (federal) countries as illustrated for Germany and Hungary in Table 1.

In Hungary there is one instruction that is valid for all forest habitat types whereas in the considered German federal countries separate rules for each habitat type have to be applied. In general mainly the coarse deadwood is in the focus of attention – the minimum dimension which is considered to be coarse deadwood varies however. Also the unit in which the quantity of occurring deadwood has to be estimated or measured or counted differs.

Although – as mentioned above – the quality of deadwood is important for biodiversity, in most cases just or mainly the quantity of deadwood has to be evaluated. Only in Saxony the assessment has to be carried out for dead deciduous and coniferous trees separately. The Hungarian assessment includes the observation of smaller dead stems, stubs and branches.

Deadwood in *ChangeHabitats2*

Based on the various official assessment instructions and after discussions between biologists and remote sensing specialists a method for the fieldwork in the *ChangeHabitats2* Project was developed that allows the comparison of ground and airborne data as well as the conversion into the different national or federal Natura 2000 assessment requirements.

In the four study sites of the *ChangeHabitats2* project in Hungary and Germany four forests habitat types (9130, 91E0, 91G0, 91I0) are investigated in which a wide variety of amount and types of deadwood occurs (figures 2 to 5). These field surveys provide ground truthing for Airborne Laser Scanning data. In the project a method to identify deadwood in these data is developed.

Figure 2: A large number of old oaks (Quercus robur) are dead or dying in the Nagyerdö close to Debrecen

Figure 3: Lying and standing deadwood in a beech forest site in the Uckermark

Figure 4: A lot of (in this case small) deadwood is typical for riparian softwood forests as in the study site at the Tisza-tó

Figure 5: Intensively managed forests – as here in an oak stand in Soproni-hegység – usually contain no or just a very small amount of deadwood

Table 1: Instructions for the assessment of deadwood in beech forests (Brandenburg and Saxony) respectively forests in general (Hungary) of different (federal) countries with regard to the ChangeHabitats2 Project

Status of conservation	A	B	C
Germany, Brandenburg	Coarse, lying and standing* > 40 m^3 /ha	Coarse, lying or standing* 21 - 40 m^3 /ha	Coarse, lying or standing* ≤ 20 m^3 /ha
Germany, Saxony	Coarse, lying and standing** ≥ 3 indiv./ha (≥1 standing)	Coarse, lying or standing** 1 to < 3 indiv./ha	Coarse, lying or standing** < 1 indiv./ha
Hungary	Coarse, lying and standing*** > 2 indiv./ha average proportion of standing deadwood trunks or stubs**** > 10% cover of lying deadwood in at least 2/3 of the area > 5%	- average proportion of standing deadwood trunks or stubs**** not > 1% -	

* - ≥ 35 cm DBH (**d**iameter at **b**reast **h**eight) on standing, thicker end on lying deadwood; ≥ 5 m high/long
** - ≥ 40 cm (DBH on standing, thicker end on lying deadwood); standing: ≥ 3 m high, lying: ≥ 5 m long
*** - ≥ 30 cm DBH on standing, thicker end on lying deadwood; standing: ≥ 0,5 m high, lying: ≥ 1 m long
**** - diameter >5 cm

References

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Identification of dead trees using small footprint full-waveform airborne laser scanning data

Werner Mücke

Introduction

The abundance of deadwood in forest ecosystems was identified as an important indicator for habitat condition. Assessment of standing dead and fallen trees is therefore part of ecological monitoring and sustainable forest management. The *ChangeHabitats2* (CH2) project aims to develop a monitoring methodology for deadwood designed for the Natura 2000 network. The ability of solely ALS to identify deadwood in forested areas should be tested. ALS data are known to accurately depict the three-dimensional forest structure down to sub-canopy strata and the forest terrain, and can be employed to derive relevant metrics for quantitative and qualitative description of vegetation. It also provides an excellent basis for the estimation of live and dead biomass in forests.

Study area and data

For this study the CH2 test site *Uckermark* in north-eastern Germany was chosen. The test site selected is a beech stand (*Fagus sylvatica*) with only few other individual species (*Quercus robur, Picea abies, Fraxinus excelsior* and *Carpinus betulus*). In 2011 and 2012 in the framework of CH2 field campaigns for the purpose of Natura 2000 mapping took place there. During mapping a significant amount of dead trees (downed and standing) was found. All of these trees (in total, 29 downed and 40 standing) were mapped with RTK GPS and terrestrial photographs were taken. Tree stumps and occasional piles of fine woody debris were not considered. The ALS data were collected in spring 2011 (May 5th and 6th, leaf-on) and in early spring 2012 (March 22nd, leaf-off) using a Riegl LMS Q680i full-waveform system mounted on a helicopter with an average point density of 21.8 echoes/m² for the leaf-on and 16.9 echoes/m² for the leaf-off flight. A highly detailed digital terrain model (DTM, grid size 0.25 m) was created from the last echoes of the leaf-off data and subsequently the ALS point cloud was augmented with the normalized point heights (i.e. the height of the echoes above the terrain).

Detection of fallen trees

This high-density point cloud provided good characterization of downed trees and made a direct identification of the stems possible. The presented approach for the detection of downed stems is based on various input parameters derived from full-waveform (FWF) ALS data. A stepwise process for the detection of fallen trees was developed, which is based on the combination of point cloud filtering, morphological image processing and map algebra. As the final result, a vector map representing the outlines of the identified downed stems is produced (see Figure 1c). Even more downed trees were found in the area by the automated process than in the field. For the whole study area 70.4% of the stems were detected and 29.6% were not found in the field.

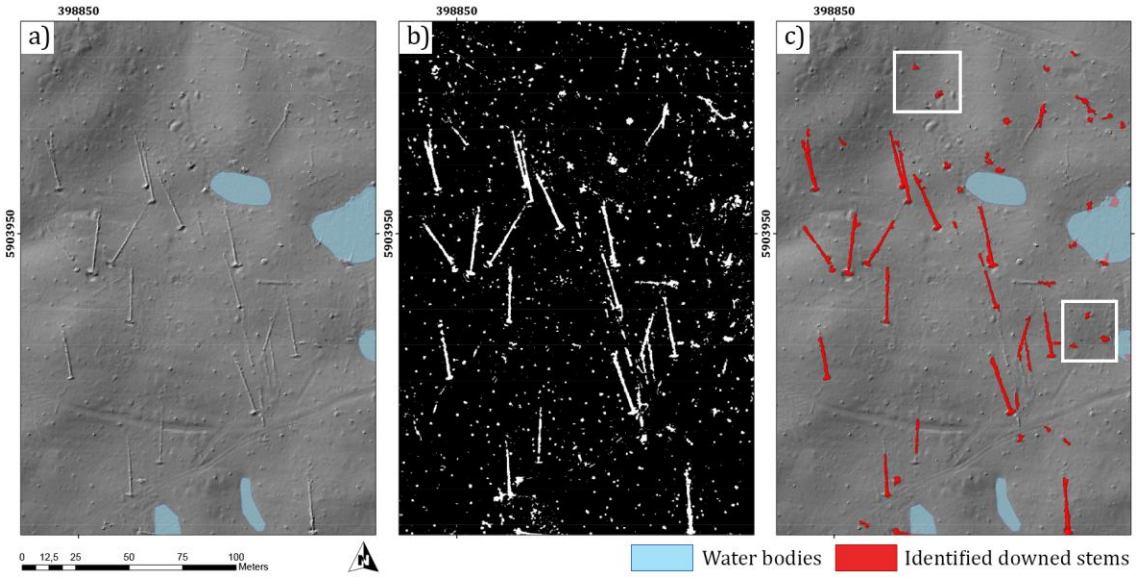


Figure 1: a) Shading of DHM overlaid with manually digitized water bodies; b) binarized normalized DHM with clearly visible downed stems; c) DHM overlaid with identified downed stems.

Identification of standing dead trees

To develop a method for the detection of standing dead trees, twelve dead and twelve live trees were selected as sample trees and their point clouds were extracted for analysis. The different representations of live and dead standing trees concerning the point distribution (i.e. number of echoes in a certain height interval), the FWF attributes echo width and amplitude were investigated per sample tree. The investigations were carried out for the leaf-off and the leaf-on data set, likewise. For visualization purposes boxplots were created, showing the distribution of the tested echo attributes with respect to the corresponding normalized point height. The boxplot given in Figure 2 shows that the vertical distribution of echoes from dead trees at both acquisition times is more equal than for live trees. This is partly due to the high number of dead sample trees without a crown in our study area, but nevertheless it serves as an indicator for trees at this stage of decay. In contrast, the echo amplitudes feature significant differences for leaf-off and leaf-on data, which can be seen in Figure 3**Fehler! Verweisquelle konnte nicht gefunden werden.**. While again the vertical distribution for the dead trees is rather equal for leaf-off and leaf-on, the trend for the live trees behaves contrarily. It shows significantly higher amplitudes in the top 30% of the echoes in the leaf-on than in the leaf-off, which is most likely caused by green foliage and its high reflectivity in the near infrared. This is also the strongest discriminator if employed for identification of dead trees during leaf-off season and live trees during leaf-on season using only the echoes in the top 30% of the tree heights.

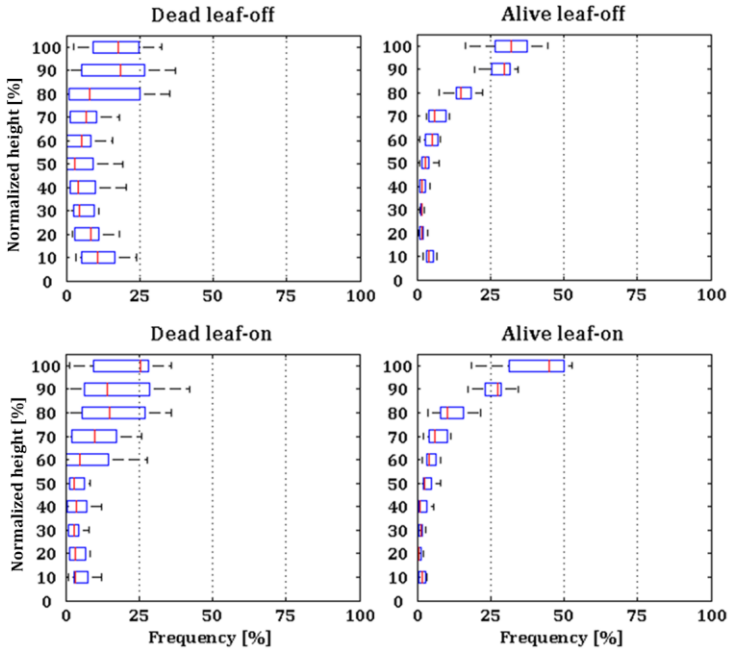


Figure 2: Boxplots showing the point distribution of all ALS echoes from the leaf-off and leaf-on data for the selected standing live and dead trees (red mark = median, blue box = 0.25 to 0.75 quantile, black line = data range without outliers).

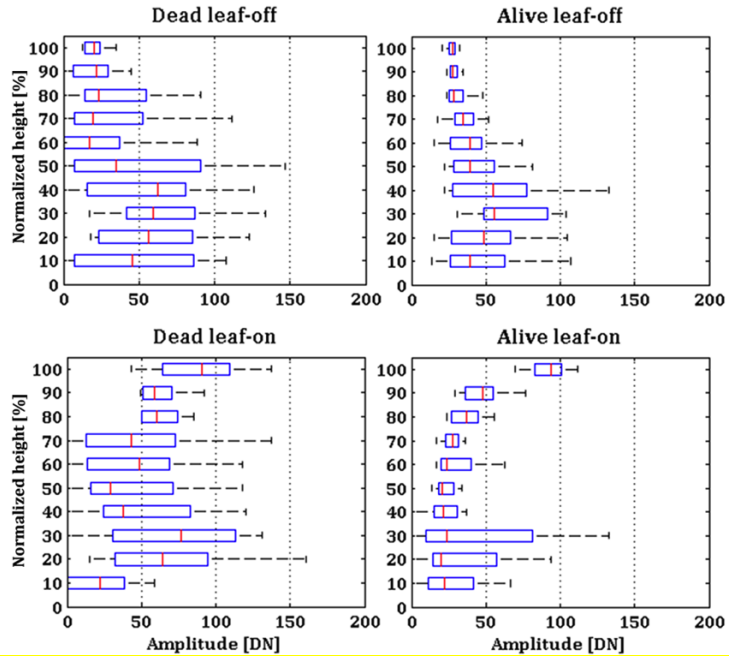
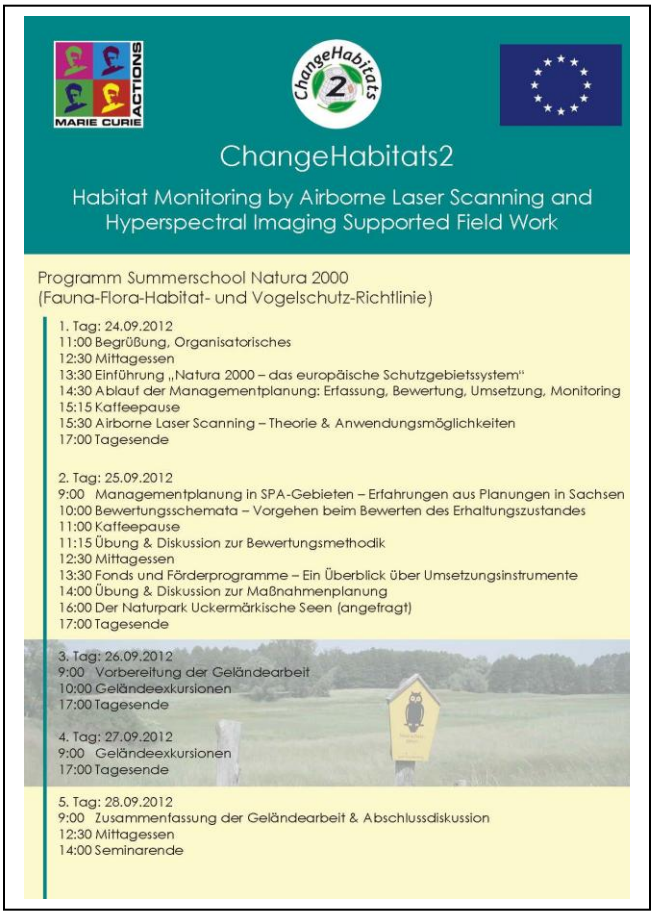


Figure 3: Boxplots showing the echo amplitudes of all ALS echoes from the leaf-off and leaf-on data for the selected standing live and dead trees (red mark = median, blue box = 0.25 to 0.75 quantile, black line = data range without outliers).



Habitat Monitoring Summer School in 2012

YGGDRASILDiemer has organized the first Summer School on Natura 2000 Habitat Monitoring in the Uckermark from 24.9. to 28.9.2012

16 people, among them university students and staff from conservation authorities, attended the event. All of them emphasized that the workshop was an excellent chance to enhance their knowledge about Natura 2000 and basic mapping of natural habitat sites. There was ample time to discuss topics mentioned in presentations as well as for practical exercises. Participants called for repeating the summer school in the future.

Please see our homepage on further information and watch out for the application templates in summer.

Good News !!

Midterm Review successfully passed!

On 4.10 and 5.10.2012 we have accomplished our Midterm Review Meeting at TU Bergakademie Freiberg under the responsibility of Patrick Herlant, our Project Officer from Brussels.

All deadlines and deliverables had been collected in due time, and the review passed very smoothly and successfully. Now we can strive forward towards our second half in ChangeHabitats2.

Many thanks to REA and to our POs!