15th Meeting on Vegetation Databases

Vegetation Databases and Resurveys

Department of Biodiversity Research / Systematic Botany, University of Potsdam

2nd to 4th March 2016
Programme “Vegetation Databases and Resurveys”
15th meeting of the German Working Group on Vegetation databases

Wednesday, 2nd of March

14:00 – 14:15  Welcome and Introduction
  by Thilo Heinken, Jörg Ewald and Florian Jansen

Chair: Florian Jansen

14:15 – 15:00  Keynote: Dramatic losses of arable plant vegetation in the German lowlands – lessons from resampling studies
  by Karsten Wesche

15:00 – 15:25  Resurveying hedgerows: Community shifts over the past 50 years
  by Kathrin Stoltenberg

15:25 – 16:00  coffee break

Chair: Barbara Michler

16:00 – 16:25  Collecting in situ data for assessing changes in habitat quality over time
  by Maud Raman

16:25 – 16:50  Vegetation of East African wetlands: human impacts and resulting changes in species composition
  by Miguel Alvarez

16:50 – 17:15  Re-survey of floodplain vegetation along the Upper Rhine
  by Peter Horchler

17:15 – 17:40  Resurveying historical vegetation data – opportunities and challenges
  by Gerald Jurasinski

19:30  Conference Dinner at Alter Stadtwächter, Schopenhauerstr. 33
      (near Luisenplatz)
Thursday, 3rd of March

Chair: Ute Jandt

09:00 – 09:45   **Keynote: Combining community resurvey data from multiple sites to advance global change research**
by Kris Verheyen

09:45 – 10:10   Using vegetation resurveys and trait-based analyses to reveal interactions among land-use legacies and global environmental changes
by Mike Perring

10:10 – 10:35   The legacy of doing nothing - accession and analysis of vegetation plot data from strict forest reserves
by Jörg Ewald

10:35 – 11:05   coffee break

Chair: Peter Horchler

11:05 – 11:50   **Poster session I with introduction by every author**

11:50 – 12:15   WeiVegBase - the Weihenstephan Vegetation Database
by Barbara Michler

12:15 – 12:40   How to make vegetation sampling data accessible on GBIF.org
by Kyle Braak

12:40 – 14:10   lunch break (e.g. Mensa Am Neuen Palais)

Chair: Thilo Heinken

14:10 – 15:10   Introduction to the Botanical Garden of the University of Potsdam
by Michael Burkart (guided tour)

15:10 – 15:35   Multiple drivers interact in changing herb layer species composition over 50 years in temperate forests
by Tobias Naaf

15:35 – 16:00   A resurvey revealed converging species richness in ancient and post-agricultural forest stand in NE Germany over five decades
by Jens Kolk

16:00 – 16:30   coffee break

Chair: Cord Peppler

16:30 – 17:15   **Poster session II with introduction by every author**

17:15 – 17:40   Vegetation change in forest nature reserves in Brandenburg over 50 years strongly depends on initial site conditions
by Thilo Heinken

17:40 – 18:05   Towards an integrated research platform of the Czech forest vegetation: combining long-term plot resurvey and historical management data
by Radim Hédl

19:30   Dinner at L'Osteria, Humboldtstr. 1 (near Alter Markt)
Friday, 4th of March

Chair: Jörg Ewald

09:00 – 09:45  
**Keynote:** How vegetation re-surveys can help to understand the effects of land-use change and atmospheric deposition on grassland vegetation  
*by Martin Diekmann*

09:45 – 10:10  
Revising Ellenbergs indicator values for continentality and zonality based on global vascular plant species distribution  
*by Erik Welk*

10:10 – 10:35  
25 years of vegetation development on an avalanche run at Mount Watzmann  
*by Hagen S. Fischer*

10:35 – 11:05  
coffee break

Chair: Frank Richter

11:05 – 11:50  
Changes in species composition of central German Nardus grasslands 1986-2012  
*by Cord Peppler-Lisbach*

11:50 – 12:15  
No changes in mountain meadows species composition after 25 years  
*by Ute Jandt*

12:15 – 12:40  
Small-scale Study on long term-development of restored mountain meadow  
*by Melanie Forker*

12:40 – 13:10  
Conclusion and plenary discussion

13:10  
End of conference and farewell
Keynote Abstracts
Dramatic losses of arable plant vegetation in the German lowlands – lessons from resampling studies

Karsten Wesche, Stefan Meyer, Benjamin Krause, Marlieb Dedek, Thomas Becker, Erwin Bergmeier & Christoph Leuschner

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The cultural landscapes of Central Europe, but also of most other regions on the continent, have been shaped by human land use over millennia. The most pronounced effects are seen in agricultural fields which were home to diverse communities of arable plants and their associated fauna. In the last century, land use has rapidly intensified, especially so since the advent of industrial arable farming in the 1950s and 1960s. In consequence, declining agrobiodiversity is increasingly viewed as a major problem in nature conservation. Long-term studies dating back more than 30 years and thus capturing the mentioned period of intensification are, however, lacking. Germany is among the most densely populated and intensively used countries in Europe, but also among its most well studied. The outstanding tradition of Central European phytosociology provided a wealth of historical information, and comparison of historical vs. recent vegetation samples is becoming a standard approach. One strategy relies on the tremendous power of analysing data bases with up to a Million and more plots, while here we concentrated on a few thousand samples from selected regions.

The talk summarises results from a concerted set of resampling studies, spearheaded by the University of Göttingen in cooperation with Senckenberg Görlitz. Our focus was on capturing the last 5-6 decades. We compared historical and own data (semi-permanent plot design), and selected regions across the northern German lowlands thereby covering the main habitats of clayey, loamy and silty soils. Our results show the vast extent of changes, with plot-level richness declining by >70%, while arable weed cover declined by >90%. Specialist species, especially those of calcareous sites were among the most heavily affected, and the formerly clear-cut differences in plant community composition between substrate types disappeared. The lack of diagnostic taxa made it impossible to assign recent vegetation samples to established phytosociological associations or alliances. Field margins, however, still maintained a reasonable richness. Unfortunately, introgressive species from adjacent habitats accounted for a large share of their species, and field margins had also declined tremendously as a consequence of ever increasing field sizes. We conducted further studies on population ecology of selected arable plants and found evidence for detrimental genetic structures raising concerns about further increasing local extinction rates. Even garden populations which form a potential for rewilding show similar adverse genetic structures. In summary, our data clearly show that diversity of our cultural landscapes has experienced catastrophic losses since the 1950s. Although we are just beginning to understand the dramatic consequences in terms of species conservation as well as ecosystem functioning and ultimately ecosystem services, we have little reason to expect any change to the better.
Combining community resurvey data from multiple sites to advance global change research

Kris Verheyen

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Increasing human impacts on the environment have large and pervasive impacts on the composition and functioning of ecosystems. This makes it important to document how ecosystems and communities are changing and to determine how the multiple drivers of global change interact. Without such knowledge, we will be unable to develop appropriate actions to prevent the further erosion of biodiversity and to maintain desired ecosystem functions. During the last decades, ecologists have been revisiting communities surveyed in earlier decades to study long-term shifts in community composition and infer the likely drivers of the ecological changes observed. The utility of such single-site resurveys is, however, limited if we are to understand the cumulative, relative, and combined importance of the multiple, often interacting, global-change drivers now affecting ecological communities. In this talk I will illustrate how combined analyses of resurvey data from multiple sites, spanning large environmental gradients, can provide novel insights and enables to answer a wide range of important basic and applied ecological questions.
How vegetation re-surveys can help to understand the effects of land-use change and atmospheric deposition on grassland vegetation

Martin Diekmann

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Changes in vegetation often manifest themselves first in floristic changes, documented in the decline or spreading of single species. To examine the general patterns of changes in species composition and their underlying environmental factors, we can apply three approaches: experiments, spatial comparisons or time series analyses. I will review the pros and cons of these approaches and show that temporal comparisons in turn consist of different types varying in the spatial precision with which old plots can be (re-)surveyed.

In grasslands, permanent plots s. str. hardly exist. Compared to forests, semi-permanent plots also are rare, but I will give three examples of studies from wet grasslands where such semi-permanent plots contribute to understand the dramatic compositional changes and the catastrophic loss of species richness in this community, but also the potential for restoration.

If no semi-permanent plots but a large number of relevés from different time periods and localities are available in data bases, such "non-permanent plots" may still enable us to analyze temporal changes in the vegetation and environment. This is shown in two case studies from acidic and calcareous grasslands. Irrespective of the type of data, however, re-surveys and other time series analyses have to deal with various problems of data analysis and interpretation, relating mainly to differences in plot size and the use of Ellenberg indicator values.
Abstracts of Oral Presentations
Resurveying hedgerows: Community shifts over the past 50 years

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We present a resurvey of hedgerows from the “Knick” landscape of eastern Schleswig Holstein, Germany. The original survey was done by H.E. Weber in 1967 in his comprehensive and pioneering work on hedgerow vegetation, and new data from totally 51 plots was sampled in 2015.

Over the past five decades, there was a distinct shift in the herbaceous species composition of the hedgerows. To understand the reasons for these changes, we compared the mean Ellenberg indicator values and the measured pH values as well as hedge shape parameters of the hedgerows between the recent and the original study. The factor that appeared to influence the species composition most is the increase in nutrient supply. The hedge shape changed as well, indicating an altered hedgerow management. An increase in the height of the shrub layer was related to a decrease in species richness. Interestingly, we found a contradictive relationship between measured pH values and mean Ellenberg indicator value for reaction: While the former showed a decrease over time, the latter suggested an increase.

Species richness decreased in some groups (shrubs and herbaceous forest species) but increased in others (grass species and arable weed species). Overall there was a decrease in species richness. An analysis of the species’ changes in frequency in relation to their Ellenberg indicator values showed that species with higher nitrogen and temperature values had increased. There was also a decline in red-listed species and a slight increase in neophytes.
Collecting in situ data for assessing changes in habitat quality over time

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In Northern Belgium (Flanders) in situ data is collected in several monitoring programs in order to assess the habitat quality over time. An overview of the most important projects (goals, output, relevance for policy) will be presented. More details will be given about the monitoring scheme for Natura 2000 habitat quality. Using permanent vegetation plots, indicators are measured or estimated to assess the conservation status of habitat types. According the habitat type nested plots with different dimensions are applied for assessing species composition, cover of vegetation structure. We’ll discuss the choice of plot dimensions in relation to the precision of indicator-values, different driving mechanisms and the scale at which vegetation quality components occur. The habitat map of Northern Belgium is used as the sample frame and a spatially balanced random sampling is applied (the Generalized Random-Tessellation Stratified method). We will explain how the sample size was determined and why Special Areas of Conservation are monitored in more detail. Total monitoring effort comprises around 5000 sampling stations for 49 habitat(sub)types that will be revisited with a 12-year frequency. We want to achieve maximum synergy with other monitoring techniques, by making use of existing sampling units as much as possible and, if needed, add extra sampling units to reach the desired precision level. By linking vegetation plots with (plot-level) environmental data not only trends of vegetation characteristics and environmental factors can be observed. Also vegetation change at future combinations of environmental factors can be predicted (scenario analyses) or the data can be used for testing ecological models.

We will finish our presentation by proposing a framework for vegetation research -using in situ data- at different spatial and temporal scales aiming to create (re)surveys on a European scale.
Vegetation of East African wetlands: human impacts and resulting changes in species composition

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East African wetlands have been affected by a wide range of land uses, causing direct impacts on structure and ecological functions of wetland vegetation. Such human activities range from material extraction for diverse purposes (e.g. fodder, craft and construction materials) to complete destruction of vegetation cover (e.g. for cropping and mining activities). Limited information on diversity of plant communities in East African wetlands makes a proper ecological assessment very difficult. In order to define reference states for different types of wetland vegetation in the studied area (i.e. pristine or potential natural vegetation), we carried out diversity comparisons of recently and historically collected data. A typology of plant communities resulted in a syntaxonomic classification of wetland vegetation for East Africa and neighbouring countries. Most of the plant communities were assigned to the classes *Lemnetea, Potametea* and *Phragmito-Magno-Caricetea*. Destruction of vegetation cover in semi-aquatic environments tends to shift the zonation of the wetland vegetation by expansion of vegetation types typically associated with seasonally flooded fringes of wetlands. Extreme destruction of the vegetation is often succeeded by the establishment of *Oryzetea* communities. Strong changes in hydrology, usually caused by drainage, result in the occurrence of terrestrial weed communities belonging to the class *Soncho-Bidentetea*. Aquatic vegetation (classes *Lemnetea* and *Potametea*) is most affected by increasing turbidity in shallow waters and aggressive spread of invasive plant species, mainly introduced from the Neotropics. Both, syntaxonomic results of our survey as well as data stored in SWEA-Dataveg have potential applications in monitoring and assessment activities. In this contribution, we also make a short account on the data stored in SWEA-Dataveg (currently more than 3,000 plots) and the development of some tools designed to handle and share such data.
Re-survey of floodplain vegetation along the Upper Rhine

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In the year 1977 the last impoundments at the upper River Rhine were built leaving this part of the river in a heavily modified hydrologic and morphologic status. The Federal Agency for Nature Conservation (BfN) had the task to monitor the effects of these changes on the floodplain vegetation. More than 100 relevés were established by 1982. 82 of these relevés could be re-located in 2012. However, the site conditions of 28 of these have been strongly changed in the meantime including complete deforestation by storm events or by the forestry. The site conditions of 54 relevés seemed to be little altered. Therefore, in 2013 these sites were re-surveyed by the Federal Institute of Hydrology (BfG). A comparative analysis of the corresponding relevé pairs revealed that there are changes in diversity, stand structure, and site conditions as indicated by changes in mean Ellenberg indicator values of the relevés. The overall gamma and alpha diversity (mean species number) as well as the dominance (Simpson) was higher in the old relevés of 1981/82 while beta diversity was slightly lower. The main structural changes were significant increases of the cover of the herb shrub and tree layers from 1981/82 to 2013. The mean Ellenberg indicator values of the relevés showed and overall significant increase in soil nutrients and a significant decrease of soil moisture and continentality. However the variance in all values is fairly high, i.e. the above mentioned main trends were reversed in some relevés. It remains unclear how these findings can be interpreted most of all because there are no reliable hydrologic data. Further investigations of land use changes and groundwater measurements may clarify the interpretation of the results.
Resurveying historical vegetation data – opportunities and challenges

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Historical plot-based vegetation surveys provide a unique opportunity to estimate vegetation changes over past decades. But historical plots were usually not permanently marked, causing uncertainty in plot location for vegetation resurveys, which may have major implications for the outcome of environmental change research studies. Vegetation data obtained from the resurveying of non-permanently marked plots are assessed for their potential to study environmental-change effects on plant communities and the challenges the use of such data have to meet. We describe the different types of vegetation data that are available from different sources for resurveying and highlight the potential of such data types for studying vegetation dynamics and their drivers. Finally, we discuss the challenges and limitations of resurveying non-permanently marked vegetation plots for different purposes in environmental change research. Pseudo-turnover caused by the imprecise location of sampling units and observer bias in studies dealing with non-permanently marked plots is the greatest challenge distorting the estimates of vegetation change to an unknown extent. For efficient reduction of the effects of uncertainty and errors related with observers and plot relocation we should: (i) assure a high quality of vegetation samples to keep estimates of change most reliable; (ii) consider all information available from historical studies in order to keep plot relocation errors low; (iii) resurvey at times of the year where vegetation development is comparable to the historical survey to control for seasonal variability in vegetation; (iv) keep a similar level of experience of the observers to keep observer bias low; and (v) carefully prepare and standardise datasets before analyses.
Using vegetation resurveys and trait-based analyses to reveal interactions among land-use legacies and global environmental changes

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A major challenge in ecology is to predict how multiple global environmental changes across spatial scales will affect future ecosystem properties, in terms of both composition and function. Here, I will discuss how vegetation resurveys, in combination with trait-based analyses, provide an opportunity to address this challenge, illustrating my points in the context of land-use legacies across European temperate forest understoreys. I will present a recent analysis which suggests that the potential for interactions among land-use legacies and global environmental changes has been ignored. I will provide arguments as to why these interactions are likely present, due in part to fundamental community processes of dispersal, selection, drift and speciation. Plant compositional trajectories related to these processes, which can be revealed through resurveys, are affected by the changed resources and conditions engendered by land-use legacies and global environmental changes. Synthesizing this information on legacies with lessons from other complex dynamic systems suggests that knowledge of a contemporary state alone will be unlikely to allow accurate future prediction of the ecological effects of global change drivers. Vegetation resurveys across spatial environmental gradients thus provide an opportunity to elucidate under what circumstances interactions among land-use legacies and global environmental changes need accounting for. These analyses, when conducted with a functional trait perspective where traits relate to fundamental community processes, can improve our understanding of ecosystem composition and process responses to environmental change, ultimately aiding ecological prediction and management.
The legacy of doing nothing – accession and analysis of vegetation plot data from strict forest reserves

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Keywords: disturbance, shade tolerance, succession, vegetation database

Strict forest reserves (SFR) where human intervention is excluded provide an important reference for silviculture and nature conservation. In Germany, ca. 730 natural forest reserves and core zones of several biosphere reserves and national parks have enjoyed this type of legal protection for up to 45 years. As vegetation sampling is a standard procedure in monitoring SFR, there are probably thousands of plots scattered in archives and databases. The scientific potential of analysing vegetation data from SFR is demonstrated on three examples. Tracing succession on permanent plots, as the most obvious approach, has often shown a slow, progressive loss of heliophytic species (disturbance indicators including less shade-tolerant trees), but even of forest plants in the strict sense, resulting in reduced species richness. Oak and pine woodlands in SFR are frequently losing their diagnostic species. Disturbance of forests by climatic and biotic agents creates ephemeral niches for nitrophytic ruderals. Few studies have demonstrated considerable resilience of open grassland and heath against colonisation by trees. Due to denser tree (and regeneration) layers, SFR are usually poorer in overall and understory species richness than managed forests on comparable sites. Low disturbance seems to favour homogeneity of microhabitats and functional groups. Comparing of overstory and tree regeneration composition in SFR yields a co-occurrence based model of shade tolerance.

We are currently trying to make vegetation plot data with a minimum of metadata (type and date of protection, plot size) available through the national platform VegetWeb 2.0. We report on progress and obstacles on this path, which should ultimately allow broad-scale, co-operative and comparative data analysis.
WeiVegBase – the Weihenstephan Vegetation Database: structure and its application for resurveys

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Databases of vegetation plots that compile data from different sources should as far as possible maintain the original information of these data. Most vegetation databases in use today are based on a three-table data model: a list of projects, a list of site factors and a list of species growing on the plot and their importance values. This is sufficient for many classical phytosociological projects. However, many projects feature a structure that cannot be represented by a three-table data model. Relevés from strict forest reserves in Bavaria e.g. are clustered in topographical space. Information associated with the nature reserve (e.g. date of designation) exists as well as information associated with the individual relevé (e.g. site factors). In projects with spatial subsampling some data are associated with the whole relevé whereas others refer to subplots. Permanent plot research and resurvey projects produce data that may change in time (cover, temperature or management) and others that may not change (e.g. altitude).

The aim of WeiVegBase, a new database model for synecological data, is to provide a data model that stores these kinds of data in a normalized relational database without losing original information. The database is implemented in the open source software PostgreSQL (www.postgresql.org), but the structure can be used in any other relational database system. It can handle different data structures commonly used in phytosociological research. It supports cluster sampling as well as spatial and temporal subsampling. It includes a great variety of importance values like cover-abundance-classes, biomass, abundances, frequencies, basal area. Faunistic data can be incorporated as well, and geographic references are implemented in a great variety of concepts.

WeiVegBase distinguishes 6 data levels (tables) as well as obligatory – standard – usual – special data. The number of obligatory data is reduced to an absolute minimum in order to not exclude any existing data. Beside the variables of the primary keys only the country, observer and the importance value of the species is obligatory. Standard data are expected to appear typically in most vegetation data sets like altitude, slope, aspect and plot size. These first two categories are stored in the standard tables. Usual data are frequently missing, like detailed geographic references. Special data are expected to be specific only to single projects. They are stored in project specific tables that can be linked to the main tables of the database.

We will present the basic data structure as well as some recent applications which focus on resurvey in Bavarian lichen pine forests and in wind thrown forests in the Bavarian Forest National Park.
How to make vegetation sampling data accessible on GBIF.org

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Vegetation scientists can now make their vegetation sampling data accessible on GBIF.org in order to enhance accessibility for other researchers and show a commitment to open access and reproducibility that are integral to scientific inquiry. GBIF.org is the world's largest source of species occurrence data, providing free and open access to more than 640 million occurrences from more than 15,000 datasets published by nearly 800 institutions. Its near real-time infrastructure is widely used, too, currently averaging more than one substantive use in peer-reviewed research per day.

Over the past two years, however, the GBIF Secretariat has been working with EU BON partners and the wider biodiversity informatics community to enable sharing of “sample event datasets”. These data derive from environmental, ecological, and natural resource investigations that follow standardized protocols for measuring and observing biodiversity. GBIF.org could not provide this type of data previously due to the complexity of encoding the underlying protocols in standardized ways.

In March 2015, TDWG, an international body responsible for maintaining standards for the exchange of biological data, ratified changes to Darwin Core that enable support for mobilization of sample event based data, in particular species abundance. Then in September 2015, GBIF enhanced a new version of the Integrated Publishing Toolkit, or IPT (its free open-source data publishing software) that enables publication of sample event datasets and updated GBIF.org with enhanced indexing and discovery of these datasets.

The purpose of this presentation is to highlight that GBIF now supports sample event datasets, and to explain how vegetation scientists can share their datasets freely and openly through GBIF.org using the IPT. As an example, the presentation will demonstrate how vegetation plot surveys exported from TurboVeg gets converted into the new Darwin Core sample event format.
Multiple drivers interact in changing herb layer species composition over 50 years in temperate forests

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Little is known about the effects of initial site conditions, such as soil acidity or soil moisture, on long-term responses of plant communities to anthropogenic environmental drivers. Also, the way how multiple drivers interact with each other in affecting plant species diversity and composition is largely unexplored. Here, we resurveyed forest herb layer vegetation plots in northeastern Germany after more than five decades. Our main objectives were (1) to determine the effects of initial site conditions, here soil pH buffer range, on herb layer and environmental changes; and (2) to identify interactions between environmental drivers in affecting species diversity and composition. We observed significant changes in species diversity and environmental conditions, mostly in dependence on the initial site conditions. Species richness increased only at moderately acidic to base-rich sites, while floristic distinctiveness (beta diversity) generally decreased but decreased significantly stronger on base-rich than on acidic sites. The indicated environmental changes comprised increased shading (particularly on acidic sites), a decrease in soil moisture, acidification (only on initially moderately acidic to base-rich sites), eutrophication (only on acidic sites) and an increase in browsing pressure. The herb layer responses were affected by several important interactions among the drivers. The floristic homogenization was more pronounced the stronger the eutrophication signal, but only on (moderately) acidic sites, while the homogenization occurred independent of any eutrophication on base-rich sites. The environmental change indicators for soil acidity and nitrogen availability showed opposing effects on temporal species turnover and a positive interaction, pointing to atmospheric deposition as the most important driver. Our study demonstrates that both initial site conditions and interactions between different drivers should be taken into account in resurvey studies to broaden our understanding of plant community responses to environmental changes.
A resurvey study revealed converging species richness in ancient and post-agricultural forest stands in NE Germany over five decades

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Resurveys are an appropriate method to investigate changes of plant species richness and composition over time. Initial surveys that range back to more than a few decades are rare and the original plots are mostly difficult to relocate. However, exactly such resurveys are necessary to detect and quantify long-term changes in plant communities e.g. the payment of an extinction debt or colonization credit. We resurveyed the herb-layer composition in 83 ancient and 36 post-agricultural forest stands that were initially surveyed around 1960 (semi-permanent plots) in a region that exhibited massive land cover changes in the 18th and 19th century. We tested the hypothesis that species richness and species composition would have become more similar over time by paying the extinction debt in ancient stands and/or depleting the colonization credit in post-agricultural stands. We compared changes in species richness, composition and occurrence of single species with generalized linear mixed models using land-use history (ancient vs. post-agricultural), survey date (1960 vs. 2014) and their interaction as predictors.

Species richness increased significantly in both, ancient and post-agricultural stands. However, there was a significantly higher increase in forest specialist’s richness in the post-agricultural stands. Furthermore, four out of the six species with a high gain only in post-agricultural stands were ancient forest specialists which are known to be slow colonizers. In conclusion, the results point towards a convergence in species richness driven by a depletion of the colonization credit.

Our study highlights the importance of resurveys for the study of long-term changes in plant communities with the main advantage that changes can be analyzed with “real” field data.
Vegetation change in forest nature reserves in Brandenburg over 50 years strongly depends on initial site conditions

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In temperate European forests vegetation analysis on (semi)permanent plots has been widely used to detect diversity changes and to identify causes and consequences of environmental changes like eutrophication, changes in the forestry regime, climate change or spread of exotic species. We used 132 semi-permanent vegetation relevés in 14 nature conservation sites in Brandenburg (Northeast Germany) from the archive of the State Office to detect vegetation change between 1960-65 and 2014. We applied multivariate ordination, α- and β-diversity indices and the analysis of Ellenberg indicator values for nitrogen, reaction, humidity and light as well as the identification of winner and loser species to describe vegetation shifts. Data allowed a regional comparison of vegetation change over a wide range of different forest types from acidic and nutrient poor beech and pine-oak forests to base rich mixed deciduous forests.

Overall species richness increased strongly due to the spread of nitrophilous and mesophilic species. Together with a loss of species adapted to nutrient poor and light conditions this led to taxonomic homogenization. While nutrient poor, acidic sites underwent strong change and lost typical species, base- and nutrient rich forests showed fewer differences between historical and recent relevés. The strong increase of Ellenberg indicator values for nitrogen and reaction can be ascribed to eutrophication due to natural humus accumulation and anthropogenic nitrogen deposition. Increased humidity and decreased light indicator values suggest microclimatic changes after ceasing of silvicultural practices in nature conservation areas and the abandonment of historical woodland management practices. These factors turn out as key drivers of the observed vegetation change. A successional shift of acidic mixed pine-oak forests and thermophilic deciduous forests to mesic forests (“mesophilisation”) after cessation of management is indicated and probably accelerated by nitrogen deposition. The latter ones will not persist without nature conservation measures.
Towards an integrated research platform of the Czech forest vegetation: combining long-term plot resurveys and historical management data

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Forest vegetation in Europe has been subject of intense management over a long time. Management is the far most important factor altering the environmental conditions and consequently leading to vegetation community changes. Such changes are of primary concern of nature conservation and forestry management policy aiming at environmentally sensitive approaches. To understand correctly the linkages between forest vegetation and management, it is essential to study the past development and implement the resulting knowledge into advanced forest management and conservation strategies. We would like to outline an emerging platform of the integrated study of long-term forest vegetation development in the Czech Republic. It combines two essential information resources: a database of resurveyed vegetation plots and a database of historical forestry management. The former largely benefits from a large set of permanent plots established in the Czech forests since the 1950s. Comprising about 60 thousand plots, this database has been digitized. Nearly two thousands of the forest vegetation plots have been recently resurveyed, representing a wide range of forest vegetation types and management regimes. The historical management data have been retrieved from archival resources. The database comprises the history of forest management in over 30 thousand single pieces of information. Studies based on the resurveyed plots resulted in insights to vegetation changes representative to particular scenarios such as coppicing abandonment, artificially increased ungulate density and alterations in tree dominants. The current effort is to link the vegetation plot data with precisely designed set of parameters related to the past forest management. The future prospect is to create a functional database integrating long-term vegetation resurvey and past management data. It will provide unique insights into the long-term effects of management on Czech forest vegetation.
Revising Ellenbergs indicator values for continentality and zonality based on global vascular plant species distribution

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The Ellenberg indicator value system is widely used to perform resurveys of local plant communities in relation to habitat conditions. In contrast to ecological gradients like moisture, soil pH and light, the biogeographical indicator values for continentality and temperature were basically derived from species distribution ranges. Misunderstandings and methodological inconsistencies have hampered the applicability of these increasingly important large scale range characteristics. Here we present consistent and comprehensible assessment protocols for the determination of biogeographical indicator values for the Central European vascular plant flora.

The biogeographical indicator values are based on global species distribution data. Species’ distribution is converted to standardized range formulas that combine information on floristic zones, altitudinal preferences, and the distribution within the oceanity-continentiality gradient. Improved and revised range formulas are converted to new indicator values for continentality (C-value), and new values for the large scale temperature niche, called Zonality-(Z)-value, using simple algorithms.

New biogeographical indicator values and amplitudes for 2984 taxa of the Central European vascular plant flora are presented. The main improvement is the application of a clear and comprehensible assessment protocol. Both values follow a more balanced frequency distribution, rendering them more useful for broad-scale biogeographic analyses. Occurrence information and vegetation data are becoming increasingly available globally, while changing climatic conditions inevitably accelerate species range dynamics, and therefore the application of biogeographical indicator values will increase.
25 years of vegetation development on an avalanche run at Mount Watzmann

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Avalanches are a natural disturbance in mountain ecosystem. In the European Alps they usually occur only in the alpine and subalpine vegetation belt. But in 1986 an avalanche runs down to an altitude of about 600 m deep into the belt of deciduous forest. The trees were not broken but bent to the ground forming a dense canopy pressed to the ground. So the avalanche affected the ground vegetation and soil only produced only marginally. Although on the landscape scale the avalanche marked a strong visual impact we hypothesized that the species composition of the forest ground layer would not change significantly. Due to this presumably unique event A. Fischer established three permanent plot transects across the avalanche run. But in 1999 a second avalanche affected the site. First they thought, the site was lost for scientific evaluation. But they continued observing the development of the vegetation. In 2009 a third avalanche runs over the site.

The transects had been observed for more than 25 years. After that time we analysed the whole time series. Our analysis of forest patches which were affected only by the first avalanche shows that, although a strong change in forest structure has taken place, the species composition here remained to a large extent unchanged. This suggests that beneath the dense crown canopy built up by the bent trees the microclimate shows little change, mechanical soil disturbances are rare, and therefore species of open land have no chance to establish. In contrast, if the avalanche uproots and kills the trees a clear change in species composition is the result. On our permanent plots we were able to identify eight different succession pathways initiated by the different disturbance events, causing at various points of time a set of different development phases of the forest ecosystem on the avalanche track.

Despite a mere recovery to the initial state the vegetation showed an increase in diversity depending on the increase of the diversity of disturbances. The observations are currently continued.
Changes in species composition of central German Nardus grassland 1986-2012

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We resurveyed Nardus grasslands (northern Hesse, central Germany) 25 years after the first inventory in 1986. Sixty plot sites were revisited and relocated as precisely as possible in the field. New releves were made with identical plot sizes. Apart from species composition, we investigated structural parameters (cover shrubs, herbs and bryophytes) and soil parameters (thickness of organic layer, soil pH and C/N ratio) as well as present management. Surprisingly (and fortunately), Nardus grassland was still present at most of the resurveyed sites. Only one site had been afforested and none of the sites had been abandoned since 1986. On the contrary, management had been re-introduced on some of the former fallow sites. However, a considerable shift in species composition was observed in many plots: diagnostic species of Nardus grassland (*Nardeta*lia) and general low-nutrient indicators declined, while at the same time, species of eutrophic grassland (*Molinio-Arrhenatheretea*) and indicators of abandonment increased in richness and abundance. Accordingly, Ellenberg indicator values for soil reaction and nitrogen increased significantly. The floristic shift was mirrored in changes of soil parameters. Soil pH increased and thickness of organic layer decreased significantly, together with a tendency towards smaller C/N ratios. These patterns could be observed throughout all management categories.

Changes in species composition and soil variables depended on initial soil acidity. Species-poor Nardus swards on very base-poor sandstone soils were mainly showing quantitative shifts with increasing cover of *Festuca rubra* and *Agrostis capillaris* as well as decreasing cover of *Nardus stricta* and *Deschampsia flexuosa*. On base-riche sites, floristic changes were more significantly associated with qualitative changes in species composition, especially due to an increasing number of *Molinio-Arrhenatheretea* species.

In conclusion, our results indicate negative effects of eutrophication and some shortcomings of management as possible causes for quality loss in Nardus grassland. Management is probably too extensive and scheduled too late in the growing season, thus leading to problems of succession and eutrophication. However, general eutrophication and associated floristic shifts is obviously a problem independent from management and site characteristics, suggesting a combined effect of atmospheric nitrogen deposition and decreasing soil acidification.
No changes in mountain meadows species composition after 25 years

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In the Harz mountains, deforestation and subsequent grazing have led to the establishment of mountain meadows with a distinctive species composition. These mountain meadows are protected by European and national law (Natura 2000, habitat code 6520). In the face of land use abandonment and intensification, we asked how species composition in these meadows has changed over the last 25 years. Out of a total of 580 permanent plots with a size of 10 m² that had been established between 1990 and 1992, 30 plots were re-visited in 2014. In addition, plant leaf traits were determined at the time of the resurvey. Statistical analyses were performed to address changes of the species composition of the study plots and to reveal whether changes were related to specific vegetation types, plant species, or plant functional traits. Furthermore, we tested whether changes depended on diversity (species richness, evenness) and productivity. Surprisingly, the community composition changed only marginally between the two surveys. Most species showed no changes in average abundance. In cases where the number and location of individuals were recorded, they were often recovered at the same positions, which points to very stable community dynamics. However, there was a trend of increasing moss cover of typical meadow mosses. The only community weighted mean (CWM) of a trait with a significant change over time was specific leaf area (SLA), which decreased significantly, whereas CWM of all other traits and of Ellenberg indicator values remained unchanged. Despite this change in SLA, which points to decreasing nutrient supply in a fraction of the permanent plots, our results indicate that the recent nature protection management of the Harz montane meadows appear to be appropriate for maintaining the mountain meadow species composition.
Small-Scale study on long-term development of restored mountain meadows

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After the collapse of intensive agriculture in East Germany, nature conservation efforts were put in place on sites with marginal yields. In Saxony, the large-scale conservation project “Bergwiesen im Osterzgebirge”, funded by the German Federal Agency for Nature Conservation (BfN), covers 750 ha in the Eastern Ore Mountains near Geising. Comprehensive management for nature restoration and conservation started in 1996. This case study is part of a larger resurvey in the Eastern Ore Mountain region and presents the general development trends at the Geisingberg-sites between 1993 and 2013 focusing on the latest improvements. Four meadows have been chosen for the long-term monitoring (Hachmöller 2000). In their initial state, they represented the following vegetation types:


On each site, eight permanent plots 5x5m have been established and marked with permanent magnets. Sampling with a full Braun-Blanquet relevé has been carried out in the years 1993–1997, 2001, 2004, 2007 and 2013. Soil data was collected in 1993 and 2013, ultimately also structural parameters were measured for every permanent plot.

For the development analysis, two-year-steps of the first sampling period have been included, resulting in 208 relevés that were considered for a detrended correspondence analysis (DCA). The gradient of all relevés equals to 4, the mean turnover in 20 years is approx. 2. The DCA shows a common trend for the 8 permanent plots on each site, but direction of development varies depending on initial state.
Abstracts of Poster Presentations

Poster session I
Regional drivers of forest vegetation change

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Systematic temporal changes in forest understory were recently identified across continents. Nevertheless, the drivers vary with scale: from local (i.e. changes associated with change in tree layer structure) to continental scale (i.e. nitrogen deposition & climate change). Here, we focus on drivers (or correlates) and spatial pattern of changes on regional scale, where the evidence is largely lacking. We compare the change in vegetation composition after four decades assessed by means of resurvey semi-permanent plots. We used GIS-derived topography indices, recent soil reaction and fine-resolution environmental map layers to see the correlates of observed change. Our preliminary results show, that nitrogen deposition rates are probably relevant not only on continental scale, but can differentiate even regional vegetation changes. Contrary, neither soil reaction nor topography indices exhibit any significant influence on the rate of the vegetation change.
Historical forest vegetation of the Uckermark region (NE Germany)

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There is a long tradition in Europe to demonstrate long-termed changes of forest cover with maps, e.g. Schlüter (1952-58) and Williams (2000). In few cases, even long-termed changes in tree species composition have been published from various parts of the world, e.g. Manies & Mladenhoff (2000) and Hall et al. (2002). For Germany, maps at scale 1:100,000 have been published by Glaser & Hauke (2004) showing the distribution of ancient and recent forest areas divided into deciduous, coniferous and mixed stands.

Maps with reconstructed historical tree species composition have been recognised as a valuable tool to assess the restoration potential of forest ecosystems (Bolliger et al. 2004). Historical maps are also a basis to analyse long-termed and large-scale changes in biodiversity of forest vegetation (Wulf & Rujner 2011, Stephens et al. 2015). Since several changes of biodiversity happened on a local scale detailed maps (scale 1:50,000 or finer scale) are needed (Hill 2005). Here, we presented a map from a northeastern German region at scale 1:50,000 with the historical forest vegetation approximately in 1780 and 1890, and compared it with the actual forest vegetation (c. 2010).

The most important results are: (i) the pattern of forest-arable field distribution was more or less stable over the last 220 years what is in accordance with the soil quality, and (ii) even the forest vegetation has been changed little. More than 80% of the forested area in 1780 was already dominated by Scots pine stands, and this pattern can be seen also in 1890 and in 2010. It underpins the necessity to maintain all (semi-)natural forest stands in the region.
Vegetation development in the Magdeburgerforth forest (Fläming Heath, Northeast Germany) over 64 years

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From 1948 to 1950 the phytosociologist Harro Passarge studied the vegetation of the former forestry district Magdeburgerforth (Fläming Heath, Saxony-Anhalt) and conducted in 120 vegetation relevés. 79 of these were resampled in 2014, i.e., after at least 64 years. The study area is characterised by a great variety of forest types (1950: Betulo-Quercetum roboris, Sphagno-Alnetum, Alno-Ulmion, Stellario-Carpinetum, Luzulo-Quercetum, thermophilic forests, Dicrano-Pinion). A part of the district is a strict nature reserve since 1975, while the rest is managed, allowing a direct comparison between managed and unmanaged forest. Because the plots were not exactly located in the first survey, this study used relevés in the same forestry section and mapped vegetation type, which were most similar to the old relevés. We applied multivariate ordination, α- and β-diversity indices and the analysis of Ellenberg indicator values for nitrogen, reaction, humidity and light as well as the identification of winner and loser species to describe vegetation shifts. Overall, there was no change in species richness. The studied vegetation showed an increase in nitrogen and a decrease light indicator values. Typical forest species sensu Schmidt et al. (2011) and woody species richness increased while open landscape species decreased. The forest vegetation types changed in different direction: While moist forests and rich deciduous forests remained quite stable, species richness in nutrient-poor forest types increased due to eutrophication, and thermophilic forests lost most typical plant species. Due to drainage within the managed forest parts the strict forest reserve is important for the Sphagno-Alnetum. The used method proved to detect vegetation development in different forest types, as they were in accordance with the results of studies based on semi-permanent plots. However, we found few differences between managed and unmanaged forests because of methodological limits and/or overall natural forestry practice in the study area.
Analysis of vegetation change of forests in the Elbe lowland between 1957-1963 and 2015

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Plant communities in temperate forest ecosystems are subject to many influences such as silviculture, nitrogen deposition, climate change and invasive species. Using historical plot-based data is an important means to document plant community changes and determine their main causes. In 2015 we investigated the vegetation change of 138 semi-permanent plots in commercial forests in the Elbe lowland of Saxony-Anhalt and Brandenburg (Northeast Germany). The first survey had been carried out by Heinz Quitt in 1957-1963 and was provided from his personal archive. The stands investigated with the Braun-Blanquet approach covered a wide range of different forest types from wet bog and swamp forests (*Betulion pubescentis, Alnion glutinosae*), base rich mixed deciduous forests (*Alno-Ulmion, Carpinion betuli*), thermophilic forests (*Quercion roboris*) to dry acidic pine forests with different nutrient status (*Dicrano-Pinion*). We applied multivariate ordination (NMDS), α- and β-diversity indices and the Ellenberg indicator values for nitrogen, reaction, humidity and light as well as the identification of winner and loser species to describe vegetation shifts. The NMDS and mean indicator values showed a decrease in soil moisture of swamp forests, whereas especially acidic pine forests became less light, more nutrient-rich and more moist. α- and β-diversity decreased in almost all communities. The number of loser species was more than twice as high as the number of winner species but with inconsistent patterns among the single forest types, and the thermophilic forests and lichen-pine forests lost most of their characteristic species. Among forest trees winner species were both indigenous species (*Quercus petraea, Fagus sylvatica*) and neophytes (*Pseudotsuga menziesii, Quercus rubra*). Overall indicator values of light decreased, whereas indicator values of reaction and nitrogen increased, but community responses differed. Although each forest type underwent an individual development, eutrophication, sinking ground water levels and silviculture are the most likely drivers of vegetation change.
Rapid changes in forest floor vegetation following catastrophic blowdown; Which plant traits best reflect the vegetation dynamics?

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Investigations combining measurements of the forest stand structure and of the changes in herbaceous layer were conducted from 1973 to 2015 in the Roztoczański National Park (50°31’–50°40’ N, 22°53’–23°07’ E), in mixed coniferous-deciduous forests of secondary origin, growing on rich and well-drained habitats. A permanent sample plot (100 m by 50 m) plot was established in 1973 to study forest stand dynamics, and a grid of 70 circular (0.5 m²) subplots was set up to study the dynamics of herbaceous plants. In August 2008 a tornado broke or up-rooted more than 50% of all trees in the sample plot. Therefore we established a twin plot in similar stand and site conditions outside the blowdown in autumn 2008. Changes in indices of plant diversity during seven years following the disturbance were compared in the between the disturbed and undisturbed plots. We also analyzed the changes in the cover of: light-demanding and shade tolerant plants; forest species and plants of open habitats; ancient woodland indicator species, species with various dispersal modes grouped into slow migrators, zoochores, and anemochores, species with various canopy heights, and species with various terminal velocities. Within the period of 2009-2015 an increase in species richness and diversity was recorded. There was also an increase in the cover of species of open habitats, in light-demanding species, anemo- and zoochores, and in species with canopy heights exceeding 0.5 m. In contrast, the shade-tolerant species of forest interior, including ancient woodland indicators, slow migrators with heavy seeds, and plants with canopy height less than 0.5 m decreased in cover. Thus, the reaction of the forest floor vegetation to sudden transformation of environmental conditions by tornado was very fast and dynamic. All the above-mentioned traits appeared to be sensitive indicators of ecological process which took place following the disturbance.
Plant functional trait changes in different forest dynamics scenarios: How much shade-tolerant are the ancient woodland plant species?

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Investigations on the dynamics of stand structure and changes in herbaceous layer were conducted from 1973 to 2015 in four study sites located in the Roztoczański National Park (50°31′–50°40′ N, 22°53′–23°07′ E), in secondary forest stands occupying rich and well-drained habitats typical for the oak-hornbeam community. Four rectangular (100 m by 50 m) plots were established for monitoring stand structure, and within each plot, a network of 70 circular (0.5 m\textsuperscript{2}) sample subplots, were set up to study herbaceous plants. In August 2008 a tornado destroyed tree stand in one of the study sites. We took advantage of that unexpected possibility to compare how different types of stand dynamics (with and without disturbance) affect the plants of the forest floor; we focused upon analyzing the plant functional traits. In the plots not affected by blowdown a gradual species turnover (decrease in pine, increase in hornbeam) has been recorded in the forest canopy. A constantly high proportion of species typical for undisturbed forest interiors has been found in the herb layer of these plots. In the plot affected by tornado changes in composition of the herb layer were very dynamic. Species of open habitats, light demanding plants, plants with large canopy heights and low terminal velocities rapidly increased in number. However, many herbaceous species regarded as adapted to very deep shade also increased in cover under the destroyed forest canopy. Thus, plant species typical for ancient forests also benefited from increased availability of light. They are shade-tolerant, but they react with increased growth and flowering to higher light levels. This is understandable when we consider the long-term dynamics of natural forests. In these stands the light conditions on the forest floor are neither homogeneous nor stable; places of deep shade alternate there with well-illuminated patches created by natural disturbances of various type.
Large-scale dieback is a characteristic of alder carrs. Different internal and external factors may trigger alder carr dieback. When the evapotranspiration rate decreases, as a result of the tree layer dieback, the groundwater table increases and the forest floor is inundated. This permanent inundation, as well as canopy openings, have a considerable influence on the vegetation of forest floor. The aim of this study was to characterise and quantify the changes in species composition in alder carr stands that have experienced forest dieback. The study was carried out in the ‘Olszyny Niezgodzkie’ nature reserve (SW Poland), a small part of a large complex of alder swamp forest (over 900 ha). In 1993, the reserve was the subject of a detailed phytosociological study, and the alder carr was documented by 16 phytosociological relevés. Unfortunately, no detailed localities of the sampled plots were given, but only the numbers of the forest sub-compartment (the smallest administration units in State Forests in Poland; a forest patch distinguished as a sub-compartment usually has the same age, structure, habitat conditions and species composition of trees). During the last 10 years an extensive forest dieback of alder carrs has been observed here. In 2013, which was 20 years since the previous study, we resurveyed the same patches of alder carrs. Due to a lack of information on detailed localities, we randomly generated the localities of the same number of new plots with the same size as previously surveyed in the forest sub-compartment. The new stands were sampled using the same methodology. We used McNemar’s test to assess the differences in species composition between plots sampled in 1993 and 2013. In addition, we used a comparison of the mean EIVs to reveal the ecological meaning of the recorded changes. The analysis revealed significant changes in species composition. The species of hummocks declined, while the species of hollows increased. Moreover, the current communities are dominated by some hydrophytes that were not recorded 20 years ago. The mean EIVs for moisture, light and temperature were significantly increased. We conclude that dieback of alder swamp forest entails extensive changes in species composition. The main drivers of this change are permanently higher groundwater level (as a result of a decrease in the evapotranspiration rate) and higher light accessibility (due to greater canopy openings).
The vegetation data set of the National Forest Soil Inventory in Germany –
A tool for studying species response to soil properties

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In our contribution we want to introduce the vegetation data set of the National Forest Soil Inventory (NFSI). Within this inventory the conditions of forest soils in Germany were assessed. The NFSI is a nationwide survey on a systematic 8 km x 8 km grid. First NFSI inventory was carried out from 1987-1993 on about 1900 forest plots, the second inventory (NFSI II) followed between 2004 and 2008 on about 1800 plots. Field assessment and sample analysis were conducted by the federal states. The measurements included pH, CEC, C, N and P concentrations, fine earth content and particle size analyses. While the NFSI is primarily a soil inventory, during the second NFSI also the vegetation was assessed on 1838 plots on a common sample area of 400m². Forest mensuration data was collected in 2011 / 2012 on all NFSI II plots. Further environmental information of the plots, e.g. climate and deposition, was assembled. The Thuenen Institute for Forest Ecosystems (TI-WO) in Eberswalde coordinates the NFSI and is the centre of the national data base. In our PostgreSQL data base we store primary data and metadata of NFSI, respectively. The evaluation of NFSI data is a joint and interdisciplinary project of TI-WO and forest unites of the federal states as well as further Federal Research Institutes (UBA, BGR) and universities. The high number of collaborating teams, the interdisciplinary approach and methodical changes over time make it crucial to take measures for data harmonization and quality assessment and control (QA/QC). In our contribution we want to explain the NFSI sampling scheme and show which measures of QA/QC were used. We want to give an overview about the vegetation data and about ongoing evaluations.
Abstracts of Poster Presentations

Poster session II
Snowbeds are more affected than other subalpine-alpine plant communities by climate change in the Swiss Alps

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Mountain regions are warming rapidly and the upward shift of plant species has been observed on many alpine and nival summits. On the other hand, the reaction of the subalpine and lower alpine plant communities to the current climate changes has been little investigated so far. The increasing temperatures, combined with lower precipitations, lead to an earlier snowmelt and therefore longer growing seasons.

In this study 63 old, exhaustive plant inventories have been selected in the Swiss Alps and revisited after 25 to 50 years later. The records cover a broad range of plant communities distributed along a subalpine–alpine elevation gradient. Both calcareous and siliceous grasslands have been studied, as well as snow bed and ridge communities.

The alpha-diversity increased in every plant community, likely because of the arrival of new species, but differences in sampling cannot be excluded. As already observed on mountain summits, new species were not very diversified, and this led to a homogenization of the plant records within a community. The studied alpine grasslands were quite stable in terms of species composition, whatever the bedrock type, although some of the species increasing in frequency indicate a trend towards warmer conditions. In contrast, snow bed communities showed pronounced vegetation changes and a clear shift towards composition of dryer grasslands. The longer growing seasons allow alpine grassland species, taller and hence more competitive, to colonize the snowbeds. This research showed that subalpine-alpine plant communities reacted differently to the on-going global changes. Plant communities linked to long snow cover are the most vulnerable to climate change and their persistence in the near future is seriously threatened.
Vegetation changes in formerly oligotrophic landscape in Northwest Germany: Resurvey after 43 years

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Keywords: resurvey, vegetation changes, oligotrophic landscape

We processed analog data from the early 1970s of the nature reserve “Sager Meere, Kleiner Sand und Heumoor”, also part of a Special Area of Conservation, in the administrative district of Oldenburg (Lower Saxony, Northwest Germany) in order to record and assess alterations in the fragile environment of two (formerly) oligotrophic waters, moor- and heathland. In 2014, we carried out a resurvey of 87 vegetation plots in the periphery of the waters. Additionally, we transformed a vegetation map of 1971 into a biotope type map that allows a comparison with a recent biotope type map of the area, which we derived from satellite images, official occasioned mapping and own mapping.

As a result we found out that areas of bushes and wood communities, partly moorland forests, have increased from 15 % to 38 % of the total area. In former times, the waters were surrounded by heathland and reeds in transition to water plants. Nowadays the water area is completely surrounded by woods. Nevertheless, oligotrophic littoral plants like *Luronium natans* and *Littorella uniflora* as well as the threatened riparian plant *Cladium mariscus* had been reconfirmed in 2014. Former occurrences of *Lobelia dortmanna*, also an oligotrophic littoral plant species of conservation interest, have been disappeared in the study area. In contrast to the forest growth moorland decreased in space from 28 % to 12 % of the total area. This led to an increase of forestdependent and shade tolerant species as well as in a decrease of mire-dependent species. As possible causes, eutrophication and acidification are to mention.
Plant–weather response during 50 years in a steppe community

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Long-term vegetation changes were studied within the period 1965–2015 in a steppe grassland community in Bohemian Karst, Czech Republic. The grasslands covered in this study have not been influenced by any management regimes or direct human impact since the 1960s. Plant species composition and vegetation structure were documented by micromaps and vegetation samples in 1966, 1979–82 and 1987–2015. We found that significant changes in vegetation took place, reflected by the composition of dominant species and some species traits. Weather fluctuations in average monthly precipitation sums and temperature means were identified as the main driver of these changes.
Northern Siberian steppes in the big picture – a database of Central Asian steppe vegetation

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The northernmost steppes of Central Asia are extrazonal outposts, restricted to well-drained, southern-exposed slopes within the zonal taiga and tundra vegetation of northern Siberia. We want to assess the species composition of these steppes and place them in the (phytosociological) context of the zonal steppe communities of Central and (to a lesser extent) Middle Asia. In particular, we want to find out whether the northern steppe outposts have analogues further south and how steppe vegetation changes along a latitudinal gradient from Mongolia towards northern Siberia. Additionally, we will analyze a continentality gradient from the east Siberian coast towards the inland.

Therefore, we compiled a database consisting of relevés from own expeditions to northern Siberia supplemented with data from throughout Yakutia (E. Troeva, M. Chytrý) and Magadan (Sinelinicova, 2008). This data is compared to relevés from Central Asia, ranging from southern Mongolia (K. Wesche), northern Mongolia (W. Hilbig) and Western Sayan/Altai Mountains (Ermakov, 2006) to southern Siberia (M. Chytrý). The database currently includes ca. 2000 relevés from more than eight different authors. Challenges in setting up and handling the database lie in combining data from several sources with different recording methods and especially, in different species concepts applied for the respective regions/flora.

We will classify steppe vegetation using JUICE and use standard ordination techniques for assessing similarity patterns. Using this database and classification we ultimately aim at characterizing ecological conditions of northern steppe vegetation using macro- (and as available micro-) climatic variables.
Database of pioneer vegetation of Ukraine

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Within the project “Syntaxonomy of pioneer and chasmophyte vegetation of Ukraine” a database of pioneer vegetation including 1452 full geobotanical releves was created. It consists of releves, which belong to the Thero-Salicornietea, Crysidietae aculeatae, Crithmo-Staticeteа, Ammophiletа, Cakiletаe maritimae, Isсeto-Nano-Juncteteа, Bidenteteа tripartitae, Koelerio-Corynephoretea and Festuceteа vaginataе classes. Besides classification of pioneer vegetation on the ground of this database an analysis of coenofloras by systematic, geographical, biomorphological, ecological structure and hemeroby degree was realized. With support of the R-project, PC-ORD, STATISTICA programs the phytoindication and ordination analyses of syntaxa were implemented as well as principal factors of their territorial and ecological differentiation were identified. In the near time the database will be registered in GIVD.
Geodatabase of vascular plants of the Tatra National Park - concept

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Tatra Mountains are the only alpine – type mountain range in Poland. Due to their unique fauna and flora as well as their high level of biodiversity they are protected by the National Park. However, the data concerning biodiversity, e.g. important plant species is scattered between different departments within the National Park and other conservation organisations outside the National Park. This situation sometimes causes difficulties in efficient management of the Tatra National Park (TNP), for instance, during renovation of marked trails, or forestry operations. Furthermore, even though the Tatras are claimed to be one of the most thoroughly examined area in Poland, almost every year brings some new floristic discoveries. The goal of this project is to establish a geodatabase of vascular plants which will be a decision-making support for different management units of the National Park. Geodatabase will be an informatics tool linking data about the plants (so called checklist of vascular plants - their description containing e. g. systematics, conservation status, Red Book status, characteristic features, status of occurrence) to the detailed distribution of species on the maps in GIS system of the Tatra National Park. The project includes both query and gathering of existing data within the institution and outside the institution, field work (inventory and mapping of species distribution, inspection of known sites of precious plants). The final output, has also a possibility to become an e-learning platform of vascular plants for the park’s employees. The project is being implemented during the Klaus Toepfer Fellowship Programme and it has been also submitted for EU funds as a part of the wider project regarding “Reduction of touristic pressure on species & sites on the area of NATURA 2000 PLC 120001 Tatra Mountains”. The author of the project hopes that this workshop will be an opportunity to discuss the concept of geodatabase, as well as to transfer technical solutions and knowledge in the field of databases with spatial reference.
BayVegBase – Start of a collaborative vegetation database as a powerful tool for ecological research in Bavaria and beyond Hagen

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We present BayVegBase, which started in early 2016 as a collaborative effort of researchers at several Bavarian universities and administrative bodies to establish a comprehensive vegetation plot database for this federal state in SE Germany. Based on experiences in other Central European regions, one can assume that in Bavaria between 100,000 and 500,000 vegetation plots exist in digital, printed or unpublished form. Of these nearly 20,000 are already imported in WeiVegBase format for previous project and hopefully mostly will become available in BayVegBase in the future, while in parallel we have started intensive digitisation efforts in Freising, Erlangen and Bayreuth. BayVegBase is the common property of the contributors who become members of the BayVegBase Consortium and elect the BayVegBase Board that governs the database. The data in BayVegBase are assigned to one of three possible data access regimes: restricted, semi-restricted and open access, where data of the first two categories are only accessible to members of the Consortium. The database in managed in WeiVegBase format (an MS Access application), but a parallel version in Turboveg 2 format for easier use will be provided in the near future. As soon as possible, BayVegBase will join the Consortia of the European (EVA; www.euroveg.org/eva-database) and global (sPlot; www.idiv.de/splot) vegetation-plot databases and when the formal and organisational requirements are fulfilled also the national platform VegetWeb 2.0. We believe that data from BayVegBase will be a major contribution to fundamental ecological research as well as conservation and land use management in Bavaria and beyond. If you wish to contribute data, please contact one of the corresponding authors.
Mycorrhiza of mountain meadows - Dispersal vs. side-conditions on small scale pattern

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The roots of nearly all vascular plant species live in very close contact with fungi-species (SMITH & READ 2008). They exchange nutrients which is mostly an advantage for both partners (BUNDRETT 2004, Smith & Smitz 2014). It is well known that management, disturbance, vegetation and floristic composition as well as the soil conditions can significantly influence the mycorrhiza community (e.g. TRESEDER 2004, SCHNOOR et al. 2011, OEHL et al. 2010). The mycorrhiza-fungi has an impact on plant species composition (see ZOBEL & ÖPIK 2014). Therefore, it is expected that mycorrhiza can influence restoration efforts (RENKER et al. 2004, MALTZ & TRESEDER 2015). Within our restoration project in the East-Ore-Mountains we investigated the mycorrhiza communities of mountain meadows in different developmental stages on a small spatial scale (project area 5 x 4 km). We analyzed the composition pattern of mycorrhiza communities to identify restorations constraints which can be caused by the absence of mycorrhiza partners. To get novel insights we sampled the soil of 50 meadows around the village Oelsen and extracted DNA. Barcoding was used to detect fungi species (done by A. SCHÜSSLER, SYMPLANTA GmbH & Co KG). In the samples 65 species of the Glomeromycota were detected. Their β-diversity is similar to the plant species diversity. We evaluate the influence of biotic and abiotic site conditions as well as the grassland management on fungi-communities. Finally, we discuss the expected restoration constrains on that local scale.
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Map of Sanssouci Park and Workshop Venue

Data from http://www.openstreetmap.org/
Map of Workshop Venue

Bus stop  
(Orangerie, line 695)

Registration & lecture room

Greenhouse: poster sessions & coffee breaks

Data from http://www.openstreetmap.org/
Map of City Center

Data from http://www.openstreetmap.org/