

# VegetWeb – the national online-repository of vegetation plots from Germany

Jörg Ewald, Rudolf May & Martin Kleikamp

**Abstract:** VegetWeb (GIVD ID EU-DE-013) is an online archive for vegetation-plot data from Germany and can be accessed at the FloraWeb website of the Federal Agency for Nature Conservation (<http://www.floraweb.de>). The data model of VegetWeb allows upload, storage and interactive search of plot data with different original formats and taxonomic reference. Due to financial constraints only a small proportion of Germany's legacy of plot data has been captured so far. VegetWeb co-operates with the journal *Tuexenia*, for which it provides an interactive online archive of relevé tables by capturing and distributing all newly published data.

**Keywords:** data sharing; ecoinformatics; vegetation database.

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## Database architecture

VegetWeb's architecture was developed based on <http://planto.de>, MoreTax (Berendsohn 2003) and <http://vegbank.org> and allows applying concept taxonomy to plant names (Berendsohn et al. 1999). VegetWeb serves as a repository with fast query interface. Data maintenance is not performed through a user interface, but by imports of the simple XML-Format ES-Veg. The vegetation information is stored in a MySQL Database which allows immediate online evaluation of the full floristic information within large datasets.

As plant names of the original relevé (e.g. *Luzula albida*) are stored alongside their interpretations with respect to standard lists (e.g. *Luzula albida* ≈ *Luzula luzuloides*), queries in VegetWeb automatically deliver plant names according to the German standard reference lists (Wisskirchen & Haeupler 1998, Koperski et al. 2000, Scholz 2000, Jansen & Dengler 2008). While query outputs are taxonomically coherent and ready-to-use, original names and their interpretations are stored in the database and can be retrieved for each plot in the form of a full observation report. The recent incorporation of the electronic reference list GermanSL (Dengler & Jansen 2008), which maps a large proportion of recurring synonymies, facilitates taxon interpretation, especially from existing TURBOVEG databases.

Three exchange formats are supported by VegetWeb: (1) ES-Veg, an easy to create XML, which is also exported by TURBOVEG (Hennekens & Schaminée 2001), the database software most commonly used in Europe. (2) A simple delimiter separated values format (csv) for exporting large numbers of vegetation plot data. (3) The new international vegetation plot exchange data standard Veg-X (Wiser et al. 2011).

Data integrity is ensured prior to import by applying XML schemas which validate the use of appropriate data types. During import of ES-Veg XML-data, missing key values like new or misspelled taxon names or references are logged and skipped, and missing values are added or corrected in a subsequent import.

Being embedded in the FloraWeb website (Fig.1), VegetWeb search results come with hyperlinks to species portraits and distribution maps. The species list of the full observation report can be submitted to the FloraMap module, where the distribution of species combinations can be visualised. FloraWeb and VegetWeb are in German language.

## Database content

VegetWeb started with two core data sets from forests. The late Udo Bohn had compiled 2,353 relevés of acidophytic beech forests, which is the vegetation type

with the largest potential distribution in Germany, at the Federal Agency for Nature Protection (BfN). In migrating this dataset to VegetWeb, Bohn made it publicly available, e.g. for the syntaxonomical treatment that was not granted to himself. In 2003 4,934 mountain forest relevés from the database BERGWALD (Ewald 1995, 2011) were added. In 2008 the Bavarian State Institute of Forestry (LWF) made 1,708 relevés from their vegetation database of natural forest reserves accessible through VegetWeb. In 2009 the conservation authority of Northrhine-Westphalia (LANUV) submitted 14,856 relevés, mostly from grasslands, and 575 relevés from the syntaxonomical treatment of *Pinus sylvestris* by Heinken (2008) were submitted. In summary, with 25,213 relevés VegetWeb has only captured a few exemplary datasets with less than 2% of the total number of relevés from Germany (estimated at 1,655,000 by Schaminée et al. 2009, see also Dengler et al. 2011), and is still far from being a representative national database.

## Co-operation with the journal *Tuexenia*

Dedicated to the link between vegetation science and application, the Floristisch-soziologische Arbeitsgemeinschaft (Flor-Soz; Central European society for floristic

and phytosociological survey) publishes the journal *Tuexenia*. The journal has a tradition of printing full relevé data to enable further syntaxonomical analysis, which is an analogue form of ecoinfor-

matics (Ewald 2005). To facilitate access to published data and to capture a minimum of high quality data, all new 2,265 relevés published since 2005 (vol. 25) have been uploaded to VegetWeb. Data

processing was supported by the society. We see this mechanism as a model for other journals that publish papers based on relevés.

GIVD Database ID: EU-DE-013		Last update: 2012-04-28
<b>VegetWeb</b>		
Scope: Central Vegetation Database of Germany. Designed to collate all available vegetation data within Germany. Capable of different taxon concepts. Import possibility from TURBOVEG (EsVEg XML)		
Status: ongoing capture	Period: 1934-2007	
Database manager(s): Rudolf May (Rudolf.May@BfN.de)		
Owner: Federal Agency for Nature Conservation		
Web address: <a href="http://www.floraweb.de/vegetation/aufnahmen.html">http://www.floraweb.de/vegetation/aufnahmen.html</a>		
Availability: free online	Online upload: yes	Online search: yes
Database format(s): MySQL	Export format(s): CSV file, EsVEg XML	
Publication: [NA]		
Plot type(s): normal plots	Plot-size range: [NA]	
Non-overlapping plots: 26,692	Estimate of existing plots: 2,000,000	Completeness: 1%
Total plot observations: 26,692	Number of sources: 211	Valid taxa: [NA]
Countries: DE: 100.0%		
Forest: [NA] — Non-forest: [NA]		
Guilds: all vascular plants: 100%; bryophytes (terricolous or aquatic): 7%; lichens (terricolous or aquatic): 6%		
Environmental data: altitude: 92%; slope aspect: 46%; slope inclination: 60%; soil pH: 4%; land use categories: 1%		
Performance measure(s): presence/absence only: 2%; cover: 98%		
Geographic localisation: GPS coordinates (precision 25 m or less): 74%; small grid (not coarser than 10 km): 21%; political units or only on a coarser scale (>10 km): 5%		
Sampling periods: 1930-1939: 0.0%; 1940-1949: 0.1%; 1950-1959: 2.3%; 1960-1969: 20.6%; 1970-1979: 20.7%; 1980-1989: 11.6%; 1990-1999: 29.2%; 2000-2009: 11.4%; unknown: 4.0%		
<a href="http://www.givd.info/ID/EU-DE-013">Information as of 2012-07-18; further details and future updates available from http://www.givd.info/ID/EU-DE-013</a>		

## Obstacles to building a national database

Why has VegetWeb, during close to 10 years, not been able to capture enough relevé data to become a comprehensive national archive? The reasons are technical, social and political. The reluctance of data owners to deliver to VegetWeb is partly due to technical requirements of uploading (creation of xml-formats, interpretation of taxon names, consolidation of header data), for which no permanent support can be offered. Until recently, there were also limitations in querying and exporting search results. In the past, both problems have prevented initiatives like the dry grassland group (Dengler & Jandt 2005) to use VegetWeb as their communal database.

Many owners hope to analyse their data before offering them to the community without having project funding to do so. Ongoing permanent plot series in particular are regarded as personal or institutional assets. In terms of funding VegetWeb, like many other databases, is hung up between science and application. Until recently, the German Science Foundation (DFG) has not explicitly funded vegeta-

tion databases, and their creation has been a mere by-product of short-term projects. Vegetation survey and monitoring in agriculture, forestry and conservation is in the competence of the German federal states, which often have limited expertise and are usually hesitant to place data in national archives. As administrations reduce their staff, surveys and data analyses are committed to private contractors, to whom re-use and sharing of data has even less priority. Ideas to make proper archiving of relevé data a standard in science, monitoring and management (Parr & Cummings 2005, Costello 2009) are still in their infancy. In summary, Germany as a federal state demonstrates the problems and complexities that have so far prevented the establishment of a European vegetation database.

## Use of VegetWeb

VegetWeb is freely accessible on the Web and has a quite powerful query interface which, using AND, OR and NOT operators, allows to combine all available items from the header data with the actual relevé data, like "show me all releve's

where species A has 20 % coverage in the tree layer and species B has 50 % coverage in the shrub layer and which is from 2008 and later". The VegetWeb web interface has an average usage of 350 requests per month (January 2010 - August 2010).

The floristic content of VegetWeb is accessible through the botanical node of GBIF-D (Kirchhoff et al. 1995).

## Prospects

VegetWeb owes its existence to the continued collaboration of some engaged individuals and limited, however crucial support by the Federal Agency for Nature Conservation (BfN) and the Floristisch-soziologische Arbeitsgemeinschaft. With the given resources, the capture of relevés from *Tuexenia* and the handling of occasional submissions of databases can be continued. Since the recent integration of the GermanSL species list there is hope that several large German databases registered in GIVD (Dengler et al. 2011) will use the EsVEg-XML exporting capability in TURBOVEG to contribute their data to VegetWeb.



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### Recherche nach Erhebungen

#### Zurück zur Recherche

Deckung Baumschicht [%]					80
Deckung Strauchschicht [%]					0
Deckung Feldschicht [%]	60	90	1		
Deckung Kryptogamenschicht [%]	20	5	0.1		
Höhe Baumschicht [m]					20
Aufnahmefläche [qm]					113 510
Neigung [Grad]	38.7	38.7	29.0		
Exposition [Grad]	sw	s	ese	e	
Höhe üNN [m]	1410	1350	1140	1160	
Aufnahmenummer im Zitat	137	324	195	11	
Projekt	BgWd	BgWd	BgWd	BgWd	
Aufnahmejahr	1978	1978	1993	1981	
Aufnahmetag/monat	1/1	1/1	1/1	1/1	
Nr	623	737	3545	4918	Frequenz

#### Baumschicht oberer Kronenraum

<a href="#">Abies alba</a>	2	3	.	3	3
<a href="#">Acer pseudoplatanus</a>	2	2	.	.	2
<a href="#">Fagus sylvatica</a>	.	2	3	2	3
<a href="#">Picea abies</a>	5	4	3	2	4

#### Baumschicht unterer Kronenraum

<a href="#">Fagus sylvatica</a>	.	.	2	.	1
<a href="#">Picea abies</a>	.	.	1	.	1

Fig.1: Screenshot from the online interface of VegetWeb; search results are presented as a cross-table; hyperlinks offer access to full observation reports and species sketches of <http://www.floraweb.de>.

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