2nd European Agroforestry Conference

Integrating Science & Policy to Promote Agroforestry in Practice

Excursion Guide

Brandenburg University of Technology

Cottbus – Senftenberg

Centrum für Energietechnologie Brandenburg

Brandenburg University of Technology Cottbus - Senftenberg

Excursion Route

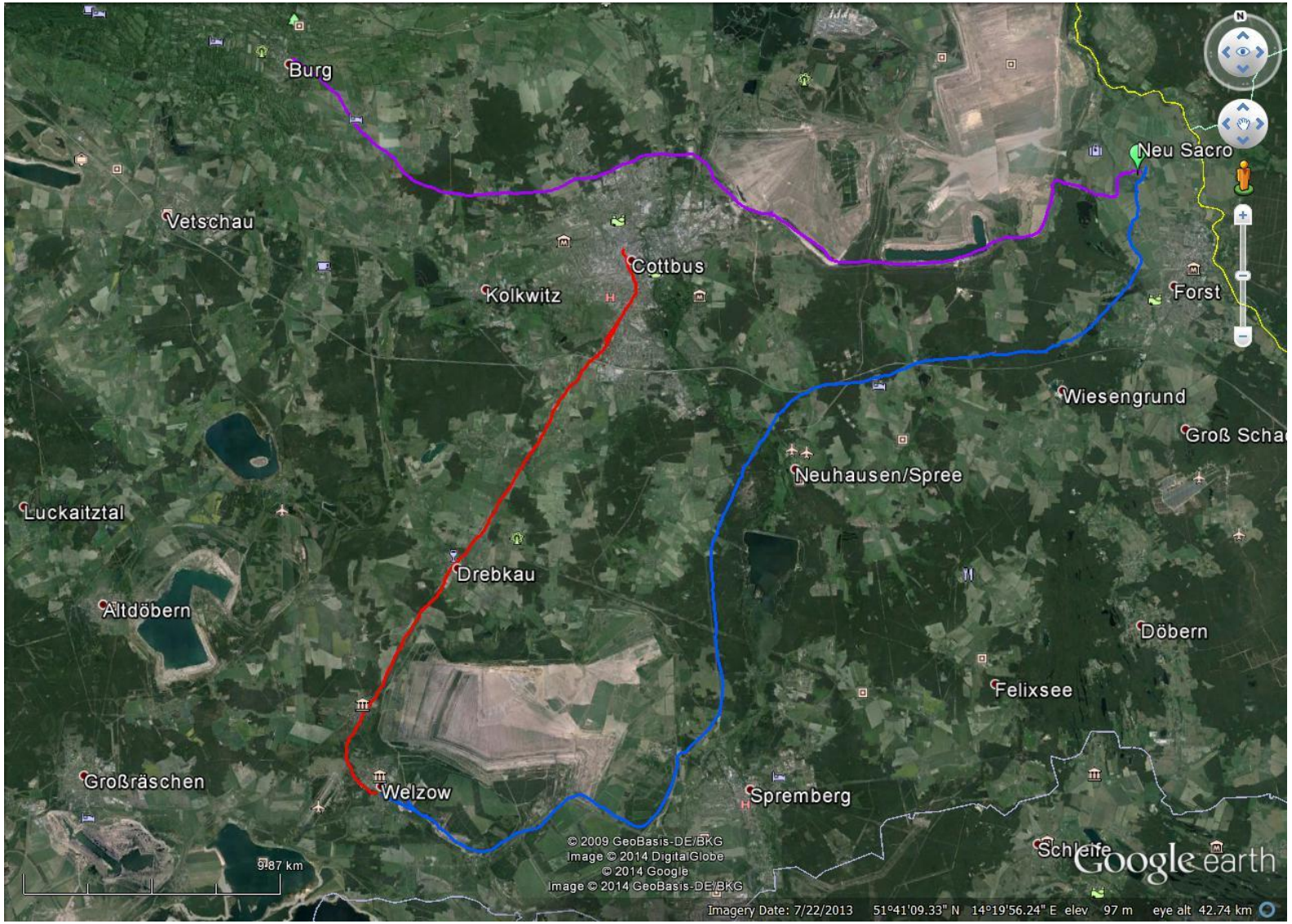


Figure 1. General overview of the excursion route

Cottbus → Weolzow-Süd Welzow Süd → Neu Sacro Neu Sacro → Burg

Excursion Timetable

08:00 Departure from Lindner Congress Hotel (The bus is arriving at 07:30)

09:00 Arrival at the first stop: opencast mine Welzow-Süd

09:30 Departure to the Vineyard plantation in Welzow-Süd

10:00 Arrival at the Vineyard plantation in Welzow-Süd

11:00 Departure to Neu Sacro, Forst

12:00 Arrival at Neu Sacro, Forst

13:00 Departure to Burg, Spreewald

14:00 Arrival in Burg, Spreewald

15:00 Departure to Cottbus

15:45 Arrival in Cottbus (Main Station and Lindner Congress Hotel)

➔ For the participants of the excursion lunch bags will be provided

Excursion Meeting Point: Lindner Congress Hotel

Figure 2. Meeting point: Puschkinpromenade 25, 03044 Cottbus

Excursion Site I. Opencast Mine Welzow-Süd

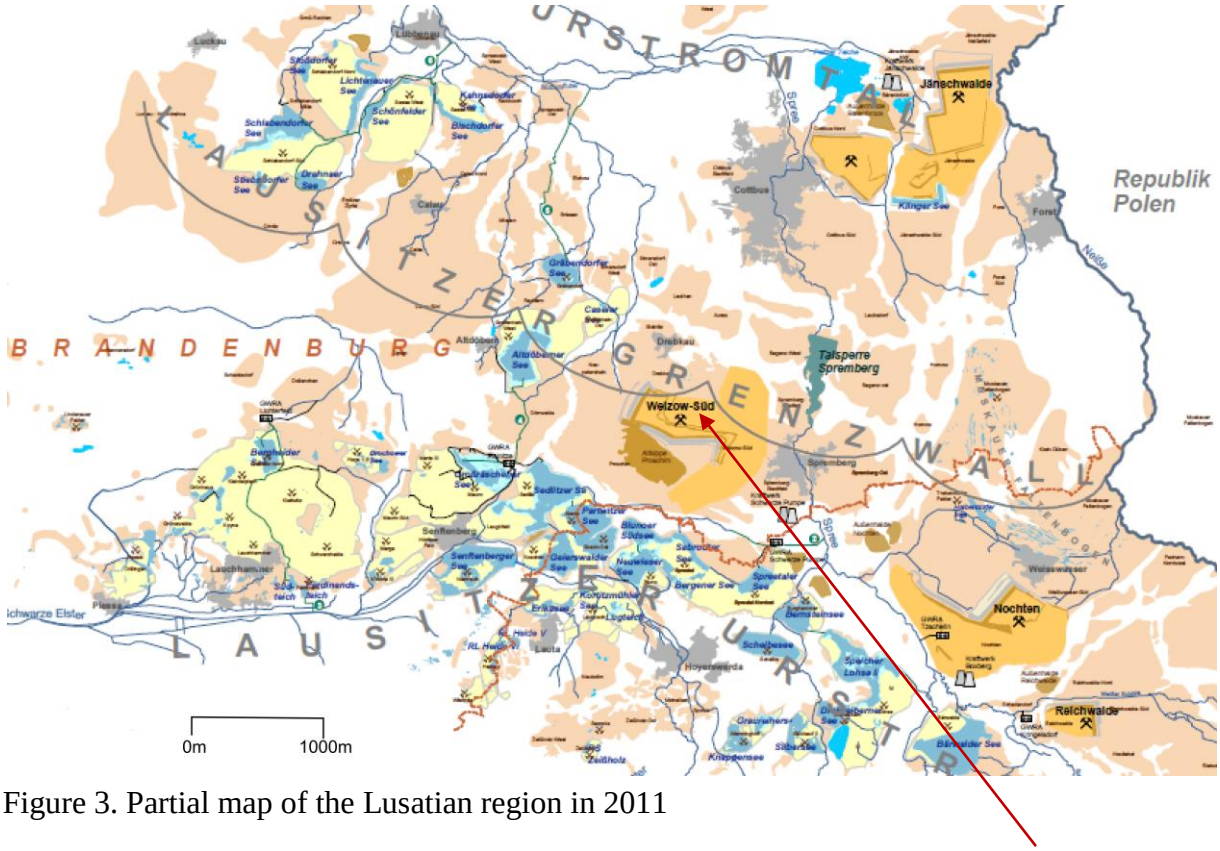


Figure 3. Partial map of the Lusatian region in 2011

Everyday up to 90,000 tons of lignite are extracted from the opencast mine Welzow-Süd.

Once the original vegetation and infrastructure has been removed and the soil layers have been sufficiently drained, overburden excavators remove sand, gravel and clay covering the lignite seam.

Conveyer belts with a width of 2.5 m transport the pre-cut overburden to the mine's dumpsite which has already been excavated, while spreaders dump this soil material shaping the relief of the future post-mining landscape.

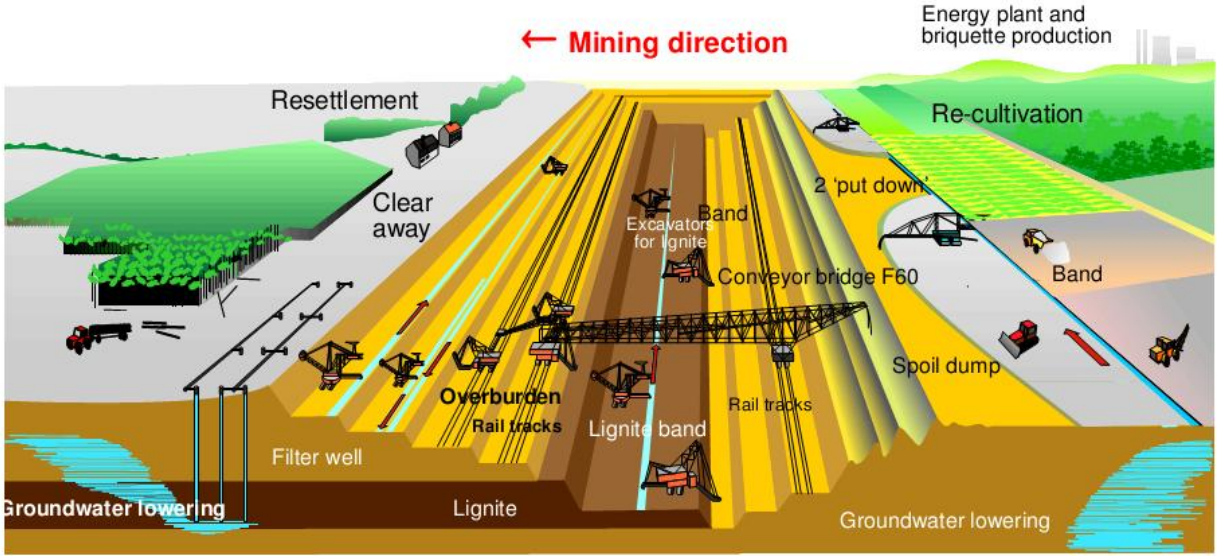


Figure 4. Cross-section of the opencast mine

Figure 5. Initial state of the landscape in 2005

The reclamation areas of the opencast mining in the Lusatian region are predominantly nutrient-poor, marginal sites, and as such have a high potential for cultivation of biogenic solid fuels.

The Chair of Soil Protection and Recultivation at the BTU Cottbus-Senftenberg, has been investigating the cultivation of fast-growing trees for bioenergy production in this post-mining landscape for more than 15 years.

The focus of the scientific activities is laid on innovative land use systems and technologies, such as:

- vineyard plantations
- cultivation of fast growing woody species in short rotation coppices or alley cropping systems for the production of woody biomass and bioenergy

Excursion Site II. Vineyard Plantation in Welzow-Süd

In cooperation with Vattenfall Europe Mining AG, the Chair of Soil Protection and Recultivation at the Brandenburg Technical University Cottbus – Senftenberg (BTU) has established a vineyard in Welzow-Süd.

The objective of the project is to evaluate the prospects of a viable viticulture as an alternative form of land use in the reclamation area and a possible contribution to the revival of the winemaking tradition in Lusatia.

Upon the recommendations of wine experts from Geisenheim, vines of "Rondo" (red), "Merzling" (white), and "Ortega" (white) were selected to be grown.

The technological implementation of such innovative projects is especially suitable in coal mining areas, due to the possibility of targeted filling of the spoils in the vineyards, thus, for example, achieving best exposition to solar radiation or a selection of appropriate substrates.

Description:
Establishment: 2006

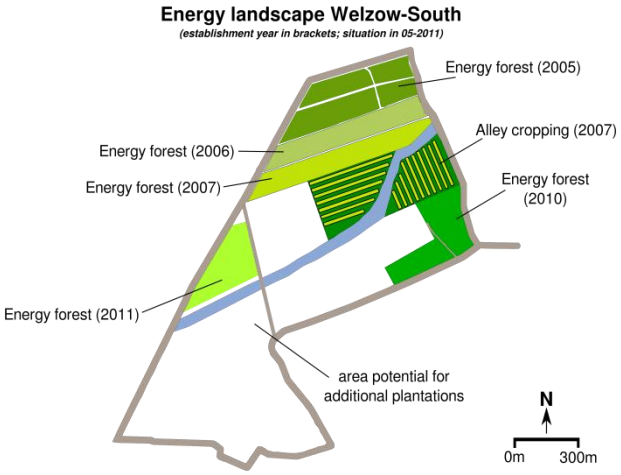
Climatic prerequisites:
Average yearly temperature: >9˚C
Temperature April – October: >13˚C
Temperature July – October: >16˚C
Temperature May – June (flowering): >15˚C
Vegetation period: >180 days
Winter frost not below -22˚C

Excursion Site III. Energy Landscape in Welzow-Süd

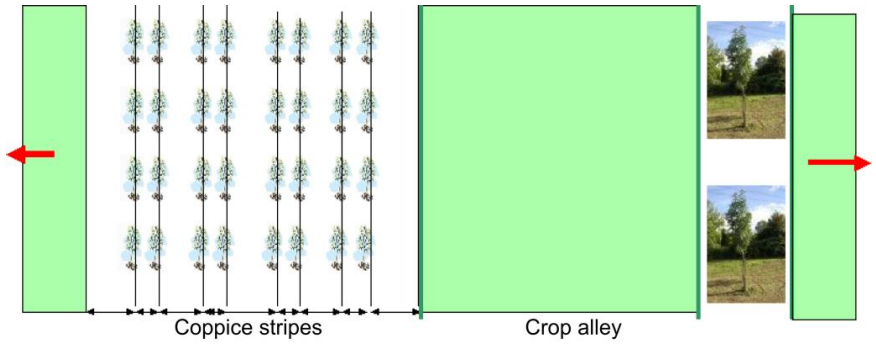
Description:
Establishment: 2005-2007

av. Precipitation: 570 mm yr^{-1}
av. Temperature: 9˚C
Substrate: heterogeneous dominated by loamy sand and sandy loam; humus- and nutrient-poor

Distant groundwater



Design:
Total area: >50ha
Long term experiments conducted have identified black locust (*Robinia pseudoacacia* L.) as a tree species suitable to the extremely harsh growing conditions of the site.
Planting density of black locust in energy forest and alley-cropping: ~9.200 trees ha^{-1}
Rotation cycle: 3–6 years

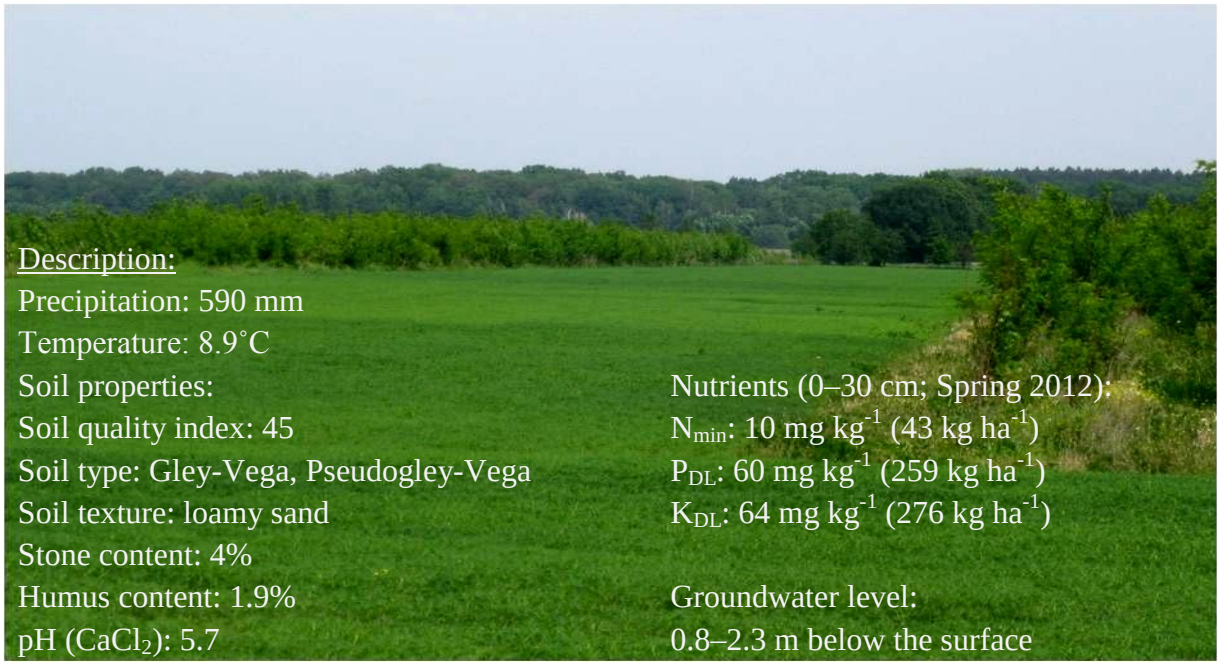


Alley cropping:
Crop alley: 12 or 24 m wide;
Coppice stripes: 12 m wide with north-south or east-west orientation

Crop rotation since 2007: alfalfa/ alfalfa/alfalfa/alfalfa/summer barley/oat/winter rye (*Secale cereale*)/winter rye (*Secale multicaule*)

Growth:
Yield: 3–6 t dry matter $ha^{-1}yr^{-1}$

Excursion Site IV. Experimental Site for Agroforestry in Neu Sacro, Forst (Lausitz)



Description:

Precipitation: 590 mm

Temperature: 8.9˚C

Soil properties:

Soil quality index: 45

Soil type: Gley-Vega, Pseudogley-Vega

Soil texture: loamy sand

Stone content: 4%

Humus content: 1.9%

pH ($CaCl_2$): 5.7

Nutrients (0–30 cm; Spring 2012):

N_{min}: 10 mg kg^{-1} (43 kg ha^{-1})

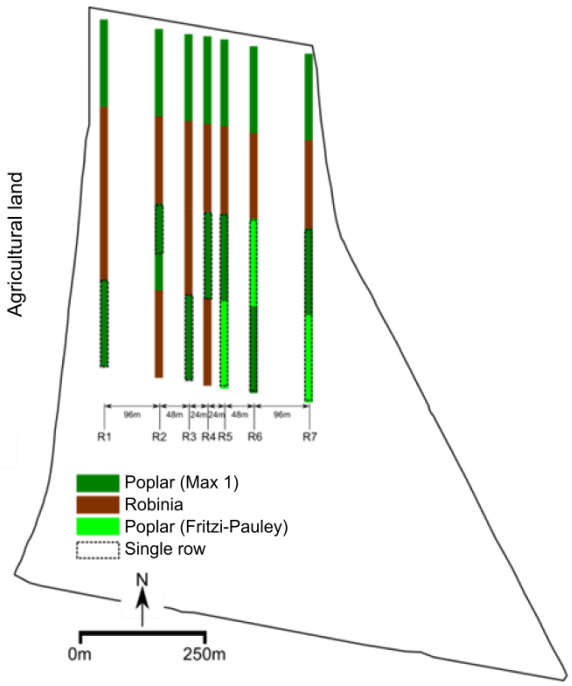
P_{DL}: 60 mg kg^{-1} (259 kg ha^{-1})

K_{DL}: 64 mg kg^{-1} (276 kg ha^{-1})

Groundwater level:

0.8–2.3 m below the surface

Design:



Total area: 40 ha,

Woody crops: 5 ha (Robinia: 2 ha, Poplar "Max 1": 2.5 ha, Poplar "Fritzi Pauley": 0.5 ha)

Rotation: 1.Rotation

Age: 4 years old Robinia, 3 years old Poplar

Planting density: 9800/ha (single row), 8700/ha (double row)

Distance between:

-tree rows: 2.6m (single row), 1.8m (double row)

- rows in double row: 0.75m

- trees within the row: 0.4m (single row), 0.9m (double row)

Crop rotation since 2010:

corn/corn/lupine/SolaRigol/potatos/winter wheat

Width of crop alleys : 24 m, 48 m, 96 m

Width of coppice stripes: 10 m

Growth:

Growth failure (Autumn 2012): 21% Robinia, 22% Poplar "Max 1", 27% Poplar "Fritzi-Pauley"

Moisture content: 40% Robinia, 55% Poplar

Tree height (Autumn 2013): 5.5m Robinia, 5.0m Poplar "Max 1", 3.1m Poplar "Fritzi-Pauley"

Root diameter (Autumn 2013): 6.5 cm Robinia, 4.9 cm Poplar "Max 1", 1.5cm Poplar "Fritzi-Pauley"

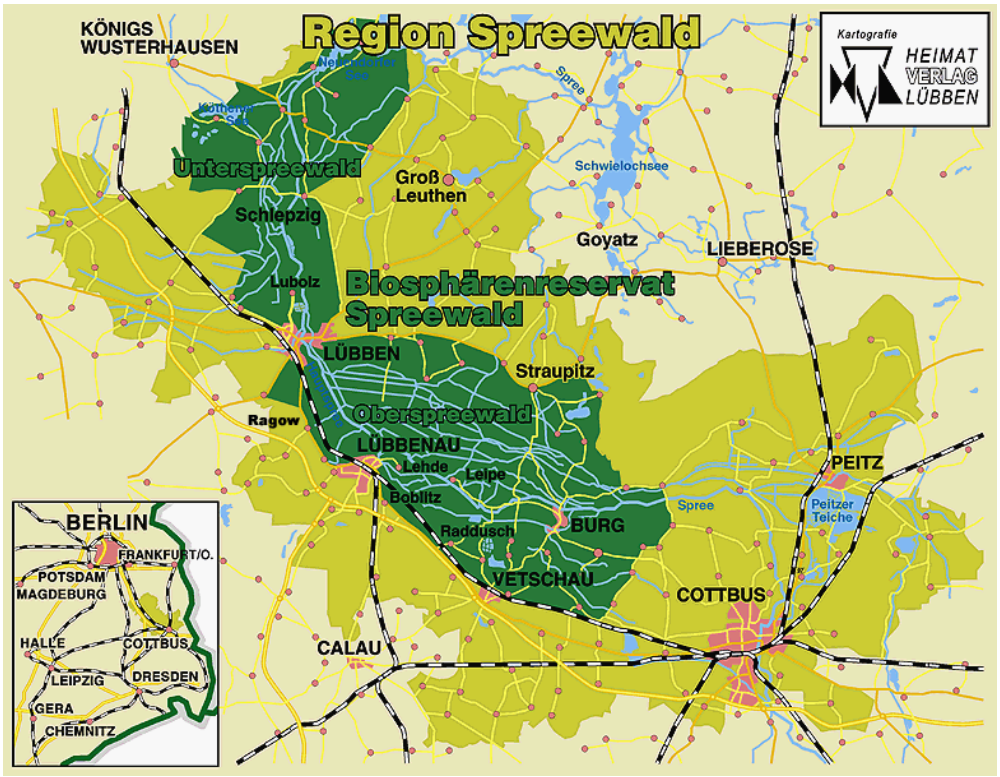
Yield estimates in Autumn 2013: 7.3 t dry matter $ha^{-1}yr^{-1}$ Robinia, 4.3 t dry matter $ha^{-1}yr^{-1}$ Poplar "Max 1", 1.3 t dry matter $ha^{-1}yr^{-1}$ Poplar "Fritzi-Pauley"

Excursion Site V. Traditional Agroforestry Systems in the Region of Spreewald

The Spreewald was declared a biosphere reserve in 1990 and obtained its UNESCO status in 1991.

The specific appeal of the area is due to its park-like landscape that is intertwined by numerous streams. By means of cultivation a mosaic, consisting of small meadows, fields and forest as well as the netting of streams, emerged.

It is a meadow landscape shaped by human touch but still in harmony with nature to a large extent, and thereby a natural habitat of prosperous flora and fauna. Here, species that are threatened or already extinct elsewhere and that are in need of protection still flourish.



Excursion Guide: Eugen Nowak (Biosphere Reserve Spreewald)

During the visit the following main topics will be addressed:

- Introduction into the structure and task of the Biosphere Reserve Spreewald
- Preservation and creation of the ecologically valuable biotope network structures, integrated in the cultural landscape of the Spreewald
- The problems of management
- The problems of land consolidation measures
- Strategies to revitalize and further develop wood growing by utilizing the concepts of agroforestry

Figure 6. Biotope network structures near the central channel

Figure 7. Grassland between strips of black alder

List of selected publications:

Böhm, C., Quinkenstein, A. Freese, D., 2011. Yield prediction of young black locust (*Robinia pseudoacacia* L.) plantations for woody biomass production using allometric relations. *Annals of Forest Research*. 54, 215–227.

Böhm, C., Quinkenstein, A., Freese, D., Hüttl, R. F., 2011. Assessing the short rotation woody biomass production on marginal post-mining areas. *Journal of Forest Science*. 57, 303–311.

Böhm, C., Kanzler, M., Freese, D., 2014. Wind speed reductions as influenced by woody hedgerows grown for biomass in short rotation alley cropping systems in Germany. *Agroforestry Systems*, 1–13

Elmer, M., Gerwin, W., Schaaf, W., Zaplata, M.K., Hohberg, K., Nenov, R., Bens, O., Hüttl, R.F., 2013: Dynamics of initial ecosystem development at the artificial catchment Chicken Creek, Lusatia, Germany. *Environmental Earth Sciences*, 69, 491-505.

Freese, D., Böhm, C. & Quinkenstein, A., 2011. The contribution of agroforestry systems to land reclamation. *Górnictwo i Geoinzynieria*, 35, 63-68

Gerwin, W., Schaaf, W., Biemelt, D., Fischer, A., Winter, S., Hüttl, R.F., 2009. The artificial catchment "Chicken Creek" (Lusatia, Germany) - A landscape laboratory for interdisciplinary studies of initial ecosystem development. *Ecological Engineering*, 35, 1786-1796.

Grünewald, H., Brandt, B.K.V., Schneider, B.U., Bens, O., Kendzia, G., Hüttl, R.F., 2007. Agroforestry systems for the production of woody biomass for energy transformation purposes. *Ecological Engineering*. 29, 319–328.

Nii-Annang, S., Grünewald, H., Freese, D., Hüttl, R. F., Dilly, O., 2009. Microbial activity, organic C accumulation and 13C abundance in soils under alley cropping systems after 9 years of recultivation of quaternary deposits. *Biology and Fertility of Soils*. **45**, 531–538.

Mantovani, D., Veste, M., Badorreck, A., Freese, D., 2013. Evaluation of fast growing tree water use under different soil moisture regimes using wick lysimeters *iForest - Biogeosciences and Forestry*. 6, 190-200.

Matos, E. S., Freese, D., Böhm, C., Quinkenstein, A., Hüttl, R.F., 2012. Organic matter dynamics in reclaimed lignite mine soils under *Robinia pseudoacacia* L. plantations of different ages in Germany. *Communications in Soil Science and Plant Analysis*, **43**, 745–755.

Quinkenstein, A., Wöllecke, J., Böhm, C., Grünewald, H., Freese, D., Schneider, B.U., Hüttl, R.F., 2009. Ecological benefits of the alley cropping agroforestry system in sensitive regions of Europe. *Environmental Science & Policy*, 12, 1112–1121.

Quinkenstein, A., Pape, D., Freese, D., Schneider, B.U., Hüttl, R.F., 2012. Biomass, carbon and nitrogen distribution in living woody plant parts of *Robinia pseudoacacia* L. growing on reclamation sites in the mining region of Lower Lusatia (Northeast Germany). *International Journal of Forestry Research*. **2012** (Article ID 891798), 1–10.

Quinkenstein, A., Freese, D., Böhm, C., Tsonkova, P., Hüttl, R.F., 2012. Agroforestry for mine-land reclamation in Germany: capitalizing on carbon sequestration and bioenergy production. *Advances in Agroforestry: Agroforestry - The Future of Global Land Use*. 9, 313–339.

Schaaf, W., Bens, O., Fischer, A., Gerke, H.H., Gerwin, W., Grünewald, U., Holländer, H.M., Kögel-Knabner, I., Mutz, M., Schloter, M., Schulin, R., Veste, M., Winter, S., Hüttl, R.F., 2011. Patterns and processes of initial terrestrial-ecosystem development. *Journal of Plant Nutrition and Soil Science*, 174, 229–239.

Slazak, A., Freese, D., Matos, E.S., Nii-Annang, S., Hüttl, R.F., 2014. Phosphorus pools in soil after land conversion from silvopasture to arable and grassland use. *Journal of Plant Nutrition and Soil Science*, 177, 159–167.

Tsonkova, P, Quinkenstein, A., Böhm, C., Freese, D., Schaller, E., 2014. Ecosystem services assessment tool for agroforestry (ESAT-A): An approach to assess selected ecosystem services provided by alley cropping systems. *Ecological Indicators*, 45, 285–299.

For more information please visit: http://www.tu-cottbus.de/projekte/en/multifunctional-land-use.html


www.tu-cottbus.de/multiland