# DENDROLOGICAL NATURE TRAIL AS A TOOL OF STUDENT´S EDUCATION FOR PRACTICE

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## ABSTRACT

The objective of the article is to emphasize necessity of addressing the topical problems of areas arisen that were disturbed by industrial activities, so-called Brownfields, and the possibility to utilize the knowledge in the field of education and to implement this knowledge in practice as well. For this purpose the dendrological nature trail of VŠB - Technical University Ostrava campus has been established. The trail can be found on the territory that was strongly affected by industrial and mining activities and it is in the vicinity of both the university and the place accessible to public. The dendrological trail with woody plants suitable for utilization in the process of reclamation of areas arisen in anthropogenic way including Brownfields was draw up for purposes of practice education students and public. This territory proved suitability of fast-growing woody plants with wide ecological valence and woody plants specialized for growing on debris or fixed on the other specified conditions. Achieving the theoretical and practical knowledge can students of a newly originated branch the European School for Brownfields Redevelopment apply in practice.

**Keywords:** Brownfields, dendrological nature trail, woody plants, education

## INTRODUCTION

Moravian-Silesian Region (Figure 1) is located in the north-eastern part of the Czech Republic and it is delimited with the districts as follows: Bruntál, Frýdek-Místek, Karviná, Nový Jičín, Opava and City of Ostrava. The natural character in the above-mentioned areas is different alike the economic development that contributes to differences in the living environment quality of individual areas of the region. The most serious impacts on the living environment concentrate to the central and north-eastern parts of the region – Ostrava District, Karviná District and Třinec District. The dominants of this territory include especially the Landscape Protected Areas of Beskydy, Jeseníky and Poodří, that are important and valuable localities both from the point of view of biotypes and occurrence of numerous protected kinds of plants and animals as well.

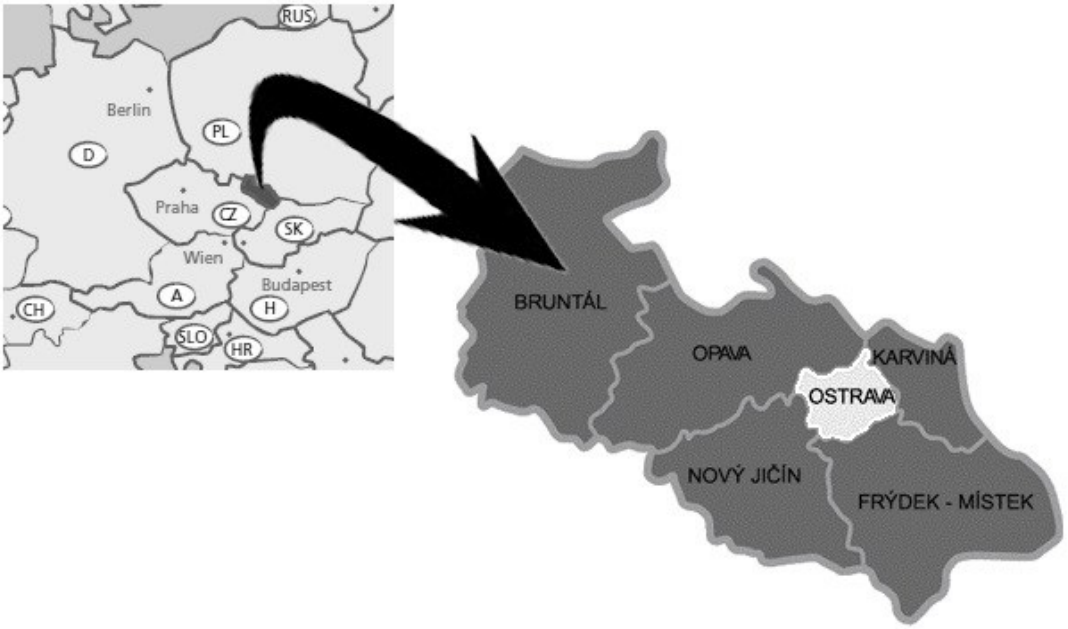


**Figure 1.** Dendrological nature trail area location

The late 19th century is typical for a substantial development of industry and in particular of the mining activity on the territory of the Moravian-Silesian Region. This development resulted in enormous production of secondary materials that were necessary to be farther utilized. For that reason the redundant debris was used for the terrain deformations leveling. At present the above-described areas are classified as brownfields. [5]

The principal objective of this article is to describe possible utilization of the territory in the area affected by industry. The building debris became a foundation for construction of the Mining University campus in the years from 1962 to 1964. At present this campus is located on the total area of 32,6 ha and its gradual expansion continues to take place.

A part of newly constructed areas was planting tree species in the vicinity of the territory. The aim was to create a slow transition between the urbanized and open countryside, improvement of microclimate in the town and reduction of industry impacts onto the ambient country due to suitable selection of species composition.

At the VŠB – Technical University campus we can notice the species composition planted in the period of 50 years connected with gradual construction buildings. During implementing the projects the task of architects was to submit a design for planting the tree species together with a design of each building. And thus the species that were planted in the campus were diverse both from the age and generic structure. Green vegetation in the school campus became basics for building the dendrological nature trail.

## Description of Territory

The campus of VŠB – Technical University of Ostrava is delimited with the streets 17. listopadu, Opavská, Studentská and Dr. Slabihoudka. The area is located in the cadastral territory of Ostrava – Poruba. The area of the campus is 32, 6 ha.

The dendrological research was carried out in the years from 2008 to 2011. At present there are in total 86 kinds of wood plants at the campus. Out of that number there are 20 kinds of coniferous trees, 28 kinds of broad-leaved tress, 30 types of deciduous bushes and 8 types of non-deciduous bushes. The broad-leaved trees include 157 pcs of *Betula pendula* Ehrh., which is the highest representation. The coniferous trees are most represented by *Pinus nigra* Arn. and their occurrence in 114 pcs is highest. Throughout the campus there are in total 1195 pcs of trees located, out of that number 390 coniferous trees and 805 broad-leaved trees. For implementation of the dendrological nature trail there were 50 specieses selected from the total number. Out of that number there were 11 coniferous trees, 22 broad-leaved trees, 17 kinds of deciduous and 2 types of non-deciduous bushes. These specieses are both the domestic (autochthonous) kinds and allochthonous kinds.

In the period from 2008 to 2011 a detailed dendrological research was carried out in which the following parameters were evaluated: state of health, age, height and width of the woody plant and other dendrological data. The researches resulted in lay-out of the line for the nature trail in particular including the woody plants that are used for regeneration of brownfields, within the frame of redevelopments and reclamations or the brownfields can be due to their amelioration abilities utilizable in industrial landscapes as the case may be (Table 1). The main objective was to create a dendrological trail with educational meaning.

**Table 1.** The tree species suitability for the reclamation purpose. Highly suitable tree species ****, suitable tree species ***, less suitable tree species **, unsuitable tree species * [1]

| Scientific term | Indication | Scientific term | Indication |
|---|---|---|---|
| *Abies alba* Mill. | * | *Betula pendula* Ehrh. | **** |
| *Abies concolor* Hoopes | **** | *Carpinus betulus* L. | ** |
| *Larix decidua* Mill. | **** | *Swida sanguinea* L. | **** |
| *Larix sudetica* Mill. | **** | *Corylus colurna* L. | **** |
| *Picea excelsa* Link. | ** | *Crataegus oxyacantha* L. | *** |
| *Picea mariana* Britt. | *** | *Eleagnus angustifolia* L. | **** |
| *Picea omorika* Purk. | **** | *Euonymus europaea* L. | *** |
| *Picea pungens* Engelm. | **** | *Fagus sylvatica* L. | ** |
| *Picea sitchensis* Carr. | * | *Fraxinus excelsior* L. | ** |
| *Pinus strobus* L. | *** | *Ligustrum vulgare* L. | *** |
| *Pinus sylvestris* L. | *** | *Populus balsamifera* L. | *** |
| *Pinus ponderosa* Dougl. | **** | *Populus nigra* L. | *** |

| Scientific term | Indication | Scientific term | Indication |
|---|---|---|---|
| *Pinus nigra* Arn. | **** | *Populus tremula* L. | **** |
| *Pseudotsuga texifolia* Britt. | **** | *Quercus petraea* Liedl. | *** |
| *Acer campestre* L. | *** | *Salix caprea* L. | *** |
| *Acer negundo* L. | *** | *Sambucus nigra* L. | **** |
| *Acer platanoides* L. | **** | *Sorbus aucuparia* L. | *** |
| *Acer pseudoplatanus* L. | **** | *Tilia cordata* Mill. | *** |
| *Alnus glutinosa L.* | *** | *Ulmus carpinifolia* Gled. | *** |
| *Alnus viridis* L. | **** | *Ulmus scabra* Mill. | **** |
| *Alnus incana* L. | **** | *Viburnum lantana* L. | **** |
| *Betula pubescens* Ehrh. | **** | *Viburnum populus* L. | ** |

The reclamation abilities of woody plants include as follows [1]:

1. Rapid growth in youth – such specieses have a capability to cover the soil surface rapidly which is appreciated by us when creating the microclimate, covering and stabilizing the soil. This function is fulfilled by representatives of the genus *Alnus*, *Betula*, *Sorbus* and genus *Picea*.
2. Frost resistance – this group includes the specieses *Pinus nigra* Arn., *Pinus sylvestris* L., and *Betula pendula* Ehrh.
3. Capability to enrich the soil with nutrients – specieses which enrich the soil thanks to their well decomposing wastes and thus they improve soil reaction (*Tilia cordata* Mill., *Carpinus betulus* L.)
4. Drought resistance – this property is especially typical for *Pinus nigra* Arn. a *Pinus sylvestris* L., *Fraxinus ornus* L. and *Tilia tomentosa* Moench.
5. Water surplus resistance – this property is appreciated on soils soaked with water. The woody plants having this property include *Alnus glutinosa* L., *Populus tremula* L. And representatives of the genus *Salix*.

## Orientation and Marking the Trail

The Figure 2 shows the dendrological trail with the selected kinds of woody plants. The trail is approx. 1 000 m long. For better orientation of students and visitors there is an information board showing brief characteristic of the territory supplemented with photodocumentation. There are labels placed on the woody plants giving the scientific names and brief description of the woody plant demands to the environment. The nature trail is accessible to the visitors and for educational purposes all year round and it is most used in the spring and autumn.

## European School

Education in area of environment as well as study of Brownfields reclamation and regeneration is a part of VŠB - Technical University of Ostrava study program. Preparation and implementation of the master field “European School for Brownfield Redevelopment” is prepared within the COBRAMAN CENTRAL EUROPE project 1CE014P4 „Manager Coordinating Brownfield Redevelopment Activities“ for bachelor graduates from the Czech republic. [2]

The field of study is designed as interdisciplinary. It is based on a combination of natural, economic and construction - engineering sciences, including the professional disciplines. The study is intended on producing graduates – experts - oriented on a complex care of environment in the industrially influenced areas. The main aim of the study is to prepare graduates to manage project and work activities in the field of restoration and development of abandoned industrial areas – brownfields. This study is preparing an engineer who is able to solve problems associated with understanding, analysis, synthesis, evaluation, application re-use and solving problems of integration into the abandoned areas urbanized landscape system, and restoration of functions after industrial elements in the landscape. An integral part of education is applied dendrology. [2]

The nature dendrological trail has been designed and implemented to combine theoretical knowledge with practical experiences within the classes. Some features of determination (such as leaves, flowers and roots) are determined directly in the field and the student is able to get a real picture of how to avoid mistakes when designing the planting both from the point of functional and aesthetical views. The main objective of the dendrological nature trail is study of mostly domestic and exotic woody plants with respect to their utilization in landscaping creation, education of the experts and non-professional public and environmental awareness spread.

For teaching the professional subjects of environmental sciences focused on a need of knowledge of woody plants and their utilization in restoring the landscape and settlements there is a teaching material created in the form of presentation and a textbook (Stalmachová, Švehláková, 2012) in addition to practical exercises as a part of the dendrological trail [3]. The above-mentioned materials comprise basic information on individual species of woody plants, possibilities and ways of their utilization in redevelopment practice with photodocumentation that captures variedness of one species of tress during the seasons of the year.

## CONCLUSION

The trail is open to the public and it serves as an educational and demonstrational element of the landscape regeneration that was affected by industrial activities. In this connection it ensures education for general public from thematic walks through training of teachers to educational events for youth.

With respect to this area past and constant impact following the mining activity, the problems of decreasing the adverse influence onto the landscape still gain seriousness. Therefore there is a hot need to put stress on maintaining the well-balanced ratio between the housebuilding and greenfields. The nature trail, in which the woody plants intended for sheltering from industrial areas were planted to good purpose, serves for the above-mentioned purposes at the campus of VŠB – Technical University of Ostrava. [4]

Vegetation depends on main vegetation factors: solar energy in the form of light, heat, water and mineral nutrients in the soil. The above-mentioned factors characterize quality of the given stand the level of which is reflected in condition of vegetation. Relation between the surrounding and plants is very closely connected. In the process of

the decision-making on the method of the devastated land use the plants can be successful glues.

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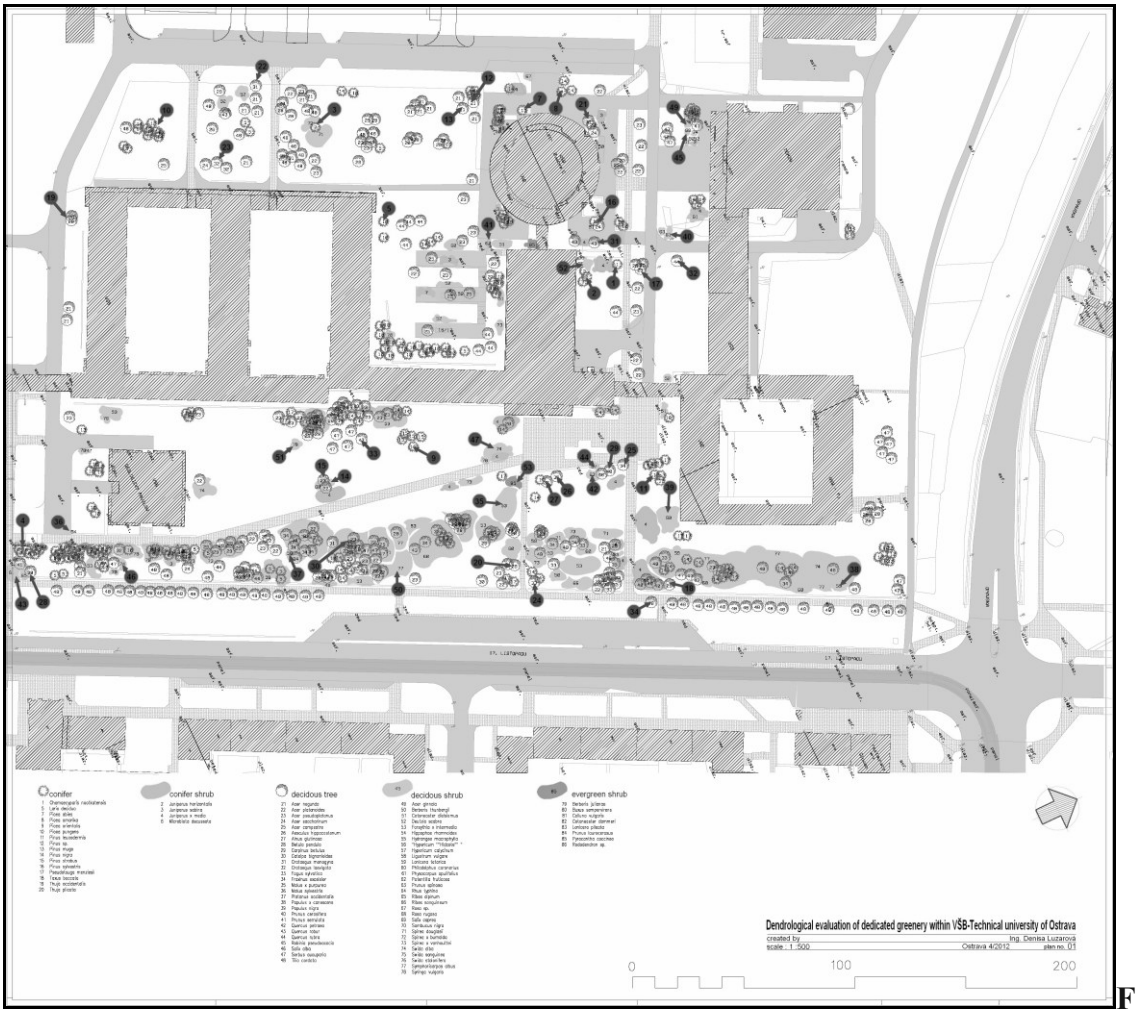


**Figure 2.** Dendrological trail map in VŠB - Technical University area

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