## NATURAL CONDITIONS

### 1.1 **Map of natural conditions of Žofín natural forest in 2008**

Valtera M., Šamonil P., Adam D., Hort L., Janík D., Král K., Unar P., Vrška T.

Presence of rocks and sites strongly affected by water is imaged on the background of hypsometric map through entire area 74.2 ha in Žofín natural forest. From the pedologic point of view, rocks represent places with absence of soils or places with presence of Leptosols (litozem in Czech); site strongly affected by water represent places of semihydromorphic or hydromorphic soils – Stagnosols, Gleysols, Fluvisols, Histosols (pseudogleje, stagnogleje, gleje, organozemě a fluvizemě in Czech)

## SOIL CONDITIONS

### 2.1 **Map of soil taxonomical units in the Žofín natural forest in 2008**

Šamonil P., Valtera M., Šebková B., Adam D., Hort L., Janík D., Král K., Unar P., Vrška T., Houška J.

Soil taxonomical units (STU) (according to Czech soil taxonomy on the level of soil type or subtype) were classified in area 74.2 ha in National Nature Reserve Žofínský prales primeval forest. Soil profiles were evaluated in 353 plots of grid, always in 5 replications. Classification of soils was processed according to Czech soil taxonomy (Němeček et al. 2001) in relation to international classification system of soils (Driessen et al. 2001, Micheli et al. 2006).

### 2.2 **Map of humus forms in Žofín natural forest in 2008**

Šamonil P., Valtera M., Šebková B., Adam D., Hort L., Janík D., Král K., Unar P., Vrška T., Houška J.

Humus forms (usually on the level of Order) were classified in area 74.2 ha in National Nature Reserve Žofínský prales primeval forest. Soil profiles were evaluated in 353 plots of grid, always in 5 replications. Classification was processed according to international taxonomy Green et al. (1993) and Klinka et al. (1997).

## DENDROMETRY

### 3.1 **Map of developmental stages and phases of the Žofín natural forest in 2003**

Vrška T., Hort L., Adam D., Janík D., Král K., Šamonil P., Unar P.

The developmental stages a their phases were charted through empirical observation on the basis of tree position map from 1997. For the definition of stages and phases the approach of Korpeľ (1995) was used. Three stages were charted – stage of growth, stage of optimum and stage of disintegration and their partial phases. The largest area was occupied by stage of disintegration, the smallest part was occupied by stage of optimum. Stage of growth was dominant in the southern part of the Žofín natural forest in the beech dominated part historically affected by man.

### 3.2 **Map of developmental stages and phases of the Žofín natural forest in 1997**

Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map of developmental stages and phases was created using a new approach based on local diameter distributions, presuming that their shape indicates the phase and trend of stand development. As input data a vector stem position map of more than 18 500 trees in the Zofin natural forest. Using focal filtering, we created local distributions of both live and dead tree counts, and tree basal areas, across diameter classes, separately for every particular site in the stand and its circular surroundings (diameter of the moving filter was 21m; mapping step 1m). These distributions were then recognized by an artificial neural network and classified into eight pre-defined categories.

### 3.3 **Map of density of living trees in the Žofín natural forest in 1997**

Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map of density of living trees was derived from the vector stem position map of the Zofin forest measured in 1997. This data set consisting of more then 15 200 living trees with DBH ≥ 10 was the essential input for further processing: Using a circular focal density filter in ArcGIS 9.3 Spatial Analyst software the local densities were calculated in a whole Zofin natural forest. Since the diameter of the filter was set-up at 30m and the computation step was 1m, the map displays a real density of living trees in circular neighbourhood area of about 700m$^2$ for every square meter of the forest. The density is calculated in pieces per 1 hectare (pcs/ha).

### 3.4 **Map of local basal area of living trees in the Žofín natural forest in 1997**

Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map of local basal area of living trees was derived from the digital stem position map of the Zofin forest measured in 1997. This data set consisting of more then 15 200 living trees with recorded DBH was the essential input for further processing: Using a circular focal filter in ArcGIS 9.3 Spatial Analyst software the local basal areas of living trees were calculated in a whole Zofin natural forest. Since the diameter of the filter was set-up at 30m and the computation step was 1m, the map displays a real basal area of living trees in a circular neighborhood area of about 700m$^2$ for every square meter of the forest. The basal area is calculated in square meters per 1 hectare (m$^2$/ha).

### 3.5 **Map of local volume of living trees in the Žofín natural forest in 1997**

Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map of local volume of living trees was derived from the digital stem position map of the Zofin forest measured in 1997. This data set consisting of more then 15 200 living trees with recorded DBH was the essential input for further processing. A volume of wood was calculated in a PraleStat software for each tree of the digital map. Consequently, the local volume of living trees was calculated using a circular focal filter in ArcGIS 9.3 Spatial Analyst software. Since the diameter of the filter was set-up at 30m and the computation step was 1m, the map displays a real volume of living trees in a circular neighborhood area of about 700m$^2$ for every square meter of the Zofin natural forest. The volume is calculated in cubic meters per 1 hectare (m$^3$/ha).

3.6 **Map of local volume of living and dead trees in the Žofín natural forest in 1997**

Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map of local volume of all trees was derived from the digital stem position map of live and dead trees in the Zofin forest measured in 1997. This data set consisting of more then 18 600 trees (more then 15 200 living and ca 3 400 dead trees) with recorded DBH was the essential input for further processing. A volume of wood was calculated in a PraleStat software for each tree of the digital map. Consequently, the local volume of all trees was calculated using a circular focal filter in ArcGIS 9.3 Spatial Analyst software. Since the diameter of the filter was set-up at 30m and the computation step was 1m, the map displays a real total volume of trees in a circular neighborhood area of about 700m$^2$ for every square meter of the Zofin natural forest. The volume is calculated in cubic meters per 1 hectare (m$^3$/ha).

3.7 **Map of local proportion of deadwood from total volume in the Žofín natural forest in 1997**

Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map of local proportion of deadwood from the total volume was derived from the digital stem position map of live and dead trees in the Zofin forest measured in 1997. This data set consisting of more then 18 600 trees (more then 15 200 living and ca 3 400 dead trees) with recorded DBH was the essential input for further processing. A volume of wood was calculated in a PraleStat software for each tree of the digital map. Consequently, the local volume of live trees and deadwood were calculated separately using a circular focal filter in ArcGIS 9.3 Spatial Analyst software. From these two datasets the local proportion (%) of deadwood was calculated in the whole Zofin natural forest.

NATURAL REGENERATION

4.3 **Map of natural regeneration in Žofín natural forest in 1997**

Hort L., Vrška T., Adam D., Janík D., Král K., Šamonil P., Unar P.

Advance growth of trees that form at least thin clusters and had not yet reached the minimum size for individual measurement ($d_{1.3}$ ≥ 10 cm) were mapped as groups of regeneration in the form of traverses. In the field, the representation of individual tree species was established by ocular estimation according to tree counts in all continuous groups with a minimum density of 10 seedlings per square metre and height span within the group was recorded as an interval. The mapping was made into the tree map 1 : 1000. Until 1997, some further pronounced changes in the differentiation of natural regeneration occurred and the total area of natural regeneration increased up. New generation of tree species is represented almost exclusively only by beech.

4.4 **Map of natural regeneration in Žofín natural forest in 1997**
Pálková M., Adam D., Hort L., Janík D., Král K., Šamonil P., Unar P., Vrška T.

In the Žofín natural forest tree species natural regeneration (DBH< 10 cm) was investigated in the area of 74.2 ha; using a reference quadrate network with a side of 44.25 m. At 360 network points was at circulat plot covering an area of 30 $m^2$ (radius 3.09 m) recorded all regeneration heigher than 1.3 m. The regeneration of *Picea*, *Fagus* and *Sorbus* is represented in the map by cartograms at three diameter classes: DBH till 3 cm, DBH 3– 7 cm and DBH 7 – 10 cm. Relatively often occured plots with zero natural regeneration (31,7%), at 52.2% plots grew 3 or more individuals. Overall *Fagus* massively prevailed in species composition (98.5%), *Picea* represented only 1.4%.

4.5 **Map of natural regeneration in Žofín natural forest in 2009**
Pícha J., Adam D., Vrška T., Hort L., Janík D., Král K., Šamonil P., Unar P.,

In 2009 a fourth complete mapping of natural regeneration in Žofín natural forest was carried out. The map shows height diferentiation and representation areas of measured groups of tree regeneration. Mapping was conducted on the basis of the tree position map. All trees with DBH < 10 cm were recorded. The European beech prevaled during the time on the whole area. Norway spruce, Sycamore maple and European mountain ash are mixed only individually.

4.6 **Map of development of natural regeneration in Žofín natural forest in the period from 1975 to 1997 according to height classes**
Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map displays the development of the natural regeneration between years 1975 – 1997. It is a synthesis of the maps of natural regeneration from the years 1975, 1987 and 1997. Overlay of maps allows identification of main trends of development of height growth (growth, stagnation and dieback) in particular periods.

4.7 **Map of development of natural regeneration in Žofín natural forest in the period from 1975 to 1997 according to changes in the species composition**

Král K., Adam D., Hort L., Janík D., Šamonil P., Unar P., Vrška T.

The map displays the development of the natural regeneration between years 1975 – 1997. It is a synthesis of the maps of natural regeneration from the years 1975, 1987 and 1997. Overlay of maps allows identification of main trends of development in species composition of growths of natural regeneration in particular periods.