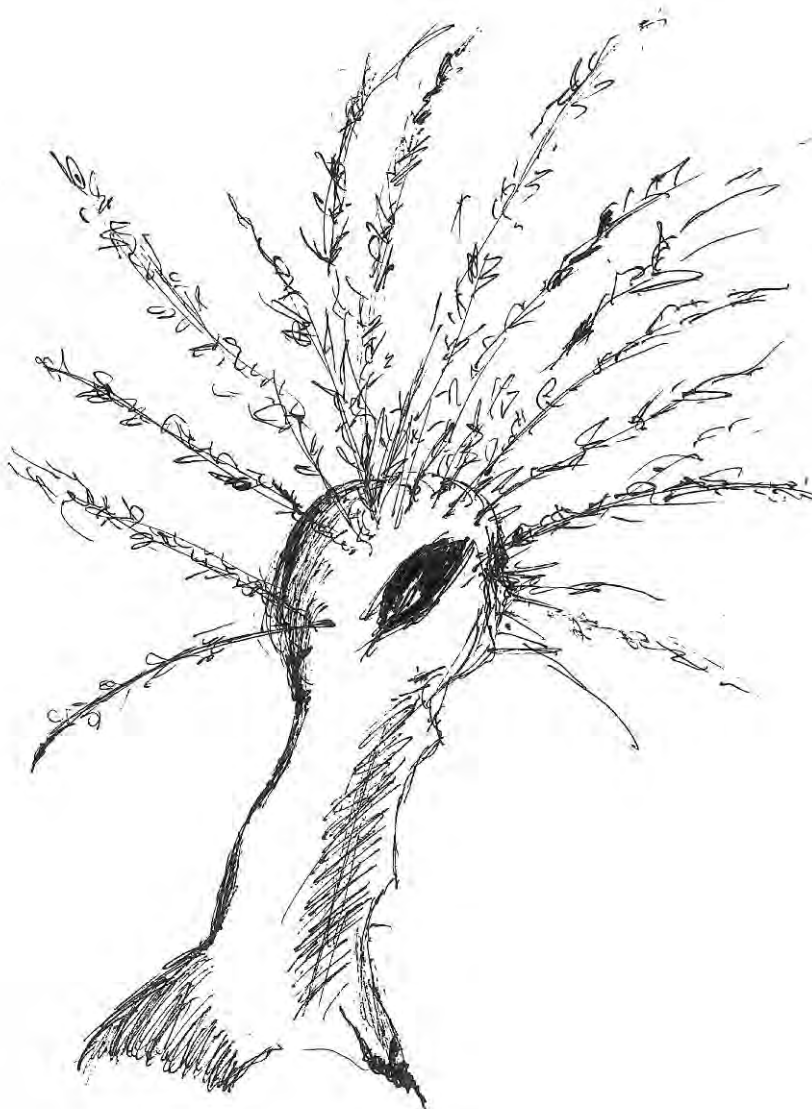


Woody Plant Care Concept In Veľký Lél and Číčov Area (Summary)



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Poplar cultures

Present state and starting points

In the objective areas we identified following clones of *Populus x canadensis*: I-214, Robusta, Marilandica, Serotina.

In optimal stands, poplar cultures are planted with 2x2, 2x1.5 or 2x1 meters spacing. 1-year old rooted cuttings are used for planting. Spacings with growth area of 1-1.5 square meters are used in low fertile marginal areas. In planting energy crops with 1-year old seedlings of Black Locust spacing of 2x1.5 and 2x1 meters proved best. Full-area soil cultivation needs to be performed until the culture is involved and improvement needs to be done in the first year after planting.

Further management of cultivated poplars

The most appropriate way of managing these plants seems to be their gradual transformation into plants with domestic woody plants.

It's suitable to fell poplar plants in a:

- a) large-area clearcutting economic; or
- b) small-area clearcutting economic way

In area of Veľký Lél it is in majority of cases a matter of special purpose and group planting, in Čičov area a matter of flat planting. We discuss the process of planting in chapter "Planting of domestic woody plant growth" of this work.

Growth ratio overview in Veľký Lél:

Area	Territory	Area (ha)	Age (to 1.1.2010)	Fund (m ³)
1.	Zlatná n.O.	1,05	38	306
2.	Zlatná n.O.	9,82	38	2979
3.	Zlatná n.O.	3,62	41	1851
4.	Zlatná n.O.	8,64	44	2960
5.	Zlatná n.O.	5,41	51	2686
6.	Zlatná n.O.	5,29	39	2128
7.	Zlatná n.O.	7,56	47	2226
8.	Veľké Kosihy	1,59	46	366
Total:		42,98		15502

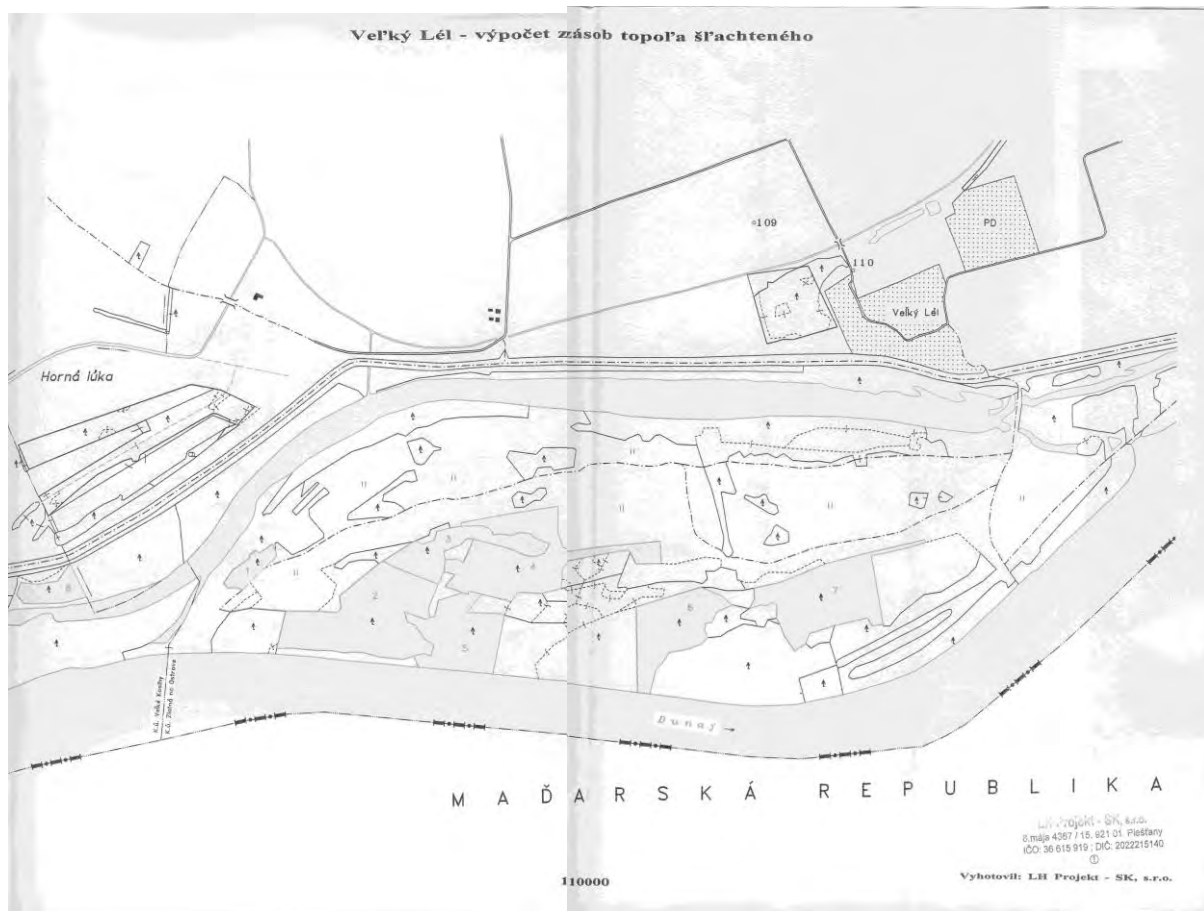


Figure 1: Map draft of poplar growth cultivated in Veľký Lél area.

Growth in Čičov is managed according to forest economic plans' regulations and within the competence of professional forest management, protection features of management can be employed in respect to growth, e.g. improvement by original species up to 10 % of growth area, preservation of reserved trees and lying or standing dead wood, respecting micro- and mesostand in the process of afforestation by various woody plants.



Figure 2: Map draft of growth of BROZ in Čičov

Other measures regarding felling of poplar plants

- Protection and nursing of reserved trees of oaks, elms and narrow-leaved ashes, eventually other species in small groups (individually) among growth of

unoriginal woody plants.

- Protection of root swellings of the remaining trees by pulling the trees (trunks) out of the cut down forest area.
- Preservation of bank vegetation (especially in shallow banks) by means of directional felling in the direction away from the bank line. Felling of unoriginal species in bank vegetation only.
- Preservation of dry and hollow trees, especially the thicker ones, individually or in small groups. Usage of biologically degradable oils used for chain saw lubrication.

Invasive woody plant growth

Practical procedure

Invasive species of woody plants in the area: Ash-leaf Maple (*Negundo aceroides*), Red Ash (*Fraxinus pennsylvanica*), American Ash (*Fraxinus americana*), Common Hackberry (*Celtis occidentalis*), Black Locust (*Robinia pseudoacacia*); are removed by chainsaw felling from 15th August to the end of February. New growth is getting removed also with brush cutters. Biologically degradable oil for chain saw lubrication is used.

As a preventive measure to prevent coppices from becoming invasive woody plants, a pasture for farm animals in the cut areas should be applied.

Strategic principles

Elimination of invasive woody plant species will have the desired effect (with regard to invasive species' nature) only if performed *permanently and across the whole area*. Regulation of invasive woody plant species in a framework of silvicultural measures, not only in Čičov and Veľký Lél area, but also in the protected land area Danube Floodplains:

- Establishment of vegetation
- Tree cleaning
- Thinning up to 50 years
- Thinning over 50 years
- Principal felling



Head willows

Significance

The presence of head willows is a product and a testimony of many years of human activity in cultural countries of Europe. As they were far more common in the past, they became an important part of nature. They increase the diversity of animal and plant species on the stand. However, in last decades they lost their economic efficiency. In their present shape their significance is rather ecologic and landscape esthetic, such as fruit groves with high trunks.

Regeneration of old trees

Regeneration will consist in trimming of old willow branches. They grow in height from 1-5 meters depending on the age and the level of damage of a tree. Plants have to be passable enough for removal, that's why they have to be appropriately cleaned beforehand, i.e. special purpose felling of coppices, mainly of invasive woody plants.

We have to trim branches as close to the head as possible, that's the only way to secure the increase of head size. We don't have to worry about shortage of sprouting branches. We don't perform snedding close to the head only in cases of highly neglected old trees with huge branches. If that's the case, we leave 10-20 cm parts of branches in order for the tree to be able to sprout young rods.

Trimming will be performed from December to February.



Figure 3: Regeneration of old head willow trees

Cultivation of new head willows

New head willows will be planted in the places where the old ones died away. Branches of White Willow (*Salix alba*), Crack Willow (*Salix fragilis*), Common Osier (*Salix viminalis*) and Purple Willow (*Salix purpurea*) are suitable. We use branches from snedded willows from the surrounding area or region. Planting stock will be obtained from further localities in order to prevent willows from crossbreeding. Planting is realized by means of so-called willow stakes, eventually rods:

- a) Thick stakes of 10 – 20 cm diameter, 1.5 - 2.5 m long, either dug 0.5 – 1.0 m into the ground or put into a bore of the same depth.
- b) 5 cm wide and up to 2 m long thin rods in the age of 1 – 2 years. Rods are put into a bore in the ground bored by a so-called planting spade. A planting spade is a metal cusped tool in the shape of a T letter, which can be with the pressure of human leg

stuck app. 0.6 m into the ground. A planting spade is full-metal, see its draft in the following picture.

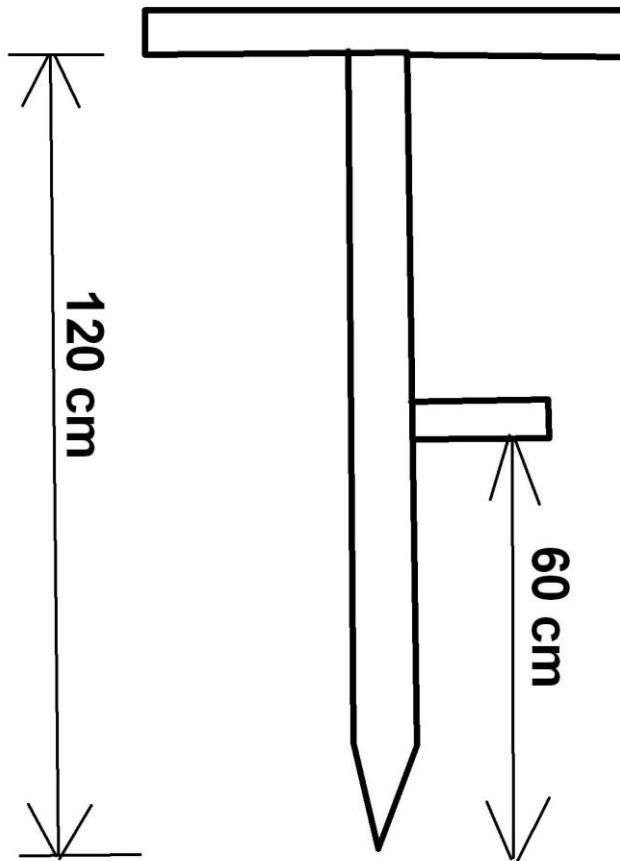


Figure 4: Draft of a planting spade for willow rods

c) Up to 10 cm thick and 3-5 m long rods for deep planting into grounds with deep level of underground water. Bores are bored 1.5 – 1.8 m into the ground by a drill connected to a tractor.

Before planting stakes are nursed by a growth stimulant and fungicidal substances. Spacing between planted willows should be at least 2 meters.



Figure 5: New planting of willow stakes

Creation of a willow head

Gradual creation of a willow head by means of goal-directed trimming depends on the size of planted branches and selected height of a place where future head is to be created.

After usually a large number of shoots grow up in the highest part of a tree, it is important to remove lateral shoots and buds from the ground up to app. 20 cm below the end of a head (two palms width) by the end of May. We have to trim lateral branches close by a trunk in order not to get so-called hat racks. We recommend performing a check in August repeating the procedure described above. We can lop off the head for the first time in the winter half of a year from November to March.

Experience has shown that this early head snedding causes intensive root formation contributing to the vitalization of a plant. Biomass production in the following year is incomparably better than in uncut exemplars.

Removal of lateral shoots up to branches of the head is desirable also in the second year (May/June). In the winter part of the year we perform head snedding again. In the third year, not such a large number of lateral shoots is sprouted. It is necessary to remove them during regular checks in May/June. If a trunk is of 10 cm or more in diameter, from the third year on we trim the head in 2 – 3 years span. According to the ratio of trunk and both weight and diameter of head branches we decide when to move to a 5-year span – unless the nature of usage requires more frequent procedure.



Figure 6: Successfully regenerated head willows. Snedding was performed after app. 20 years.

Biodiversity and head willows

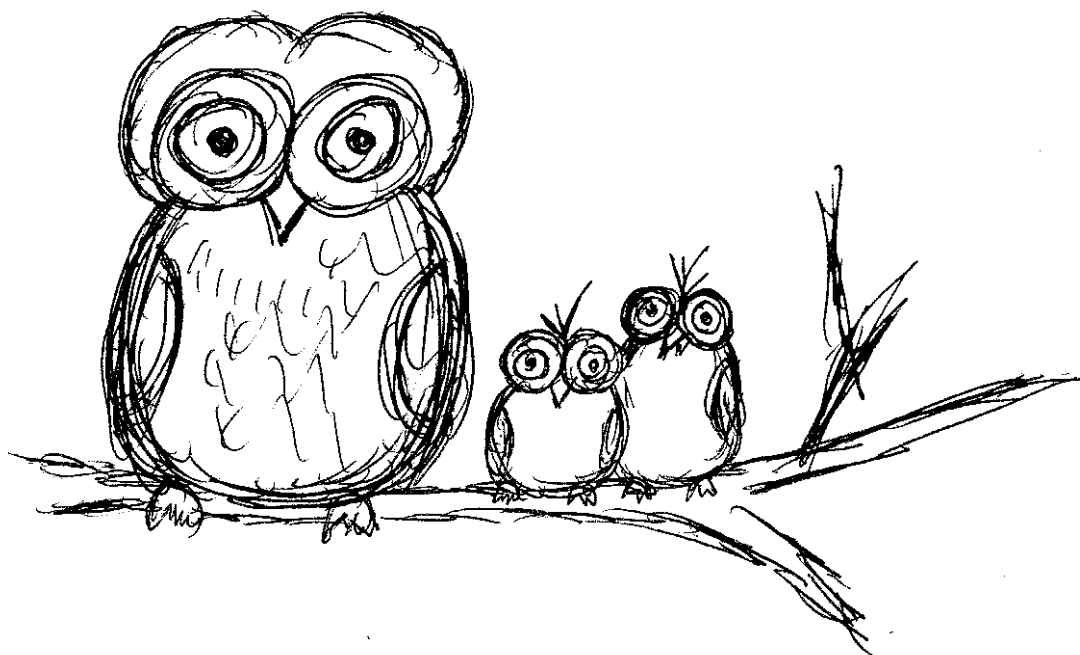
Colonization by non-parasitic plants, which colonized the willow, thanks to piled dust, carious wood and suitable humidity, is noticeable. In addition to higher vascular

plants a whole range of lichens, bryophytes and tree mushrooms can be found.

Head willows are immensely significant because of a large number of animals colonizing them. Researchers found on 5 observed willow species as many as 450 mite and insect species. Older head willows provide living and also dying wood in various degree of decay, that's why also xylobiont beetle species such as hermit beetle, rusty click beetle, *Ampedus elegantulus*, *Betarmon ferrugineus*, musk beetle, weaver beetle, twin spot longhorn beetle, *Agrius pratensis* or lesser stag beetle can be found.

Willows are colonized also by other small animals, notably for example by some snail species. Hollow willow trunks are used as daytime shelters or burrows by martens, rabbits, muskrats, dice snakes, bees, wasps, hornets and others.

Also bats and many bird species - colonizing even the top of the head - are often to be found in hollows. These include e.g. winter wren, common redstart, the European robin, spotted flycatcher, white wagtail, various tit species, tree sparrow, lesser spotted woodpecker, wild duck, stock pigeon, long-eared owl, common kestrel and tawny owl.





Woody plant and forest regeneration

Starting points

Following species among tree species of domestic woody plants were identified on Danube's alluviums: *Acer pseudoplatanus* L. (Sycamore Maple), *Alnus glutinosa* L. Gaertn. (Common Alder), *Alnus incana* Moench. (Grey Alder), *Carpinus betulus* L., (European Hornbeam), *Cerasus avium* Mönch (Bird Cherry), *Fraxinus angustifolia* Vahl. (Narrow-leafed Ash), *Fraxinus excelsior* L. (Common Ash), *Populus alba* L. (White Poplar), *Populus x canescens* Sm. (Grey Poplar), *Populus nigra* L. (Black Poplar), *Quercus cerris* L. (Turkey Oak), *Quercus robur* L. (Pedunculate Oak), *Salix alba* L. (White Willow), *Salix fragilis* L. (Crack Willow), *Tilia cordata* Mill. (Small-leaved Lime), *Ulmus laevis* Pall. (the European White Elm), *Ulmus glabra* Huds. subsp. *glabra* (the Wych Elm) and *Ulmus minor* (the Field Elm). Woody plants marked in bold type grow also in objective areas. These, as well as others listed above, can be planted in both localities.

Planting of domestic woody plant growth

Typical species for this area are notably: Grey Poplar, Black Poplar, Narrow-leafed Ash, Pedunculate Oak, the European White Elm, the Field Elm, the European Pear, Wild Apple, White Willow, Crack Willow, Common Alder. Their mixing, age, origin, way of planting will be a subject of consultation with silvicultural persons and Professional forest managers. The planting will take place based on results of this consultation. In majority of cases it will be a matter of special purpose and group planting. Planting will take place either in autumn time (November-December) or in spring time (February-April).

When dealing with genus Oak, it is important in terms of nature preservation to focus on genera from section *Robur* (*Quercus robur*, *Q. pedunculiflora*). According to Varga et al. (2000), one of ways how to prevent damages caused by weed infestation and

partially longer lasting floods in the process of artificial regeneration of floodplain forests is planting of grown up trees.

In the process of planting of Pedunculate Oak and Narrow-leaved Ash this way can be used provided that these grown up trees reach the desired quality parameters. Their usage simultaneously enables to lower the number of these woody plants in the area in the process of planting. Oak and Ash are not suitable for mixing in one area, because of the growth differences between them at their young age. The quicker growth of Ash would negatively influence the quality of Oak individuals in the culture and at the same time, if tending of Oak wouldn't be supported, it could lead to lowering of its presence or eventually total fall-out from growth structure. Oak and Ash in one growth should be mixed in small islands or even areas. It is advisable to plant Oak as well as Ash into growth along with associate woody plant, which is able to grow in the second crown layer and simultaneously perform a soil-protecting and tending function. Species growing with Oak and Ash in natural growth compositions are used for this purpose, in inundation conditions of Danube notably elms, beyond inundation also the Field Maple and Small-leaved Lime. Except of these, Norway maple, and to a lesser extent as an addition also the Field Maple, can be used in floodplain and lowland forests. In the process of planting of associate woody plants it is important, especially in relation to Oak, to respect their quick growth at young age, so Oak has to be at age at least 3 years ahead of them. This age can be modified according to growth speed observed in the first years after planting. 1 – 2 years is long enough for Ash, eventually it can be planted along with associate woody plant provided that it is well ahead of it in terms of height, i.e. if only common-sized seedlings of associate woody plants are planted. In case of lime in overflow lands of floodplain forests it is advisable to plant grown up trees. In a mixture with Oak it is necessary to keep the afore-mentioned age difference. Because of its quick growth, Norway maple is recommended to be planted prevalingly in a mixture with Ash. In case of planting with Oak, the age lead of Oak would have to be increased considerably.

If time interval between planting of Oak, Ash and associate woody plants is met and strangling of Oak, eventually Ash, still occurs, associate woody plants can be

trimmed in order to prevent this from happening for some time. However, it is generally enough to help Oak and Ash in cultures by means of positive selection of adequate intensity.

Planting of Oak (Ash) along with associate woody plant (being hornbeam, lime) should be carried out in a square spacing with a space of 1 x 1 m. Because of technological reasons it can be adjusted to 1.2 x 0.8 m. The regenerated tree presence is dominated by associate woody plants, which considerably distinguishes it from the target presence.

Poplars of section *Leuce* of domestic provenance (i.e. no species and crossbreeds with *P. termuloides* and *P. grandidentata*) are in terms of nature preservation considered main and stabilizing woody plants in special interest growth. Via cultivation (BIELIKOVÁ 1983, BIELIKOVÁ 1992), results comparable to Euro-American poplar clones in terms of production have been achieved (VARGA 1999). Seedling production and silvicultural measure technology is gradually being put into practice by forest service. In genus of Maple we prefer Norway maple.

On stands of Saliceto-Populetum, conditions and growth development (where cultivated poplars were planted) themselves qualify the transition to original woody plants, notably Common Alder (utilization of results achieved by BODÓ (1992) a o.), addition of willow (particularly findings and material in VARGA (1988), VARGA (1999) a o.), the European White Elm.



Figure 7: Sprouting White Poplars grown from root cuttings

Seeding amount application

According to Tučeková (2009a), technology of artificial regeneration via seeding “into vegetation cells” started to be tested in Slovakia in extremely dry and sterile (in terms of nutrients) sands of Záhorie. Seeds of following woody plants were used: the Scots Pine, the European Black Pine, Pedunculate Oak, Black Locust, the European Birch, the European beech, Common Alder.

Technological procedure of seeding „into vegetation cells“

A 10 cm deep hole of a size of the used cell in diameter (app. 8 cm) is dug

manually in the mother soil. App. 5 cm of organic matter (seeding substrate with addition of hydroabsorbents, eventually granulate of soil conditioner) is manually poured onto its bottom. On a manually rammed seeding substrate a seed is seeded, which is covered by backfill (substrate with addition of damp perlite, according to the seed size). A “vegetation cell” is placed onto this organic matter and then covered in tightened by the surrounding layer of sand (mineral soil). Vegetation cell is from plastic material with circular section (diameter: 8 cm, height: 15 cm). Nowadays it is proposed to replace plastic covering with ecological material decomposing during first two years since its application. In case of need there is a possibility to protect seeding amounts, especially of large seeds (broadleaves), against rodents by means of the application of wire coverings adjusted to upper part of plastic cone. There is also a possibility to protect sprouted seedlings during full-area chemical spraying by means of a removable plastic covering.

Tučeková (2009b) states that in case of quality seed with a good quality of germinating activity, 85-100% seeds of all tested woody plants sprout successfully. Seedlings survive with no problems, damage, mostly in good health. During vegetation period they have favourable conditions in a cell without any major temperature and humidity variations.



Figure 8: Oak seedlings in a vegetation cell in the first year of seeding (Photo: A. Tučeková)

Technological procedure in Danube conditions

- Excavation of a hole in a diameter of the used cell, i.e. 8-10 cm. The excavation should be performed after spring, eventually summer inundation.
- App. 5 cm of organic matter (seeding substrate with addition of hydroabsorbents, eventually granulate of soil conditioner) is manually poured onto its bottom.
- On a manually rammed seeding substrate a seed is seeded, which is covered by backfill (substrate with addition of damp perlite, according to the seed size).
- A “vegetation cell” is placed onto this organic matter and then covered in tightened by the surrounding layer of sand (mineral soil). (Vegetation cell is from plastic or biologically degradable material with circular section (diameter: 8 cm, height: 15 cm). It should be easily seen for better search options when nursing against weed and wild animals is necessary.

During vegetation period, a check of seedlings should be performed three times, they should be nursed against weed and mechanical or chemical protection against wild animals should be applied.

Woody plants suitable for this technology: DL, VZ, BP, JU, JS, JM, JP, JL, JX.

Index of woody plants and their abbreviations

DL	Pedunculate Oak - <i>Quercus robur</i>
HB	European hornbeam - <i>Carpinus betulus</i>
JH	Sycamore Maple - <i>Acer pseudoplatanus</i>
JM	Norway maple - <i>Acer platanoides</i>
JP	Field Maple - <i>Acer campestre</i>
JT	Tatar Maple - <i>Acer tataricum</i>
JS	Common Ash - <i>Fraxinus excelsior</i>
JU	Narrow-leafed Ash - <i>Fraxinus angustifolia</i>
JK	Manna Ash - <i>Fraxinus ornus</i>
BZ	European Elder - <i>Sambucus nigra</i>
BP	Field Elm - <i>Ulmus minor</i>
VZ	European White Elm - <i>Ulmus laevis</i>
AG	Black Locust - <i>Robinia pseudoacacia</i>
JL	Common Alder - <i>Alnus glutinosa</i>
JX	Grey Alder - <i>Alnus incana</i>
VB	White Willow - <i>Salix alba</i>
VF	Crack Willow - <i>Salix fragilis</i>
VK	Shrub willow - <i>Salix</i> sp.
LM	Small-leaved Lime - <i>Tilia cordata</i>
LV	Large-leaved Linden - <i>Tilia platyphyllos</i>
OS	Common Aspen (aspen) - <i>Populus tremula</i>
TS	Euro-American Poplar - <i>Populus x euroamericana</i>
TC	Black Poplar - <i>Populus nigra</i>
TB	White Poplar - <i>Populus alba</i> , <i>P. x canescens</i>
CS	Bird Cherry - <i>Prunus avium</i>
BX	Wild Service Tree - <i>Sorbus torminalis</i>
OC	The Eastern black walnut - <i>Juglans nigra</i>
TP	European bird cherry (chokecherry) - <i>Padus racemosa</i>
DR	European Cornel - <i>Cornus mas</i>
HR	European Pear - <i>Pyrus pyraster</i>
JN	European Wild Apple (crab-apple) - <i>Malus sylvestris</i>
HJ	Common Hawthorn - <i>Crataegus monogyna</i>
HO	Northern European Hawthorn - <i>Crataegus oxyacantha</i>