CHILDREN OF TREES FROM FOREST NURSERIES

Forest nursery is a special facility where plants are raised for artificial forest regeneration. Originally, small temporary nurseries and seeding nurseries used to be established right in the forest stands. Today, large nursery enterprises use various advanced technologies and mechanization, providing good conditions and background to their workers.

Forest nurseries are operated on forest and agricultural lands in the flat terrain with loamy sands. Important for them is a water source for irrigation, electricity connection, good accessibility for machines and transport vehicles and site fencing to protect seedlings and plants against wildlife.

- Forest nursery equipment Plastic greenhouses, seedbeds, ploughs, harrows, cultivators, seeding and planting machines, irrigation systems, machines for packaging plants, background for workers, workshops, spaces for substrate preparation, halls for sorting and packaging of plants, storage rooms for chemicals etc.
- Sowing in forest nurseries The first thing to do is to prepare the soil (aeration, fertilization, disinfection). Seeds are sown on the beds or into the furrows and rows. Sowing density, depth and sowing period, which lasts from spring to autumn, depend on the type of seed. According to their size, the seeds are sown by hand or mechanically by machines. Then they are covered with soil, pressed back and watered.

The seed develops into a seedling, plantlet, i.e. a plant with the typical primary leaves, which usually differ from the leaves of adult plant. In the nurseries, seedlings are understood to be plants arisen from the seed before transplanting, undercutting or lifting. After these operations, they are considered ready for being planted out.





NURSERY PRACTICE

Age group: **Basic school – Seniors**



Weeding machine. Photo: Archives of the Secondary Forestry School in Hranice





Spruce seedlings on the bed in forest nursery. Photo: Archives of the Secondary Forestry School in Hranice



A beech seedling with beech mould. Photo: Archives of the Secondary Forestry School in Hranice

Raising seedlings by transplanting – The plant is lifted from the bed, its root system is cut back, and the seedling is returned back to the soil at a larger spacing (planted again at a greater distance). The root system must not dry out or suffer damage. Seedlings are transplanted in order to strengthen their aboveground as well as underground parts. Transplanting takes place on the beds in spring or in autumn. Seedlings grown in the glasshouse or plastic greenhouse can be transplanted throughout the year. Transplanting is typically used for trees with the widely spreading root systems (spruce, fir).

Technologies: - manually – by using a plank or transplanting frame, transplanting spade; - mechanically – by using transplanting machines



Transplanting of seedlings by using a transplanting frame Photo: Archives of the Secondary Forestry School in Hranice

 Raising seedlings by undercutting – This method replaces transplanting and ensures a properly developed root system, which is important for the success of planting. Advantage of undercutting is that the root system does not become

damaged. The method is fully mechanized and can be applied in a majority of our tree species. The root system of the seedling is cut manually by using a spade or mechanically to remove ca 1/3 to $\frac{1}{2}$ of root system volume. The cut has to be clean, made at a depth determined specifically for each species. The undercut seedling is pressed back into the soil, watered and fertilized after about a week. Undercutting is typically made in the tree species with a long, so-called taproot system (broadleaves, pine).



Stock determined for transplanting Photo: Archives of the Secondary Forestry School in Hranice



Spruce plants on the bed in forest nursery Photo: Archives of the Secondary Forestry School in Hranice

Lifting, sorting, distribution – The final stage of producing forest tree plants is their lifting from the bed, sorting by
quality and distribution to forest stands where they are used in forestation.



Lifting of plants in forest nursery Photo: Archives of the Secondary Forestry School in Hranice

Forest nurseries produce two types of plants:

• Bare rooted plants and seedlings are grown on beds, lifted and sold for the purpose of forest regeneration with bare

roots and without soil. Their production is simpler and cheaper but the plants are more susceptible to weather (sun, frost, drought). This is why they have to be kept in snow caches or in air-conditioned storerooms before they are planted out.



Snow cache in Beštín – LČR, s.p. Foto: http://novadus.hyperlink.cz/references/vychozi/detail/61-snezna-jama-bestin

• Containerized plants and seedlings are grown each separately in special packages in glasshouses and plastic greenhouses on air cushion. These plants have a dense root system in earth thanks to which they are less susceptible to weather and become better established.



Packages for containerized plants



Growing of containerized plants on air cushion



Containerized plant. Photo: Archives of the Secondary Forestry School in Hranice

THEMES FOR ACTIVITIES

- Visit to the nearest forest nursery forest pedagogy with the forester in the forest: www.lesnipedagogika.cz / Kontakty.
 - Counting of seedlings and plants on the given site Training of estimate and verification of reality
 - Demonstration of transplanting
 - Identification of plants of individual tree species
 - What can tags on the forest nursery beds tell us about the plants? Try to create such a tag about yourself (who is your family).
 - Pricking out the seedlings
 - Weeding
- Pictures of seedlings are to be matched to the names of seedlings according to their characteristics. Children will work in groups, or each of them will peg a seedling picture or seedling description and name on their chest, and matching pairs are sought. Aids: pegs, cards with the pictures of seedlings (see Working sheet "Why the babies of tree do not take after their parents?"), cards with the names and characteristics of seedlings (can be downloaded from www.lesnipedagogika.cz/cz/pro-skoly/tyden-lesu-2016; Note: The website is not publicly available; it will appear only after entering this address in the address bar of your web browser).
- Test of seed quality Put a piece of moistened absorbent paper in a small dish or a plastic cup, cut out according to its shape. Place 25, 50 or 100 seeds on the paper. You can use seeds that you have husked from the cone by yourself or even peas bought in the shop. Check how many of them will germinate. Determine the seed germination percentage according to the size of the cut out sector.
- Forest regeneration by sowing spreading of seeds The game is best to play in collaboration with a forester who will help to explain the stages of forest development as well as the requirements of individual tree species. The teacher or the forester will throw a handful of seeds into the air (their number corresponding to the number of children). The child will squat where the seed has fallen and rises with the growing seedling (seed – squat, seedling – kneeling position, self-seeding – trunk bend, advance regeneration – stand, coppice – arms at a mild distance from the body, small pole stage – arms raised sideways with elbows bent at an angle, pole stage – arms outstretched sideways, high forest – arms above the head). Then the forester explains why some saplings die (due to the lack of moisture, light or nutrients in an excessively dense stand, some become food for wildlife, and some are removed by the foresters from the young growth to decrease its density, or in the pole-stage stand by operations called cleaning and thinning in order to achieve a good quality mature stand). Aids: cards with the names of forest growth stages (can be downloaded from www.lesnipedagogika.cz/cz/proskoly/tyden-lesu-2016; Note: The website is not publicly available;



Natural seeding of spruce after cleaning Photo: Archives of the Secondary Forestry School in Hranice

it will appear only after entering this address in the address bar of your web browser).

Stratification game – We shall explain to the children that forest trees do not give fruits every year and that the nature has arranged it so that not all seeds falling onto the ground germinate at once in the first year but some of them are delayed in germination. Since it is not possible to have plants of different age on one bed in the forest nursery, all seeds must germinate in the first year. This is achieved by a process called stratification. The seeds are exposed to cold and humidity, by which the action of growth hormones is unified and all seeds will germinate in the first year.

We shall create simple arithmetical problems of fractions: For example: We have 270 seeds. One third of them germinated the first year, the second year germinated the other two fifths of them, and the remaining seedlings did not germinate at all. Express the reality in numbers.

- Slash removal All logging residues, namely branches, must be removed from the clear-cut area before the planned planting out of new plants occurs not to hamper their growth. In flat terrains and in favourable conditions, the slash is removed mechanically. A tractor will arrive to the site, which pulls a roller behind, from which small hammers come out. The tractor crushes the branches into small pieces. Thus, obstacles in the terrain and places for a possible development of pests are removed. Alternatively, the branches are piled in one direction so that the pile is as low as possible, air gaps smallest possible, to make the pile decay soon.
- A picture of the forest nursery manager to be filled with colours is presented in Working sheet "Why to pamper the forest"

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