Project: Partnership for the development of training standards for tree assessors in Central and Eastern Europe
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TREE
ASSESSOR

Valuation of trees

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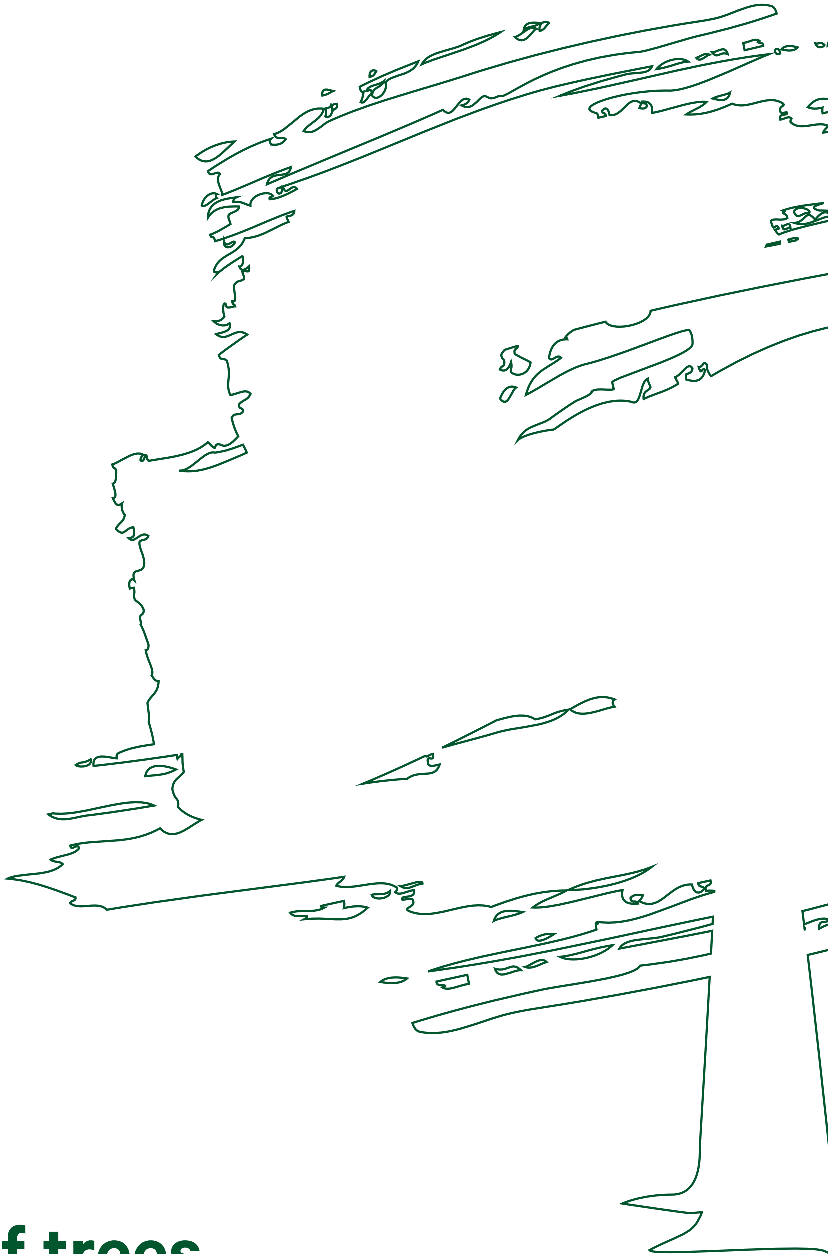

TREE ASSESSOR

Valuation of trees

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I.
Introduction

Green areas are integral parts of any settlement. They affect the ecology of built environments and microclimate beneficially, reduce the possibilities of extreme temperature development and play significant role in filtering dust and pollutants. Through assimilation they reduce CO_2 concentration and produce invaluable oxygen for human and animal life. They mitigate noise and vibration pollution, protect soil, and built objects.

Inside green areas trees have the most decisive role, these are the most valuable elements. A city tree in the middle of a concreted square with the many living creatures bound to it, creates an individual ecological system.

Municipal green areas are the same property as any other element that is treated as an asset in everyday life, such as real estate and agricultural land. A characteristic of a tree is that its biologically active foliage is multiple times the size compared to the occupied land, which grows continuously until the species specific size is reached.

The total "services" given by trees have a value (not price!). Calculating the value of trees is a quite complex task, since we must determine the value of a constantly changing living organism, to which many objective elements belong. To be aware of the value of the property entrusted to us, we must first realize the species, quantity, size, and condition of trees. We can record this in the tree cadastre. Given the existing data, we can approximately calculate the value.

With the spread of information technology, data management became simpler, updating data cause no concerns. Thanks to the advanced technology nowadays complex registration cadastral systems are starting to spread, in which, besides the map registration of real estates, utilities and green areas, descriptive data are also available.

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FŐKERT

II.
Necessary data and documents for creating and operating tree cadastre

TERRITORIAL DELIMITATION OF THE LOCATION OF TREES

Legal delimitation of trees standing in the area

Primary source is the land office register. Parts:
- title deed
- deed archive
- real estate registration map.
  (Real estate identification is based on parcel number)

Spatial delimitation of trees in the area

To identify trees, the map (topographical) marking is important.
The disadvantage of paper-based register is that changes are hard to follow, therefore digital format is recommended.

DATA FROM A FIELD SURVEY

Data from a field survey consists the following:
- basic data recorded during data upload
- changes made during periodic inspections
- modification data recorded during daily work
- modifications implemented during extraordinary events

ADDITIONAL DATA APPLIED BY THE TREE CADASTRE HANDLER (FOR TREE VALUE CALCULATIONS)

- annually refreshed nursery garden prices
- table of age multipliers
- table indicating the vigor of tree species and varieties
- table indicating the dendrology value of tree species and varieties
- table indicating classification/coefficient data taken during cadastre measuring and tree-value calculations
- the protection and territorial classification of the tree

CALCULATED DATA

- calculated value of the tree

OTHER DATA AND DOCUMENTS

- pictures
- tree care unit prices
- copy of settlement accounts of tree-related works and materials
- copy of worklogs and construction logs
- copies of accident and damage records

BASIC DATA RECORDED FOR DATA UPLOAD DURING THE FIELD SURVEY

Marking the tree on map, site plan
- Tree ID (and/ or) coordinates

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Marking the tree based on area definition
- Settlement/District
- Avenue/Park
- Section/Block
- Side/Table
- Tree serial number

Topographical identifier (Parcel Number, street number)

Physical parameters of the tree
- Species, varieties
- Trunk diameter
- Crown diameter
- Tree height
- Trunk height

Condition assessment of the tree
- Condition of the roots
- Condition of the trunk
- Condition of the crown
- Degree of tree care

Viability and health condition of the tree

Unique protection of the tree and its location inside a settlement

Treatment suggestions

Other remarks, comments

Recording time of the cadastre

Name of the recorder

SIMPLIFIED CADASTRE RECORD SHEET

SETTLEMENT: Alsótapod (ATAP) | DISTRICT: 1 | ALLEY/PARK: Deák Ferenc fasor (DFF)

SECTION	SIDE	SERIAL NUMBER	ADDRESS	TREE SPECIES (LATIN NAME)	TRUNK DIAMETER (CM)	CROWN DIAMETER (M)	TREE HEIGHT (M)	TRUNK HEIGHT (M)	ROOT CONDITION	TRUNK CONDITION	CROWN CONDITION	DEGREE OF TREE CARE	VIABILITY	PROTECTION	TREATMENT SUGGESTIONS	OTHER REMARKS, COMMENTS
01	01	001	1/a	Sophora japonica	45	16	19	2,8	3	3	4	4	4	3	Gallyazás	Tábla a koronában
01	01	002	1/b	Tilia cordata	12	4	7	2,5	5	4	3	4	4	3	Koronaalakító metszés	[illegible]
01	01	003	1/c	Aesculus hippocastanum	140	24	30	3,2	3	2	3	4	3	1	Favizsgálat	[illegible]

RECORDER: Kiss István | ADMINISTRATOR: Nagyné | DATE: 2011.11.02 | PAGE No: 1

The simple tree cadastre is not sufficient for work planning and work scheduling, but if there is no need for this, in the case of a couple hundred trees, paper-based registry is enough. Main disadvantage is that updating the data is circumstantial, calculation tasks and summaries with existing data requires a lot of work effort. At bigger quantity it becomes cumbersome, requires a lot of space, therefore rather using computer-based tree cadastre (software) is recommended.

OTHER OFF-SITE DATA REQUIRED TO CALCULATE TREE-VALUE

- Nursery garden prices
- The calculated age of the tree, in case we are unable to determine it with on-site methods
- Dendrological value of the tree

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III.
Physical properties of trees

SPECIES, VARIETIES

The tree cadastre should primarily include the taxonomically accurate scientific name, but it is important not to use synonymous names for particular species. The Hungarian/Polish/Latvian name may be indicated, but this may vary from region to region, and, in some cases the same Hungarian name covers different species per region. The name of the tree variety is of great importance, referring to habitus, growth vigor and many other characteristics of the variety.

TRUNK DIAMETER

In horticultural practice, the trunk diameter is measured at a height of 1m from the soil surface, in case of multi-trunked bush trees it is measured below the branching, if this is not possible, the trunks are measured individually at the given height. Determining the tree trunk diameter is indispensable, the age of the tree can be determined by it with good approximation. In forestry practice tree diameter is measured at 1.3m height (breast height), this method is not recommended though, because trunk diameter - age conversion is designed for measurements at a height of 1m.

CROWN DIAMETER

The average crown diameter should be given in meters, for asymmetrical crowns the average of the smallest and largest crown diameters needs to be recorded. It is an essential value for one of the basic operations of tree value calculation, the calculation of crown area.

TREE HEIGHT

The total height of the tree measured from the soil surface, given in meters.

TRUNK HEIGHT

Distance between the root collar and crown base. For Avenue trees, the standard trunk height of 220 cm is a basic requirement when planting, but this also varies depending on the environment, because the trunk height increases during section pruning. For trees planted in parks, the value varies.

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IV. Tree condition assessment and evaluation

To determine the condition of the trees, we recommend using the model adopted by Dezső Radó in 1998 (published in 1999), which is the generally accepted model in the European Union. "The method for assessing the condition of avenue trees is based on the five-step model adopted by the European Union's Forestry and Timber Management Committee in 1984, which examines tree species in the temperate zone. The five-step model means that the parts of the individual trees of an avenue (root, trunk, crown, degree of care, viability) are given number values of 1 to 5, and the condition of the tree is determined from arithmetic mean of these values" [RADÓ, 1999]
During condition recording, numerical values are given based on textual condition definitions. During the adoption of the method, the order of the numbers used in the EU was reversed by Radó (in Hungary, the value 5 indicates the best condition). The crown and the crown base are not valued separately either but together.

CONDITION OF THE ROOTS

Examination of roots without excavation, visual inspection of the soil surface is the most decisive aspect. The shape and injuries of the root collar refer to the health status of the roots running in the soil, therefore (as Dezső Radó combined the evaluation of the crown and the crown base) it is recommended to determine the condition of the root system using the root collar and root system examinations together.

CONDITION OF THE ROOTS	
ASSESSMENT	RATING
Visibly developed root system, in optimal land area, intact root collar	5
Development of the roots is slightly obstructed, in acceptable land area, root collar is not damaged	4
Smaller visible damages (injuries and rot) on the root system and/or root collar, within a land area with slight faults	3
Potent visible surface damage on the root system and/or on the root collar, on poor land area	2
At least 50% potent damage on the roots, on terrible land area	1
Dead roots, empty tree place	0

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CONDITION OF THE TRUNK

The changes in condition of the trunk have a strong effect on the health of the tree. In case of rot of the wood part, the static condition of the tree deteriorates, in case of damage to the transport tissues, the nutrient circulation is limited. When examining the trunk, the condition of the root collar and the crown base should also be considered, because the condition of both parts also affects the trunk.

CONDITION OF THE TRUNK	
ASSESSMENT	**RATING**
Trunk is not damaged	5
Small damages (few surface injuries)	4
Clear damage on the trunk (few surface injuries and rot spots)	3
Potent damage to the trunk (several great wound, deep rot)	2
Advanced damage on the trunk, dead, rotten (The trunk is damaged to such an extent that it is unable to perform its static or nutrient supply function)	1
Empty tree place	0

CONDITION OF THE CROWN

When assessing the condition of the crown structure, the condition of the crown base needs to be assessed as well. Assessing the crown is the most difficult task, as a closer examination is difficult due to its location. The primary consideration in condition assessment is to determine the ratio of true to ideal foliage weight.

CONDITION OF THE CROWN	
ASSESSMENT	**RATING**
The crowns shape is intact (species specific), foliage loss does not exceed 10 percent.	5
Foliage loss is between 11-25 percent	4
Significant foliage loss (26-50%)	3
Potent crown rot (above 50%)	2
Dead crown, complete foliage loss	1
Empty tree place	0

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THE DEGREE OF TREE CARE

The degree of tree care should be given in relation to the ideal maintenance. The tree is optimally cared for if all its physiological needs are met, as a result of which it has the growth vigor characteristic of the species, the care work was carried out in time and in sufficient quality, and the maintainer did everything to preserve the condition of the tree.

THE DEGREE OF CARE	
ASSESSMENT	RATING
The tree is optimally cared for	5
The tree shows a slight lack of care	4
The tree shows a moderate lack of care	3
The tree shows a significant lack of care	2
The tree is in a neglected condition (It has most likely not been cared for at all or has been cared for a very long time ago)	1
Empty tree place	0

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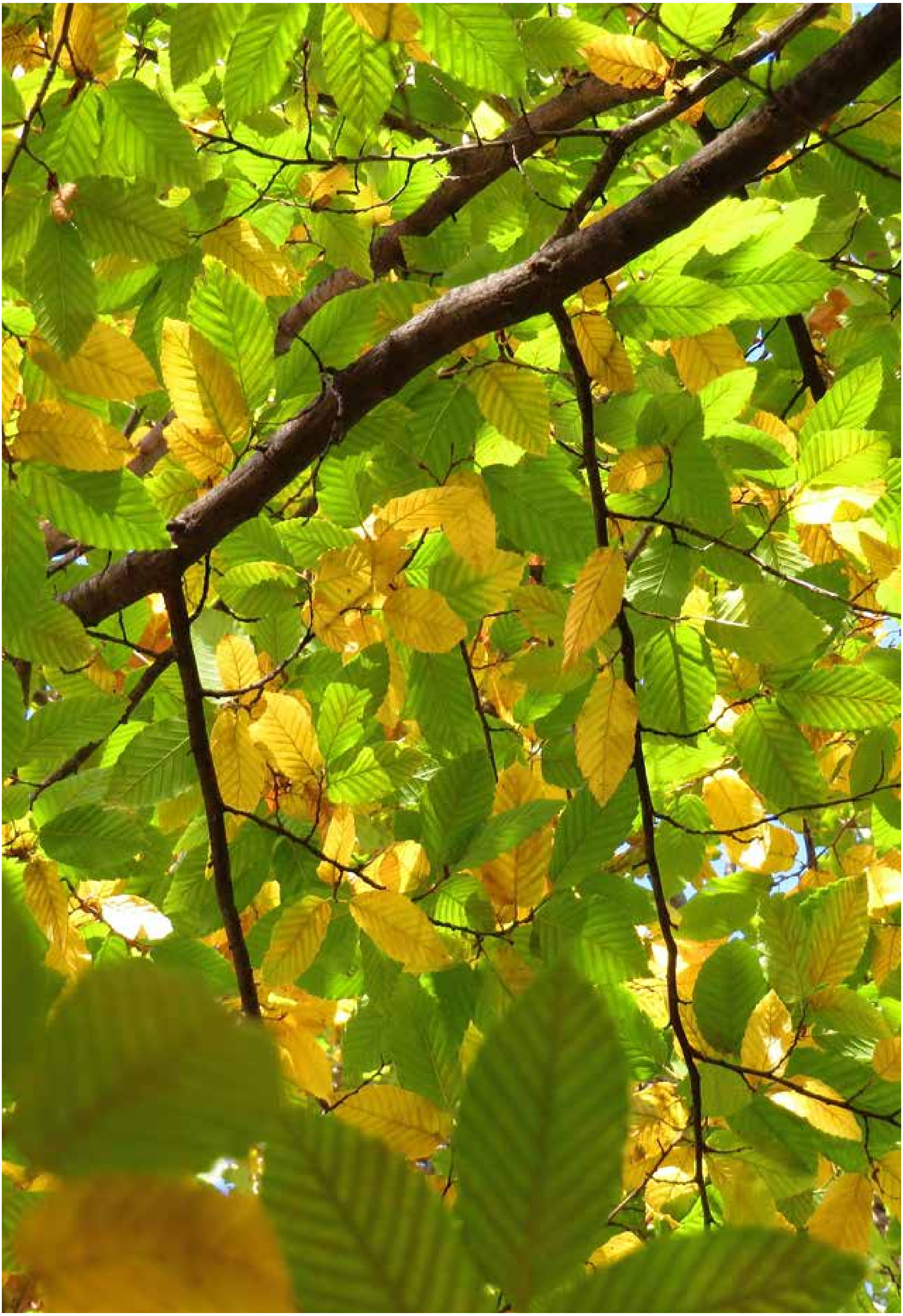

V.
Calculating the value of the tree

HISTORICAL BACKGROUND

In America, during the conquest of the West, settlers riding wagons passing through various settlements caused serious damages in the tree rows in already built up areas. Due to the greatness of damage, the need to determine the value of living trees rose. The person who inflicted the damage, had to pay 5 to 150 $, depending on the extent of damage.

At the suggestion of one of the early conservationists, Filibert Roth (1858-1925), a professor at the Faculty of Forestry at the University of Michigan, they started to use a method for determining tree value since 1901. The method was named after him. The principal of the method was to give trees a value of 15$, regardless of age. Annually their value grew with 4% interest, until they reached 25 years of age. Trees older than 25 years were given the same value. However, due to the interest rate calculation, the application of the method was short-lived. There were attempts to determine living tree value in Europe as well. The most well-known method is of American origin. Its name is Mauer-Hoffman method and it was used in Germany.

There are many tree value calculation methods in the world today, but the principles form only a few groups based on some characteristics.

A FEW FOREIGN TREE VALUE CALCULATION METHOD

VALUE CALCULATION BASED ON TIMBER YIELD

Primarily used in forestry practice. The base of the calculation is tree diameter or tree cross-section. The result of the calculation is the value of the timber after industrial use. At first, these methods were used to determine the value of trees standing on public space.

CIRCLE SIZE - METHOD

It was a common method in America, with 1 inch of the trunk circumference of the tree measured at breast height representing a value of 5$.

STONE - METHOD

Also, in America, a method developed by dr. George T. Stone was used. The method set the value of 1 square inch of trunk cross-section measured at breast height to 0.75 $. It was possible to deduce the size, location, and condition of the tree, based on the price.

FELT - METHOD

In the early 1930s, dr. E. P. Felt, Director of the Bartlett Experimental Laboratory, made the method named after him public, which further refined the Stone method. While calculating the tree value he already took the tree species,

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health status and location into consideration. This method can be considered as the first tree value calculation method, which was able to determine the tree value of trees standing inside settlements based on factors other than timber yield.

FELT - SPICER - METHOD

The Felt-method complemented with the rate of dollar inflation.

THE TREE AS ENVIRONMENTAL VALUE – FOREIGN METHODS

I.S.T.C. FORMULA

In 1947 the American National Arborist Association (NAA) and the National Shade Tree Conference (NSTC) created a joint committee, with the purpose to develop a method, which able to determine the value of trees in city environments. In 1957, the committee published the formula for the value of tree:

BASE VALUE × GEOBOTANICAL VALUE × VALUE OF VITALITY

Base value: The cross-sectional area measured at breast height multiplied by X $ per square inch (X= the value was changed multiple times)
Geobotanical value: plants categorized in 5 classes, based on geographical location and geobotanical compatibility. Each group was given a value, the difference between the values were 20%.
Value of vitality: 5 classes based on age, location, and health condition.
The system became outdated by 1970, then the method got reworked.

CTLA (COUNCIL OF TREE AND LANDSCAPE APPRAISERS) - METHOD

It was published in 1975 as the rework of the I.S.T.C formula. The original calculation was modified, when the base value was calculated, it did not anchor the multiplier, but the $ value is appertained to the “largest generally available tree” in the nursery gardens of the survey region. In addition, to the vitality and geobotanical value, the location value number appeared as a multiplier.
The calculation formula:

BASE VALUE × GEOBOTANICAL VALUE × VALUE OF VITALITY × LOCATION

The International Society of Arboriculture (ISA), which brings together American arborists and timber inspectors, still uses this method today to determine tree value.

REWORKED BURNLEY – METHOD

It was published by McGarry and Moore in Australia in 1988 and reviewed by Moore in 1991. Currently

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they use the reworked method published by P. R. Tyler in 2005. The conception is similar to the CTLA model, it is based on tree size and a single monetary value. It determines the approximate volume of the tree, then multiplies the calculated value with the nursery gardens trade price / cubic meter. We can decrease this value with certain factors, like life expectancy (0,5-1,0), shape and vitality (0,5-1,0) and location (0,4-1,0). The calculation method:

TREE VOLUME × EXPLICIT MONETARY VALUE × VALUE OF LIFE EXPECTANCY × VALUE OF SHAPE AND VITALITY × VALUE OF LOCATION

HELLIWELL - METHOD

Rodney Helliwell published this procedure for evaluating trees in Great Britain in 1967, which has been constantly evolving. The method examines each tree based on 6 criteria, each factor having a score, which needs to be multiplied. Calculation formula:

SIZE OF THE TREE × LIFE EXPECTANCY× IMPORTANCE OF POSITION IN THE ENVIRONMENT × PRESENCE OF OTHER TREES × RELATIONSHIP WITH ENVIRONMENT × SHAPE × SPECIAL FACTOR × 14 POUNDS

CAVAT (CAPITAL ASSET VALUE FOR AMENITY TREES) METHOD

The procedure based on the Helliwell method has become accepted and widely used in the United Kingdom by 2008. The calculation is based on the "Unified Value", which is the average nursery garden price for seedlings of 1m3 of foliage of several different species together with +150% of this value as the sum of the planting costs. (The value was 12,55 pounds in 2008). Each component of the five-step calculation method is precisely defined. The calculation formula:

"UNIFIED VALUE" × TREE VOLUME × IMPORTANCE OF POSITION IN THE ENVIRONMENT × HEALTH CONDITION OF THE TREE × AESTHETIC VALUE OF THE TREE × LIFE EXPECTANCY

STEM (STANDARD TREE EVALUATION METHOD) – METHOD

The method was developed by Ron Flook in 1966 for the environment in New Zealand. The method is similar to the method developed by Helliwell. It uses a score system to estimate the attributes of the tree (3-27 points for every factor). These are in 3 bigger groups: habit, aesthetic values, external properties. The habit group involves examination of the shape, abundance, occurrence, vitality, usefulness, and age. The aesthetic group includes size, visibility (km), proximity (presence of other trees), role, climatic factor. The third group is only examined if the tree is 50 years or older. The factors in this group are size, characteristics (for example exceptional size), special shape, history, age, relic nature, scientific interest, genetical interest, rarity, endangerment. If the

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final score is acquired, it needs to be multiplied with the wholesale price of a 5-year-old seedling. Thereafter the planting cost (preparation, transport, planting) must be considered. Furthermore, the price of tree care until the tree reaches the size of the previously removed tree. Finally, this value is multiplied with the retail margin. Calculation method:

SCORE (MAXIMUM 540) × WHOLESALE PRICE + PLANTING COSTS + MAINTENANCE COSTS × RETAIL MARGIN

NORMA GRANADA

The method was first published in 1990, it was reviewed in 1999. The method is used in Spain. The method uses a series of tables, which consists tree species (growth rate and long lifespan) and size capabilities. It calculates the value based on these tables. This value needs to be multiplied with the initial value, which can be determined by wholesale nursery garden prices. Similar to the CTLA and Burnley methods, a value factor is determined based on the vitality and location of the tree. Unlike the above mentioned two methods where the vitality can only decrease the value, here the vitality rate can improve the value as well. The base value can only be decreased based on the habit and life expectancy of the tree. The maximum theoretical value of the tree can be eight times bigger than the initial value.

[VALUE FACTOR × WHOLESALE PRICE × VITALITY] × [1+ LIFESPAN + (AESTHETIC VALUES + RARITY + LOCATION + SPECIALTY)]

KOCH METHOD

This method is used in German-speaking areas. It was published in 1987, finalized in 1997, and in 2002 it become recommended for official procedures by the German Tree Assessors' Society (FLL). The plant valuation method based on maintaining costs is used during expert tasks. The calculation is a simple costs-calculation including all the expenses spent on the growth, the planting and replanting, and the caring of the tree, and the formula also includes the proper rates to calculate the present values. The price of the tree individual, the planting and transportation costs, 4% interest to count to present value, risk factor (%), value decreasing in case of aged trees, if their function suffers a loss, and depreciation if the tree is damaged are used of the mathematical sum of them to provide the value of the tree individual.

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VI.
The method recommended by the Hungarian Tree Assessors' Society

A×B×C×D×E×M

where:

A = The tree nursery base price of the tree increased by VAT

B = Age multiplier

C = Multiplier for the tree's protected category and for the location in the settlement

D = Coefficient for the crown's condition based on the cadasrte rules of the EU

E = Coefficient for the general health and viability of the tree

M = Multiplier for the dendrological value

A:
Tree nursery base price

One of the most important data for tree valuation is the nursery price. It should be updated at least every year. It is recommended to take into account the prices of several larger nurseries, due to the narrower species and variety offer of smaller nurseries, we do not always find a price for the tree species in the cadastre.
In the case of available data, the gross average price of seedlings of the same species and variety in the offer of the three most significant ornamental tree nurseries in the country. Recommended sizes for the calculation basis by plant type:

- in the case of deciduous trees: a globe tree with a trunk size of 12-14 cm, trained at least twice,
- in the case of tall evergreens, at least 140-160 cm high, in the case of other evergreens (spherical, spreading) at least 60-80 cm, globe or container seedling.

B:
Age multiplier

DETERMINING THE AGE OF TREES

One of the cornerstones of tree value calculation is the age of the tree.
Determining the age of a tree is a gradual procedure, if we can't find an exact data at one level, we move on. The primary source of its dating is the official documentation of tree planting.
If it is not available, the age should be determined based on the chronomorphological characteristics of the tree species. This is most possible at a young age, when the growth of the plant can still be traced backwards. It can be helped for example with the growth rings and branching of deciduous tree species, and the counting of branch buds in some pine species. If these characteristics do not provide a definite point

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of reference, then we have to deduce the age of the tree from the trunk diameter.
The table containing the trunk's diameter – age, published as an appendix to the description of the tree evaluation developed by Dezső Radó, contains a detailed description of 94 tree species, so we can trace the age of the tree based on the trunk diameter.

SEE: APPENDIX 1

If the species is not included in the table, it is possible to assign multipliers to the trunk diameter of the trees based on the knowledge of the site conditions and growth vigor.

TRUNK DIAMETER – AGE RATIO, AND MULTIPLIERS [RECOMMENDATION OF THE HUNGARIAN TREE ASSESSORS' SOCIETY, 2012]			
	VIGOR OF GROWTH		
Site conditions	**Slow growing tree**	**Average growing tree**	**Fast growing tree**
Optimal site	0,9	1,1	1,3
Acceptable site	0,85	1	1,15
Poor site	0,8	0,9	1

A vigor of growth of the tree species can be found in the tables published in 2003, in dr. Gabor Schmidt: Plants in Garden Architecture (Original language is Hungarian, the title in Hungarian: Növények a kertépítészetben). **(2/a. appendix: deciduous tree species, 2/b. appendix: evergreen species)**.
As with all the averages, of course there can be real data differ from these multiplier, but these values are fair enough for the mathematical calculations.
If none of the previous methods could been used to determine the age of the tree, as a final possibility, an individual age estimation must be made, however, this should be done by a highly experienced, experienced professional.
For the calculation of the age multipliers, we also used the most recently published work as a source: Gábor Schmidt's data, published in 2003 in his book Plants in Garden Architecture, the data is based on decades of dendrological research covering the most common 179 tree species.
In determining the multipliers, we took into account the periods of tree foliage growth, as well as the closely related assimilation product and the condition of the tree's skeletal structure.

These are the following:

PERIOD 1: Intensive crown and skeletal growth
PERIOD 2: Slowing crown and skeletal growth
PERIOD 3: The amount of active foliage stagnates, the aging of the skeletal structure begins
PERIOD 4: Period of decline, deciduous mass decreases, skeletal structure declines, hazard risk increases

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The basic values of our recommendation are the same as the values of the Radó method, the higher coefficients were determined based on the analysis of the physiological and dendrological properties of nearly two hundred tree species.

(If the age of the tree can be estimated more accurately than the ten-year interval, or data are available about the time of planting, the average of the multipliers given for the two boundary decades should be calculated by interpolation.)

"B" MULTIPLIER DEPENDING ON THE KNOWN OR ESTIMATED AGE OF THE TREE	
EVALUATION	COEFFICIENT
In case of a 10 years old tree	10
In case of a 20 years old tree	40
In case of a 30 years old tree	80
In case of a 40 years old tree	160
In case of a 50 years old tree	300
In case of a 60 years old tree	500
In case of a 70 years old tree	700
In case of a 80 years old tree	850
In case of a 90 years old tree	1000
In case of a 100 years old tree	1150
In case of a 100 years old tree	1280
In case of a 120 years old tree	1400
In case of a 130 years old tree	1520
In case of a 140 years old tree	1630
In case of a 150 years old tree	1730
In case of a 160 years old tree	1810
In case of a 170 years old tree	1870
In case of a 180 years old tree	1920
In case of a 190 years old tree	1970
In case of a 200 years old or older tree	2000

C: Multiplier for the protection status and for the location in the settlement

THE PROTECTION STATUS AND THE LOCATION OF A TREE

THE PROTECTION TYPES

The division is based on the sections of (the Hungarian) *Act LIII of 1996 on the protection of nature* which ones concerning trees, and the provisions for protection issued by municipalities.

These are the following:

Protected natural areas of national importance (nature conservation area, etc.)
Natural areas and values protected under international conventions (World Heritage, etc.)
Protected natural areas and values of local significance (natural monument, etc.)
Other protected areas, values (water base, cave's surface protection zone, dendrological value, etc.)
Unique landscape values.

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LOCATION OF TREES IN SETTLEMENTS

Trees are more valuable in a densely built-up environment with few trees, so the location of the tree should also be taken into account in the assessment. This value is also one of the cornerstones of the wood value calculation published by Dezső Radó in 1981.

"C" THE COEFFICIENT BASED ON THE PROTECTION STATUS AND THE LOCATION IN THE SETTLEMENT		
EVALUATION	GRADE	COEFFICIENT
Protected tree	5	10
Tree standing in a protected area	4	2,5
Significant cityscape environment	3	1,5
In the case of the tree stands of an area with a high housing density with harm in the environment (housing estate, the protective alley of an industrial area)	2	1
In case of tree stands in a suburb-like location (low housing density, gardens)	1	0,5

In order to simplify the cadastral survey, grades were assigned to each definition.

1. PROTECTED TREE

Natural areas and values protected by individual legislation that also affect trees. The maximum rating is justified if the reason for the protection is clearly related to the trees, i.e. the subject of the protection is the tree, or if any life cycle of the subject of the protection can be related to the tree.

AS AN EXPLANATION:
Subject of protection: protected tree, trees, row of trees, forest, pasture with trees, etc. If the life cycle of the protected subject can be linked to a tree: for example, trees in the habitat of protected fungal species living in symbiosis with trees, trees in the habitat of protected animals that reproduce on the tree or consumes it as food, etc.

2. TREE STANDING IN A PROTECTED AREA

Trees standing in protected areas which are not classified in the previous point, but for other reasons, these areas are also covered by the Act LIII of 1996 on nature protection, or trees in areas not protected for nature conservation or in areas under local protection. This includes protected trees placed under local protection by municipalities but not regulated by law, or individually highlighted protected trees.

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3. TREE STANDING IN SIGNIFICANT CITYSCAPE ENVIRONMENT

These areas are also defined by the municipalities, the decision is made public, such as locally prioritized public green spaces.

4. IN THE CASE OF THE TREE STANDS OF AN AREA WITH A HIGH HOUSING DENSITY WITH HARM IN THE ENVIRONMENT (HOUSING ESTATE, THE PROTECTIVE ALLEY OF AN INDUSTRIAL AREA)

Tree stands in an area with little green space, densely built-in and the area is also significantly affected by environmental damage.

5. IN CASE OF TREE STANDS IN A SUBURB-LIKE LOCATION (LOW HOUSING DENSITY, GARDENS)

Sparsely populated areas with relatively large green spaces.

The legal regulations have changed since the publication of Radó's tree value calculation, we have adapted the definition to the change. The division is based on the “Act LIII of 1996 on the Protection of Nature”. sections of the Act concerning trees and provisions for protection of trees issued by local governments.

The definition of the location within the settlement needed to be clarified, in order to have a uniform classification, we assigned to each category to the land use units of the government decree *253/1997. (XII. 20.) On the National Settlement Planning and Construction Requirements*.

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D:
Coefficient for the crown's condition based on the cadasrte rules of the EU

“D” COEFFICIENT REGARDING THE CROWN'S HEALTH		
EVALUATION	GRADE	COEFFICIENT
The crowns shape is intact (species specific), foliage loss does not exceed 10 percent	5	1
Foliage loss is between 11-25 percent	4	0,75
Significant foliage loss (26-50%)	3	0,5
Potent crown loss (above 50%)	2	0,25
Dead crown, complete foliage loss	1	0
Empty tree place	0	0

During the evaluation of the condition of the crown, the primary consideration is the ratio of the foliage mass and characteristic of the tree species and variety living under real and optimal conditions.

E:
Coefficient for the general health and viability of the tree

The viability of a tree is affected not only by the condition of the crown, but also by the health of the tree as a whole, so in addition to the condition of the crown, the condition of the root system and trunk must be taken into account when determining viability.

THE VIABILITY AND THE HEALTH OF THE TREE

The method was originally developed to study the viability of trees of allies. During the examination, the structure of the crown and the vitality of the tree was in focus.

“The viability of roadside tree lines depends on the unique viability of the trees that make up the tree line. Especially in the case of old rows of trees, the viability within the stand is very different” [RADÓ, 1981].

In order to be able to apply the cadastre uniformly to trees standing in parks, we excluded the limit of the age of “cutting maturity” from the definition when examining viability, as a tree standing in a park can be in good condition even well over a hundred years old.

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“E” COEFFICIENT FOR EVALUATION OF THE GENERAL HEALTH AND VIABILITY OF THE TREE		
EVALUATION	GRADE	COEFFICIENT
The tree is in excellent health	5	1
By intervention, the lifespan of the tree can approach the maximum age determined by the habitat	4	0,75
The tree must be replaced before the age determined by the habitat	3	0,5
It needs to be replaced within a decade	2	0,25
It needs to be replaced urgently due to its conditions or risk of damage (the risk of damage can only be avoided by felling the tree)	1	0,1
Empty tree place	0	0

M:
Multiplier for the dendrological value

“M” MODIFYING FACTOR BASED ON THE DENDROLOGICAL VALUE OF THE THE TREE SPECIES	
EVALUATION	COEFFICIENT
Valuable tree species	1
Moderately valuable tree species	0,75
Less valuable tree species, invasive tree species	0,5

The classification of the most common tree species in Hungary and some species according to their dendrological value is included in the tables prepared by Dr. Gábor Schmidt.

CHECK:

2/a appendix: Deciduous species
2/b appendix: Evergreen species

SUMMARY:
Consideration of the dendrological value of a species is one of the most important elements in the value calculation, as the value of an invasive species cannot be compared to, for example, a red oak.
In our recommendation, we have distinguished three categories.

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Appendix

APPENDIX 1.

THE AGE OF TREES AS A FUNCTION OF TRUNK DIAMETER (BY DEZSŐ RADÓ)												
DIAMETER (CM):		5	6-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91
TREE SPECIES		THE AGE OF THE TREE IN YEARS										
1.	*Abies alba*	4	8	20	25	32						
2.	*Acer campestre*	4	8	15	25	40	45	50	57	65	72	80
3.	*Acer monpessulanum*	4	8	14	22	30	40	48	55	62	71	80
4.	*Acer negundo*	4	9	16	25	35	48	60	68	75	80	85
5.	*Acer platanoides*	4	7	12	20	28	38	45	50	58	67	75
6.	*Acer pseudoplatanus*	4	8	14	22	30	40	48	55	62	70	80
7.	*Acer saccharinum*	4	8	15	23	30	38	50	57	65	73	82
8.	*Acer tataricum*	4	7	16	24	32	40	47	54	60	65	70
9.	*Aesculus hippocastanum*	4	7	13	20	26	33	40	46	52	59	65
10.	*Ailanthus altissima*	4	7	12	18	27	35	45	50	56	65	72
11.	*Alnus glutinosa*	4	8	15	23	31	40	48	56	64	71	85
12.	*Amygdalus communis*	4	9	16	26	36	45	52	60	67	75	82
13.	*Betula pendula*	4	9	15	25	35	45	52	60	67	75	85
14.	*Broussonetia papyrifera*	4	8	14	20	26	32	38	45	52	60	67
15.	*Caragana arborescens „Pendula"*	4	10	18	25	32	38	45				
16.	*Carpinus betulus*	4	9	20	30	40	50	58	65	71	76	84
17.	*Castanea sativa*	4	8	16	24	32	40	47	53	60	67	75
18.	*Catalpa bignonioides*	4	7	15	22	30	35	40	45	48	51	60
19.	*Celtis occidentalis*	4	8	15	25	40	48	55	66	80	90	96
20.	*Cerasus avium*	4	10	18	26	35	43	50	55	60	65	70
21.	*Cerasus serrulata*	4	10	25	33	40	46	53	60	67	70	75
22.	*Cercis siliquastrum*	4	9	17	25	33	40	45	51	56	62	70
23.	*Chamaecyparis lawsoniana*	2	7	20	30	42	50	58	65	73	80	87
24.	*Cornus mas*	3	8	16	30	42	52					
25.	*Cornus sanguinea*	3	8	16	30							
26.	*Corylus colurna*	4	8	17	25	33	40	48	55	63	70	76
27.	*Cotinus coggygria*	3	8	16	25	33						
28.	*Crataegus laevigata*	4	8	20	28	35	46	52	58			
29.	*Crataegus monogyna*	4	8	20	28	35	46	52				
30.	*Cupressus arizonica*	4	8	20	25	30	35	40	44	48	51	60
31.	*Cydonia oblonga*	4	9	15	22	29	36	42	48	55	62	70
32.	*Diospyros lotus*	4	10	18	27	35	42	50	57	64	70	75
33.	*Eleagnus angustifolia*	4	8	16	27	35	42	50	57	65	72	80
34.	*Euonymus europaeus*	3	8	15	25	34	43	50	55	60	64	70
35.	*Evodia huppenensis*	3	6	12	18	25	32	38	43	47	52	55
36.	*Fagus silvatica*	4	9	16	25	33	40	46	52	58	65	75
37.	*Fraxinus angustifolia*	4	8	18	25	31	38	46	53	60	66	75
38.	*Fraxinus excelsior*	4	7	15	22	28	35	42	50	58	65	70
39.	*Fraxinus ornus*	4	8	18	25	30	36	45	58	65	72	75
40.	*Fraxinus pensylvanica*	4	7	16	24	32	40	47	54	61	68	74
41.	*Ginkgo biloba*	4	8	15	24	35	46	56	65	74	82	90
42.	*Gleditsia triacanthos*	4	9	18	27	36	45	53	60	67	73	80
43.	*Gymnocladus dioicus*	4	7	16	25	34	45	54	63	71	78	86
44.	*Juglans nigra*	4	8	16	27	36	45	53	61	68	75	82
45.	*Juglans regia*	4	9	17	28	38	47	55	64	72	80	87

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THE AGE OF TREES AS A FUNCTION OF TRUNK DIAMETER (BY DEZSŐ RADÓ) (CONTINUED)												
DIAMETER (CM):		5	6-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91
TREE SPECIES		THE AGE OF THE TREE IN YEARS										
46.	*Juniperus chinensis*	2	10	18	25	32	40	47				
47.	*Juniperus communis*	2	10	17	23	30	38	45	52			
48.	*Juniperus virginiana*	2	9	17	24	32	40	47	55			
49.	*Koelreuteria paniculata*	4	10	20	28	38	50	62	70	77	85	90
50.	*Laburnum anagyroides*	2	10	15	25							
51.	*Liriodendron tulipifera*	4	9	18	27	36	45	54	63	70	76	85
52.	*Magnolia cobus*	4	7	15	24	32	40	46	53	60	65	72
53.	*Malus alba „Pendula"*	4	8	18	27	36	45	55	64	72	80	85
54.	*Malus sp.*	4	9	18	30	40	51	60	68	76	83	88
55.	*Morus alba*	4	8	16	25	33	40	47	54	60	66	71
56.	*Padus avium*	4	7	16	26	34	42	50	57	65	73	80
57.	*Parotia persica „Rubroplena"*	4	9	17	25	32	40	47	55	60	65	70
58.	*Paulownia tomentosa*	4	7	17	24	31	38	46	55	66	73	80
59.	*Picea orientalis*	3	6	13	30	40	48	56	64	71	77	85
60.	*Picea pungens*	3	6	12	26	42	50	60	68	72	80	86
61.	*Pinus mugo*	3	6	11	23	32	40	50				
62.	*Pinus nigra*	3	8	20	28	37	45	52				
63.	*Pinus strobus*	3	7	12	20	28	37	46	55	64	73	80
64.	*Platanus sp.*	4	7	15	23	30	35	40	45	52	58	65
65.	*Populus alba*	4	9	17	23	30	36	42	47	53	60	65
66.	*Populus alba „Pyramidalis"*	4	8	16	23	28	35	40	46	52	58	60
67.	*Populus canadensis*	4	7	15	22	30	37	44	50	55	60	65
68.	*Populus nigra „Italica"*	4	7	12	18	23	30	36	42	47	52	60
69.	*Populus simonii*	4	7	14	20	27	34	40	46	51	57	62
70.	*Populus tremula*	4	8	15	19	24	31	38	45	52	58	65
71.	*Prunus cerasifera*	4	9	17	25	33	42	50	57	61	66	72
72.	*Prunus domestica*	4	8	15	24	32	40	48	54	63	70	75
73.	*Prunus persica*	4	7	14	22	30	36	42	48	55	62	70
74.	*Pseudotsuga menziesii*	4	9	18	25	34	44	53	62	70	78	85
75.	*Pyrus silvestris*	4	8	16	22	27	32	38	45	53	58	65
76.	*Quercus cerris*	4	8	16	25	36	44	54	63	72	80	85
77.	*Quercus petrea*	4	10	16	26	37	45	53	64	71	80	87
78.	*Quercus robur*	4	9	17	27	36	46	55	65	74	82	90
79.	*Quercus robur „Pyramidalis"*	4	8	15	20	28	35	45	52	60	65	70
80.	*Quercus rubra*	4	9	17	26	36	45	56	65	74	82	90
81.	*Rhus typhina*	3	10	20	26	31	37	41	46	50	54	60
82.	*Robinia pesudoacacia*	4	8	15	22	30	38	46	54	62	70	80
83.	*Robinia pesudoacacia „Umbraculifera"*	4	10	18	28	38	45	53	62	71	80	90
84.	*Salix alba „Tristis"*	4	9	16	23	30	38	46	55	63	70	76
85.	*Salix matsudana „Tortuosa"*	4	9	18	25	32	40	47	55	63	70	75
86.	*Sophora japonica*	4	8	16	25	33	40	47	55	64	70	75
87.	*Sorbus aucuparia*	4	9	17	26	31	38	44	50	56	62	70
88.	*Sorbus borbásii*	4	7	15	24	31	40	48	53	62	70	76
89.	*Thuja orientalis*	3	9	17	26	34	42	50	57			
90.	*Tilia argentea*	4	8	16	25	33	45	55	64	70	76	85
91.	*Tilia cordata*	4	7	15	24	32	39	47	56	64	70	76
92.	*Tilia plathyphillos*	4	9	17	25	33	40	45	50	58	65	70
93.	*Ulmus laevis*	4	8	16	25	35	42	50	57	62	70	77
94.	*Ulmus minor*	4	8	16	24	34	41	48	56	62	68	75

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APPENDIX 2/A

THE DENDROLOGICAL VALUE AND VIGOR OF GROWTH OF THE MOST COMMON DECIDUOUS TREE SPECIES (DR GABOR SCHMIDT, 2011)						
TREE SPECIES	DENDROLOGICAL VALUE			VIGOR OF GROWTH		
	Valuable	Moderately valuable	Less valuable	Slow growing	Moderated growing	Fast growing
Acer campestre	X			X		
Acer cappadocicum	X			X		
Acer × freemanii		X				X
Acer ginnala	X			X		
Acer grosseri	X			X		
Acer monspessulanum	X			X		
Acer negundo			X			X
Acer platanoides			X		X	
Acer pseudoplatanus	X				X	
Acer saccharinum		X				X
Acer tataricum	X			X		
Aesculus × carnea	X			X		
Aesculus hippocastanum	X			X		
Aesculus octandra	X			X		
Ailanthus altissima			X			X
Albizia julibrissin	X				X	
Alnus glutinosa	X				X	
Alnus incana	X				X	
Betula jacquemontii	X					X
Betula pendula		X				X
Broussonetia papyrifera	X					X
Carpinus betulus	X				X	
Castanea sativa	X				X	
Catalpa bignonioides		X				X
Cedrela sinensis	X				X	
Celtis australis	X			X		
Celtis occidentalis		X			X	
Cercidiphyllum japonicum	X				X	
Cercis canadensis	X				X	
Cercis siliquastrum		X			X	
Chionanthus virginicus	X			X		
Cladrastis lutea	X			X		
Corylus colurna		X			X	
Crataegus laevigata species/varieties		X			X	
Crataegus × lavallei		X			X	
Crataegus × mordenensis species/varieties		X			X	
Cydonia oblonga		X		X		
Davidia involucrata	X			X		
Diospyros kaki	X			X		
Diospyros lotus	X					X
Diospyros virginiana	X				X	
Elaeagnus angustifolia			X			X
Eucommia ulmoides	X				X	
Evodia hupehensis		X			X	

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THE DENDROLOGICAL VALUE AND VIGOR OF GROWTH OF THE MOST COMMON DECIDUOUS TREE SPECIES (DR GABOR SCHMIDT, 2011) (CONTINUED)						
TREE SPECIES	DENDROLOGICAL VALUE			VIGOR OF GROWTH		
	Valuable	Moderately valuable	Less valuable	Slow growing	Moderated growing	Fast growing
Fagus sylvatica	X			X		
Fraxinus americana		X				X
Fraxinus angustifolia		X			X	
Fraxinus angustifolia subsp. pannonica		X			X	
Fraxinus excelsior		X			X	
Fraxinus ornus	X			X		
Fraxinus pennsylvanica			X			X
Ginkgo biloba	X			X		
Gleditsia triacanthos		X			X	
Gymnocladus dioicus		X		X		
Juglans nigra	X					X
Juglans regia	X				X	
Koelreuteria paniculata		X			X	
Liquidambar styraciflua	X			X		
Liriodendron tulipifera	X				X	
Maclura pomifera		X			X	
Magnolia kobus	X			X		
Malus baccata	X					X
Malus floribunda	X				X	
Malus 'Golden Hornet'	X				X	
Malus 'Hopa'	X				X	
Malus 'John Downie'	X				X	
Malus 'Liset', 'Professor Sprenger'	X				X	
Malus × purpurea	X				X	
Malus 'Royalty'	X				X	
Malus spectabilis	X				X	
Malus 'Van Eseltine'	X				X	
Mespilus germanica		X		X		
Morus alba		X				X
Morus nigra	X			X		
Ostrya carpinifolia	X			X		
Parrotia persica	X			X		
Paulownia tomentosa	X					X
Platanus × acerifolia	X					X
Populus alba	X					X
Populus × canadensis			X			X
Populus × canescens		X				X
Populus 'Favorit'		X				X
Populus nigra		X				X
Populus simonii		X				X
Populus tremula	X					X
Prunus avium		X				X
Prunus × blireana	X				X	
Prunus cerasifera		X			X	

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APPENDIX 2/A

THE DENDROLOGICAL VALUE AND VIGOR OF GROWTH OF THE MOST COMMON DECIDUOUS TREE SPECIES (DR GABOR SCHMIDT, 2011) (CONTINUED)						
TREE SPECIES	DENDROLOGICAL VALUE			VIGOR OF GROWTH		
	Valuable	Moderately valuable	Less valuable	Slow growing	Moderated growing	Fast growing
Prunus cerasus		X				X
Prunus dulcis		X			X	
Prunus mahaleb		X			X	
Prunus padus		X				X
Prunus 'Rubin'	X					X
Prunus serotina	X				X	
Prunus serrulata	X					X
Prunus subhirtella	X			X		
Prunus × yedoensis	X				X	
Pterocarya fraxinifolia	X				X	
Pyrus betulifolia	X				X	
Pyrus calleryana	X				X	
Pyrus elaeagrifolia	X			X		
Pyrus nivalis	X			X		
Pyrus pyraster	X				X	
Quercus cerris	X					X
Quercus farnetto	X				X	
Quercus libani	X				X	
Quercus petraea	X				X	
Quercus pubescens	X			X		
Quercus robur	X				X	
Quercus rubra	X					X
Quercus × turneri 'Pseudoturneri'	X			X		
Robinia hispida		X				X
Robinia luxurians		X				X
Robinia viscosa		X				X
Robinia pseudoacacia			X			X
Salix alba		X				X
Salix babylonica	X					X
Salix × erythroflexuosa		X				X
Salix fragilis		X				X
Salix matsudana 'Tortuosa'	X					X
Sophora japonica	X				X	
Sorbus aria	X				X	
Sorbus aucuparia	X				X	
Sorbus borbásii	X				X	
Sorbus dacica	X				X	
Sorbus degenii	X				X	
Sorbus domestica	X				X	
Sorbus intermedia	X				X	
Sorbus pseudolatifolia	X				X	
Sorbus redliana	X				X	
Sorbus rotundifolia	X				X	
Sorbus semiincisa	X				X	

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THE DENDROLOGICAL VALUE AND VIGOR OF GROWTH OF THE MOST COMMON DECIDUOUS TREE SPECIES (DR GABOR SCHMIDT, 2011) (CONTINUED)						
TREE SPECIES	DENDROLOGICAL VALUE			VIGOR OF GROWTH		
	Valuable	Moderately valuable	Less valuable	Slow growing	Moderated growing	Fast growing
Sorbus × thuringiaca	X				X	
Sorbus torminalis	X				X	
Sorbus vértesensis	X				X	
Tilia americana	X					X
Tilia cordata	X				X	
Tilia × euchlora	X				X	
Tilia × europaea 'Pallida'	X				X	
Tilia × flavescens 'Glenleven'	X				X	
Tilia platyphyllos	X				X	
Tilia petiolaris	X				X	
Tilia tomentosa	X			X		
Ulmus laevis	X				X	
Ulmus minor	X				X	
Ulmus pumila var. arborea		X				X
Ulmus scabra	X				X	
Zelkova serrata	X				X	

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APPENDIX 2/B

THE DENDROLOGICAL VALUE AND VIGOR OF GROWTH OF THE MOST COMMON EVERGREEN SPECIES (DR GABOR SCHMIDT, 2011)						
TREE SPECIES	DENDROLOGICAL VALUE			VIGOR OF GROWTH		
	Valuable	Moderately valuable	Less valuable	Slow growing	Moderated growing	Fast growing
Abies species	X			X		
Calocedrus decurrens	X				X	
Cedrus atlantica	X					X
Chamaecyparis nootkatensis	X			X		
Chamaecyparis other species	X				X	
× Cupressocyparis leylandii	X					X
Cupressus arizonica	X					X
Cupressus sempervirens	X					X
Ginko biloba	X			X		
Juniperus chinensis	X			X		
Juniperus communis	X			X		
Juniperus communis 'Bakony'	X			X		
Juniperus communis 'Stricta'	X			X		
"Juniperus x media 'Pfitzeriana' (and other spreadin forms)"	X					
"Juniperus sabina (lying down forms)"	X					
"Juniperus scopulorum (columnar forms)"*		X				X
Juniperus virginiana	X				X	
"Juniperus virginiana (columnar forms)"	X				X	
Juniperus virginiana 'Tripartia'	X				X	
Larix decidua	X					X
Metasequoia glyptostroboides	X					X
Picea abies	X				X	
Picea omorika	X				X	
Picea orientalis	X				X	
Picea pungens	X				X	
Pinus wallichiana	X					X
Pinus nigra	X				X	
Pinus sylvestris	X				X	
Pinus strobus	X				X	
Pseudotsuga menziesii var. caesia	X				X	
Pseudotsuga menziesii var. glauca	X				X	
Pseudotsuga menziesii var. viridis	X				X	
Sequoiadendron giganteum	X				X	
Taxodium distichum	X					X
Taxus baccata	X			X		
Thuja occidentalis alapfaj	X				X	
Thuja occidentalis (columnar forms)	X				X	
Thuja orientalis	X				X	
Thuja plicata	X					X
Tsuga candensis	X			X		

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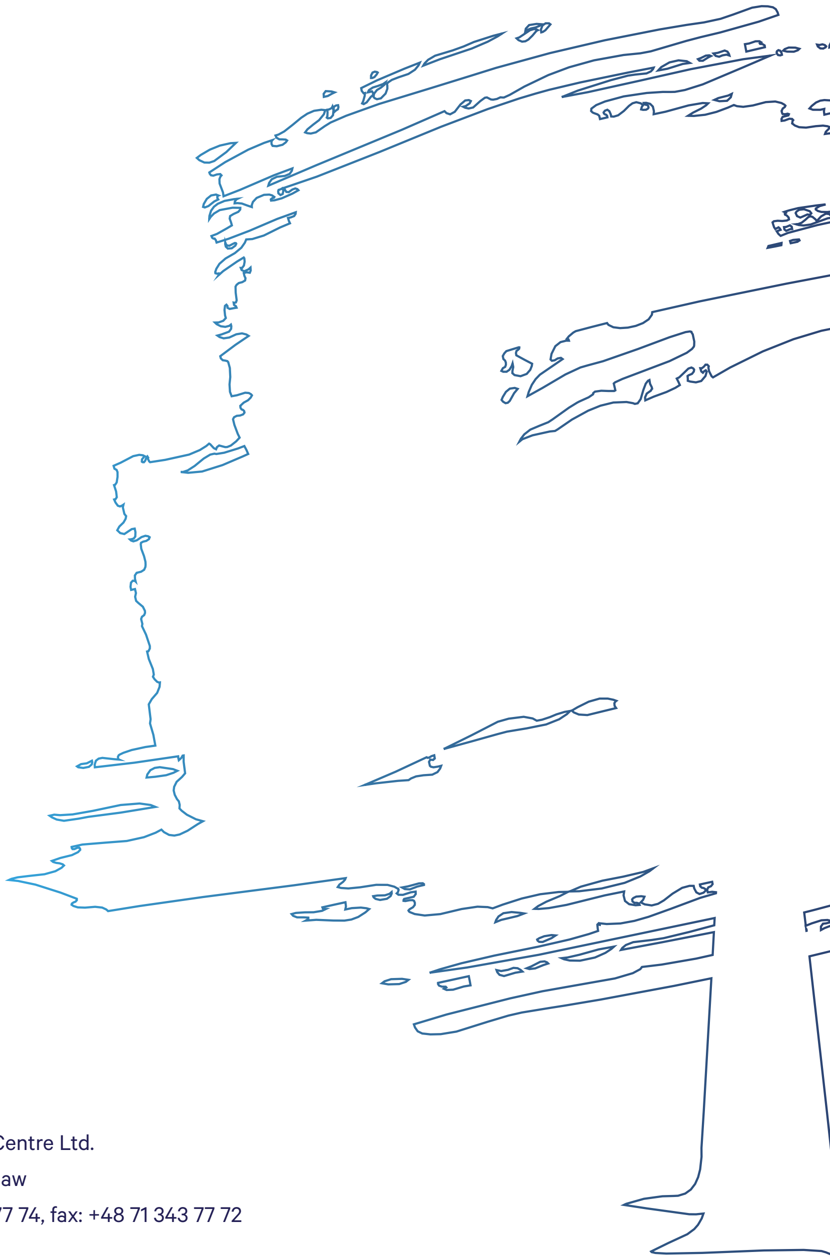
FŐKERT

Project: Partnership for the development of training standards for tree assessors in Central and Eastern Europe
PROJECT NUMBER – 2019-1-PL01-KA202-065670



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