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METHODOLOGY OF CLIPPED WOODY VEGETATION ELEMENTS ASSESSMENT

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Clipped woody vegetation elements are an integral part of most historical gardens and parks and they play a significant role in the modern garden and landscape architecture. Given their importance, it is necessary to develop tools for understanding their real state. The aim of this paper is to present the complex methodology of assessment of clipped woody vegetation elements in objects of garden and landscape architecture. This methodology is a tool you can use to determine the current qualitative state and potential of these objects. Subsequent evaluation of observed facts allows you to suggest adequate tree care and regeneration measures. This methodology is fully applicable also when mutually comparing objects or evaluating changes of individual objects over time. Results obtained using this methodology may serve as a basis for the design of adequate tree care and regeneration measures in practice. This methodology may be also used for a deeper understanding of individual factors that are involved in the resulting quality of clipped woody vegetation elements.

Keywords: clipped woody plant, assessment methodology, current state, quality, potential

Introduction

Clipped woody vegetation element (hereinafter referred to as CWVE) is defined as an element of artificial compositional characteristics for a given taxon and site. Its habitus as well as variability are specific because of periodically repeated clipping, pinching or leading of shoots or even removing buds (Pejchal and Šimek, 2012a).

Using of CWVEs is an integral part of garden and landscape design in almost all its development stages. CWVEs have become a major compositional element as early as during the Renaissance and Baroque periods and still are an integral part of most historical gardens and parks. They have a significant importance in contemporary creation, too. A significant portion of CWVEs begin to die or are in a poor condition. It is therefore necessary to have a tool that would point to their current qualitative state and potential.

One of the last publications in the Czech Republic on assessment of CWVEs is Methodology of woody species assessment for the purposes of historic preservation (Pejchal and Šimek, 2012a), from which I partially proceeded when creating the methodology presented in this paper. Earlier paper (Šonský, 1987) addresses this issue only partially because it mainly focuses on suitability of taxa for clipped hedges. Foreign publication Kendal et al. (2008) deals with the evaluation of selected woody plant taxa used for creation of clipped hedges from different perspectives of the climatic conditions of Australia. Inspiring approaches may be methodologies of assessment of unclipped taxa applicable for clipping in terms of the growth quality, survival quality and aesthetic quality exposed to various landscape exposure (Le Duc, 2000), in terms of the influence of light to both quantitative and qualitative characteristics (Taheri and Abdinejad, 2011); or studies investigating the effects of different light intensity on the physiological and morphological change (De Jong et al., 2012; Letts et al., 2012).

The aim of this paper is to present the current methodology of assessment of CWVEs in objects of garden and landscape architecture.

Material and methods

Development of this methodology of CWVE assessment carried out in several steps:

a) First were identified and studied historical as well as contemporary sources or methodologies of assessment of a given issue.
b) By means of adoption, modification and supplementing several sources (Pejchal, 2008; Pejchal and Šimek, 2012b; Burian, 2013) it was worked out this methodology proposal.
c) Using this methodology, there has been assessed 2524 pcs of CWVEs with total clipped area of 261 195 m^2 in 21 important historical objects in the Czech Republic.
d) Experiences gained in field evaluation of CWVEs were incorporated into the current form of methodology of clipped woody elements assessment.

Results and discussion

The methodology of clipped woody elements assessment is a set of several groups of attributes that are necessary

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to determine the current qualitative state of CWVEs and their potential. Overview of attribute groups with their further characterization or division is described in Table 1. Attributes that need to be characterized extensively are described in text below the table.

Further characteristics of attributes from Table 1:

a) Character

- **Point** – one individual or CWVE compound of more individuals with common cover whose height is equal to the width or exceeds it. The length is usually equal to the width or is not significantly higher.
- **Linear** – CWVE compound of more individuals, clearly (at least twice) longer than wide and the height is equal to the width or exceeds it. Either without common cover (usually a line of point objects – see below – which do not touch each other) or with common cover (e.g. hedge or wall).
- **Surface** – CWVE compound of more individuals, at least twice wider than taller; this width to height ratio can be even greater in case of elements whose length is a multiple of the width. Either without common cover (e.g. grid of point objects) or with comon cover (e.g. green architecture).

Table 1 Overview of attribute groups of methodology of CWVE assessment

Attribute group	Attribute	Detailed characterization of attributes
Identification data	Object	– place of assessment
	Serial number	– continuous numerical series
	Character	– part of the text (see a)
	Type	– part of the text (see b)
	Taxon	– genus, species, intraspecific unit (in case of multispecies CWVE give all the present taxa and their percentage composition)
Mensurational data	Height	– total height of CWVE from base to peak; measured in places of the last cut
	Length	– in case of linear CWVEs, length is measured from the beginning to the end; in case of point and surface CWVEs, length is determined by the distance of two parallel tangents touching the opposite of outermost points of the CWVE; measured in places of the last cut
	Width	– in case of linear CWVEs, width is measured: (a) in base of CWVE, (b) peak of CWVE; in case of point and surface CWVEs, width is measured at their widest parts perpendicular to the longitudinal axis; measured in places of the last cut
	Planting distance	– the average distance from each individual plant
Descriptive data	Shading	– part of the text (see c)
	Unclipped parts of cover	– expressed in % of unclipped part of the cover: (a) on the sides, (b) on the upper side
	Clipped area of cover	– in m^2 (calculated from mensurational data)
	Development stage	– categories: (a) newly planted individuals, (b) rooted individuals, (c) stabilized maturing individuals, (d) mature individuals, (e) old individuals; in the sense of PEJCHAL, ŠIMEK (2012b)
Qualitative data	Horizontal canopy	– part of the text (see d)
	Vertical canopy	– part of the text (see e)
	Physiological vitality	– categories: (a) optimal, (b) slightly reduced, (c) moderately reduced, (d) strongly reduced, (e) very strongly reduced; in the sense of PEJCHAL, ŠIMEK (2012a)
	Biomechanical vitality	– categories: (a) optimal, (b) slightly reduced, (c) moderately reduced, (d) strongly reduced, (e) very strongly reduced; in the sense of PEJCHAL, ŠIMEK (2012a)
	Growing state	– (a) clipping technique, (b) weed infestation, (c) maintaining the desired shape; mentioned specific characteristics evaluated separately on a scale: optimal / satisfactory / unsatisfactory
	Landscaping value	– part of the text (see f)
Other data	Note	– any other additional information on CWVE

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b) Type

- **Point** – point elements, depicted as basic or compound geometric shapes, figural forms, stylized trees etc. Applied as solitaires (point character) or as part of a lineaer or surface elements without a common cover.
- **Surface cover** – low CWVE of a surface character whose height does not form an optical barrier.
- **Hems, small hedge** – CWVE of a linear character to a height of 0.5 m.
- **Low hedge** – CWVE of a linear character with a height from 0.5 to 1 m.
- **Medium-high hedge** – CWVE of a linear character with a height from 1 to 3 m.
- **High hedge, wall** – CWVE of a linear character higher than 3 m.
- **Green architecture** – CWVEs of a point, linear or surface character that are by the way of their use similar to some (building) elements of architecture and may have a construction, e.g. arches, gates, arbour, "green" chambers, colonnades etc.
- **Other objects** – cannot be classified into the above.

c) Shading

– five-pont scale based on the shadow depth and length of the shading of CWVE during the day. When combining the following properties of a shadow among categories, the evaluator will be inclined to the degree that is more characteristic for a shadow.

- **Very low** – moderate shadow, CWVE is shaded only a few hours of daylight.
- **Low** – moderate to medium deep shadow, CWVE is influenced by the so called "wandering shadow".
- **Medium** – medium deep shadow, CWVE is shaded for one third of the daylight.
- **High** – medium deep to deep shadow, CWVE is shaded for most of the daylight.
- **Very high** – deep shadow; CWVE is shaded throughout the daylight.

d) Horizontal canopy

– closing of upper part of CWVE layer. For technical reasons it is evaluated only for elements to the height of circa 1.5 m.

e) Vertical canopy

– when evaluating, CWVE is divided into quadrants according to cardinal directions (N, S, E, W), vertical canopy in each quadrant of the cardinal direction is then evaluated separately in three zones – lower third (zone 3), medium third (zone 2) and upper third (zone 1).

For evaluation of both canopies applies the following scale:

- **Very high** – covered at least 95 % of the CWVE surface.
- **High** – covered at least 90 % of the CWVE surface.
- **Medium** – covered at least 80 % of the CWVE surface.
- **Low** – covered at least 60 % of the CWVE surface.
- **Very low** – covered maximally 60 % of the CWVE surface.

f) Landscaping value

– total value of CWVE in terms of garden and landscape architecture (current state and potential) resulting from its biological nature and way of growing. It summarizes the information on development stage, cover quality, physiological and biomechanical vitality and growing state. Total value of CWVE is expressed using the following scale:

- **Very valuable CWVE** – already adult CWVEs, exceptionally CWVEs at the end of the development stage 3 and at the beginning of the development stage 5. Individuals are absolutely healthy and not damaged, full of vitality and long-term perspective, of high quality in terms of growing, with very high both vertical and horizontal canopy.
- **Above-average valuable CWVE** – CWVE with some imperfections that do not significantly detract from their value, exceptionally CWVEs at the beginning of the development stage 5, fully correspond to both growing and compositional needs, are long term-perspective and their both vertical and horizontal canopy is high or very high.
- **Average valuable CWVE** – CWVE with assumption of medium to long-term existence, individuals possibly with lower vitality and health condition, usable in terms of growing. Both canopies of CWVEs are at the medium level or one of them may fall into the category of high or very high.
- **Below-average valuable CWVE** – vitality is significantly reduced due to old age, diseases and pests or damage, the probable existence is just a short-term. CWVE with the low vertical canopy, horizontal canopy is usually medium to very low.
- **Very little valuable CWVE** – vitality is so reduced due to old age, diseases and pests or damage is so reduced that prerequisites just of short-term existence are missing. To this category fall also the exemplars to be removed immediately for safety or phytopathological reasons (dangerous infectious diseases). Both canopy categories are on the very low degree, horizontal canopy is exceptionally low.

The results of the search for methodologies of clipped woody vegetation elements assessment – there were found only three similar sources (Kendal et al., 2008; Pejchal and Šimek, 2012a; Šonský, 1987) – suggest

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that the topic of qualitative state of CWVEs is rare. Presented methodology was inspired by Pejchal and Šimek (2012a) and was modified and supplemented. Afterwards, it had been verified on several hundreds of CWVEs in a number of historical objects. The restuls of these assessment shown suitability of this methodology when investigating the current state of CWVE. Species-conditioned specifics of individual taxa are an important factor that influences the assessment. Function and meaning of specific CWVE in an object, its current state, taxonomic composition and the assumption of its further development must be taken into account when suggesging future care or a way of recovery. This methodology can be useful after editing for assessment of pollarded trees. In common practice can be used simplified version of this methodology.

Conclusion

The methodology of woody elements assessment is a set of several groups of attributes that are necessary to determine the current qualitative state of CWVE and its potential. Results obtained using this methodology may serve as a basis for the design of adequate tree care and regeneration measures in practice. This methodology may be also used for a deeper understanding of individual factors that are involved in the resulting quality of CWVE.

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