

# THE TOPOGRAPHICAL CHANGES CREATED BY THE LANDSCAPE DESIGN ACTIVITIES. CASE STUDY OF THE CZERNIN PARKS, BOHEMIA

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## ABSTRACT

Landscape is considered a specific type of heritage, and cultural landscapes provide an interface between nature and culture, the tangible and intangible, and biological and cultural diversity. They represent a closely woven network of relationships and the essence of cultural and personal identity. The most valuable cultural landscapes are designed landscapes or landscape parks. This paper focuses on landscaping activities associated with park foundation and management, especially those involving terrain changes and the remodeling of the natural topography. Terrain changes in landscape parks are typically meant to be hidden from viewers and to mimic natural lines and shapes. The paper focuses on determining to what degree the natural topography was used and changed, as well as what impact it had on the form and creation of the parks. Terrain changes should differ according to the natural topography, the landscape design activities, and contemporary landscape trends. Archival sources, including written documents, maps, and pictures, were considered viable sources. Four model areas were chosen for a detailed analysis of landscaping and design activities and their impact on the terrain: landscape parks around manor houses in Krásný Dvůr, Jemčina, Petrohrad, and Chudenice.

**Keywords:** landscape parks, terrain modeling, Czernin, Bohemia

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## 1. Introduction

Landscape and its natural and cultural value have long been of interest to researchers and have figured prominently among the considerations shaping planning policies. Landscape itself is considered a specific type of heritage (Kučera et al. 2008a; Kučera et al. 2008b; Lowenthal 2005). Cultural landscapes provide an interface between nature and culture, the tangible and intangible, and biological and cultural diversity. They represent a closely woven network of relationship and the essence of cultural and personal identity (Rössler 2006). The World Heritage Committee (UNESCO) established three categories of cultural landscapes, one of which was clearly defined landscapes designed and created intentionally by humans. This category includes garden and parkland landscapes constructed for aesthetic reasons. Such landscapes are often (but not always) associated with monumental buildings and ensembles (Rössler 2006). However, most studies of landscape value generally refer to an integrity criterion that encompasses coherence, harmony, visual balance, undisturbed functional entities, continuity over time, and the fit of land use to the landscape's natural characteristics (Gullino, Larcher 2013). Specifically, in landscape parks, attention is concentrated on dendrological value and veteran trees (Pejchal 2011; Pejchal, Šimek 2012; Nutt et al. 2013).

Though there is a large body of grey literature, few papers on the value of landscape parks have been

published in Europe (Kümmerling, Müller 2012). Both within and outside of the Czech Republic, several approaches to historical parks and gardens are apparent. First, some papers focus on the composition of the garden or park and its components. This approach attempts to identify hidden compositional values and is often associated with park reconstruction (Kulišťáková et al. 2014; Kulišťáková, Sedláček 2013; Flekalová, Kulišťáková 2014; Nordh et al. 2009). Another strand of research is focused on plant species, the introduction of plants to new areas, rare plants or plants important for their shape (Abendroth et al. 2012; Nutt et al. 2013; Pejchal 2011; Pejchal, Šimek 2012). Historical parks and gardens and the manor houses to which they are attached are important components of tourism, and the attractiveness of the landscape is essential for tourism development (Navrátil et al. 2015; Kučera et al. 2013; Kozak 2013; Balcarová, Kulišťáková 2012). However, parks and gardens are also important for biodiversity in cities and in intensively managed landscapes, whether agricultural and forest. Endangered species may find refuge in such areas, and remnants of natural or seminatural biotopes could be incorporated into parks and be protected thereby (Löhmus, Liira 2013; Liira et al. 2012; Jonsell 2012; Šantrůčková et al. 2015; Kümmerling, Müller 2012).

Landscape parks are specific areas, where the influences of natural conditions and intentional human intervention intersect closely. It is typical of such parks that they tried to fuse these human modifications with nature, and

unknowing visitors often cannot even recognize this. This fact contributes to the pleasant impression given by landscape parks, but it also carries the risk of underestimating intentional terrain changes. However, there could not have been one unified concept of ideal landscape parks during their long history. Today in the Czech Republic, there are several hundred landscape parks of which several have significance on the European level. The natural environment contributes to the appearance of landscape parks significantly through various forms of relief. At the same time topography is not taken passively to be a base for establishing parks, but it is actively modified at great cost and effort. Other steps in the creation of parks were closely connected to land forming, such as the design and modification of water features, vegetation planting and modeling, and the compositional arrangement of the park (Lang 1974).

The landscape style was developed on the British Isles in the 18th century, during the second half of which this style began to spread to continental Europe. Its perception in France and in the German-speaking lands was important for further development as European landscape parks were enriched with peculiar elements there. This free landscape style remained popular in Europe throughout the entire 19th century with certain changes, considering its long existence. There was a concurrence of several influences that mutually intertwined and affected individual architects with various intensities in different time periods (Newton 1971).

The perception of the landscape as a whole and its aesthetic qualities became established in the 17th and 18th centuries. This conception resonated with infant Romanticism and contributed to the further expansion of the landscape park fashion, which was supposed to embody ideal, uncorrupted nature. Three aesthetic categories were discussed in particular in connection with early landscape parks – beauty, the sublime, and above all the picturesque. The picturesque expressed the quality of the landscape; the overall effect and perception of landscape/parks/gardens was emphasized. Individual components and objects were evaluated based on their working within the whole (Clark 1980). Another important impulse for the development of landscape parks was 17th and 18th century painting. The landscape park itself was conceived as a painting; gardens were created as three-dimensional pictures, where mutual relationships between individual features played a critical role (Kuča 1974).

Two attitudes towards life markedly appeared in art – Classicism and Romanticism. These seemingly opposing movements coincided at the turn of the 19th century and naturally influenced each other, which was noticeable in garden art. Classicism influenced parks on the one hand with the construction of buildings that reflected Classical and Palladian ideals, and on the other hand influenced the overall formation of parks. Harmonic relationships between materials, spaces and that which binds them were characteristic for Classicist park design. The park,

not to say the entire landscape, was arranged with the help of centers and axes. The Romantics returned to spiritual experience, cultivated rural landscapes were also admired. With a return to spiritual values there was a related renewed interest in Christianity and the Gothic style, which was understood to be the most organic form of expressing desires and ideas. However, there was also interest in the traditions of pre-Christian Europe, and exotic lands. Under the influence of Romanticism landscape parks were modeled to be like wild nature (Hallbaum 1927).

Landscape parks, using natural, and less frequently, architectural features, were built to be intentionally irregular. Hilly terrain was sought after as it allowed for a moment of surprise to be introduced and also gave parks vantage points. Water could not be missing from the park. Stands of vegetation and meadows were created to be irregular; kidney-shaped forms were favorites. Especially large meadows were made to stand out with solitary tress or bushes, or groups of trees. Much attention was focused on the lay-out of paths, since as artificial creations they were not based on natural features. Paths were supposed to wrap around bends; circular paths leading visitors through the most important parts of the park were favorites (Clark 1980). The seemingly natural curves of landscape parks and their individual features (such as topography, water, and paths) were often the result of marked hard work. Complicated land forming was the rule, rather than the exception. As needed, valleys in parks were deepened and artificial hills were created. There were big changes in water features. Not only were ponds established for example, but stream channels were adjusted, or were dammed to create cascades, or new stream channels were dug. Work with vegetation, which formed park spaces and axes, were also very important. The dynamic features of vegetation were utilized and supported by planting various tree species, resulting in various foliage structures, textures, and colors (Hallbaum 1927). Follies were supposed to enhance views and contribute to creating certain desired moods of which they were symbols.

This paper focuses on landscaping activities associated with park foundation and management, especially those involving terrain changes and remodeling of the terrain's natural topography. Terrain changes in landscape gardens were typically meant to be hidden from viewers, and they often mimicked natural lines and shapes. This paper focuses on determining the degree to which the natural topography was used and changed and what impact it had on the form and creation of the parks. We assume that the natural topography played an important role in the park design. Furthermore, terrain changes are assumed to differ according to the natural topography, the landscape design activities, and the fashion prevailing during the time period the park was created. Several types of archival sources (written documents, maps, pictures) were consulted.

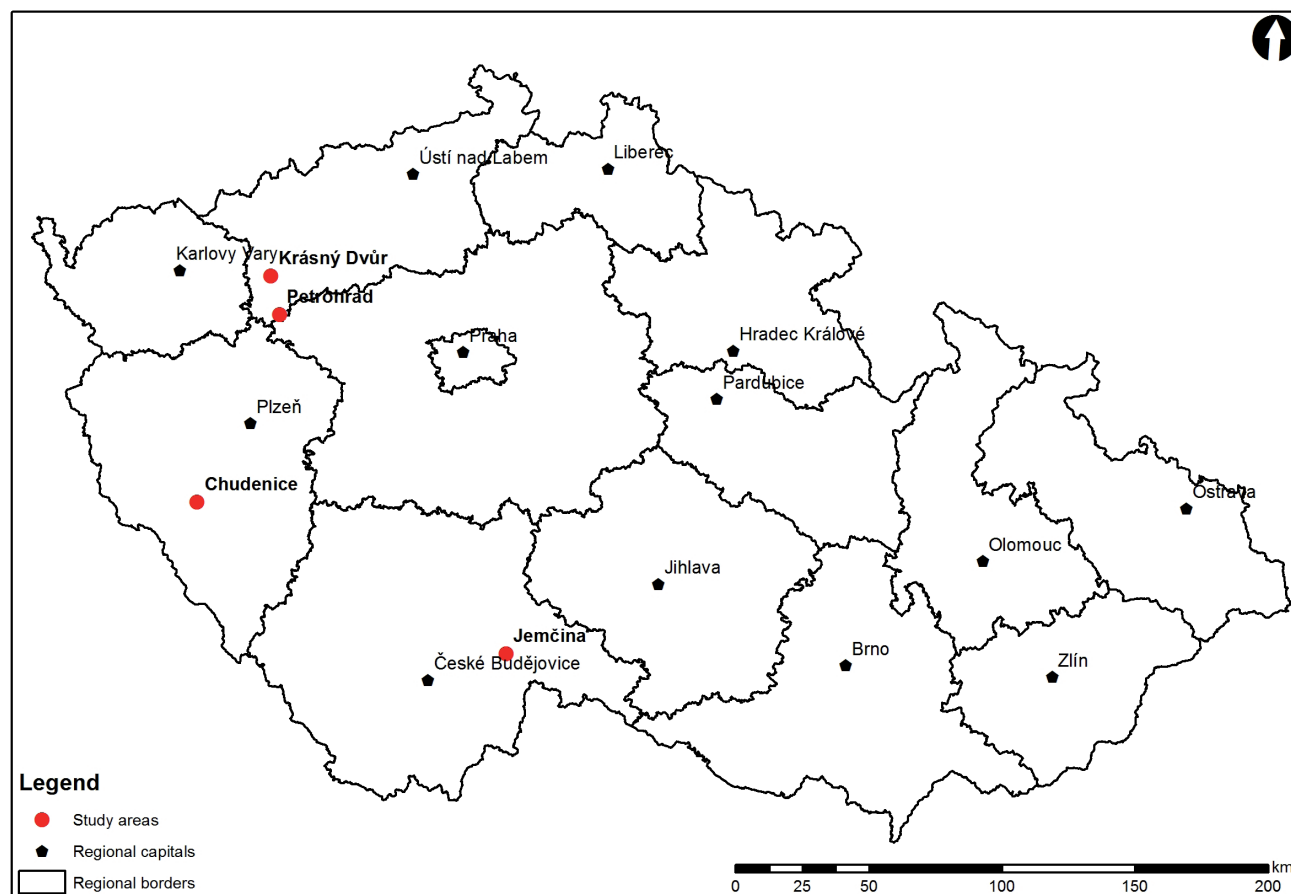


Fig. 1 The study areas.

## 2. Materials and Methods

### 2.1 Study areas

Four model areas were chosen for a detailed analysis of landscaping and design activities and their impact on terrain modeling: landscape parks in villages Krásný Dvůr and Petrohrad, small town Chudenice and around game manor house Jemčina (Fig. 1). Each of these parks was founded and owned by the same landlord, Johann Rudolph Czernin, and his son, Eugen Karl Czernin, during the end of the 18th century and the first half of the 19th century (Šantrůčková 2014). The oldest park, Krásný Dvůr, was built in the 1780s by J. R. Czernin, L. Födisch and G. Wachtel in the flat, rural landscape of the Mostecká Basin (Mostecká pánev) 300 m above sea level. The local climate is hot (average year temperature is 7.5–8 °C) with little precipitation (450 mm per year). The park is located in a deep valley of the Leska Stream (Leskovský potok) and covers 96 ha. This park was highly prestigious and expensive, and many of the original brick follies are still extant. The flat parts of the park are occupied by meadows, often with follies or ponds, and the slopes are covered by woods. The whole area is Nature monument Krásný Dvůr for protection saproxylic beetles.

Jemčina is a large game park that occupies 2400 ha, which include Holná pond. This park was founded in approximately 1790 by J. R. Czernin and G. Wachtel on the flat, marshy, wooded edge of the Třeboňská Basin (Třeboňská pánev), 430 m above sea level. The local climate is moderate (average year temperature is 7–7.5 °C), and the area receives 650 mm of precipitation per year. Landscaping was less intensive in Jemčina because it was primarily used as a game park. The most intensively landscaped section was that which surrounded the hunting castle. Roads and paths were also intensively cared for in the wooded part of the park. The follies, however, were rare and wooden and have completely disappeared. Jemčina is a part of Protected landscape area Třeboňsko.

A small Baroque garden, an orchard, and a small game park were built in Petrohrad during the first half of the 18th century. These areas were transformed into a landscape park in the 1790s by J. R. Czernin and A. Födisch and remained such until the 1840s. Petrohrad lies in a hilly landscape among the granite boulders of the Rakovnická Hilly land (Rakovnická pahorkatina), 400 m above sea level. The local climate is moderate (average year temperature is 7 °C), and the area receives 500 mm of precipitation per year. The park's area is 300 ha, but it is difficult to delimit because the park flows continuously into the surrounding landscape. The park is composed

**Tab. 1** Types of terrain changes resulting from landscaping in the parks.

Space characteristic	Landform characteristic	Landform specification	Brief description	
Area changes	Artificially undulating areas		Primarily park grasslands that were leveled and then "naturally" modeled	
	Leveled areas	Original leveled areas	Leveled when the park was built. Used as a base for buildings, follies, a courtyard, and a plant nursery.	
		Playgrounds	New playgrounds with regular shapes constructed primarily in the 20th century for tennis, football, etc.	
		Terraces	Slopes formed like "staircases" with a wide base.	
		Depressions	Depressions of ponds	Wet depressions on the river or water channel.
			Dry depressions	Depressions that have never been used as ponds.
		Artificial hills		Small manmade hills.
Linear changes	Embankments	Embankments	Huge embankments, often near a road.	
		Banks	Small embankments, e.g., near water channels or in front of visually problematic areas.	
		Dams	Massive but short embankments, mainly near ponds.	
	Trenches	Artificial canals	Manmade water channels.	
		Modified flows	Natural creeks that were remodeled by man.	
		Ha-ha trenches	Dry trenches that protect the park from animals but do not interrupt the visual connection between the park and the landscape.	
		Shapes on the terrain level	Ways	Regularly managed networks of roads, ways, and paths.
		Walls	Primarily stone or brick walls used to buttress slopes.	
Point changes			Small terrain changes near banks and other small follies.	

of four large park meadows with scattered trees and the wooded Castle Hill (Zámecký vrch). Northern part of the area is Nature monument Petrohrad for protection saproxylic beetles.

The last park, located in Chudenice, was founded in the 1790s, but the 130 ha area was primarily developed from the 1820s to the 1850s by E. K. Czernin and J. C. Blumenstängel. This park is also situated in a hilly landscape approximately 500 m above sea level in Švihovská Highland (Švihovská vrchovina). The local climate is moderate (average year temperature is 6.8 °C), and the area receives 650 mm of precipitation per year. The largest area in the central part of the park is forested, but meadows are found at the park's southern and western edges. Chudenice is also historically important for introducing overseas plant species to Bohemia and a part called American garden is protected as National nature monument.

## 2.2 Data analysis

Landscaping history must be reconstructed from various sources that are scattered across many documents and institutions, including archives, museums, galleries, and libraries. However, reconstructing design activities from archival sources is accompanied by problems resulting from the variable quality and reliability of the historical information provided in the documents and their interpretation. Descriptions of a particular park in written documents, maps, and pictures were subject to observer

bias, both deliberate and accidental, making comparison across time and space difficult (Foster 1992; Endfield, O'Hara 1999; Šantrůčková et al. 2015; Black et al. 1998). Abundant archival data are available for the studied parks because they were exceptional areas on each estate and the landlord was keenly interested in their development and maintenance (Šantrůčková 2014).

Landscape parks and gardens are special areas that are often well documented in archival sources because their foundation and cultivation was the center of landlords' interest. However, old maps are relatively well known and the most frequently used resources and are often used for studying both landscape changes (Skaloš et al. 2011; Gustavsson et al. 2007; Van Eetevelde, Antrop 2009) and designed landscape composition and structure (Flekalová, Kulišťáková 2014; Kulišťáková et al. 2014) because they are the most accessible sources. Map language is universal across time and space, and maps can be analyzed using geographical information systems (GIS). Maps from the 19th century onwards were usually accompanied by geodetic measurements and accurate spatial information. Therefore, the scanned copies of these maps can be georeferenced. Maps made at different time points can be visualized and compared.

Written documents and old pictures comprise the second, less frequently used group of sources. Nevertheless, they are under-utilized because their study is time consuming and requires the ability to read and interpret old documents (Nestor, Mann 1998; Šantrůčková 2014). These sources are extremely scattered, narrative,

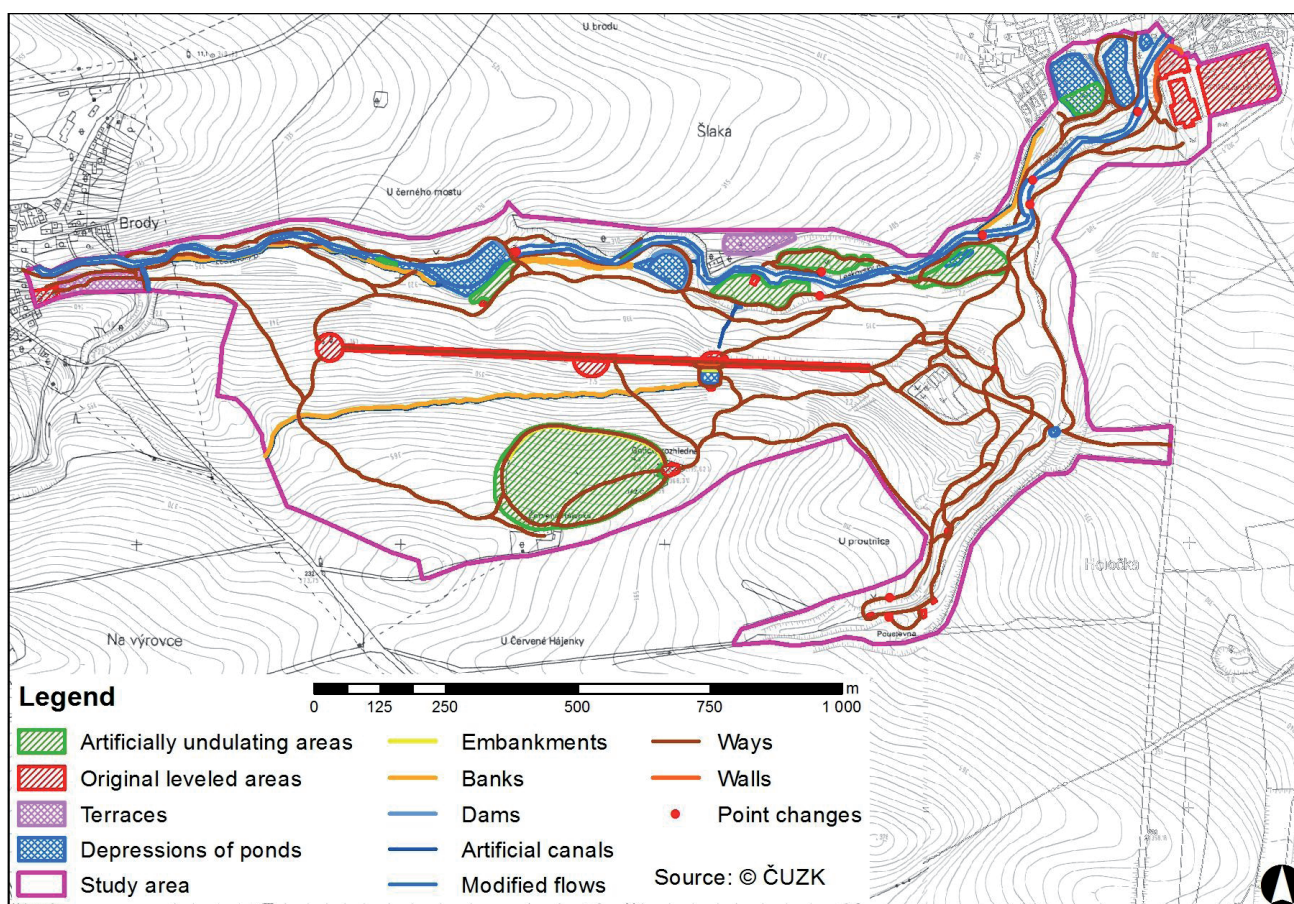


Fig. 2 Landform in the landscape park in Krásný Dvůr.

and individual, and many of them are not easily legible. However, they offer unique information about the landscaping process, terrain modeling, and plants used (Black et al. 1998; Endfield, O'Hara 1999; Nestor, Mann 1998). Common historiographical methods (textual analysis, inner and outer critics) were applied to analyze the written sources (Black, Macrauld 2007), from which information about the design activities and terrain modification were obtained for each model area. The archival sources allowed us to identify, on historical and modern maps, the areas, lines, and structures that indicate terrain modeling (Table 1). All of the information and the current state of the terrain created by landscaping were confirmed by a terrain survey of the model areas.

### 3. Results

Terrain changes in the model areas were identified through a terrain survey and drawn on the maps on a 1:5,000 scale. They were assessed based on both the time and manner of their implementation and their current state. The area and linear changes proved to be the best preserved and the most varied (Table 2 and 3). Point changes, however, were difficult to identify. The terrain changes that were implemented respected the natural topography.

#### 3.1 Landscape park in Krásný Dvůr

The establishment of the park in Krásný Dvůr was a highly prestigious event. The naturally broken terrain was not only perfectly used but subtly complemented. The terrain was deliberately manipulated to merge with the surroundings as quickly as possible, and though these changes are now immediately obvious, a layman would not recognize them. Krásný Dvůr is a typical picturesque park in which the natural interacts with the artificial terrain to evoke romantic images and create the illusion of a unified whole rather than a set of separate parts. Unlike the garden structures, the terrain changes are more permanent and erode slowly. Although some of the buildings have not survived, it is easy to detect their past locations because of clues in the terrain (Figure 2). Krásný Dvůr predominantly used artificial undulations on 0.07 km<sup>2</sup> to define individual representative areas of the park, which were usually complemented by a visually distinctive folly. One of the highlights of Krásný Dvůr is the high-volume Leska Stream, which runs through the entire landscape park. The bed in park (2.3 km) was laid with stones to create rapids, the banks were reinforced and curves were added to change the stream's route. Further changes included the building of paths; their total length is 15.7 km.

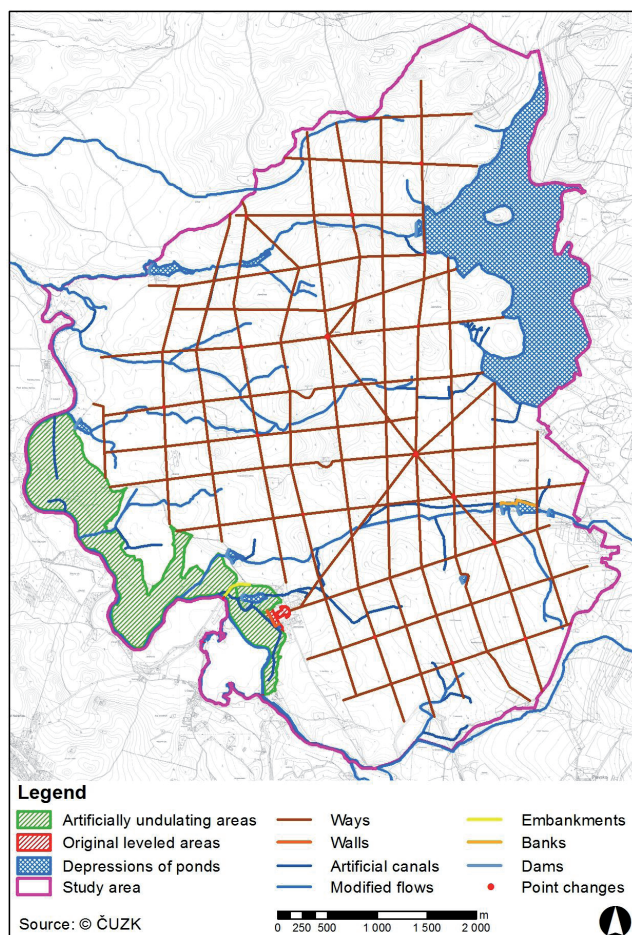


Fig. 3 Landform in the game park in Jemčina.

### 3.2 Game park in Jemčina

The game-park in Jemčina was primarily used for hunting. To pursue game on horseback with dogs, it was necessary to maintain an easily penetrable terrain that provided a broad view of the landscape. It was most important to accommodate the rapid movement of the riders. Therefore, a flat area near Jemčina was chosen for the park, and the main changes to the terrain included creating a dense network of paths and ways and draining the wet areas. The mass of the Jemčina woods was divided regularly by a chiefly rectangular network of forest breaks with ways (total length 90.5 km) whose main direction was determined by a set of three ways that ran through the woods from the northeastern face of the castle. An aesthetic dimension was added by the inclusion of granite boulders, ponds and streams, which broke up the dense forest mass. The Jemčina castle is located on an important river terrace above the flat and wet flood plain of the Nežárka River. This meadow is several tens of meters wide. The most significant terrain changes were made in the immediate vicinity of the castle to meet the high standards of the mansion and its surroundings. The areas called the honour court and a viewing terrace were leveled, total area is 0.04 km<sup>2</sup>. In addition, a park meadow (1.7 km<sup>2</sup>) beneath the castle,

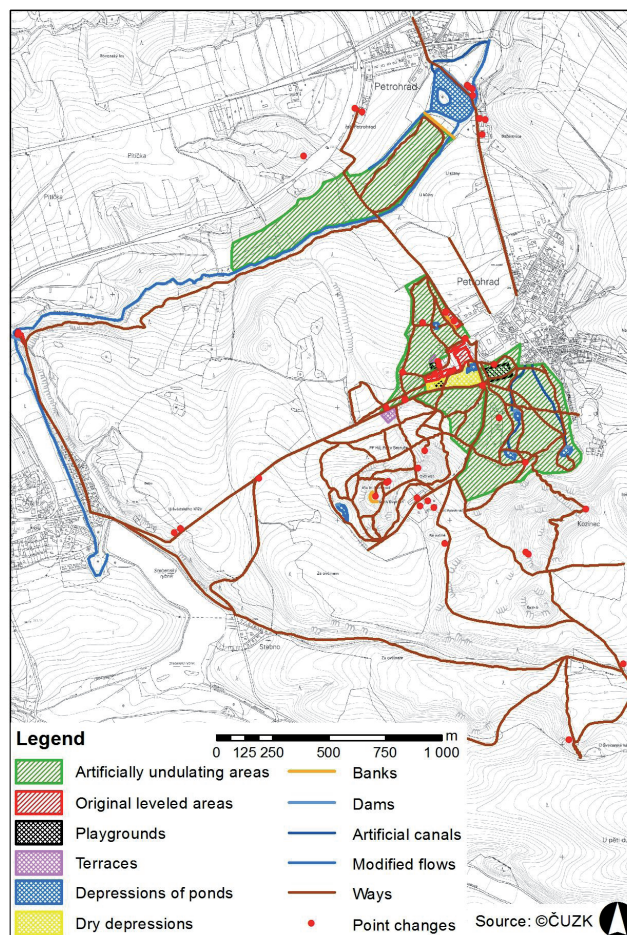


Fig. 4 Landform in the landscape park in Petrohrad.

the surroundings between Jemčina Pond and the manor farm were undulated and accompanied by ways and groups of trees (Figure 3).

### 3.3 Landscape park in Petrohrad

The park in Petrohrad was designed to give the manor house a pleasant and representative backdrop. The park primarily comprises open spaces, especially meadows in which groups of trees or single trees were grown. The undulating areas are therefore closely massed on 0.5 km<sup>2</sup>. Establishing meadows required much effort, especially in the south of the park on the steep slopes of the Zámecký and Kozí Hills. Because the soil is stony there, it was necessary to remove the stones before installing a new plantation, and the surface needed to be undulated again. However, diverse and picturesque rock formations in the valley of the Podvinecký Stream, on Zámecký Hill and Kozí Hill and in the game park complemented the scenery or served as viewpoints. They were welcome as an enlivening element for walks in the garden meadows and provided overlooks. Terrain changes in the Petrohrad park also included the planting of trees, creating networks of paths (31.3 km), constructing buildings and creating water elements. The water elements were typically small ponds made in naturally damp places; however, even

these required terrain alterations and their total area is 0.03 km<sup>2</sup> (Figure 4).

### 3.4 Landscape park in Chudenice

Chudenice landscape park is situated on the Žďár ridge, which provides a wide view of the surroundings. The landscape is picturesque and hilly. In Chudenice, a decorative tree and fruit tree nursery played a much more important role than in the other Czernin parks. The tree nurseries influenced the appearance of the modified areas, which were (where needed) leveled, terraced or undulated after being planned. The largest terrain changes in Chudenice were associated with the construction of the Lázeň manor house and the surrounding buildings and with the construction and demolition of St. Wolfgang's Church. The areas in the vicinity of these two buildings underwent the most significant alterations. Large buildings in the garden were scarce, so it was not necessary to make any other demanding terrain changes. The largest area is occupied by artificially undulating meadows (0.3 km<sup>2</sup>). It was also important to build ways and paths (16.5 km), which in the undulating terrain required much care, including terrain changes. Changes were also made to the water drainage systems, especially in Karolína's and Jaromír's meadows, and small ponds were created (Figure 5).

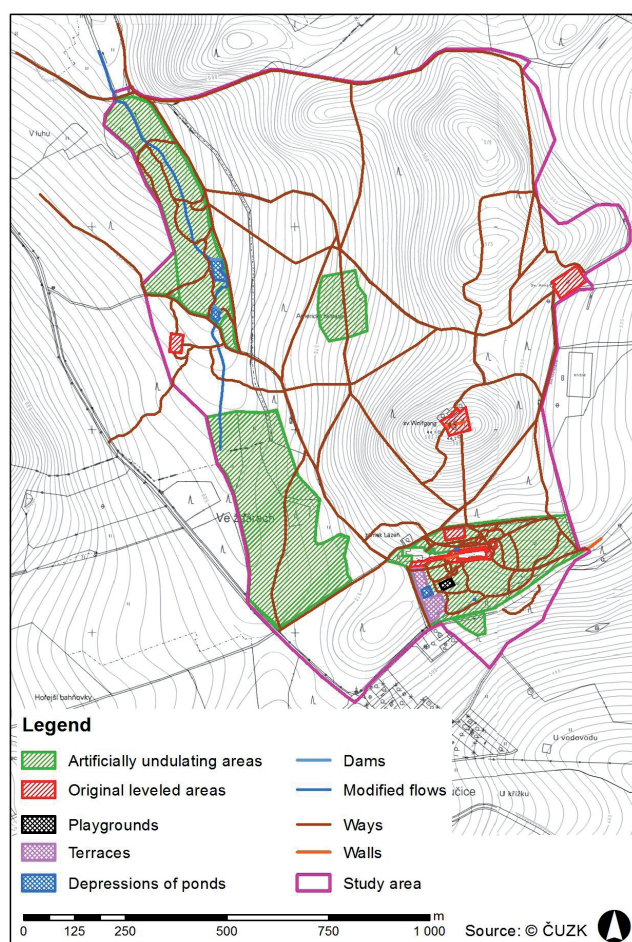


Fig. 5 Landform in the landscape park in Chudenice.

Tab. 2 Areal landforms in the model parks.

Areal landforms	Area (m <sup>2</sup> ) in Krásný Dvůr	Area (m <sup>2</sup> ) in Jemčina	Area (m <sup>2</sup> ) in Petrohrad	Area (m <sup>2</sup> ) in Chudenice
Artificially undulating areas	72,234	1,670,942	531,163	261,110
Original leveled areas	36,057	37,684	10,819	11,959
Playgrounds	x	x	7,372	556
Terraces	9,390	x	2,771	4,286
Depressions of ponds	27,124	2,414,640	29,808	2,277
Dry depressions	x	x	14,526	x
Artificial hills	x	x	x	x

Tab. 3 Linear landforms in the model parks.

Linear landforms	Length (m) in Krásný Dvůr	Length (m) in Jemčina	Length (m) in Petrohrad	Length (m) in Chudenice
Embankments	371	301	x	x
Banks	2,117	400	336	x
Dams	339	1,453	395	47
Artificial canals	2,039	12,909	1,119	x
Modified flows	2,292	31,667	4,404	410
Ha-ha trenches	x	x	x	x
Ways	15,660	90,464	31,253	16,537
Walls	189	224	x	149

## 4. Discussion

Archival sources were key to conducting a detailed study of landscaping activities. Historical and current maps document the state of the landscape, the presence of design elements and their exact locations. Terrain modeling is closely associated with the composition of the landscape parks, and both can be visualized on maps (Kulišťáková, Sedláček 2013; Flekalová, Kulišťáková 2014). Nevertheless, written sources are necessary for understanding the landscaping process, its timing, which alterations were planned and which actually executed, and the technical details of the design activities (Nestor, Mann 1998; Endfield, O'Hara 1999).

Landscape parks deliberately made use of the local topography, and its configuration was of key importance to the outcome of the landscaping. The topography influenced the appearance of the park in two ways. First, it played an important role in the selection of the park's location. Terrain changes are expensive; therefore, the parks' locations were selected to minimize these costs.

However, even the most suitable terrain was not left unchanged. The existing conditions of the parks were, therefore, actively created. This confirms the hypothesis that terrain changes differ based on the natural topography, the function of the landscape change and the time at which the changes were made. Therefore, the three assumptions explained above are closely intertwined. The analysis showed that the function of the landscaping was a fundamental factor at the time of the selection and in the terrain changes made. Another factor was the land available to the developer from which he could then select a place suitable for the establishment of a park. Financial limitations were also a consideration.

#### 4.1 Terrain changes according the function

Significant changes made to all of the studied areas and that are common in other built landscapes include artificially undulating areas. The method used to prepare the undulated areas was similar in all of the parks (1.7 km<sup>2</sup> in Jemčina, 0.5 km<sup>2</sup> in Petrohrad, 0.3 km<sup>2</sup> in Chudenice, 0.07 km<sup>2</sup> in Krásný Dvůr). The location was first made into a plane and then molded into the shape of a mildly undulating area. These undulating areas substantially reflected the original shape of the terrain: in flat, broad, flood-plains they are almost even; on slopes they mimic the topography, but their surface is rougher. Where the land was not fertile, the area being modified was covered with soil of higher quality. Nevertheless, at present, the areas look natural, and the challenges associated with the artificial modifications are visible primarily in the archival documents.

Ponds were either created simultaneously with the landscaping for the purpose of the park or pre-existing water features were incorporated into the park (2.4 km<sup>2</sup> in Jemčina, 0.03 km<sup>2</sup> in Petrohrad, 0.03 km<sup>2</sup> in Krásný Dvůr, 0.002 km<sup>2</sup> in Chudenice). To make new ponds, it was necessary to create a basin, and the excavated soil was used to construct dams. Similar methods were used in each location and differed only based on the size and shape of the pond and the robustness of the dam. In two cases (Jemčina and Petrohrad), an artificial island was made to rise above the pond basin.

Unlike with these features, the anthropogenic origins of the original leveled areas are apparent (0.04 km<sup>2</sup> in Jemčina, 0.04 km<sup>2</sup> in Krásný Dvůr, 0.01 km<sup>2</sup> in Chudenice, 0.01 km<sup>2</sup> in Petrohrad). However, these areas are not large. They were typically situated at the back of buildings because of the need to create a flat plane or to create a foundation for a structure. Often the leveled area exceeded the area of the building, emphasizing its role and relevance as a human artistic element. Some leveled areas were made only for practical purposes, such as to facilitate the management of vegetable gardens or tree nurseries.

In all of the gardens, a network of paths represented a substantial part of the terrain changes (90.5 km in

Jemčina, 31.3 km in Petrohrad, 16.5 km in Chudenice, 15.7 km in Krásný Dvůr). The design of the network visibly reflected the configuration of the terrain. Usually these ways passed directly beneath surfaces with elevated edges. In wet areas, the ways were constructed raise slightly above the surrounding terrain. More landscaping work was needed to create paths on slopes: the surfaces of the paths needed to be leveled so that they did not slope down. Therefore, the foundations of the paths built on the slopes needed to be leveled in advance by digging out the upper part of the slope and moving the excavated soil to the lower part of the slope. Through this process, a terrace step was produced on which the path ran, slightly submerged in the step. Most of the ways were also slightly sloped and accompanied by one or two trenches.

#### 4.2 Terrain changes and the natural topography

The methods used to make the terrain changes differed based on the differences in the natural topography, though this was not true for all types of changes. This difference is most striking with regard to differences in function. The natural topography influenced the appearance of the parks because the natural configuration of the terrain was used to the maximum degree, especially during the layout of individual sections, the overall composition of the parks and the laying out of the viewpoints and dominant features. However, the creators of the landscape parks did not reject relatively large terrain changes if these changes were not eye-catching and did not detract from the impression of a natural landscape.

The most outstanding divergence is the absence of terraces on the flat terrain of Jemčina. Other gardens used terraces, especially for orchards, gardens or vineyards (0.009 km<sup>2</sup> in Krásný Dvůr, 0.004 km<sup>2</sup> in Chudenice, 0.003 km<sup>2</sup> in Petrohrad). Their function was not only practical – terraces made it easier to cultivate the land – but also aesthetic. Similarly, drainage canals were only created in wet areas. Slopes were reinforced and steepened where needed; retaining walls were used (224 m in Jemčina, 189 m in Krásný Dvůr, 149 m in Chudenice).

The streambeds were altered to support or even create curves. Where needed, banks were reinforced to prevent them from being washed away and disrupting the river course. Boulders and small weirs were introduced into the streams to make the flow more dynamic (31.7 km in Jemčina, 4.4 km in Petrohrad, 2.3 km in Krásný Dvůr, 0.4 km in Chudenice). The artificial canals (12.9 km in Jemčina, 2 km in Krásný Dvůr, 1.1 km in Petrohrad) also resemble natural shapes but are usually straighter than the modified flows. Artificial canals were built to copy the stream through the addition of curves and grass banks. In some cases, the canals are accompanied by banks that separate them from the stream or slope and prevent inundation (2.1 km in Krásný Dvůr, 0.4 km in Jemčina).

Artificially made hills were used in flat terrain to enliven the scenery and introduce a dominant element. They



were accompanied by major plantings and/or follies. An artificial hill could have a grotto, which would otherwise have been difficult to construct in a flat terrain. Some artificial hills, however, also had a practical function of protecting plantings against a high water table. Other rare structures included ha-ha trenches. Ha-has were relatively deep and distinctive terrain features. The wall of a ha-ha adjacent to the garden is steep and paved, while the other wall slopes gently and is covered with grass. The trench is visible only at a close distance, and it therefore does not disrupt the view and creates the illusion of open space. At the same time, it prevents wild and domestic animals from entering the park. Ha-has were used more often in flat terrain. None of these structures were built in the model areas.

#### 4.3 Terrain changes after the main period of landscaping

Only minor differences between the terrain changes based on time of origin were found. The types of terrain changes made were similar throughout the period from the end of the 18th century until the end of the 19th century. Moreover, the methods used for their implementation were based on the terrain conditions, and the technology used remained the same. Differences were not visible until the 20th century, when the recreational function of the parks began to be emphasized. Completely new elements were introduced to the existing parks. These consisted chiefly of playgrounds (0.007 km<sup>2</sup> in Petrohrad, 0.0006 km<sup>2</sup> in Chudenice), which began to be built in the first half of the 20th century and which required the introduction of regular-shaped, leveled and consolidated areas.

Focusing on the mutual interaction between the influence of nature and human interventions and activities during the creation of the parks offers insights that improve our understanding of the current relevance and state of landscape parks. Understanding the relevance of topography and the sensitivity of the changes made to it can reveal how to best care for and maintain the parks and how their modern use should be limited to prevent irreversible damage to the gardens.

## 5. Conclusion

The study of landscaping and terrain changes is demanding because it requires detailed research of the literature; the context of the sources, including their critique and interpretation; and detailed terrain surveys. The analysis of the historical maps using GIS is also indispensable. Landscape parks are specific sites in which the influence of natural conditions is integrated with deliberate human interventions. What is unique about them is that people strove to integrate these human changes into the natural topography, and a layman often fails to recognize these

changes. This contributes to a pleasant impression of the landscape park, but there is also a risk that the deliberate changes to the terrain will be underestimated. In fact, the protection of parks often emphasizes the protection of the park's composition, valuable trees, and/or places that are botanically or zoologically valuable. Topography and configuration of the terrain are usually not considered elements that need to be protected. Nevertheless, insensitive changes to a landscape park, e.g., by creating a golf course, may, despite preserving the composition and precious organisms, constitute a complete degradation of the park. Terrain changes are a more permanent part of landscaping, though even these suffer from degradation and lose their outstanding and characteristic features if left unattended. Nevertheless, they can be easily identified, even when the composition is difficult to recognize and the trees have aged considerably.

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## RESUMÉ

### Terénní úpravy v krajinářských parcích. Případová studie z černínských parků v Čechách

Krajinářské parky a v širším smyslu komponované krajiny jsou specifickou součástí kulturní krajiny a významným kulturním dědictvím. Českým i zahraničním krajinářským parkům je věnována řada titulů, jež detailně popisují jednotlivé objekty. Zaměřují se především na kompozici zahrad a parků a na významné dřeviny. Parky jsou rovněž zkoumány jako významné komponenty cestovního ruchu či v souvislosti s ochranou přírody. Při studiu historického vývoje zahrad a parků jsou nejčastěji využívány staré mapy, které jsou poměrně jednoduše přístupné. Ostatní typy pramenů, zejména prameny písemné a obrazové, jsou využívány podstatně méně často. Příspěvek na základě detailního studia všech typů pramenů a terénního výzkumu charakterizuje terénní úpravy, jež byly prováděny v krajinářských parcích, což je téma, kterému zatím nebyla věnována systematická pozornost. Modelovými objekty jsou parky rodiny Černínů z Chudenic v Krásném Dvoře, Jemčině, Petrohradě a Chudenicích. V krajinářských parcích byly mnohdy prováděny poměrně značné terénní úpravy, které však

měly evokovat přirozený terén. Prováděné terénní úpravy závisely na původní přírodní modelaci reliéfu. Byla snaha nákladné terénní úpravy minimalizovat, proto byl pro park vybírán pokud možno vhodný terén a úpravy se mu přizpůsobovaly. Každý z vymezených typů terénních úprav vyžadoval specifické terénní práce. Plošně nejrozsáhlejším typem byla tvorba zvlněných povrchů, téměř každá louka byla takto uměle upravena, byť louky velmi zdařile evokují přirozený terén. Dalšími částmi terénními úpravami bylo budování cestní sítě, úprava koryt potoků, tvorba nových vodních příkopů a tvorba zarovnaných povrchů u budov a školek dřevin. Méně plošně rozsáhlé, ale časté byly hráze, násypy a valy. Terénní úpravy tvoří neoddelitelnou součást identity krajinářských parků a zasluhují tak stejnou ochranu jako kompoziční hodnoty či staré dřeviny.

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