

## NEW ELEMENTS IN THE LANDSCAPE OF THE PAVLOVSKÉ VRCHY HILLS

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### Abstract

The benefits of land consolidations for improving the ecological stability and recreational potential of agricultural landscapes are now well known. In this process, space for the design and implementation of soil, water and environment conservation measures (e.g., grassing, strip cropping, balks, tree belts, water reservoirs, ...) is created. Land consolidation plans supported by the government can provide conditions for improving quality of life in rural areas.

Protected area Pálava (Pavlovské vrchy hills) is sought after by tourists from the Czech Republic and abroad. The habitats of rare ecosystems on the slopes of hills with beautiful limestone rock formations are the subject of protection. The elements of plan of common facilities designed as a part of the simple land consolidation in Perná have potential to contribute to an increase the recreational attraction of this area.

**Keywords:** Rural countryside, land consolidation, nature close measures, landscape non-production functions, recreation potential

### Introduction

The Pálava protected landscape area (PLA) is located in southern Moravia, near the town of Mikulov. It covers an area of 85 km<sup>2</sup>. Its heart is the Pavlovské vrchy hills, but the PLA also includes their agriculturally used slopes, and in the foothills banks of the Dyje river and several ponds. The altitude varies from 163 to 550 m. The characteristic appearance of the hills was imprinted by the white limestone rising in the highest positions.

People have lived here for thousands of years, which is evidenced by archaeological finds of artifacts from the Stone Age, the remains of Roman military camps and castle ruins. Remains of original forests and steppes are subject to strict protection. Due to the unique natural conditions, very rare species of plants and animals are found here. Thousands of tourists, pedestrians and cyclists visit Pálava every year, for which a dense network of roads and trails is marked and maintained. In addition to tourism, people also practice other recreational activities here, such as swimming, fishing, rock climbing, etc. The recreational potential of Pálava is supported by a wide range of accommodation, catering, wine tasting options and a number of cultural events.

The slopes and foothills of the Pavlovské vrchy hills are covered by very fertile soil, which is intensively used for plant production, vineyards and orchards. At present, tendencies towards greening of farming gaining ground more and more. The administration of the Pálava PLA communicates with farmers and, in their common interest, they introduce, for example, grassy strips, hedges, planting fruit trees and avenues, etc. One example of cooperation between farmers, the PLA and the State Land Office under the Pavlovské vrchy hills is land consolidation in cadastre of the municipality of Perná, the results of which the paper presents.

### Material and methods

A simple land consolidation in the cadastral territory of Perná was initiated by the State Land Office in 2023 and applies to the locations U studny and Bergrus (Fig. 1). Both localities are strongly at risk of erosion, even with the risk of landslides. During heavy rainfall episodes, widespread erosion occurs. This leads to degradation of fertile agricultural land and surface runoff, which is concentrated due to the high slope and ruggedness of the terrain. As an affect of the concentrated runoff, rills and gullies are created on the slopes and the surface of the field roads is eroded. Resulting flooding with transport of eroded soil can potentially cause damage in the built up area. The area of the entire area of interest is 6.9 ha and includes 4.5 ha of orchard, 2.4 ha of other area. The following objectives of simple land management were established:

- improving the environment and increasing the ecol. stability of the landscape,
- creation of conditions for rational farming, incl. accessibility of land,

- creation of conditions to protect the agricultural land,
- improvement of the environment and enhancement of the landscape,
- creation of prerequisites for the possibility of using the support from the funds of the European Union.

The analysis of the current state of the territory was based on background maps and data (CENIA, RISWC, Czech Geological Survey, ...), processed spatial planning documents, project documentation and studies related to the interested area. On the basis of the collected documents, the owners' claims, the results of the survey, the survey of the actual state, the analysis of erosion and runoff conditions, a draft plan of common facilities (PCF) was drawn up. The plan of common facilities was prepared in accordance with applicable legal regulations and methodological guidelines. It also takes into account comments from state administration bodies and the concerned organizations. Proposed elements are based on the results of an expert engineering-geological survey of the area. The PCF includes:

- reconstruction of four field roads including objects interrupting and diverting concentrated surface runoff,
- stabilization of ravine with the check dams,
- drainage elements for draining water from field roads,
- small water pool.

### Results and discussion

The importance of land consolidations in the process of soil, water and landscape conservation was emphasized, for example, by Podhrázská et al. (2021) or Kupidura et al. (2014). Within the framework of simple land consolidation, measures were proposed in the cadastre of the municipality of Perná to improve accessibility of plots and limit very intense water erosion, which is locally manifested by landslides (e.g., Bíl et al. 2020).

The proposed road network is essentially based on the original road network, which it amends and supplements with the aim of improving the patency of the landscape and the transport services of the land. In addition to its basic function, the transport network creates an important landscape-forming element with an ecological function, as accompanying greenery is planted (Szturc et al. 2023). Sections of reconstructed field roads can be seen in Fig. 2 and 3, their lengths are 610 m (VC 1), 25 m (VC 2), 190 m (VC 3) and 325 m (VC 4). In all cases, the roads are designed as single-lane roads with a width of 3 m (plus 2 x 0.25 m reinforced roadside). Directionally, the roads are designed in such a way as to make the extravillan of the Perná village optimally accessible, thereby enabling local residents and tourists to connect with the surrounding nature. Field roads consist of arches and straight sections. Longitudinal slopes of the sections follow the natural terrain as much as possible. Transverse slope is one-sided 3 % and guarantees the drainage of the plain as well as the safe drainage of surface runoff to drainage objects along the roads. Surface of the field roads will be made of mechanically reinforced aggregates, which guarantees good resistance to the movement of agricultural machinery and simultaneously it allows partial seepage of water into the subsoil.

A water pool with an earth dam (Fig. 2) with a flood area of 480 m<sup>2</sup> was designed in the Bergrus location. This dam (length 59 m, height 1.10 m) holds up to 192 m<sup>3</sup> of water. A lowered place is designed in the crown of the dam for the drainage of possible higher flows. The surface of the embankment will be covered with humus and sown with a grass mixture. It will therefore be an element close to nature, which in the locality will contribute to the increase of water retention in the landscape. Its implementation, together with the subsequent planting of the banks with trees, can realistically be expected to increase ecological stability and biodiversity. There will be an improvement in the subsidization of underground water supplies and the conditions for the development of fauna and flora linked to the wetland community will be improved. The positive effect of small water reservoirs on water retention in the landscape and the transformation of flood waves was described, for example, by Tlapák et al. (2015).

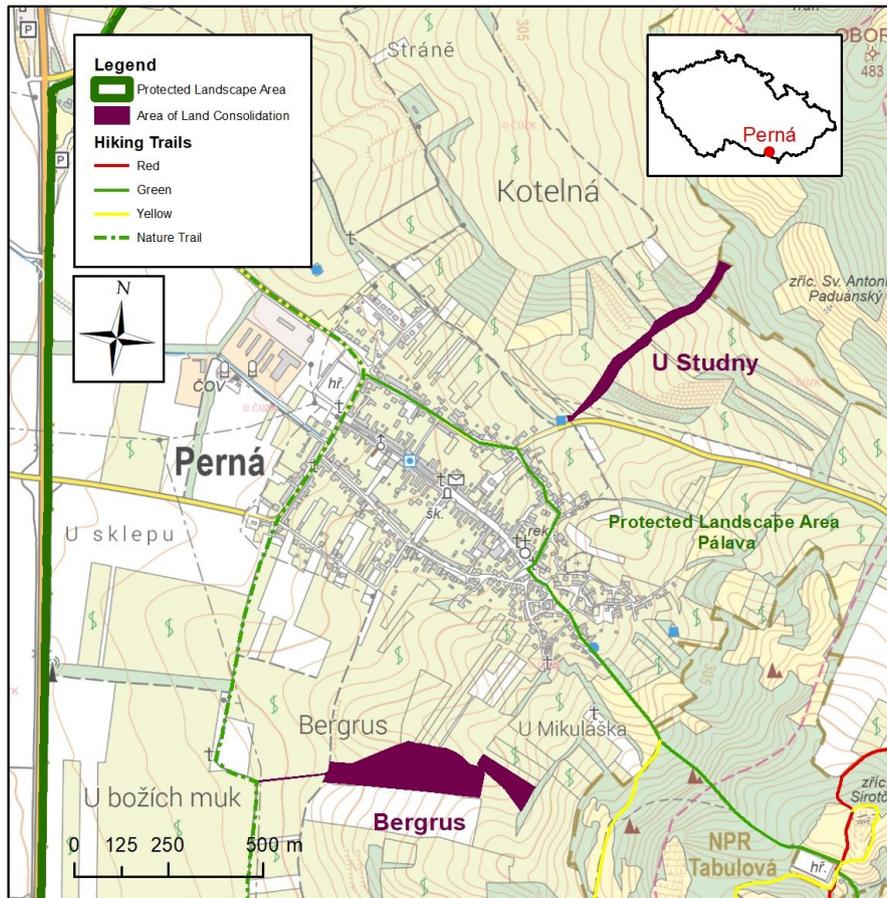


Fig. 1: Area of interest

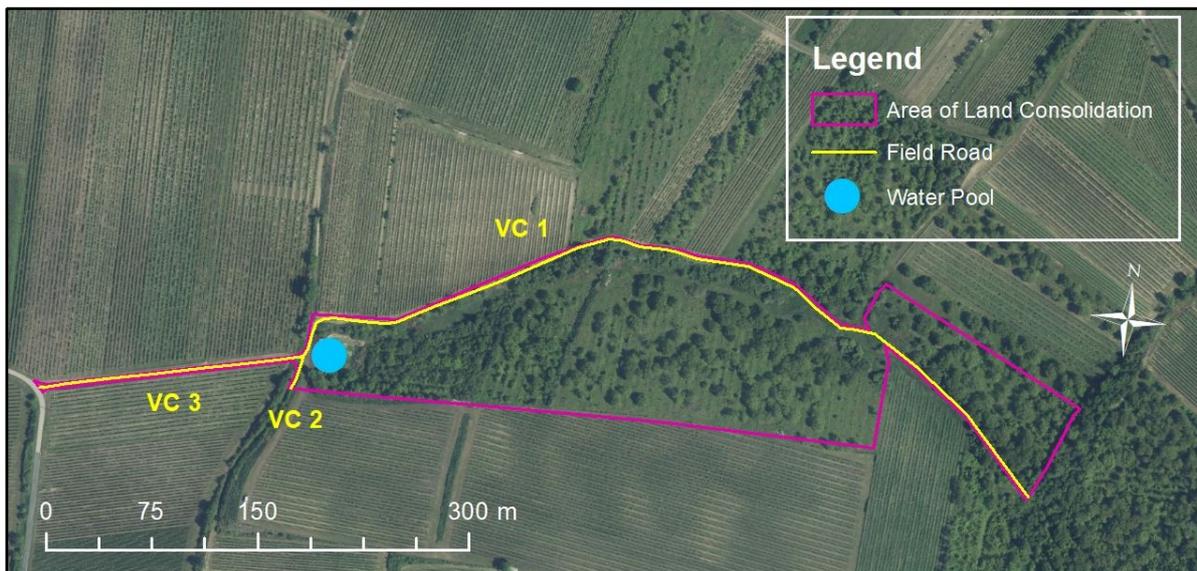


Fig. 2: Design of water pool (loc. Bergrus)

The U studny location (Fig. 3) is characterized by a strong soil erosion risk. Original VC 4 field road acted as a culvert and surface runoff posed a flood risk to the built up area. On the other hand, the field road had to be preserved due to the accessibility of field and vineyard tracks. That is why the strengthening of the field road surface was designed. The surface runoff on the field road will be interrupted by accompanying transverse drainage elements, which divert water from the road into ditches and then the water is led into the local ravine. A system of ten dams of four different types was designed in the ravine (Fig. 3): 3 wooden, 2 stone, 2 gabion and 3 log dams (Tab. 1). Wooden and log check dams will be constructed from horizontal and vertical system of logs and stakes. Gabion dams will be made of gabion baskets filled with gravel placed on compacted gravel bed. Also the stone

dams will be placed on a compacted gravel subgrade. All dams include safety overflows and stilling basins.

Tab. 1: Basic parameters of the designed check dams

Check dam	Type	Dam length (m)	Dam high (m)	Max. contain (m <sup>3</sup> )
PR1	wooden	15	0.76	35
PR2	stone	17	2.86	511
PR3	gabion	11	1.68	175
PR4	log	12	0.76	93
PR5	wooden	8	0.78	12
PR6	wooden	9	0.55	9
PR7	log	10	1.44	41
PR8	gabion	14	2.83	392
PR9	log	14	1.98	204
PR10	stone	14	2.04	326

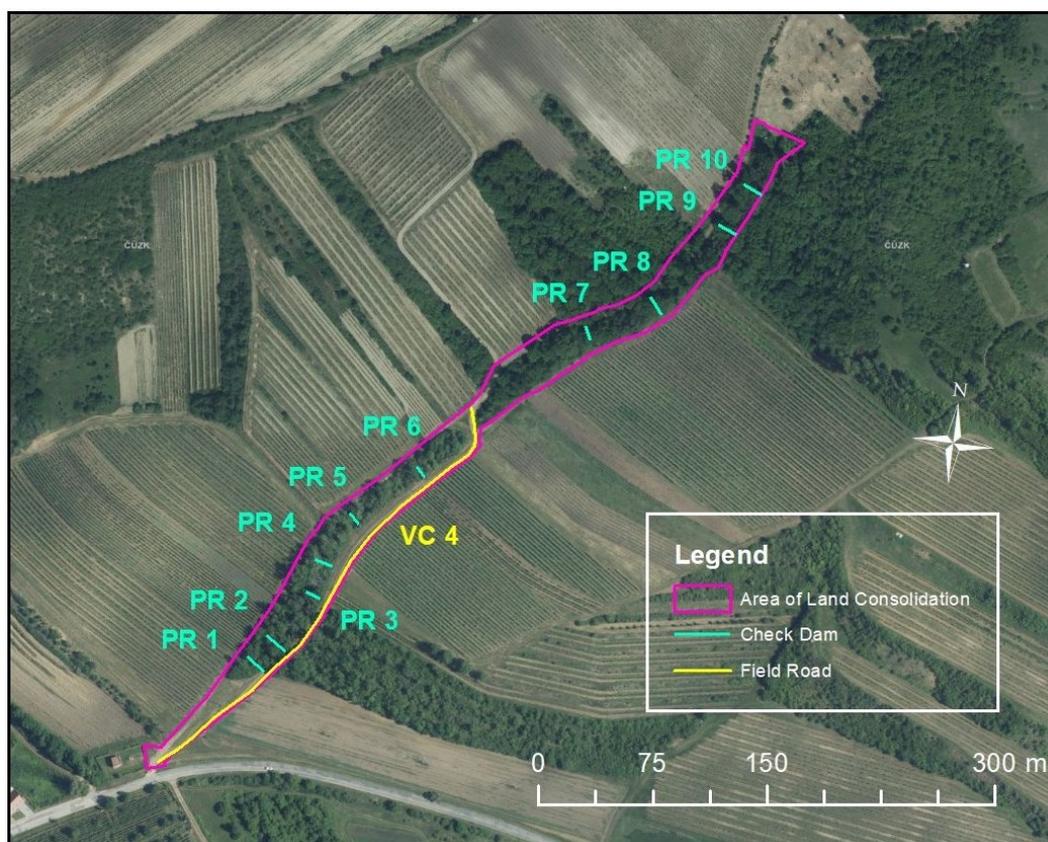


Fig. 3: Design of stabilization of ravine (loc. U Studny)

Both the water pool and the ravine stabilised with dams will be well accessible to tourists and, once completed, are expected to be a destination for recreational and sightseeing walks. The unique system of check dams will be especially interesting for tourists. The barriers will be conceived in four different construction methods using different materials. Descriptive boards, which will be installed near the realized elements of the PCF, will provide visitors with detailed information of both technical and ecological characteristics.

### Conclusion

The elements of the PCF designed and implemented in the Perná cadastre are an illustrative example of the potential of the land development process for the protection of soil, water and the environment. These are elements close to nature, which, in addition to increasing water retention and erosion control, will contribute to increasing biodiversity and further making the area passable. Their recreational potential lies in connecting the village with the countryside and creating new attractive points (Fig. 4). There will be achieved the access to locations of tourist interest, locations suitable for

relaxation will be created with the opportunity to gain new knowledge about the landscape, its functions and conservation.



Fig. 4: Lookout over the ravine (view of the Perná village)

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## Souhrn

Přínosy pozemkových úprav pro zlepšení ekologické stability a rekreačního potenciálu zemědělské krajiny jsou dnes dobře známy. V rámci jejich procesu se vytváří prostor pro návrh a realizaci opatření na ochranu půdy, vody a životního prostředí (např. zatravnění, pásové střídání plodin, meze, pásy dřevin, vodní nádrže, ...).

Chráněná oblast Pálava (Pavlovské vrchy) je vyhledávána turisty z České republiky i ze zahraničí. Předmětem ochrany jsou biotopy vzácných ekosystémů na svazích kopců s překrásnými vápencovými skalními útvary. V území se uplatňuje aktivní spolupráce CHKO s farmáři i obyvateli. Jednoduchá pozemková úprava, která probíhá v k.ú. Perná, je příkladem takové spolupráce, zejména CHKO a SPÚ. Prvky plánu společných zařízení navržené v Perné mají potenciál přispět ke zvýšení rekreační atraktivita této oblasti. Konkrétně se jedná o čtyři polní cesty, stabilizaci strže unikátním systémem přehrážek a jednu tůň. Jejich realizace povede ke zvýšení průchodnosti krajiny, zlepšení retence vody

v krajině, zvýšení ekologické stability a biodiverzity. V dotčených lokalitách vzniknou nové turisticky velmi zajímavé cíle s krajinotvornou a edukační funkcí, které rozšíří rekreační potenciál Pálavy.

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