

# Relief assessment methodology with respect to geoheritage based on example of the Deblínská vrchovina Highland

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# Geodiversity concept

- “The natural range (diversity) of geological (rocks, minerals, fossils), geomorphological (land form, processes) and soil features, including their assemblages, relationships, properties, interpretations and systems” (Australian Geoconservation Commission, 2002, Gray 2004)
- Many geodiversity sites are used for outdoor education; geodiversity sites are often of great recreational and tourism value, inspiring people to enjoy or learn about nature
- **Evaluation and maintaining an inventory of geodiversity can serve as a tool for geoconservation and management of geoheritage and geodiversity**



# Geoheritage and geoconservation

- **Geoheritage:** a term which includes geologic, geomorphologic and pedological elements, forms and processes worth of protection (Sharples, 2002)
- **Geoconservation:** an activity of humans that is oriented to the conservation of geoheritage.
- Conservation of geoheritage or geoconservation includes both **management and strategies for rational use of this heritage**
- For geoconservation purposes, we **need to identify and evaluate** the sites of geological and geomorphological interest
- Concept of „**geosites**“ and „**geomorphosites**“

# Geosite and geomorphosite concept

- **Geological features/landforms** that have acquired a scientific, cultural, historical, aesthetic and/or economic value due to human perception; they can be single geomorphologic objects or wider landscapes. These can be modified, damaged, and even destroyed by the impacts of human activities (Reynard, Coratza, Regolini-Bissig eds. 2009)
  - 1) scientific values
  - 2) additional values
- **Assessment process:**
  - 1) identification of the significant geosites
  - 2) inventory of these sites
  - 3) assessment of the scientific and additional values
  - 4) SWOT analysis
  - 5) synthesis → MANAGEMENT OF GEOHERITAGE, RATIONAL USE OF GEOHERITAGE, PROJECTS OF GEOPATHS etc.

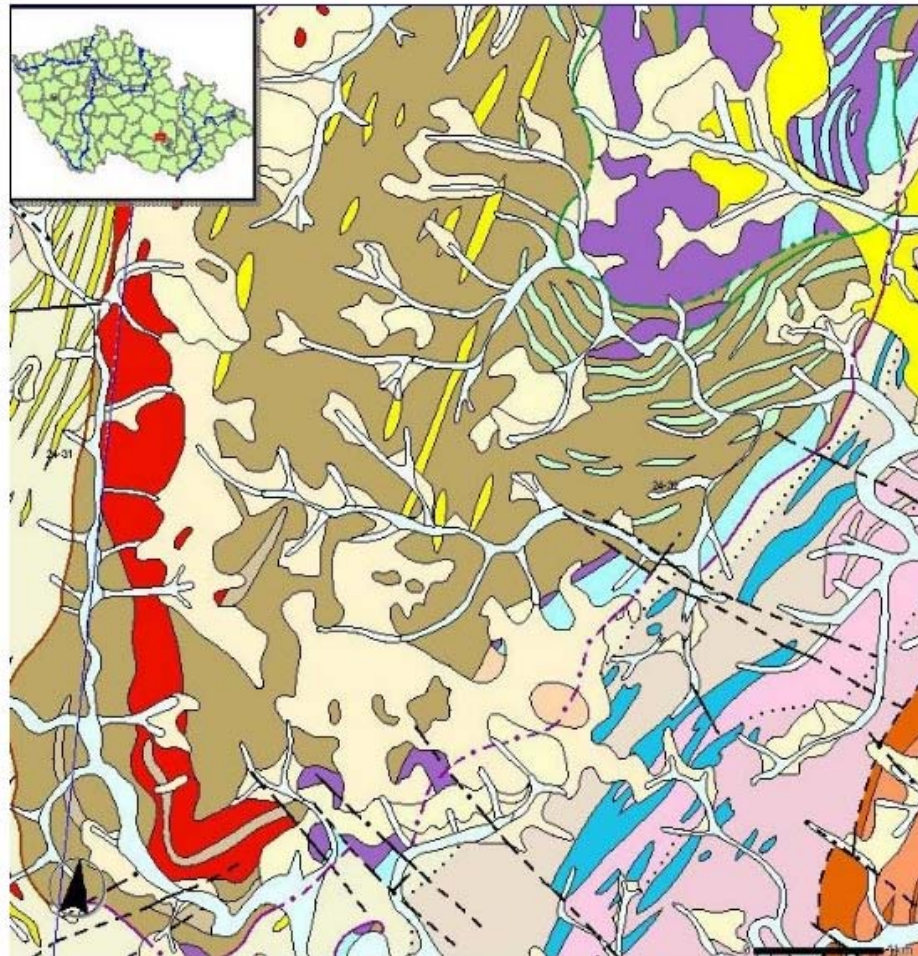
1. Scientific value		
number	criteria	score
1.a	Representativeness	0-1
1.b	Integrity	0-1
1.c	Exemplarity, pedagogical use	0-1
1.d	Number of similar sites in the area of interest	0-0,5
1.e	Number of similar sites in the country	0-1
1.f	Mezoforms, microforms	0-1
1.g	Presence of geological and pedological features	0-1
1.h	Knowledge of the site, scientific articles	0-1
1.i	Importance for understanding to geological evolution	0-1
1.j	Paleogeographic importance (reconstruction of landscape, climate etc.)	0-1
1.k	Existing protection of the geo(morpho)logic features	0-1

2. Additional values		
2.a	Aesthetic value	
	The number of colors	0-0,5
	Structure of the space	0-0,5
	Global aesthetic value	0-1
2.b	Ecologic value	
	The influence of the geomorphologic feature on the ecologic feature	0-1
	Presence of the protected species	0-0,5
	Existing protection of the ecologic features	0-0,5
2.c	Cultural value	
	Historical and archaeological importance	0-1
	Religious and symbolical importance	0-1
	Literal and artistic importance	0-1
2.d	Knowledge of the site due to its additional values	0-1

# Deblínská vrchovina Highland

- 25 km NW from Brno (SE part of Czech Republic)
- **Varied geological structure** thanks to its position on the eastern margin of the Bohemian Massif
  - Svatka dome:
    - parautochthonous basis : Svatka massif (Prepalaeozoic intrusive and metamorphic rocks, Palaeozoic basal clastics and limestone of Devonian age, siliciclastics sediments of Carboniferous age)
    - Alochton: Moravicum nappe (volcano-sedimentary complex with prevailing phyllites, orthogneiss)
  - Miocene and Pliocene freshwater sediments (clays with sand and gravel positions)
  - Pleistocene: fluvial sandy gravel, loess,
- **Variety of landforms:** deep incised valleys, karst forms, various rock formations of cryogenic origin and old abandoned quarries
- **Study area: Maršov valley and its surroundings**

## Geologické poměry širšího okolí Maršovského žlebu



### kenozoikum

#### kvartér

##### holocén

Fluviální a deluviofluviální sedimenty

pisčito-hlinité, hlinito-pisčité, kamenité až hlinito-kamenité sedimenty (deluviální)

##### pléistocén

spraš a sprašová hlína

#### neogén

##### pliocén

pisek, štěrk (fluviální)

### paleozoikum

#### karbon, perm

slepenec, brekcie

arkózové pískovce

jílovce, prachovce, pískovce

#### devon

vápence

arkózy, slepenec

### proterozoikum

porfýroblastická ortorula

sericitický fylit místy s chloritem

laminovaný, chlorit sericitický fylit

sericitický kvarcit

erlan

vápenec krystalický

kataklažovaný leukokrámí až biotitický granit, aplitický granit

sericitický fylit (složení sericit)

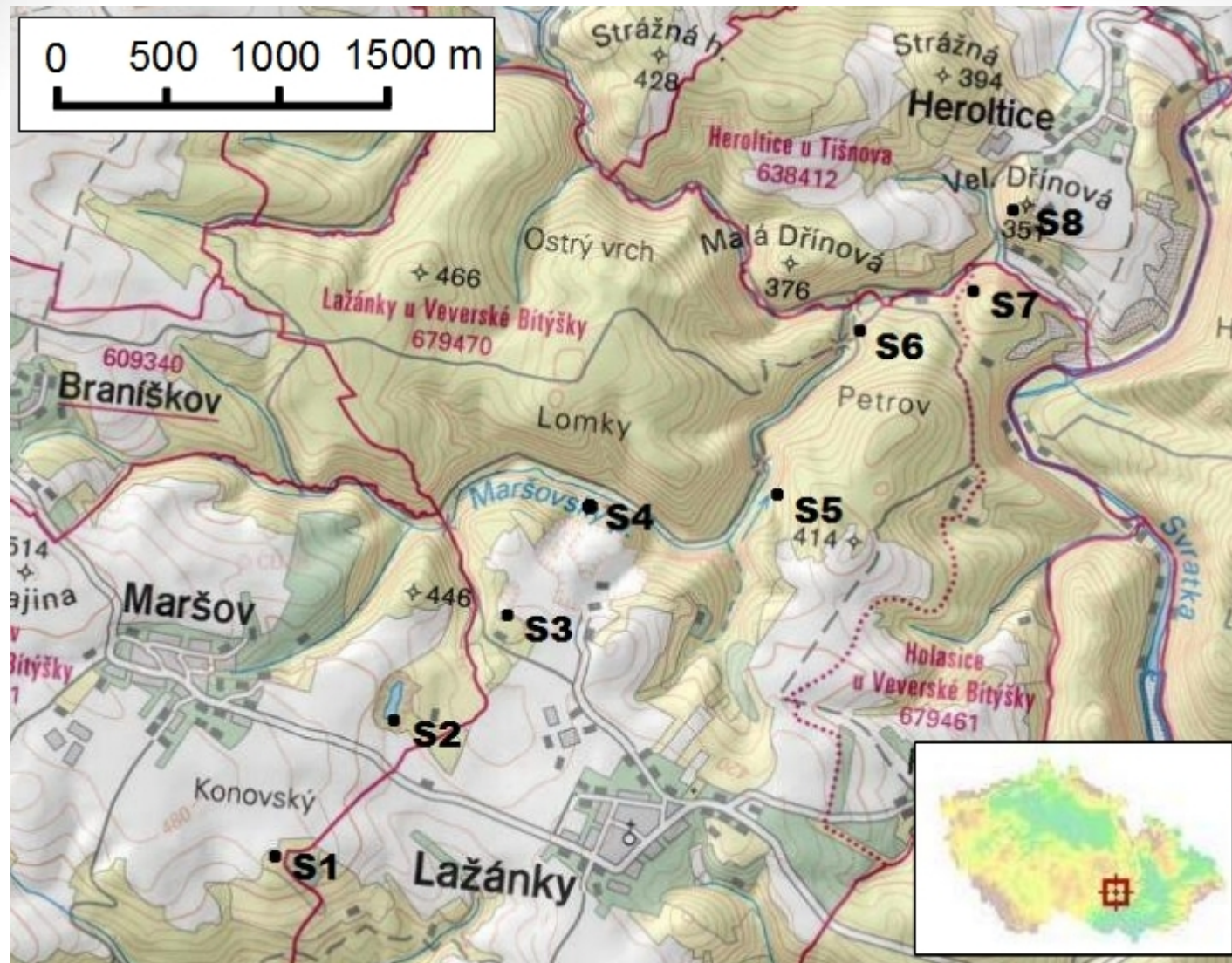
migmatizovaná biotitická pararula až migmatit, místy s amfibolem

metabazit, metatuf

# Selected geosites and geomorphosites

- Varied geology and big variability of landforms → variability of geosites and geomorphosites
- **Geologic sites:** Skalky (site n. 1), Dřínová hill (site n. 8)
- **Fluvial forms:** Floodplain of Maršov stream (site n. 6)
- **Karst landforms:** Karst spring near Budger's cave (site n. 4), Narrow cave (site n. 7)
- **Antropogenic landforms:** Kaolin mine (site n. 2), Old limestone quarry (site n. 3), Maršov adit (site n. 5)





*Map of study area and selected sites: S1 – Skalky, S2 – Flooded kaolin quarry, S3 – Old limestone quarry, S4 – Karst spring and Badger’s cave, S5 – Maršov adit, S6 – Floodplain of Maršov stream, S7 – Narrow cave, S8 – Dřínová hill outcrop (source: [geoportal.gov.cz](http://geoportal.gov.cz))*



**Skalky (site n. 1)**

**Kaolin mine (site n. 2)**

**Old limestone quarry (site n. 3)**

**Karst spring near Budger's cave (site n. 4)**

**Maršov adit (site n. 5)**

**Floodplain of Maršov stream (site n. 6)**

**Narrow cave (site n. 7)**

**Dřínová hill (site n. 8)**

1	2
3	4
5	6
7	8

# Numerical assessment

- **scientific values:**
  - Site n. 1 (Skalky) - high representativeness, intactness, educational value and palaeogeographical importance
  - Site n. 3 (Old limestone quarry) - high educational value and representativeness
- **additional values:**
  - sites n. 3 and 2 (Old limestone quarry) and L2 (Kaolin mine) especially thanks to their historical importance and aesthetical value
- **potential to use:**
  - sites n. 1, 2, 3 (Skalky, Kaolin mine and Old limestone quarry) thanks to the visibility
  - site n. 8 (Dřínová hill outcrop) thanks to its good accessibility and proximity of infrastructure

Value/site	s1	s2	s3	s4	s5	s6	s7	s8
Scientific value	<b>8</b>	6,25	6,75	5,75	3,25	4,5	6,25	6,25
Additional values	2,75	<b>4,25</b>	<b>4,5</b>	1,5	2	2	1,5	0,75
Potential for the use	4,75	6	<b>6,25</b>	3,25	3	4,25	3,75	4,75
Threats and vulnerability	2,5	0,5	1	2,5	2,5	2	2	1,5
<b>TOTAL SCORE</b>	<b>18</b>	17	<b>18,5</b>	13	10,75	12,75	13,5	13,25

# SWOT analysis of the geoheritage

- **Strengths**

- Relatively high geodiversity of the study area
- High cultural and historic value of some sites (Kaolin mine, Old limestone quarry)
- Good potential for education
- High ecological (or zoological) value of some sites (caves, Maršov adit)
- Localization of the study area in the catchment area of the regional center (Brno)
- Regular scheduled transport
- Localization of geosites within walking distance from the places of tourist infrastructure
- Existing network of hiking trails

- **Weaknesses**

- Lack of promotion of the area
- The area is not known behind the borders of region
- Active limestone quarry negatively influences harmonious landscape
- Bad accessibility of some sites
- Lack of legislative protection

- **Opportunities**

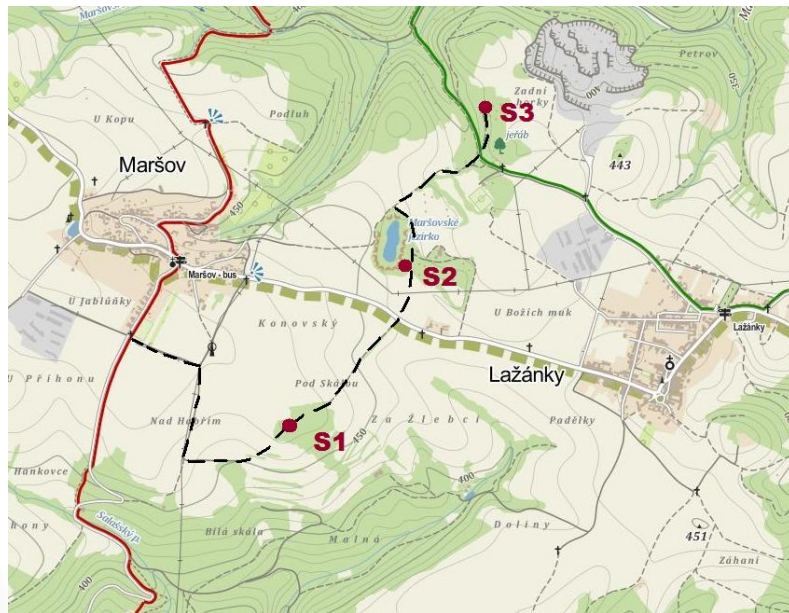
- Geopath leading through Maršov valley and its surroundings supplemented by information panels can serve for education of visitors
- Suitable terrain for walking and cycling
- Promotion of geoheritage can increase the attractiveness of the territory and bring the possibility of development of surrounding communities
- Study area is suitable for school trips (presence of tourist infrastructure in short distance)
- Possibility to suggest a draft of declaration of natural monument Maršov valley or to extend natural park of White Creek and to protect better the geosites and geomorphosites
- Cooperation with local authorities, museums and schools

- **Threats**

- In the case of larger promotion of the area and due to following increasing attendance there can be possibility of growing anthropogenic pressure on the sites
- Rubbish dumps and vandalism in the proximity of the sites
- Disturbation of important habitats, especially in caves and adits
- Continuing limestone extraction and further destruction of karst phenomena

# Synthesis and management proposals

- For the area of interest:
  - Geopath
  - Guided excursions (based on voluntary work)



- For every site (an example of Skalky – site n. 1)
  - easily accessible, but inadequate marking → new marked tourist trail
  - high pedagogical potential → geoeducation activities (information panel which would clarify the geological and geomorphological conditions)
  - Promotion on internet → the site is already put in the Database of geosites (kept and updated by Czech Geological Survey)
    - <http://lokality.geology.cz/3456>
  - a problem: vandalism → rangers, „guards of nature“ (based on voluntary work)

# References:

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# Thank you for your attention!

