Witold Wesołowski, Anna Fijałkowska-Mader

From former mines to the UNESCO areas in Holy Cross region

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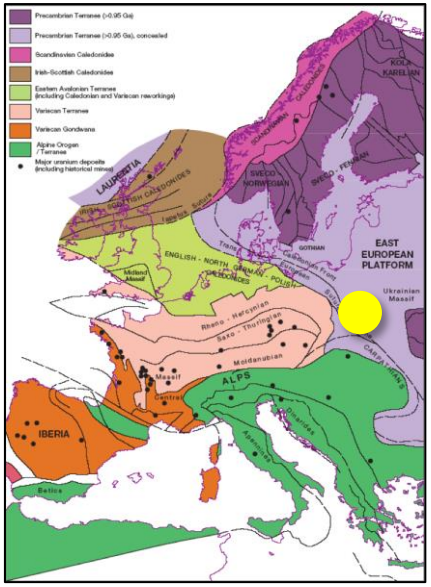
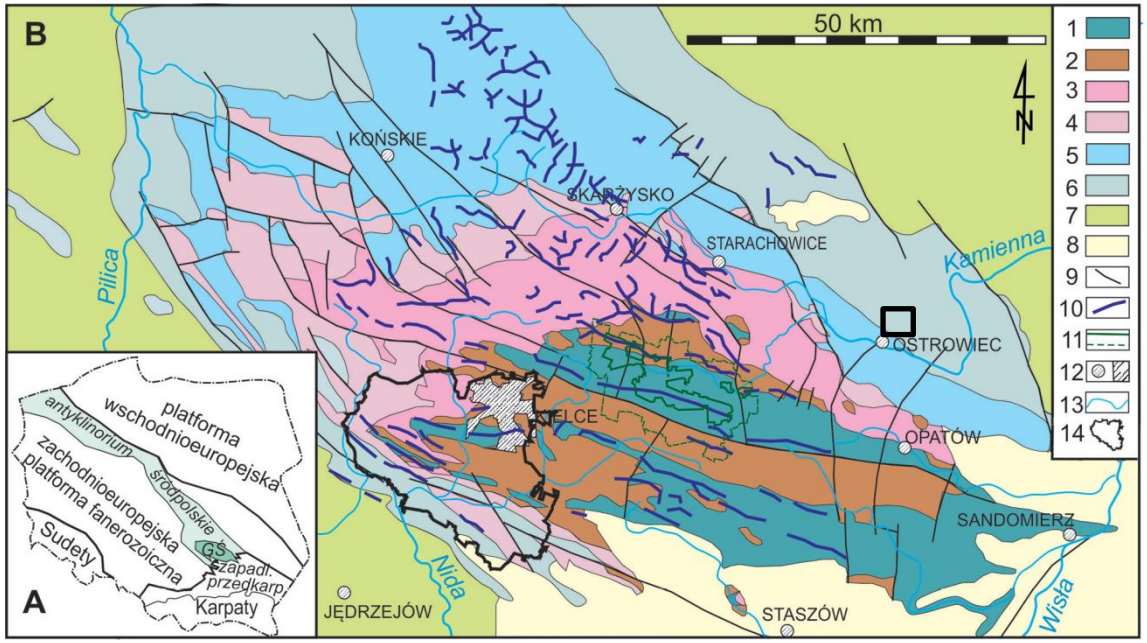
Location of the Holy Cross Region





- The Holy Cross (Świętokrzyskie) Mountains is the oldest orogen in Poland, belong to the central Polish highlands
- The Holy Cross (Świętokrzyskie) Mountains is a geological region situated within Trans-European suture zone – from the geographical point of view is the mid-eastern Europe
- They comprise the Paleozoic core and the Permian-Mesozoic margin. The Paleozoic core's complex geological structure encompasses rocks from the Lower Cambrian to the Carboniferous, resulting from multiple tectonic events that affected the area during various orogenies, from the Middle Cambrian Old Caledonian movements to the Neogene Late Alpine tectonics
- The Świętokrzyskie (Holy Cross) Mountains is the only region in poland where paleozoic, mesozoic and cenozoic sedimentary rocks crop out at the surface

Fig. Location of the Holy Cross Mountains Geopark and the Krzemionki Prehistoric Striped Flint Mining Region against the background of the geological structure of Poland and the Świętokrzyskie (Holy Cross) Mountains.

Source: Poros M., Urban J., Ludwikowska-Kędzia M., 2021. Dziedzictwo geomorfologiczne Geoparku Świętokrzyskiegoi jego znaczenie dla geoturystyki. Landform Analysis 40:

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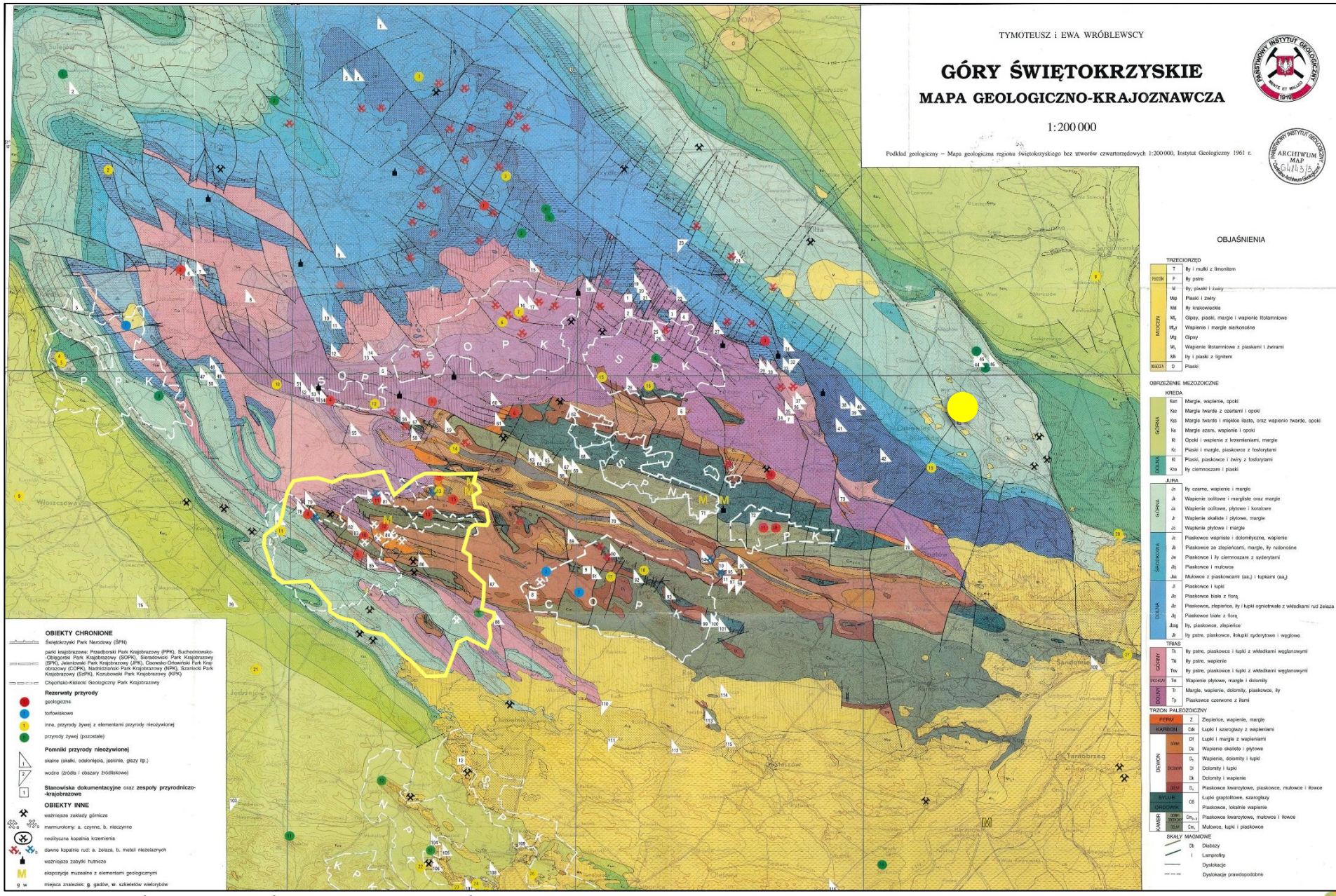
Location of the Holy Cross Region

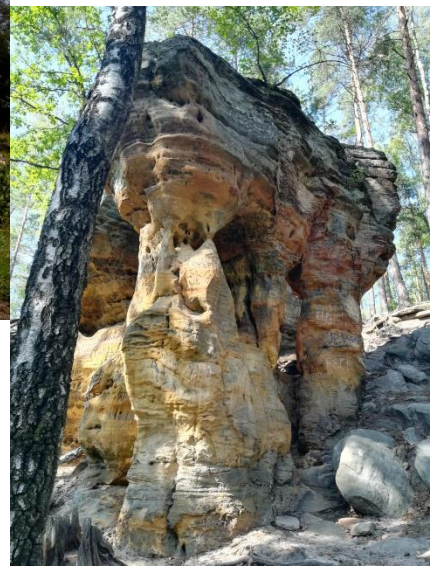


Source: WRÓBLEWSKI T., WRÓBLEWSKA E., 1996 – Góry Świętokrzyskie. Mapa geologiczno-krajoznawcza. 1:200 000. Wyd. Kart. Pol. Agencji Ekolog., Warszawa., PIG-PIB

Holy Cross Mountains Region

Slichowice quarry - the Jan Czarnocki Rrock Reserve.– photo: Witold Wesołowski

Wymyślna Moutain– photo: Witold Wesołowski



The nature reserve Rocks Hell (Piekło) near Niekłań– photo: Witold Wesołowski

Kadzielnia quarry – photo: Witold Wesołowski

Gołoborze– photo: Witold Wesołowski

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Photos by Witold Wesołowski

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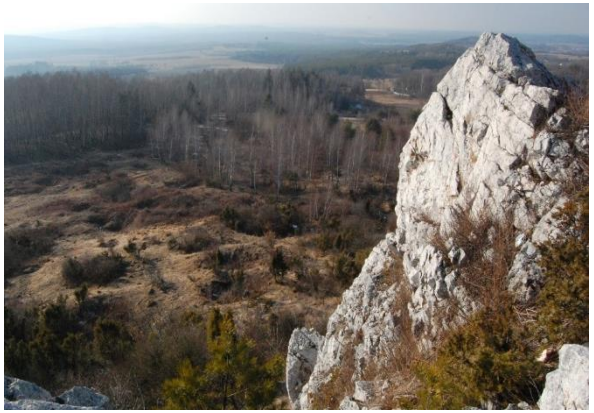
A region with mining traditions

Zelejowa quarry – the 20s of the XX century

– photo: Archive of the National Museum of Kielce

Bolechowice quarry at the begining of XX century

.– photo: Archive of the National Museum of Kielce



Miedzianka nature reserve – natural rocky forms and hill ridges and remains of the historical copper ore mining.– photo: Michał Poros

Szewce quarry - photo: Łukasz Zarzycki

St. Karol Boromeo Church in Karczówka Hill – the sculpture of St. Barbara made of one piece of galena (lead ore) – photo: Witold Wesołowski

Examples of using Świętokrzyskie „marbles" in architecture – photos: Witold Wesołowski

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The Chęciny – Kielce Lanscape Park – The Core of the Geopark

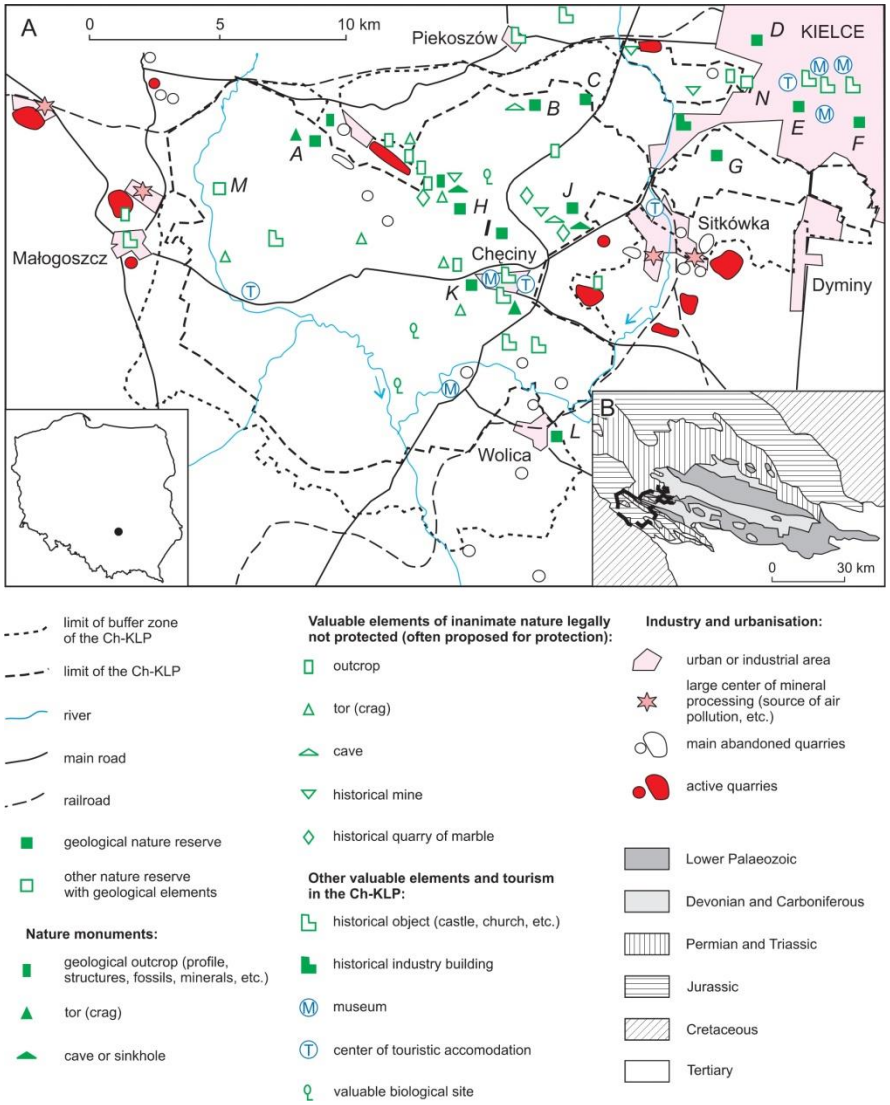

Fig: Natural values and economy of the Chęciny–Kielce Lanscape Park and its vicinity (A) and location of the Park within the geological structure of the region (B)

The castle in the Chęciny – photo: Witold Wesołowski

Limestone with visible copper minerals - malachite and azurite – photo: Witold Wesołowski

Source: Urban J., Wróblewski T., 2004. Chęciny-Kielce landscape park – an example of officially not proclaimed geopark. Polish Geological Institute Special Papers 13:

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Scientific research - the basis for the creation of a geopark

The idea of the Chęciny-Kielce Geological Landscape Park

T. Wróblewski, 1991

Świętokrzyskie Branch of PGI-NRI

The concept of the Geoeducation Center in Kielce
T. Wróblewski, 1995 (foundation)
T. Wróblewski, 2000 (concept)
Świętokrzyskie Branch of PGI-NRI

1996 - establishment of the Chęciny-Kielce Landscape Park

Establishment of a budgetary unit of the City of Kielce called:
2003 Center of the Geoeducation 2003
Geopark Kielce 2021
Geonatura Kielce 2021,

GEONATURA KIELCE
Centrum Geoedukacji

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Holy Cross Mountains Geopark

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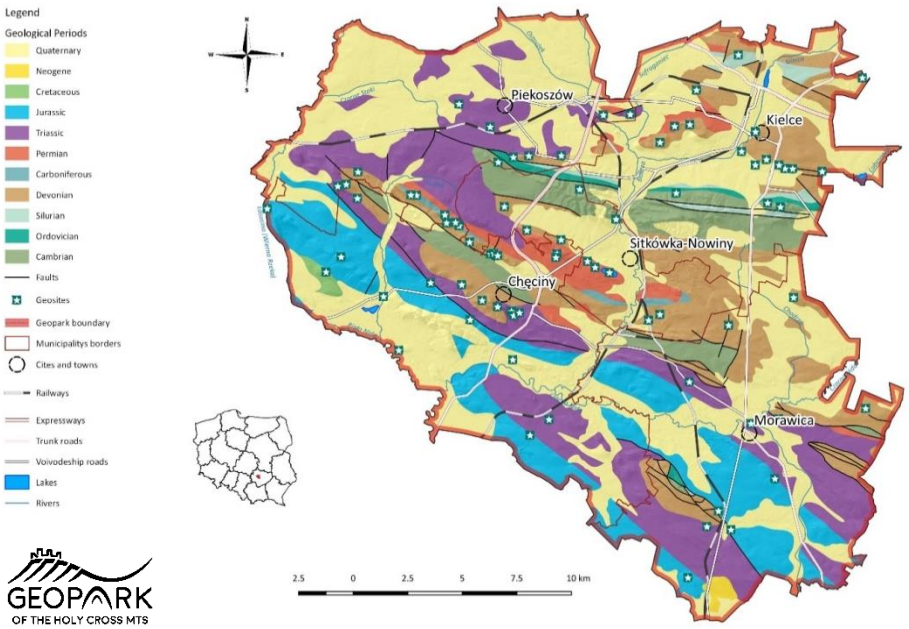
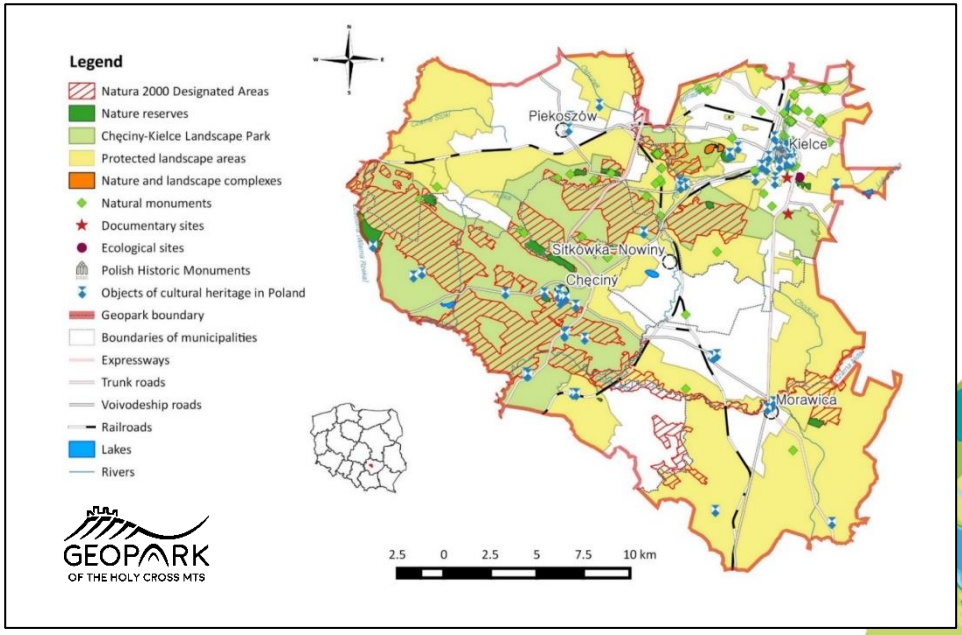
GEOPARK ŚWIĘTOKRZYSKI



A simplified geological map of the Holy Cross Mts. UGGp



The map of the nature protection areas and places at the territory of the Holy Cross Mts. UGGp

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Source: geopark.pl

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Two educational centers in the geopark located in former quarries

The Geoeducation Center in Kielce – photo: Krzysztof Pęczaski

The European Center for Geological Education of the University of Warsaw– photo: Archive of the University of Warsaw

The Exhibition in the Geoeducation Center in Kielce – photo: Krzysztof Pęczaski

One of the laboratory of the European Center for Geological Education of the University of Warsaw – photo: Witold Wesołowski

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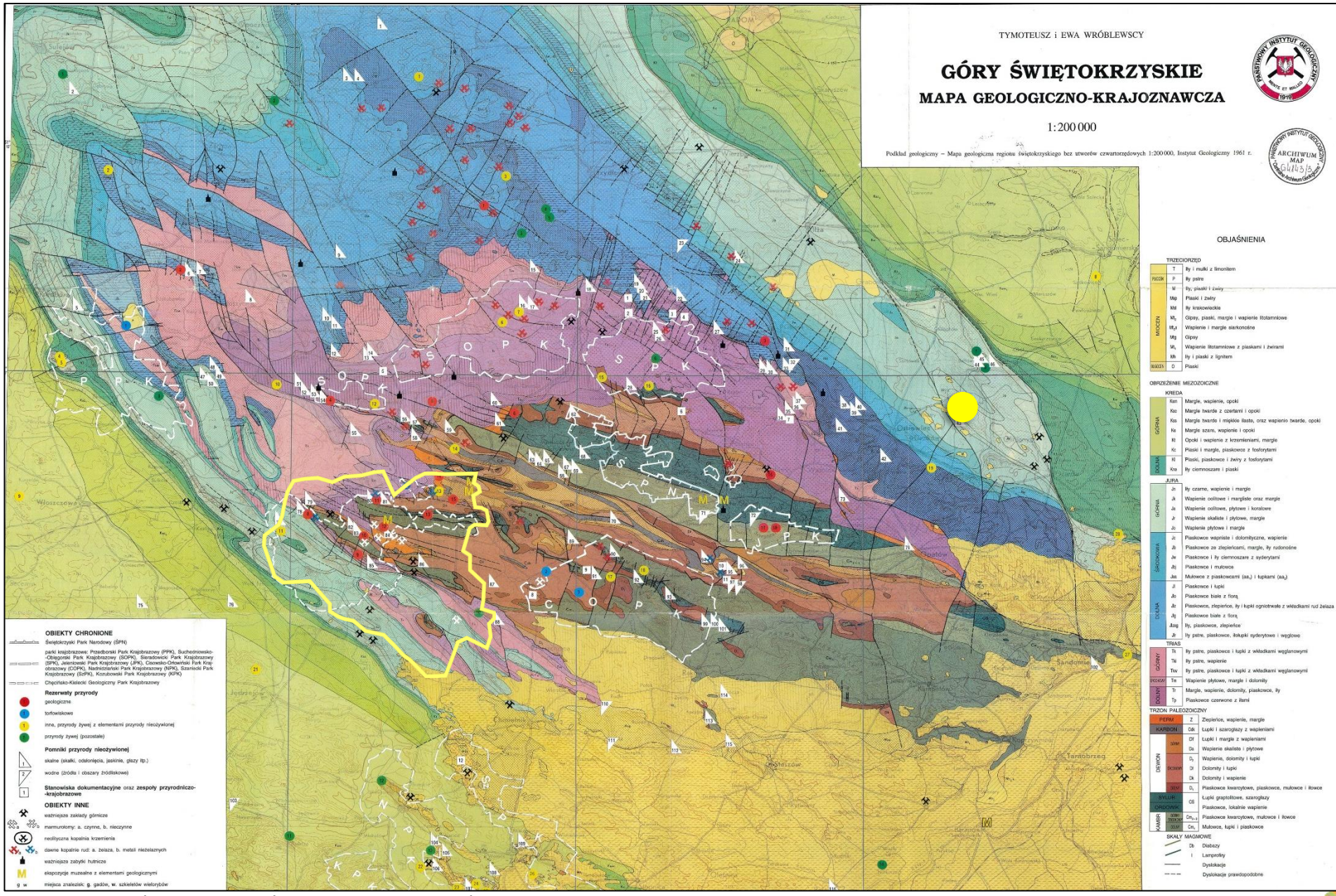
Location - Krzemionki Prehistoric Striped Flint Mines



Source: WRÓBLEWSKI T., WRÓBLEWSKA E., 1996 – Góry Świętokrzyskie. Mapa geologiczno-krajoznawcza. 1:200 000. Wyd. Kart. Pol. Agencji Ekolog., Warszawa., PIG-PIB

Striped flints in the Holy Cross Mountains Region

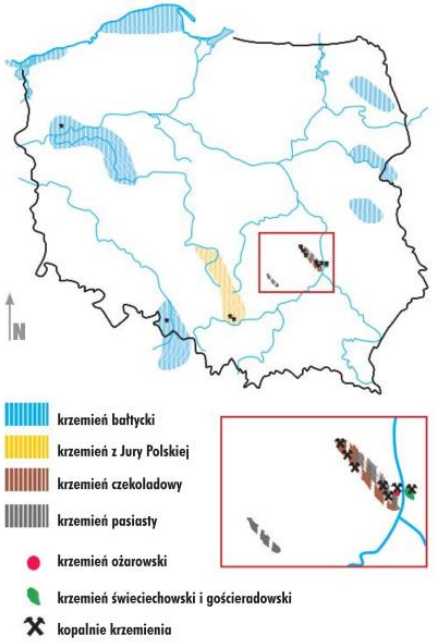


Fig. Location of the main flint deposits and mining sites in Poland according to Balcer 1983

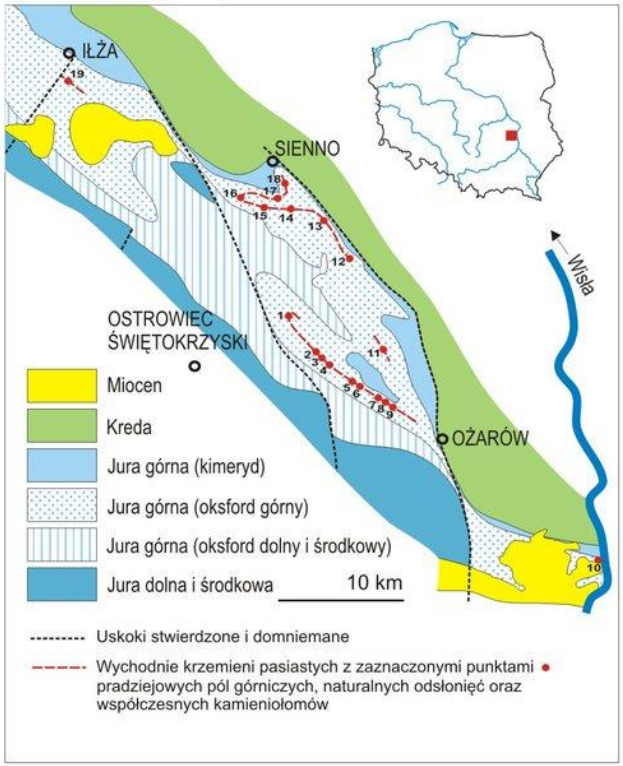


Fig. Occurrence of striped flint against the background of sub-Quaternary sediments of the north-eastern outskirts of the Świętokrzyskie Mountains, according to Budziszewski and Michniak, 1984.

Striped flint – photo: Anna Mader

Source: Król P., Migaszewski Z. M., 2009, *Rodzaje, występowanie i geneza krzemieni. Zarys Problematyki.* (in): "Historia krzemienia", Muzeum Narodowe w Kielcach, Kielce 2009.

The Genesis of Flint - Theories:

1. The "Upwelling" Theory: This theory proposes that flint formation occurs due to the development of siliceous organisms in zones where sea currents rise from deeper to shallower parts of the sea.
2. The Theory of Colloidal Silica Transport: According to this theory, colloidal silica is transported by bottom currents from deltas and estuaries to deeper parts of sea reservoirs, leading to flint formation.
3. The Theory of Silica Dissolution and Re-precipitation: This theory suggests that silica present in diatoms, radiolaria, and/or sponges undergoes dissolution and is subsequently moved and re-precipitated within the upper rock layers during diagenesis or epigenesis, resulting in flint formation.
4. The Theory of Hybridized Silica-containing Waters: This theory proposes that the mixing of marine and fresh waters leads to the circulation of hybridized silica-containing waters in the basin, contributing to the formation of flint.
5. The Hydrothermal Theory: This theory postulates that flint concretions are formed as a result of the activity of undersea hydrothermal springs, which supply the reservoir with silica-enriched solutions.

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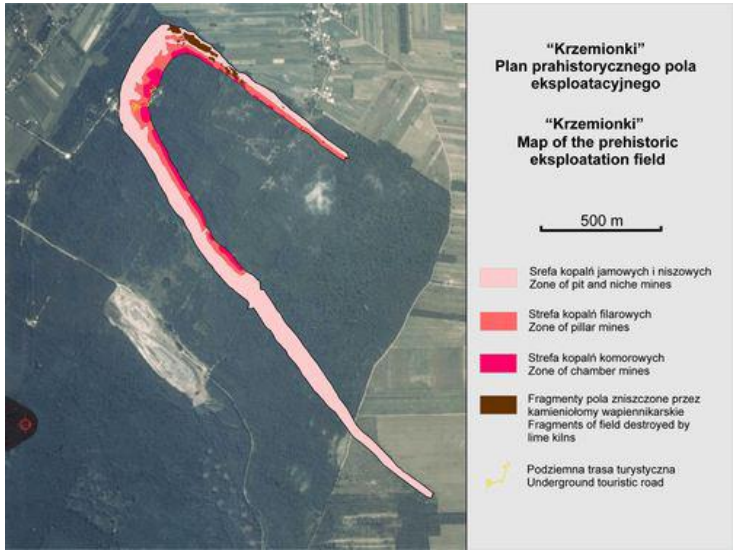
Krzemionki Prehistoric Striped Flint Mines



Plan of the prehistoric exploitation field in Krzemionki. Fig. A. Jedynak.

- Exploitation of Flint from approximately 3900 to 1600 BC:
- During the Neolithic period, flint mining was carried out by the Funnel Beaker Culture and the Globular Amphora Culture. In the Bronze Age, the Mierzanowice Culture continued the mining activities.
- The primary flint processing products during this time were tetrahedral axes and chisels.
- There have been four types of mines discovered at the site: pit mines, niche mines, pillar-chamber mines, and chamber mines.
- A total of over 2,700 shafts have been located at the site, interconnected by a network of radiating galleries.
- The average depth of the shafts is approximately 5 to 6 meters, with the maximum depth reaching 9 meters. The shafts' maximum diameter measures 4 to 5 meters.
- The tourist route in Krzemionki is approximately 1.5 kilometers long. The most intriguing section of the route is the underground part, which spans 465 meters.

Schematic cross-section of the mining field in Krzemionki in its central part with a visible diversification of mines. Fig. K. Hood

Interior of a niche mine – photo: Anna Mader

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Source: Król P., Migaszewski Z. M., 2009, *Rodzaje, występowanie i geneza krzemieni. Zarys Problematyki.* (in): "Historia krzemienia", Muzeum Narodowe w Kielcach, Kielce 2009.

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Calendar

1922 - Geologist Jan Samsonowicz discovers Krzemionki.

1926 - Krzemionki Opatowskie Archaeological Reserve is established, with the State Archaeological Museum (PMA) in Warsaw taking responsibility for site preservation.

Gradual acquisition of lands, completed in the **1960s**, leading to the relocation of the entire village of Krzemionki.

The second half of the 1960s - Construction of two exhibition and storage pavilions.

1968 - Creation of a one-person branch of the PMA in Krzemionki Opatowskie.

1978 - Transfer of Krzemionki to the Regional Museum in Ostrowiec Świętokrzyski (since **1986** Historical-Archaeological Museum).

1985 - Opening of the first section of the underground tourist route.

1994 - Krzemionki is recognized as a Monument of Polish History.

1995 - Krzemionki Opatowskie Nature Reserve (378 hectares) is established.

2012 - Completion of the Archaeological Museum's headquarters construction.

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Source:

Photos: Anna Mader

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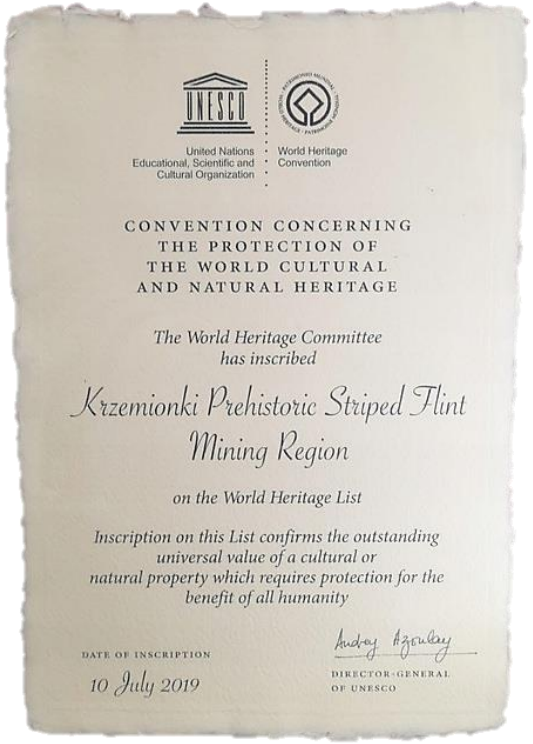
Inscription of the Krzemionki Flint Mining Region on the UNESCO World Heritage List



United Nations Educational, Scientific and Cultural Organization · World Heritage Convention

CONVENTION CONCERNING THE PROTECTION OF THE WORLD CULTURAL AND NATURAL HERITAGE

The World Heritage Committee has inscribed

Krzemionki Prehistoric Striped Flint Mining Region

on the World Heritage List

Inscription on this List confirms the outstanding universal value of a cultural or natural property which requires protection for the benefit of all humanity

DATE OF INSCRIPTION
10 July 2019

DIRECTOR-GENERAL OF UNESCO

KRZEMIONKI

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Source: Archive of the Historical and Archaeological Museum in Ostrowiec

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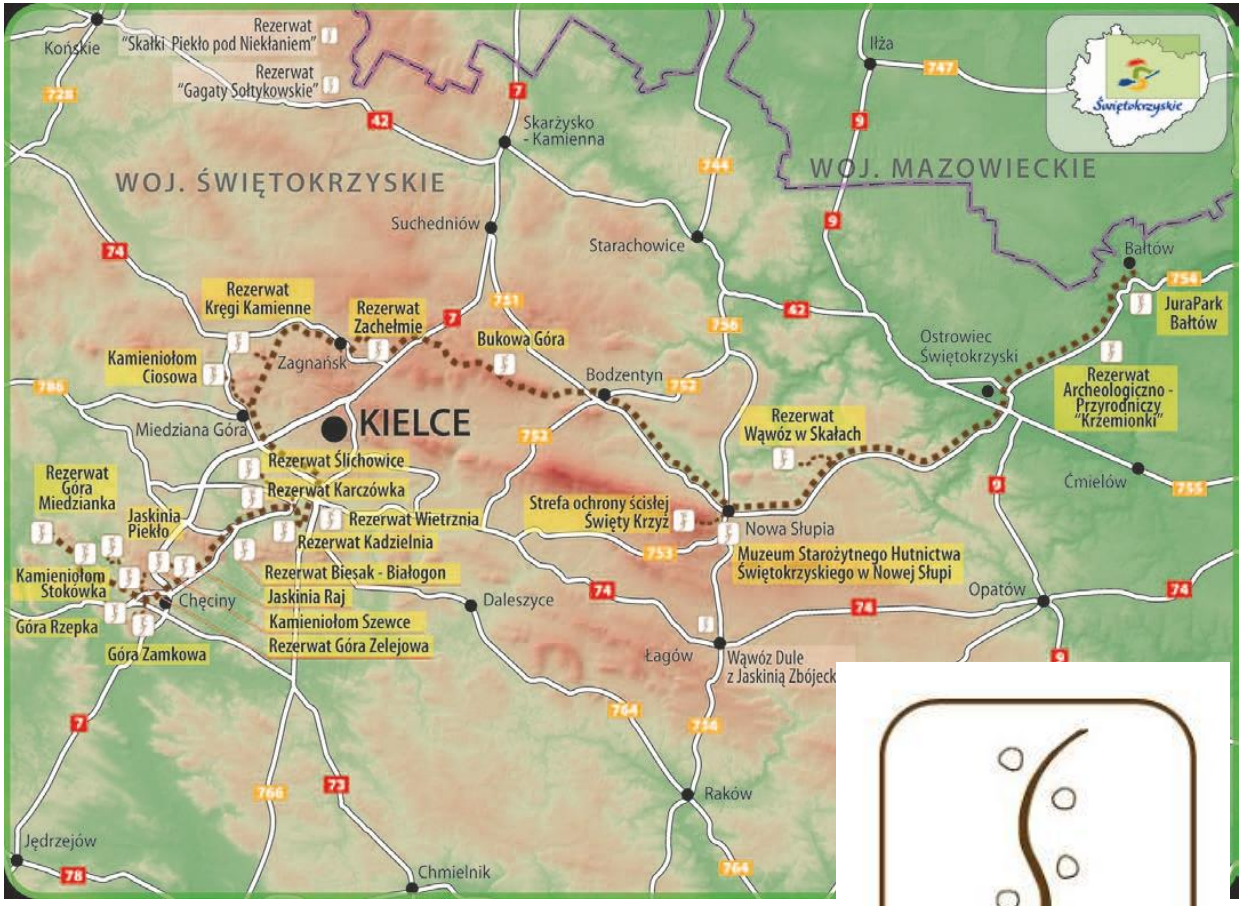
Archeogeological Trail - the Świętokrzyskie Voivodeship



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Source : ROT Świętokrzyskie, Holy Cross Mts Geopark

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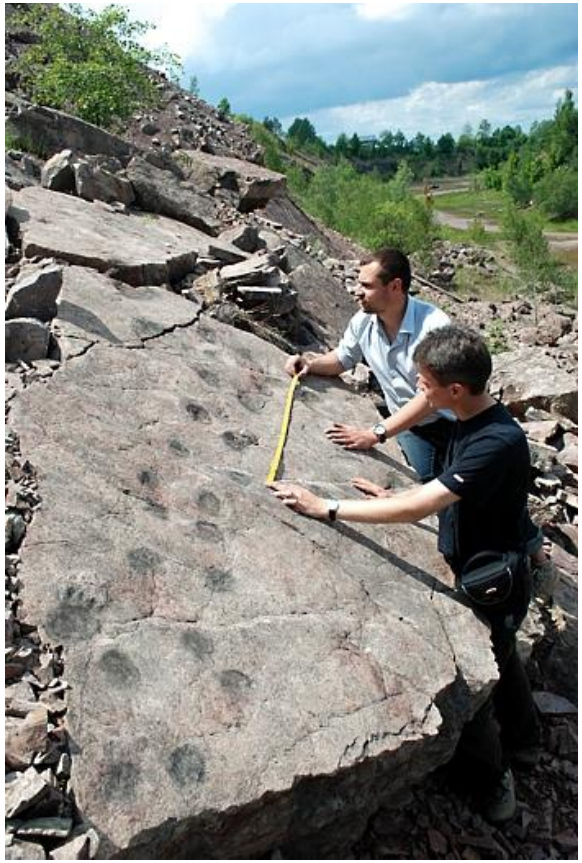
IUGS Geological Heritage sites
Devonian Tetrapod Trackways of Holy Cross mountains



Scientific partners:

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Source : IUGS - International Union of Geological Sciences
Polish Geological Institute – Polish Resarch Institue
Photo: M. Hodbod, S. Salwa, P. Szrek

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THANK YOU FOR YOUR ATTENTION!

witold.wesolowski@pgi.gov.pl

anna.mader@pgi.gov.pl

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