

## Lesson plan

### **Subject: Natural environment of the Carpathian Mountains within the Polish-Slovak borderland territory from the Low Beskids, Bieszczady to Wihorlat.**

#### I. Main goal:

Getting acquainted with the natural environment of the Carpathians on the Polish - Slovak borderland area.

#### II. Specific goal:

Student knows:

- division of the Carpathian Mountains into geographic regions,
- location of the mountain ranges,
- the main peaks, rivers, soil types, plants and animals occurring in the borderland area,
- Terms: flysch, nappe, drainage divide, fluvial processes, endemism

Student can:

- present elements connecting areas of the Polish-Slovak borderland,
- Explain how the height above the sea level influence the mountain climate and vegetation,
- Discuss process of Halny foehn wind formation,
- Indicate connection between land relief and geological construction,
- Evaluate the meaning of national parks and reserves for the Carpathian fauna and flora protection,

#### III. Duration: 90 minutes

#### IV. Methods of work:

Individual, group, elements of lecture, discussion, work with map, exercises with work card.

#### V. Didactic measures:

Map of Polish-Slovak borderland, wall map, work card, presentation, auxiliary material (attached to the lesson plan)

#### VI. Lesson flow:

Introduction phase:

1. Organisational activities.
2. Lesson subject and goals presentation.
3. Students find the Carpathian Mountains on the wall map of Europe and name countries, on which territories this mountain range system is located.
4. Teacher asks students about how they understand the term "borderland" and then to determine borderland range on the map and read main mountain ranges.

Implementation phase:

1. Teacher presents multimedia presentation "Natural environment of Polish-Slovak borderland" (available on the project website <http://naszekarpaty.pol-slov.eu/multimedia>). Students receive a "Geographic map of the Polish-Slovak borderland" (appendix to the publication) and analyse position of discussed elements of the natural environment: geological construction, land relief, water regimes, climate, soil types, fauna and flora, locations associated with the nature conservation. Students make notes.
2. During the presentation teacher uses brainstorm method and asks questions concerning among others:
  - The Carpathian flysch formation
  - Artificial lakes function
  - Landslides formation
  - Halny foehn wind formation

Teacher verifies information from students.

3. Teacher divides students into groups and distributes auxiliary material which together with notes made by students will be a basis for solving the tasks. Level of the exercises should be adjusted to intellectual capabilities of students (appendix to the publication).

Summary phase:

1. Teacher asks students:
  - If they see a lot of similarities between natural environment in Polish and in Slovak part of the Carpathian Mountains?
  - If there is a need of cooperation between Poland and Slovakia in terms of nature conservation? - what possibilities of mutual cooperation do they see?
2. Teacher asks to complete one task from the work card.

I. Match correct answers to the questions:

1. What's the highest peak in the Carpathians?
2. What is the longest river in the Carpathians?
3. What bird has been preserved in the Carpathians since the Ice Age?
4. What is the biggest Carpathian mammal?
5. What is the name of a representative of the Carpathian rivers?
6. Which mammal is the smallest in the Carpathians?
7. What is the largest beetle of Central Europe, which is also found in the Carpathians?
  - A) Hookbill curvirostra, Thrush
  - B) Stag beetle
  - C) The Gerlach Peak
  - D) common pipistrelle
  - E) European bison
  - F) the Tisa
  - G) Danube salmon

II. Answer the questions

1. What countries are located in the Carpathians ? .....
2. What rocks are Carpathians built from? .....
3. The volcanic summit in Slovakia is eg .....
4. Name the largest artificial lakes in the Bieszczady Mountains. ....
5. What is the name of the main river in the Slovak Carpathians? .....
6. Give the name of the main river in the Bieszczady Mountains. ....
7. Lake landslide in Slovakia is eg .....
8. Give the name of the highest peak in the Carpathians. ....
9. What kind of tree dominates in the Carpathian forests in the border area? .....
10. The highest peak in the Bieszczady is .....
11. The largest reservoir of drinking water in Slovakia .....

III. Mark the country where the given object is located.

Names	Lower Beskid,	Ondavian Foothills	Bieszczady	Bukowskie Wierchy	Wyhorlat
-------	---------------	--------------------	------------	-------------------	----------

1. Tarnica					
2. Starina Lake					
3. Kremenaros					
4. Ondava					
5. Rabia Skala (peak)					
6. Morskie Oko					
7. Poloniny NP					
8. Carpathian flysch					
9. Andesit					
10. Solińskie Lake					
11. Laborec					
12. Domasa Lake					
13. Vihorlat					
14. Busov					
15. Nova Sedlica					

IV. Add words so that they begin with the letters of the word KARPATY and create a simple story.

**K  
A  
R  
P  
A  
T  
Y**

**Didactic text**

## **Natural environment of the Carpathian Mountains within the Polish-Slovak borderland territory from the Low Beskids, Bieszczady to Wihorlat.**

Polish-Slovak borderland is located on the Carpathian Mountains territory that stretch in an arc through Central Europe from Danube water gap near Bratislava (Slovakia) to Iron Gates - Danube water gap near Orszowa (Romania). Beside the two countries mentioned above, the Carpathians also include Austria, the Czech Republic, Poland, Hungary, Ukraine and Serbia and are divided into the Western, the Eastern and the Southern. Discussed area is located within the Western and Eastern Carpathians and their smaller units (subprovinces) such as: Western Carpathians (Lower Beskid, Ondavian Foothills), Outer Eastern Carpathians (Bieszczady and Bukowskie Wierchy) and Inner Eastern Carpathians (Wihorlat). The administrative area of the borderland is covered by the Podkarpackie Voivodship on the Polish side and the Preslav and Kosciuszko regions on the Slovak side.

### **GEOLOGICAL STRUCTURE**

The Carpathians were folded and uplifted in the crescent and the paleogene as a result of the alpine orogenesis; different parts of the Carpathians differ in both tectonic and lithological terms. Outer Carpathian Mountains (Eastern and Western) are made mainly of conglomerates, sandstones and shales (less frequently of other sedimentary rocks), that we call Carpathian flysch. They have been forming from the late Jurassic to the Paleogene at the bottom of a deep sea tank (geosyncline<sup>1</sup>) called the Tethys Ocean. Then they were folded at the turn of the Paleogene and the Neogene and pushed to the north in a form of placed one on another nappes. On the discussed area one can distinguish nappes: Magura, Dukla, Silesian, Lower Silesian and Skolsk. Inner Carpathian Mountains are made of magma eruptive rocks (andesites and loose tuffs), that were formed as a result of volcanic activity accompanying the alpine orogenesis. Within the discussed area one can meet them in Wihorlat mountains.

### **LAND RELIEF**

In the land relief of the Low Beskids, Bieszczady Mountains and Bukowskie Wierchy one can distinguish their characteristic grid construction. The ridges are separated one from another with wide depressions and they run parallel from the south-east to the north-west in the Polish part of borderland, and from north to south in Slovakia through valleys of the rivers eroded in less resistant rocks. The highest peaks are: in the Low Beskids in the Polish part Lackowa (997 m above the sea level), in the Slovak part Busov (1002 m); in the Western Bieszczady - Tarnica 1346 m and in the Slovak part of Bieszczady, so called Bukowskie Wierchy – Kremenec (Kremenaros/Krzemieniec 1221 m) - meeting point between three Polish, Ukrainian and Slovakian borders). In the Bieszczady Mountains in general the highest peak is Pikuj with a height of 1405 m located in Ukraine. Wihorlat has a shape of an irregular arch curved to the

---

<sup>1</sup>Geosyncline - Extensive deepening of the earth's crust filled with sediments, which are then subject to folding and finally isostatic piling up. *Flis J.: Szkolny słownik geograficzny, Warszawa 1982, WSiP*

north, consisting of volcanic massifs, the highest peaks of which are: Wihorlat (1076 m), Nežabec (1023 m), Sniński Kamień (1005 m).

The main role in shaping of the Carpathian relief on the discussed area of the Polish-Slovak borderline plays fluvial processes (rivers), gravitational mass movements (crawl, downhill creep, crumbling, rock falls and others), and in the higher parts of the mountain mechanical weathering. Common forms in this part of the Carpathians are river canyons, knickpoints, waterfalls, and in the peak parts inliers and outliers or rock rubbles. As a result of sloping processes such landslide dams as Duszatyńskie, Szmaragdowe in Poland, Morskie Oko in Slovakia were formed.

## WATER REGIMES

On the Polish-Slovak borderline, the Carpathian Arch is a European watershed between the Baltic Sea and the Black Sea. Rivers in the Lower Beskid (Osławica, Wisłok, Jasiołek, Wisłok, Ropa) and in Bieszczady (San) flow to the north and belong to the Vistula river basin. Watercourses flowing just outside the Polish-Slovak border go south to the Danube and to the Black Sea. These are: Ondavská Highlands - Laborec and Ondava with falling into Topla, in the Bukowskie Wierchy - Cjbroch and Undava (tributaries of the Laborc). In Wihorlat watercourses falls into the Laborec river and to its tributaries - Uż, Cirocha. There are also Polish rivers located on the discussed territory that flow into the Black Sea: Strwiąż and Mszanka belonging to the Dniester basin.

The natural lakes present in this area are of landslide origin. We can include to them: in the Beskids - Beskidy Morskie Oko under the Maślana Góra and Cergowa; in Bieszczady - Duszatyńskie lakes; in Wihorlat Mountains - Morskie Oko near Sniński Kamień. There are also several artificial man-made tanks. In the Low Beskids the dams were formed in Klimówka on the Ropa, in Sieniawa on the Wisłok and in Krempana on the Wisłoka; in Bieszczady on the San river - Solińskie and Myczkowieckie Lakes. Artificial tanks were made also on Slovak rivers – on the territory of Ondavskie Highlands - Veľká Domaša on the Ondava river, near the Bukowskie Wierchy - Starina on the Cirocha river and under the Wihorlat - Zemplínska širava, with many streams flowing into the river from the mountains and water channelled from the Laborc.

## CLIMATE

The climate of the Polish-Slovak borderland from the Low Beskids through Bieszczady to Wihorlat is moderately warm transitional. The weather in Bieszczady and in the Low Beskids is characterized by polar and marine air masses (about 60%) and slightly less polar - continental (about 25%), rarely arctic and tropic air. In the Slovak part of the Carpathian Mountains temperature is slightly higher, because of the masses of continental tropic air flowing from the Hungarian Plain. January temperatures range is from -2 ° C in the valleys of the Ondawska Highlands to -5 ° C in Bieszczady valleys; In higher parts of ridges and hills at the indicated time and in the same places it is -4 ° C to -10 ° C, respectively. Average July temperatures fluctuate from 20 ° C in in the valleys of the Ondavska Highlands to 15 ° C in Bieszczady and in the higher parts of 16 ° C and 14 ° C, respectively. On the discussed area the highest rainfall in the range 800 - 1200 mm is recorded in Bieszczady, slightly less in the Low Beskids - 800 to 1000 mm, and the least in the Ondavskie Highhills - 400 to 500 mm. The number of days with snow cover looks quite similar, on the Polish part of the borderland this number is the largest, about

90-150, in Wihorlat -100-140, and in the Ondavska Highlands only 80-100 days. Southern and western winds prevail in the whole area, in Bieszczady and Wihorlat one can experience also the Halny foehn wind. For the Low Beskids warm and dry winds so called Dukel or Ryman winds occurring in spring, winter and autumn are characteristic. Narrow, parallel abatement of the land relief from the south-east to the north-west called the Jasielsko-Sanockmi Pits favours their formation.

## SOILS

Soils in the Carpathian Mountains, also on the Polish-Slovak borderline are rather poor. The acid brown earths and gley brown earths (about 85%) formed on the sandstones prevail, the remaining 15% is soil with initial character (with unexploited soil profile) occurring in the upper peak parts, muds in the river valleys and peat soils in the unexploited parts of the valleys.

## WORLD OF PLANTS

In all mountains as well in the Carpathians climatic conditions change along with the height - the temperature is falling, the amount of rainfall increases, the period of snow cover retention extends, the vegetation period becomes shorter. This results with multi-level vegetation structure. In Carpathian Mountains 6 levels of vegetation have been formed - highland level, the lower mountain level, the higher mountain level, the pinus mugo level, mountain pastures and crags, however on the discussed territory only three first occur. Highlands level reaches up to about 500 meters of high. (in the Slovak part due to a milder climate it reaches about 400 meters and in Bieszczady about 550 m) and the lower mountain level reaches about 1150 meters over the sea level. The additional level characteristic for the Carpathian Mountains and present in Bieszczady and Bukowskie Wierchy are Polonyna meadows - areas of alpine and subalpine meadows extending from the top border of forest to the highest peaks. On the discussed territory the higher mountain level with spruces is absent. Forests in this part of the Carpathians cover about 70% (in the Wihorlat 90%). The most widespread collection, especially in Bieszczady, Bukowe Wierchy and Wihorlat, is naturally preserved Carpathian beech forest. The beech prevails in the species composition, especially in the upper parts of the lower mountain level, as well as fir, spruce, sycamore, alder. Highlands level is overgrown by oak forests with oak, hornbeam, fir and lime tree. In the Low Beskids artificial forest stands dominated by pines prevail.

## WORLD OF ANIMALS

Low population and extensive forest areas on the borderland favouring the large presence of animals, and the location on the Western and Eastern Carpathians borderland determines the species diversity on this territory. In this area live, among others bears, wolves, lynxes, wildcats, deers, roe deers, golden eagles, black storks; in Bieszczady and Bukowskie Wierchy one can also meet wisents.

## NATURE CONSERVATION

The greatest achievements of Poland and Slovakia as well as of Ukraine in the field of nature protection in the analysed area was the establishment of "the Eastern Carpathians" International Biosphere Reserve in 1992 under the auspices of UNESCO. Currently the reserve includes: On the Polish territory: Bieszczady National Park and its surrounding Landscape Parks - Ciśniańsko-Wetliński and Valley of the San river, on the Slovak territory: Poloniny National Park (until 1997 a part of the Landscape Park of the Eastern Carpathians), and on the Ukrainian territory: Uzhanian National Nature Park and Nadsiansky Regional Landscape Park. The reserve covers some of the least transformed ecosystems, such as some of Europe's largest natural beech forest complexes and the Eastern Carpathian mountain meadows - polonyns, and protects rare and endemic mountain species and vegetation complexes. There are other protected areas in the border area, including Magurski National Park, Jaśliński Landscape Park, and landscape parks located on the Slovak territory: The Eastern Carpathian Mountains and Wyhorlat.

Developed by: Kamila Walasek

Literature:

1. Fogas A., Kollar T., *Karpaty Wschodnie – przewodnik*, Bratysława 2006, Dajama
2. Krukar W., Swaniewicz P., Olszański T. A., Luboński P.: *Bieszczady – przewodnik.*, Pruszków 1999, Oficyna Wydawnicza Rewasz,
3. *Przewodnik geologiczny po wschodnich Karpatach fliszowych. Pod redakcją K. Żytki*, Warszawa 1973, Wydawnictwo Geologiczne,
4. Winnicki T, Zemanek B.: *Przyroda Bieszczadzkiego Parku Narodowego, Ustrzyki Dolne 2009*, Wydawnictwo Bieszczadzkiego Parku Narodowego,
5. <http://www.sopsr.sk/nppoloniny/en/nature.php>
6. <http://www.magurskipn.pl>