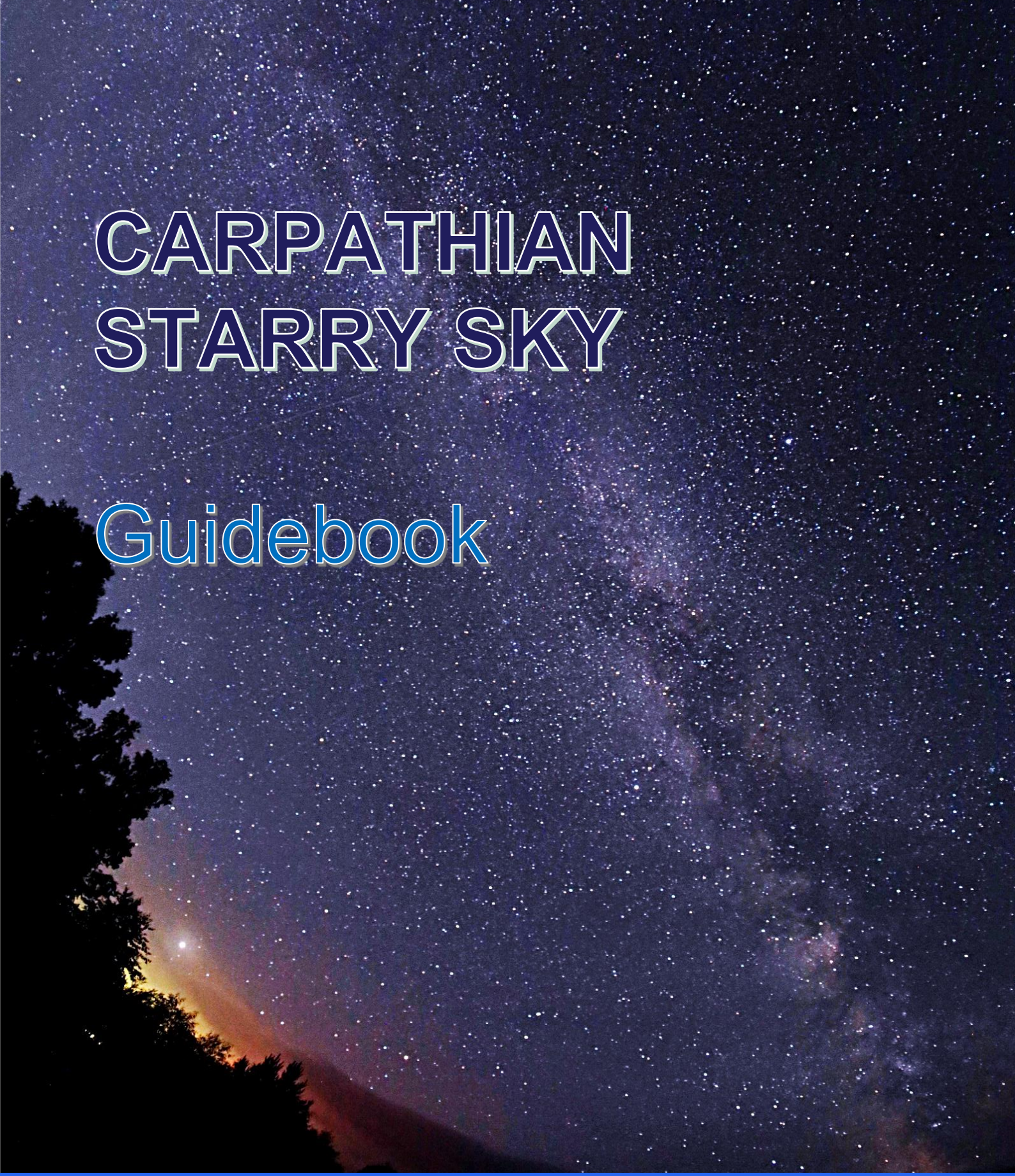

CARPATHIAN STARRY SKY

Guidebook

„Carpathian Starry Sky” Project

CARPATHIAN STARRY SKY

The project is co-financed by the European Union under the
Poland-Belarus-Ukraine 2014-2020 program.
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Carpathian Starry Sky. Guidebook
"Quality of starry sky on cross-border area of Poland and Ukraine and possibilities of nature- and astro-tourism development".

Project partners:

The lead partner of the project is Ukrainian organization "Institute of Development of Carpathian Region", Uzhhorod. The Polish partner of the project is Association for Innovation and Technology Transfer "Horizons", Rzeszow.

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Carpathian Starry Sky. Guidebook.

Quality of starry sky on cross-border area of Poland and Ukraine and possibilities of nature- and astro-tourism development.

Rzeszow - Uzhhorod 2021

Content

Introduction

Man's interest in the study of celestial bodies and phenomena, as well as the observation of the starry sky dates back to antiquity. The desire of modern tourists to gain new knowledge and impressions, diversification of available tools and greater mobility create a constant demand and provide a constant interest in the starry sky and related objects. This has led to the creation of a separate branch of tourism industry - astrotourism, which provides an opportunity to satisfy the desire to understand space by people of all ages. Astro-tourism is one of the youngest types of tourism, which is aimed at observing stars and astronomical phenomena (based on observatories or in places with low light pollution), visiting places where it is best to observe solar eclipses and the Moon, traveling to meteorites and comets.

In their hobby, astronomy enthusiasts can use a variety of tutorials that indicate what and when to observe, what equipment and techniques to use for observations and night photography, as well as how to develop the collected materials. Our guide shows selected places where you can observe and photograph the starry night sky on the Polish-Ukrainian border area. Which places of the Bieszczady Starry Sky Park and the Transcarpathian Dark-Sky Park can and should be visited at night to observe the phenomena in the dark night sky. In addition, we also show selected natural attractions related to astronomy and Earth sciences that can be visited by a night observer for daytime recreation, for training or improving photography and filming techniques.

We invite you to Bieszczady and Transcarpathia!

About the „Carpathian Starry Sky” project

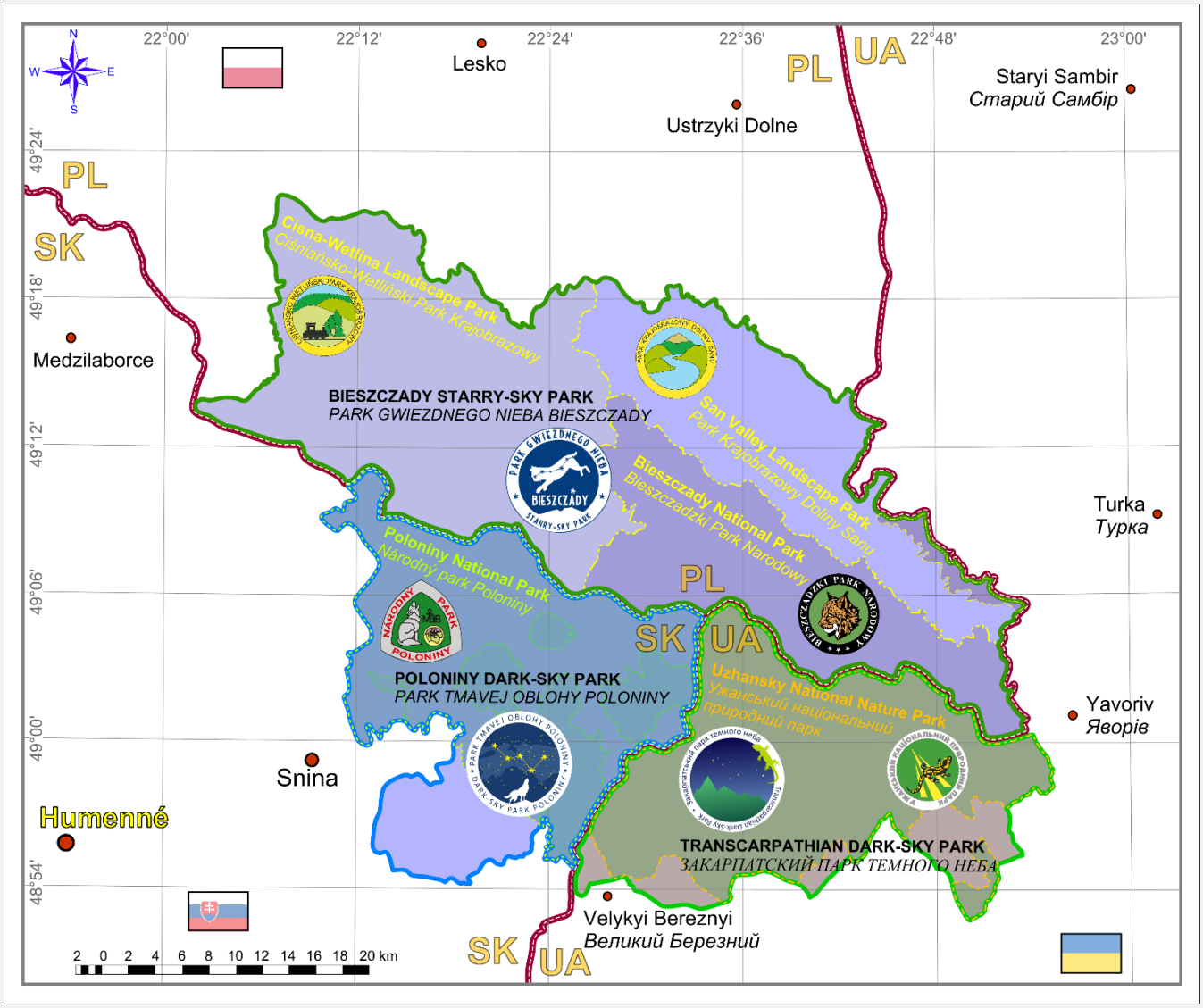
The „Carpathian Starry Sky” project was implemented within the framework of the Poland-Belarus-Ukraine 2014-2020 program from December 2020 to November 2021. The project partners are: NGO "Institute of Development of Carpathian Region", Uzhhorod and Association for Innovation and Technology Transfer "Horizons", Rzeszow. The main goal of the project was to develop Polish-Ukrainian cross-border cooperation in the field of astrotourism promotion and protection of the dark sky.

The most important activities of the project were:

- Development and marking of a route related to astronomy and the problem of light pollution in the Transcarpathian Dark-Sky Park.
- Audit of light pollution in Bieszczady Starry Sky Park and Transcarpathian Dark-Sky Park.
- Preparation of reports on natural and astronomical potential for the creation of natural tourism and astro-tourism products.
- Development of a joint cross-border strategy on astrotourism development.
- Development of an electronic guidebook about places in our dark sky parks that are suitable for astronomical observations and astrophotography.
- Launch of the certification process of our dark sky parks in the International Dark-Sky Association, an organization that brings together such parks around the world.
- Preparation of films about parks.
- Preparation of a series of astronomical shows for the public in parks.

East Carpathian Dark-Sky Tripark

The least polluted nature can be found in the Carpathians. The night sky in the Carpathians also attracts the attention of astronomy enthusiasts and astrophotographers from many countries. Bieszczady, located in the Carpathians, like no other place in Poland has become synonymous with wildlife for Poles. Such places in the Carpathians are one of the last places in Europe where there is still a really dark sky, free from artificial light pollution of our civilization. The sky, heavily polluted by artificial light, can disrupt astronomical observations and astrophotography. Natural darkness is one of the ecological resources that needs protection, as it is one of the endangered elements of the natural environment.



To protect it, in 2013 the Starry Sky Park "Bieszczady" was created. The territory of the park is promotional and was created by 12 partner organizations. The natural values of the Bieszczady Starry Park include the natural heritage of the Bieszczady National Park

(highest protection rank), the San Valley Landscape Park and the Cisnia-Wetlin Landscape Park.

Starry sky (and dark-sky) parks are areas of unique natural environment that protect natural night darkness from pollution by artificial light. They are the equivalent of reserves - protected areas of exceptional natural value. They perform protective functions for the darkest corners of our planet, where the night environment is not disturbed by artificial light. These parks perform not only environmental but also educational functions

On the Ukrainian side, in 2016 the Transcarpathian Dark Sky Park was created - the first of its kind in Ukraine. It covers the entire territory of Uzhanskyi National Nature Park. Located in the western part of Transcarpathia in the basin of the river Uzh and stretches from the village Zabrod (226 m) to Uzhotsky pass (852 m). Its area is 39,159 hectares. Together with the Slovak Dark-Sky Park Poloniny (founded in 2010), our parks form one of the largest protected areas for dark skies in Europe and in the world. Developing cooperation, these three parks signed a joint memorandum on the establishment in 2017 of the East Carpathian Dark-Sky Tripark.

Our dark-sky parks have very good conditions for watching the night sky. The Milky Way is clearly visible to the naked eye in almost any place where there are no artificial light sources that cause a significant effect of illumination. Night sky quality measurements (using SQM device) indicate a maximum sky brightness at a moonless night exceeding 21 mag / arcsec2. The visible range of stars is up to the 7th magnitude with the naked eye.

Dark-Sky Park Poloniny is an astronomical observatory on Kolonitsky Pass.

Bieszczady Starry Sky Park

General description

Bieszczady Starry Sky Park was established in March 2013. It was created by twelve institutions, including local governments (municipalities of Lutowiska and Komancha), a national park, landscape parks, forest management, universities, a primary school, and local organizations for the development and promotion of nature tourism. The park is also supported by local media and an original website. In the village of Stuposiany, in the youth hostel, a Park Information Center was established for its promotion and teaching of astronomy and ecology.

Dozens of people take part in organized astronomical shows in Bieszczady, and, despite the late time, children often take part in them. In addition, there are astronomical camps for teenagers and adults, as well as master classes in astrophotography, which are attended by hundreds people a year.

In 2013, 3 night sky monitoring stations were built in the park, which collect the data needed to study the phenomenon of light pollution. Stations were built in Lutowiska, Stuposiany, and on Polonina Vetlinska.

As an additional infrastructure, 5 sundials were also built - including 3 in Lutowiska, as well as in Stuposiany and Vyzhna Pass. There are also 3 informational boards (Wyżna Pass, Lutowiska Pass, Stuposiany).

In the Otrit massif, near the shelter „Chatka Socjologa" an equipped observatory was built with a telescope Newton with a diameter of 16 ", on the Dobson mount. The telescope is protected by a sliding roof.

In 2021, the Bieszczady National Park near the village of Tarnawa Niżna a special place for demonstrations and observations of the night sky was prepared. A house with a sliding roof, which was named "Lynx Hut "was built, around which night sky shows are arranged.

For tourists traveling to the hut by car a parking on the asphalt road is available.

The state of pollution of the sky with artificial ligh

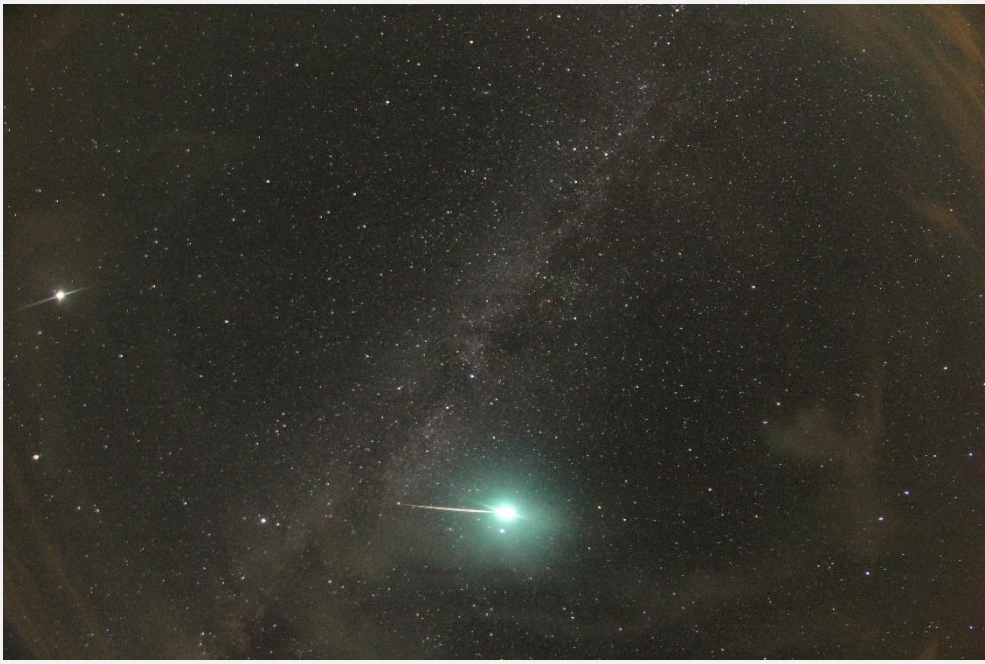
In 2013, as part of the Bieszczady Sky and Stars project implemented by the Lutowiska Commune, 3 permanent measuring stations were installed to measure the level of artificial light pollution: in Lutowiska, Stuposiany and Polonina Vetlinska. They were equipped with the SQM-DL device, which continuously measures the brightness of the night sky. In 2021, only the station in Stuposyany conducted measurements.
As part of the Carpathian Starry Sky project, additional measurements of the brightness of the night sky were carried out in the entire Bieszczady Starry Sky Park and its surroundings. The measurements on more than 100 locations between July and October 2021 were conducted with SQM-L device.

Measurement results range from about 19-20 magnitudes per square second of arc in places where street lights do not turn off, to 21.70 magnitude per square second of arc in places far from populated areas, and in some places where street lights are turned off at night. In most of the studied places, the quality of the sky is good (above 21.00 magnitude per square second of arc) or very good (above 21.50 magnitude per square second of arc) when the street lighting is off.

The Milky Way with its structures or the Andromeda Galaxy is visible everywhere, even if lanterns are shining nearby, which means that the local illumination from this lighting is weak.

Most places with very dark sky are located in the border areas with Slovakia and Ukraine, as well as in sparsely populated parts of the valleys of the San, Solinka and Oslava rivers. There are few local, large light sources that glow all night.

In darker places (southern part of the park) you can see the zodiacal light and counter-reflections. Weak meteorites are also easy to spot.



In Ukraine, artificial light pollution is not very much noticeable - the exception is the railway station in Sianky and the glow of large cities - but it is more noticeable when it is partly cloudy.

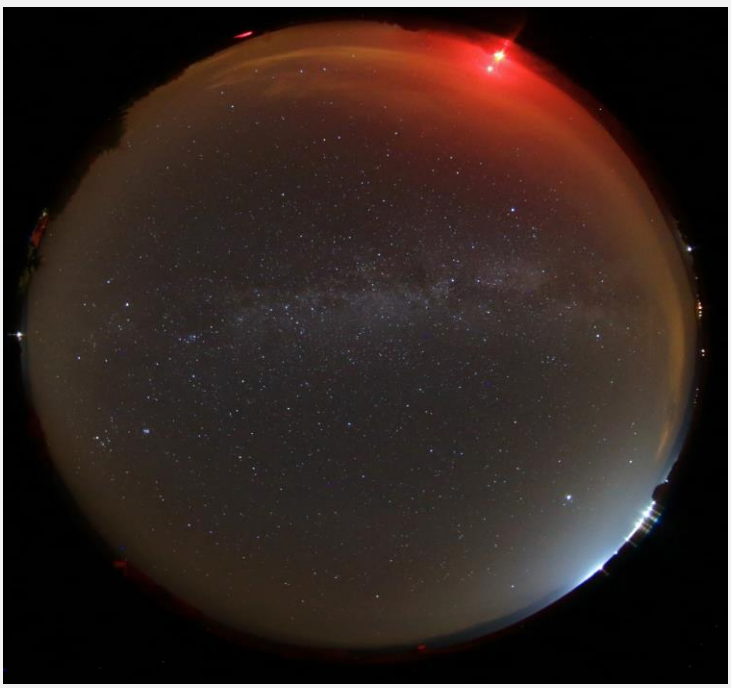
Lutowiska before turning off the street lights (on the right the glow of the light is highlighted).

Compared to previous years' research, the quality of the night sky in the Bieszczady Mountains has not changed in general. There are places where it has improved due to the wider switching off of the lights at night. There are also places where it has deteriorated as a result of the installation of new lighting, a telecommunication tower or a badly lit hotel. Most communes in Bieszczady turn off the street lights after 22.00, some (Komancha) after 23.30. In the summer tourist season (June-September) street lighting around Solin Lake is not turned off at night.

The biggest threats to the quality of the night sky in Bieszczady now are:
- expansion of urban development in new areas, and thus the increased number of private and public lighting,
- incorrect lighting of existing facilities (monuments, institutions, shops, gas stations)

Lighting of temples in Smolnik and Komancha (until 11.30 pm)

- constantly expanding network of telecommunication towers with red signal lights.

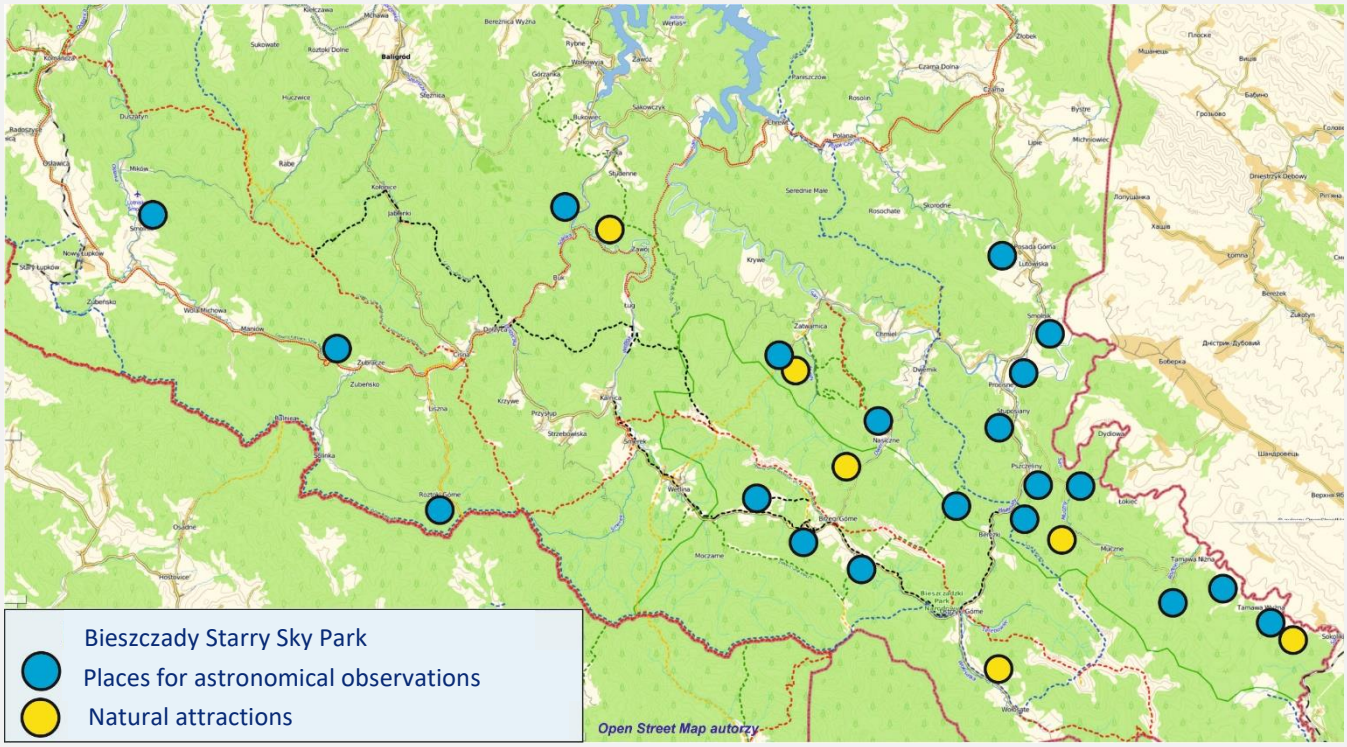


Light from the towers - Ustrzyki Górne, Nowy Łupków.

During the summer tourist season, the night sky can also be temporarily polluted by light from cars, even on roadsides and forest roads. And even late in the evening.

Suggestions for places for observations and astrophotography.

Fans of astronomy who stop in the Bieszczady Mountains are recommended to use the following places for night observations. These are mostly public places that can be reached by car, parked safely and installed with surveillance and photography equipment. It is also a place with a dark sky full of stars.



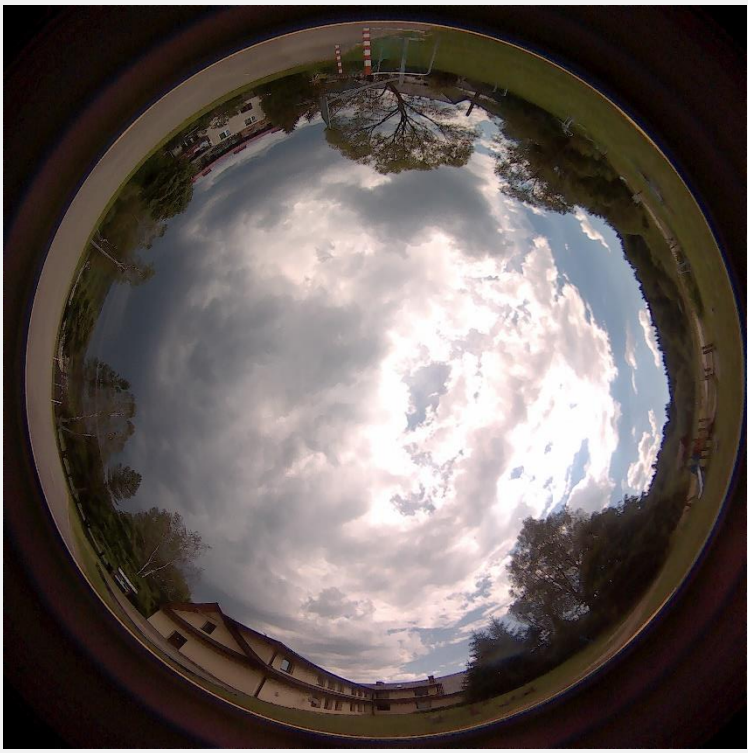
And in your free time or when the weather is unfavorable for astronomy, we invite you to visit the natural attractions of Bieszczady

1 Stuposiany

Coordinates: 49°11'16.9"N 22°40'57.4"E
School youth hostel in Stuposiany. Address: Stuposiany 9, 38-713 Lutowiska, www.ssmstuposiany.pl/
Object owner: School complex in Lutowiska, 38-713 Lutowiska, Lutowiska 45, контактний телефон: 13-461-00-25
Accessibility of the object and description of the infrastructure on the object: A forty-eight-bed youth hostel with a kitchen and dining room or lecture hall, equipped with a multimedia projector, a folding screen and a widescreen TV. The facility is open all year round, located on the provincial road №896, has its own parking lot, there is a covered bus stop nearby.

Possibilities of using the object:
In 2009-2012, the institution was adapted to astrotourism within the project "Carpathian Sky". Here you can find:
• The paved platform, which serves as an observation deck, with a painted analemic sundial, is located west of the building, 75 meters from the road, surrounded by tall and medium-sized vegetation.
• An electrical box located on the outside wall of the building, which supplies power to telescopes located on the platform using a fifty-meter cable.
• The windows of all dormitory rooms facing west are equipped with blinds, which effectively reduces the presence of artificial lighting in the area intended for observation.

- The surrounding street lighting - lanterns - is turned off every night at 22:00, which is ideal for astronomical events - shows, visual and photographic observations.
- Basic astronomical equipment, including the Coronado solar telescope, is available by the dormitory manager.



2 Observational point on Lutowiska

49°15'55.8"N 22°41'07.4"E

Astrotourist characteristics: a place with an open view to the east, south and west, with a board that allows you to identify individual elements of the landscape. The owner of the object is Lutowiska gmina
Accessibility of the object and description of the infrastructure on the object: There is a parking lot on site and an observation deck above it, located twenty meters from the provincial road № 896, there is also an electric box, which can be accessed by prior arrangement with the Lutowiska gmina. Next to the parking lot there is an observation telescope, as well as information boards and panoramas
Possibilities of using the object: In Lutowiska gmina the city lighting is turned off at 22:00, the place is suitable for shows and amateur visual and photographic observations, especially with the use of wide-angle lenses. In the south, on the horizon, you can see the light coming from the spotlights at the railway station in Sianky, in Ukraine.

The street lights are turned on until 10 p.m.

After 10 p.m. the street lights are turned off.

The Milky Way above Lutowiska, visible from the observational point

Above the parking lot is a large private lawn, but available for tourists by arrangement with the owners of a neighboring hotel. It is often used for "meteorite hunting", for example, the August Perseids.

3 Tarnawa Niżna – parking lot near the peat bog

The name of the object: Paid parking in Bieszczady park Coordinates - 49°06'39.2"N 22°49'49.7"E
The owner of the object: Bieszczady National Park Astrotourist characteristic: Open view of the High Bieszczady with Bukove Berda, Kremin, Bukovets and Tarnitsa's nest, the possibility of conducting demonstrations and astrophotography classes in the context of the landscape .
Accessibility of the object and description of the infrastructure on the object - 24-hour parking, Toi-Toi toilet on the territory, fenced area, located at the end of the gravel road leading from Muchne.

Possibilities of using the object: Nice place for astrophotography, all sky is visible, the absence of artificial light sources nearby makes this place promising, but due to the proximity of peat bogs there is a possibility of fog.

4 Parking near Wyżna pass

Coordinates: Wyżna pass, 49°08'25.6"N 22°32'55.4", 872 m a.s.l.
Paid parking Astrotourist characteristic: place with an open view of mountain meadows, equipped with a board with a description of the landscape. Object owner: Lutowiska gmina, tenants
Availability of the object and description of the infrastructure on the object: The Zajazd u Górala restaurant and toilets are open during the day. Observation deck on Polonyna Vetlinska and Karynska. Information boards, panoramas.
Possibilities of using the object: a place without artificial lighting, ideal for astronomy shows and classes and amateur astrophotography. Possibility to photograph the night sky in the context of the characteristic silhouettes of Polonyna Karynska and Polonyna Vetlinska. Also a good place to observe the sun due to the height - 872 meters above sea level

5 Shcherbanivka-observation tower

Coordinates: 49°12'37.2"N 22°14'37.4"E
Власник об'єкта: Cisna Forestry

Astrotourist characteristic: Wooden three-level structure, about eight meters above ground level, opens the view to the eastern, southern and western parts of the sky.

Accessibility of the object and description of the infrastructure on the object: the object is located twenty meters from the provincial road №897, near the parking lot. There is a wooden shelter with a fireplace. On the tower there is a telescope for landscape observations and a panorama. Possibilities of using the object: a view from the tower is directed towards the mountain range, there are no significant sources of artificial lighting, and easy access is an incentive to engage amateur astrophotography and even organize shows for the public. No roof is an extra convenience.

6 Roztoki Górne and Pass above Roztoki

Coordinates: 49°09'16.4"N 22°18'54.5"E

Roztoki Górne, hamlet Solinka, a large meadow south of the resort "Silent Valley".
Owner: State forests

Astrotourist characteristic: the best place in Poland for astrophotography. The lack of local sources of artificial light and the distance from large human settlements led to the location of the astronomical observatory of the Jagiellonian University here. The station operated in 1976-2003, here the existence of Kordilevsky's clouds is documented.

Availability of the object and description of the infrastructure on the object:
Access from Cisna via Provincial Road No. 897, from Solinka to Roztok there is a hardened road. On the Roztoki Pass, on the Polish-Slovakian border, there is a wooden one-level lookout tower and a wooden shelter nearby. Access by car is possible via a paved road, a bicycle path is being built on the Slovak side.
Possibilities of using the object:
The very nature and past of this place encourage it to be promoted as favorable for amateur astrophotography and telescope observations. This place is not suitable for public shows due to lack of proper infrastructure.

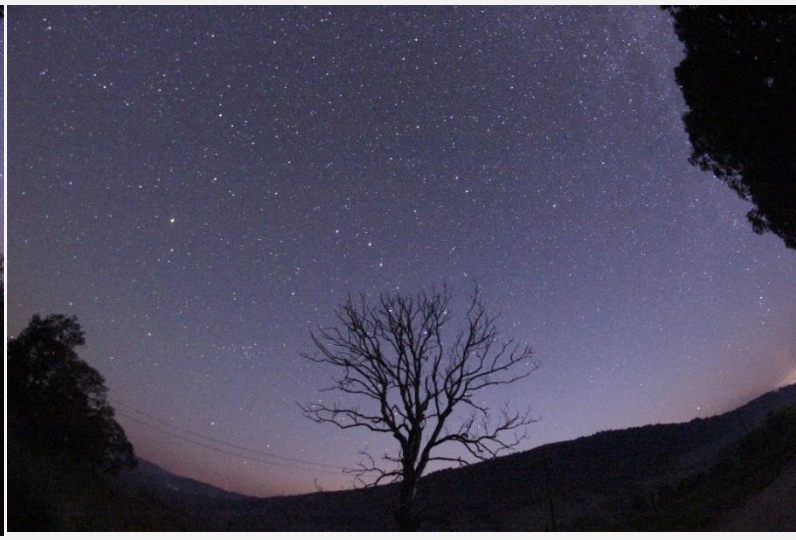
View from the observation tower on the Vihorlat ridge

7 Smolnik near Lutowiska-parking near the church

Coordinates: 49°12'38.1"N 22°41'15.5"E

Roman Catholic Church of Assumption of the Blessed Virgin Mary
Object owner: Lutowiska parish
Astrotourist characteristic: Parking near the former church, located on the hill over the San River.

Availability of the object and description of the infrastructure on the object: Distance from the provincial road № 896 is about three hundred meters, the entrance is on an asphalt road.
Possibilities of using the object: Great place for astrophotography in the context of an old, well-preserved sacred building. There is an open view of the whole sky to the northeast and lighting from a large hotel.



8 Suche Rzeki - BNP Field Station for Environmental Education

Coordinates: 38-713 Zatwarnica, 49°12'08.0"N 22°31'30.5"E

Object name: BNP Field Station for Environmental Education
Owner of the object: Bieszczady National Park

Astrotourist characteristic: Resort is situated in the place without artificial lighting, in the valley of the Berdo stream.
Availability of the object and description of the infrastructure on the object: One-storey pavilion-type building, entrance by car on a gravel road three kilometers from Zatvarnytsia. Accommodation is available in a hostel with kitchen, dining room, two classrooms. There is a parking space and a wooden canopy with benches and a fire place, which can also be used to show the sky in a comfortable environment.

Possibilities of using the object: six hundred meters from the center, in the meadow was once the Shelter of the Polish Scout Association in Suche Rzeki, today this place is ideal for astrophotography. Also in the vicinity of the resort there are comfortable places with the view on large areas of the sky. The complete absence of artificial lighting and a good infrastructure base create exceptionally favorable conditions for astrophotographers and sky watchers.

If we add to this the possibility of using the mentioned dormitory, we can conclude that Suche Rzeki have great potential in the field of astrotourism.

View to the south, Polonina Vetlinska on the horizon

On the next page: Planetarium Starry Sky, Milky Way and meteorit

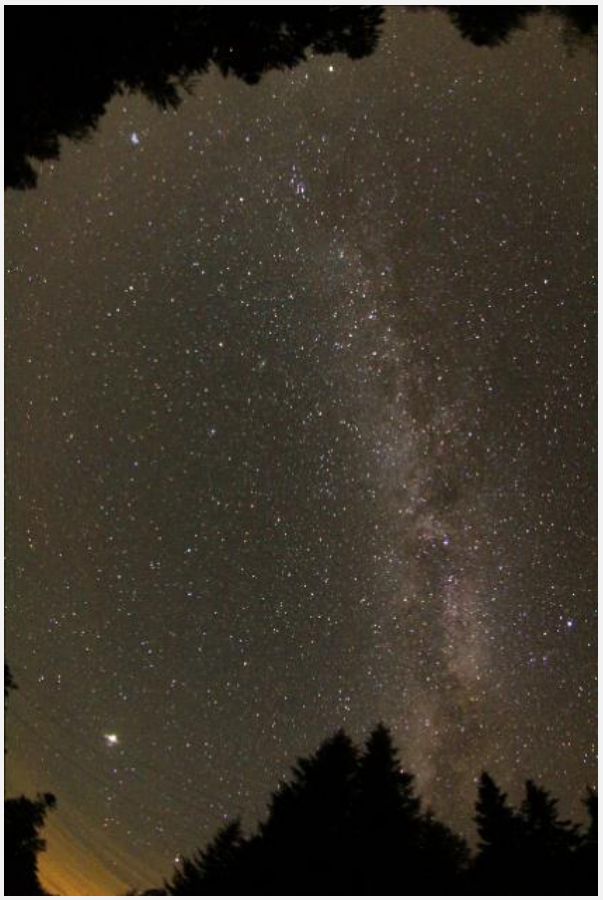
9 Shelter Kolyba

Coordinates: Tsarynske 1, 38-713 Lutowiska, 49°09'05.4"N 22°38'37.0"E, 777 m a.s.l.
Object name: Student Kolyba of the Warsaw Polytechnic
Object owner: Warsaw Polytechnic

Astrotourist characteristics: A place on Pryslup Tsarynskyi, in the Bieszczady National Park, with a wide view of Polonina Karynska and Bukove Berdo, far from human settlements.
Accessibility of the object and description of infrastructure on the object: thirty beds, banquet hall with fireplace, place for fire, entrance by a narrow gravel road from Nasichne.

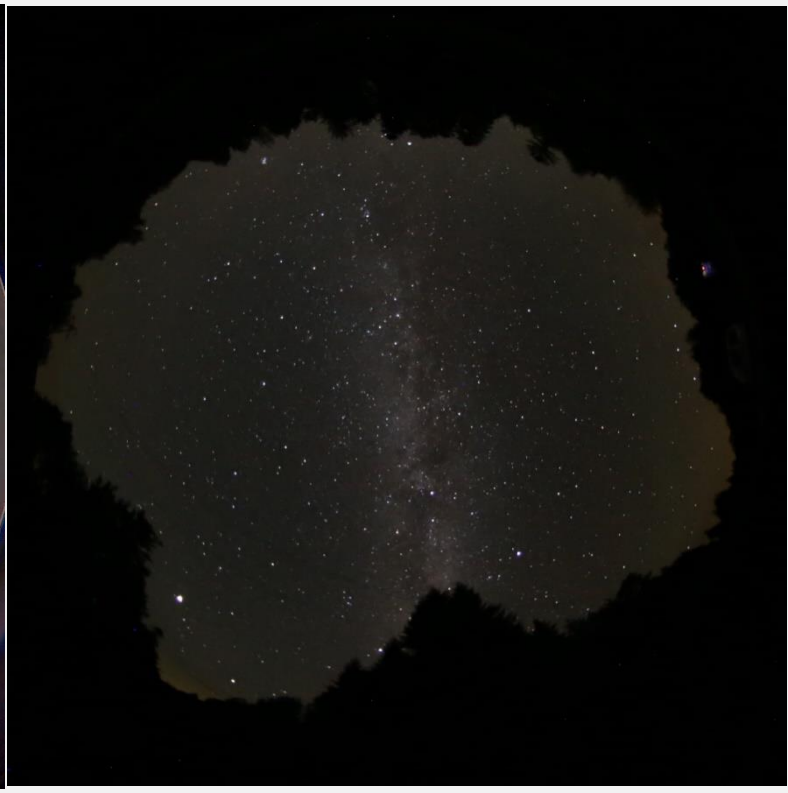
Possibilities of using the object: Magnificent panorama to the south, as well as views of the sky in the west, north and east, virtually no lighting make this place extremely favorable for astrophotography and observations. Along the way there is a large meadow, marked on the map as a place of rest for travelers, which also offers a view of the sky, located at a height of 30 degrees above the horizon.

10 Open-air charcoal burning museum



Coordinates: 49°09'30.7"N 22°42'58.2"E
Museum of charcoal burning in the open air

A well-marked place, located on the road from Stuposian to Muchne, is covered with trees, where the night sky is not illuminated, which is favorable for photography and astronomical observations.
Possible difficulties for observations and astrophotography due to light from passing cars.



11 Pichurov lookout point

Coordinates: 49°06'23.1"N 22°47'10.3"E,
Name: Observation terraces Pichurov
Object owner: State forests, Stuposiany forestry

The place is located on the road from Stuposiany to Muchne, at the turn there is a parking lot, asphalt road with no entry for cars leads to the destination, it can be entered by bike. The climb is about one kilometer, walking time is 20 minutes. There are two terraces on the territory - the lower and the top one as well place for rest. The main advantages are the great height above sea level, full absence of the lighting of the night sky, open view of Bukove Berdo, Kshemen and Kopa Bukovska.

It is a place for night astrophotographic events, shows and astronomical observations. It`s a great place to practice contextual astrophotography, if you remove the tall greenery that obscures the view of most of the sky.

The upper terrace of the scenery "Khata Rebrova" from the series "Vataga"

View from the upper terrace on the Bieszczady Mountains, the Milky Way is on the background

12 Forest parking lot near the bridge in Procisne

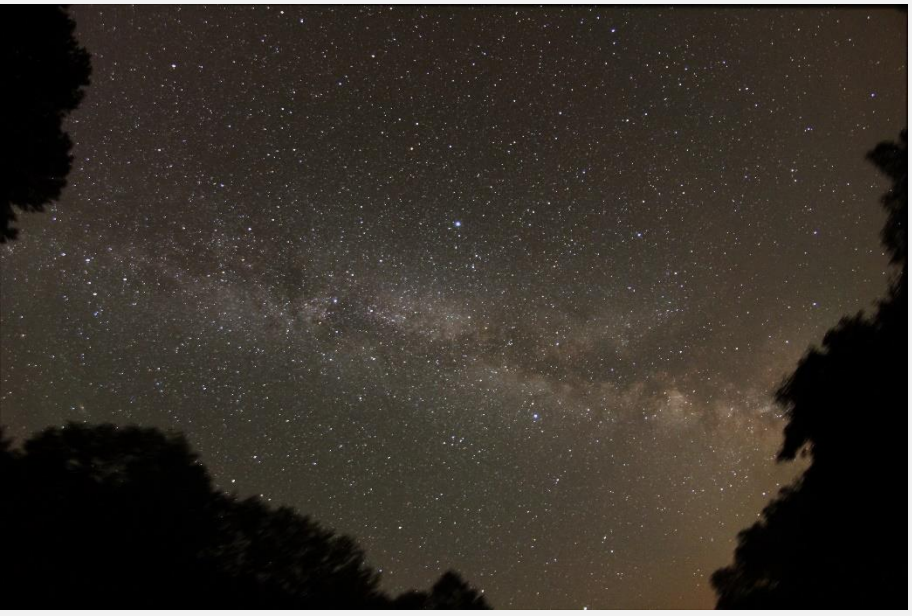
Coordinates: 49°11'47.0"N 22°40'52.1"E

Location: Forest Parking and the bridge over the stream Volosate

Owner of the object: State forests

Description: Place is well marked, near the National Road № 896, near the bridge over the stream Volosate, directly at its confluence with the San River. On the territory there are no light sources, the street lights are turned off at 22.00. The road behind the bridge leads up to the hill and is accessible to pedestrians and cyclists. As traffic in this part of the Bieszczady Mountains is significantly reduced at night, the lighting from cars on the road nearby is insignificant.

The place is designed for night astrophotography and astronomical observations.



13 Parking Pszczeliny- Widełki

Coordinates: 49°09'04.4"N 22°41'03.0"E
Location: parking lot near the National Road № 896 in Widełki
Object owner: Bieszczady National Park
Description: Parking near the information point of the Bieszczady National Park. For night astrophotography and astronomical observations.
The place is well marked,there is one house nearby, there are no lanterns. As traffic in this part of the Bieszczady Mountains is significantly reduced at night, the lighting from cars on the next road is negligible.

14 Camping "Górna Wetlinka"

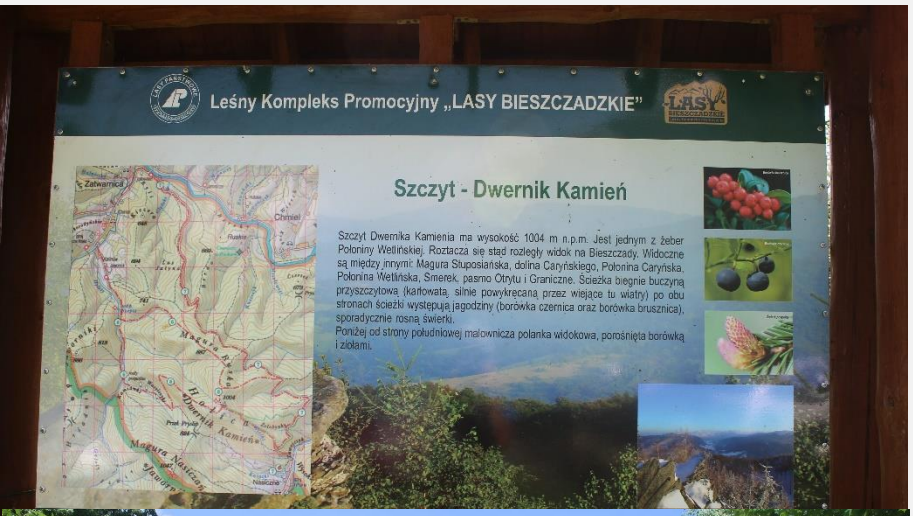
Coordinates: 49°08'50.7"N 22°31'13.6"E
Location: Camping and parking in the Górna Wetlinka.
Owner: Bieszczady National Park, tenants

From camping in national park, a place with a bar and a wooden shelter, opens a view of Polonina Wetlińską. The campsite has a large cobbled yard with seating. This is a good starting point to Polonina Wetlińską and its surroundings.
This can be an attractive place for landscape astrophotography, especially since it is easily accessible from the provincial road № 897.


PRZEŁĘCZ
ORŁOWICZA
1099 m - 6,1 km
BRZEGI GÓRNE
- 3,8 km
CAMPING BdPN
„GÓRNA WETLINKA"
POŁ. WETLIŃSKA
1h
UKRAINA
UKRAINA
UKRAINA

15 Parking in Nasiczne

Coordinates: 49°10'53.9"N 22°36'12.8"E
Place: Forest parking in Nasiczne
Owner: Promotional Forest Complex „Bieszczady forests".
Description: a well-marked place located on the road connecting Dvernik with Beregi-Gurne, at the foot of Dvernik-Kamen. There are few houses nearby, few street lights that turn off after 22.00.



This can be an attractive place for astrophotographers looking for less "marked" landscapes. The facility is equipped with a shelter with the ability to light a fire.

16 Parking in Pszczeliny

Coordinates: 49°10'11.8"N 22°41'23.6"E
Location: parking lot in Pszczeliny, near the provincial road № 896.

The site is located in the Wolosate Valley, on the provincial road № 896. The facility is managed by the „Bieszczady Forests" Promotional Forest Complex.
There is a wooden shelter and two information boards. There are few houses in the area, and the lights turn off at 22.00.

Selected suggestions of places for contextual astrophotography.

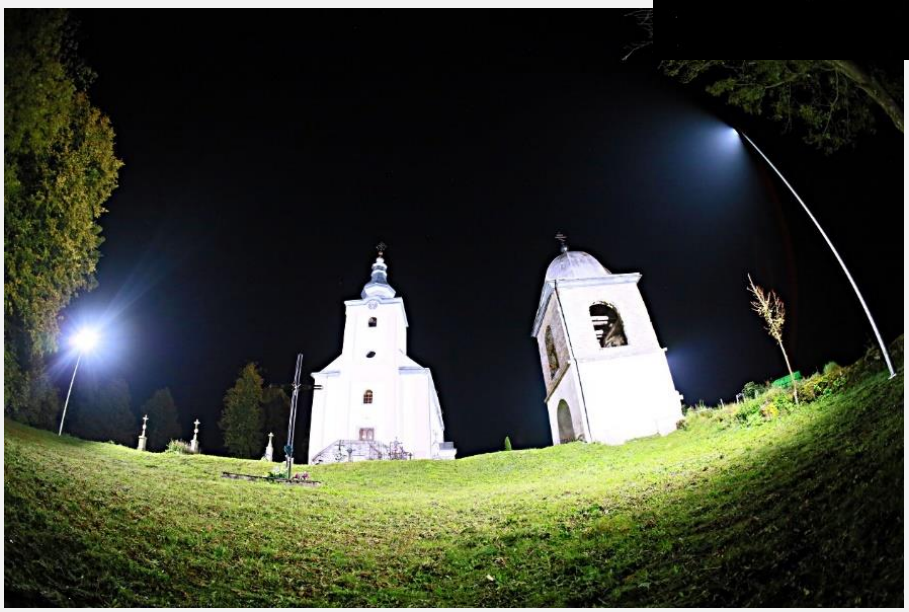
1 The outskirts of the church in Lopience

Coordinates: 49°15'47.3"N 22°22'09.6"E
Greek Catholic Church of St. The Martyrs of Paraskevi in Lopienza can be an exquisite subject for astronomical photography in the context of sacred architecture. The area is devoid of human settlements, and there is a wooden tourist shelter on the footpath leading to the Sine Wiry Nature Reserve. This means that this place is quite suitable for astrophotography. Access to the church is possible only from the Provincial Road № 893 from Yablonki.

2 The outskirts of the ancient church in Smolnik near Komańcza

The ancient church of St. Nicholas is located on a hill and surrounded by a cemetery. The nearby bell tower and the church building can be attractive objects for contextual astrophotography.

With easy access by car on an asphalt road, the church offers a magnificent view of Chryszczatą.



Suggestions of additional natural attractions

1. *The Wołosate Swamp*

Location: County: Bieszczady; commune: Lutowiska; Village: Volosate
N: 49^0 4’ 28.44” E: 22^0 40’ 18.1”

Natural characteristics: Wołosate peat bog with an area of 2.04 hectares was protected in 1959 as part of the created natural reserve. In 1991, as a result of the expansion of the Bieszczady National Park, the entire territory of the swamp became part of the park. As a result, the reserve formally ceased to exist, and the Bieszczady National Park, which has the highest (legaly) protection rank, performed protection tasks. Peat bog is located at an altitude of about 662 m above sea level in the valley of Wolosatka. It developed on the gravel-clay terrace, which was formed at the beginning of the Holocene - about 10 thousand years ago on the outskirts of alluvial cones and in the former Lake Wolosatka.

Peatland is formed by layers of peat that have accumulated over thousands of years under climate change. Developed on the post-glacial terrace in a concave area. The development of the swamp is facilitated by a cool and humid climate with precipitation of 1000-1200 mm, 70% of which is during the growing season.

Peat bogs in Europe are threatened with extinction. They are very sensitive to changes in hydrological conditions and climate change. Owner: State Treasury, managed by Bieszczady National Park

Availability of the object and description of the infrastructure on the object: The facility is available regardless of weather conditions. It is located on the (provincial) road between Ustrzyki Górne and Wołosate. The peat bog can be reached by a wooden footbridge. It also runs along the fence, so you can look at the mentioned plants and observe the structure of the peat dome. On the opposite side of the peat bog there is a

shelter with benches and educational stands about the natural characteristics of the swamp. The shelter has a canopy, it can be used in case of bad weather.

The place is available to visit at dusk, before the astronomical shows, and can complement the night observation program. In front of the swamp there is an information board where you can find information about nature. However, it should be remembered that the facility is located in the Bieszczady National Park and the rules of its visit apply



Photo. Larch and lingonberry, sundew

2. Field ecological educational station BdNP in Suche Rzeki

Location: N: 49^0 12’ 6.82”; E: 22^0 31’ 33.61”

Owner: Bieszczady National Park
Availability of the object and description of the infrastructure on the object: The facility is located near a paved city road. The station seats 26 people and has an audio-visual room and a kitchenette with a dining area. Available for people with disabilities. Not far from the station there is a place for a bonfire and a botanical garden.

Characteristics of nature

In the north-western part of the Bieszczady National Park there is a field ecological educational station (hereinafter: FEES) in Suche Rzeki. Before the Second World War, Suche Rzeki was a hamlet of the village of Zatvarnytsia, from which they are located about 3 km in the valley of the Rika stream. The asphalt road to FEES passes through the forest along the picturesque section of the river Rika. Next to FEES there is one residential building, a toilet and an information and cash desk with a parking lot. Next to the FEES there is a place for a bonfire and a educational garden, which together with the existing natural trails are an excellent educational base for exploring the nature of Bieszczady.

Educational garden

The garden has areas with rare and endangered plants, which are often found in hard-to-reach places, outside the footpaths. There are the following species: Lathyrus laevigatus, Cirsium waldsteinii, Trollius altissimus, Aconitum lasiocarpum, Delphinium elatum, Helleborus purpurascens and others. Due to the mosaic of forest vegetation and thickets, there are a large number of bird species. This allows you to observe the regularity of the sounds of birds depending on the time of day, creating a symbolic "bird clock".

The bird clock sounds like this:

• the singing thrush wakes up the whole forest and its surroundings from the branches of the tree canopy at 3:00 am and sings its trills for almost an hour;

• in ten minutes a melodic small, but loud, red-brown European robin sings melodic;

• in five minutes the blackbird is slowly whistling and tearing its orange beak with a song;

• at 03:20 among the branches of tall trees sounds a forest twitter, which is sometimes called the singing of the "forest canary", because the middle part of her song resembles a canary song;

• at 3:30 the cuckoo wakes up, which is difficult to see because the bird is very timid, but with such a characteristic voice that no one ever confuses it. It should be remembered that this characteristic forging is the work of the male;

• the common and very useful yellow-blue great tit, the largest tit that inhabits our forests, fields, gardens and parks, sings vigorously at 3:40;

• immediately after her - at 3:50, also in the lower floors of the forest, sings his song common chiffchaff - a bird smaller than a sparrow, which arrives from wintering in very early spring (hence its Polish name);

• thrush, robin, blackbird , cuckoo, tit and chiffchaff finish the morning concerts at 4.00. At this time, more birds wake up, and the sun - already higher in the sky - looks into their nests

• the first is a finch - the most common bird in our forests, it is accompanied by a small redstart from the tops of trees

• at 4:20 in the canopy of tall trees near natural reservoirs begins its concert golden oriole in black and yellow feathers;

• ordinary, inquisitive, useful, but also capable of damaging gardens, the starling begins to respond at 4.40;
• a relative of the redstart, the invisible Cinderella, wary of her winged brothers, but not afraid of people, starts singing at 5.00. Her singing is quite loud, so she doesn't wake up until dawn, although she sometimes talks in the middle of the night by the streetlights
• 6.00 belongs to Eurasian blackcap, the so-called blackcap;
• at 7.00 a greenfinch sings in a loud voice, who sings his songs during the flight in the wedding period;
• a lively and cheerful goldfinch wakes up only at 8.00.

The voices of these birds are loud and easily recognizable, and at the same time original and beautiful, and are not just individual sounds, but repetitive songs.

The educational garden is an excellent base for various activities for different age groups. Bieszczady National Park offers the organization of master classes on the basis of a field station in Suche Rzeki. The remote location of the station provides an opportunity to conduct educational activities in the wild, on the natural trails " Suche Rzeki - Smerek " and "Yavorniki". Offer of activity: Forest night life - with recognition of various sounds and traces of animal activity.

Entrance by the yellow trail to the Orłowicza pass from Suche Rzeki.

3. Muczne – demonstration farm of bison

Location: N 49° 8´ 34˝; E 22° 42´ 53˝

Owner of the object: State forests - Stuposiany forestry
Characteristics of nature: The demonstration bison farm is located in the area of Muczne forestry, near the road Stuposiany - Tarnawa Niżna, near the stream Chervony, about 2 km from the village of Muczne. Bison of the Bialowieza-Caucasian line can be observed on the spot. The farm covers a forest area of about 8 hectares and allows you to observe animals in their natural environment. The area is overgrown with old firs and spruces, and through the center flows the Chervony Stream, which provides water to bison. You can watch the bison from the observation deck, which allows you to do it regardless of the weather. The object is a natural educational and is an outstanding tourist attraction. The presence of bison in the Bieszczady forests probably ceased in the second half of the 18th century. The first bison of the Bialowieza-Caucasian line appeared in 1963 in Stuposiany forestry (only 18 individuals), and Komancha forestry was the second place of reintroduction. According to the inventory conducted in the winter - spring of 2021 in the Bieszczady Mountains recorded an increase in the number of bison to 719 individuals
Availability of the object and description of the infrastructure on the object:

The object is available 24 hours a day on the asphalt road Stuposiany - Muczne. There is a parking lot in front of the entrance. Within the estate there are canopies, boards and information tables.

Possibilities of using the object: The site, along with other attractions in the area, may be a tourist product associated with the upper San Valley. It is worth mentioning the field paths marked by Stuposiany forestry, such as "Pichurov" or "Brenzberg", as well as an exhibition of wood burning and arboretum in Muczne, where there are various species of shrubs, trees, ferns and herbaceous plants. Geophytes (plants that bloom before the first leaves appear on trees) grow in the arboretum in early spring, for example, spring white flowers, snowdrops, bear garlic. Also nearby are the Bieszczady Fauna and Flora Exhibition Pavilion and the Open-Air Charcoal Burning Museum.

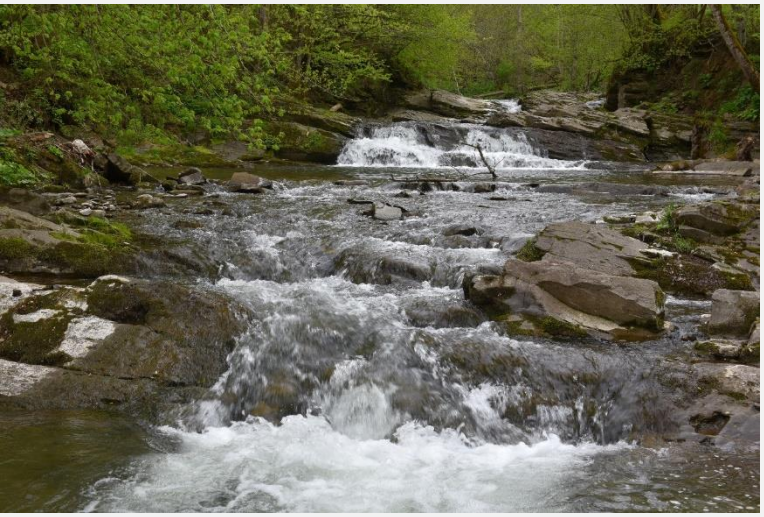
4. *Quarry Nasiczne*

Location: N: 49° 9' 17.3" E: 22° 34' 34.19"
Object owner: Bieszczady National Park

Natural characteristics External Carpathians are formed during the Alpine rock formation and consist of a number of tectonic units: Magurian, Ducles, Silesian, Podlasie and Skol. They overlapped from the south to north. The geological substrate formed by the Carpathian flysch, forms rows of alternating layers of sedimentary rocks of marine origin, ie sandstones and shales, with a small proportion of argillites, conglomerates or less common marl. These rows are strongly folded and accumulated as a result of their displacement to the north. On this territory the border between two large geological formations passes, which are formed from sedimentary rocks formed in separate parts of the marine reservoir (geosynclines).
This basin of sedimentary rocks, known as the Tethys Ocean, separated the continent of Eurasia from smaller landslides to the north along with a large African lithosphere plate for about 130 million years (from the end of the Jurassic to the Miocene). During the formation of the Inner Carpathians (including the Tara and Penina Mountains) in the northern part of the Tethys, the Carpathian flysch basin bent and expanded outside. The proximity of the young orogen and tectonic movements has led to the intensive formation of crumbly material from eroded young mountains and highlands and cordilleras.

Bending and overlapping were primarily the result of pressure from the African shield on the European plate. It is worth paying attention to the lower surfaces of sandstone layers with clearly visible hieroglyphs, ie preserved traces of processes occurring in the marine environment, the origin of which could not be established at the time of their discovery,

as well as Egyptian hieroglyphs. Hieroglyphs can be protrusions or depressions with characteristic size and shape. These are preserved traces of the influence of suspended currents and crumbs of rocks carried by these currents, traces of movement of living organisms at the bottom or in the sediment. There are also traces of disturbances suffered by soft deposits on the seabed. On a layer of sandstone, these traces have the form of molds. Their shape depends on the shape of the object, the type of movement and the method of its contact with the bottom. Traces of grooves on the sandstone layer were caused by pulling or dragging. Due to their size and shape, it is possible to distinguish whether it was pulling or dragging, and its direction.



Availability of the object and description of the infrastructure on the object:

The object is available on the main asphalt road: Nasiczne - Berehy Górne. Next to the quarry there is a convenient parking lot and an information and educational board with a geological description. The place is fenced, movement on the exits of the rocks is prohibited for the safety of visitors.

Possibilities of using the object in tourist products

Geopark is an interesting and effective form of protection of geodiversity and promotion of inanimate values in the region. It has an open form, not related to legal forms of nature protection, and allows you to freely combine many goals

- protection of non-renewable elements of inanimate nature, implementation of activities in the field of education, development of educational tourism, in particular geotourism.

Cascades on the stream Nasicznyansky.

5. Nature Reserve „Sine Wiry”

Location: 49^{0}15’38.43” N; 22^{0}25’35.31” E

Owner: State forests - Baligrod and Cisna forestry

Characteristics of nature

The nature reserve called "Sine Wiry" covers an area of 444.50 hectares and covers the area of the Wetlina river ravine, from the village Luh to Polanek, as well as the surrounding beeches and firs growing on the slopes of Poloma and Szczycisko.

The watershed of the Wetlina stream is a tortuous channel caused by tectonic cracks, as well as deepening and formation of the channel in places of less stable rocks, avoiding more stable rocks. Breakthrough valleys are formed where the stream "breaks" the elevation in accordance with the slope of the terrain, finding a convenient place (within the tectonic fault, with a predominance of less stable rocks compared to adjacent rocks). Under the rocky rapids, the water formed depths, giving the water a dark blue hue. These depths were called "blue vortices" by the former inhabitants of the surrounding villages because of their color. The Polish name - " Sine Wiry " - gave the name to the reserve. The reserve covers an area of 9 km with a slope of about 100 m.

At low water levels from the bottom of the river appear sandstones, interspersed with inserts of sandy and silty shales. Along the current almost vertically sandstone shoals 10-20 cm thick protrude, creating a kind of rock threshold.

The reserve has documented the presence of more than 350 species of vascular plants, of which 21 are under strict protection. It is a support for wild animals - lynx, bear, deer, wolves and carnivores birds - golden eagle, little eagle and black stork. Availability of the object and description of the infrastructure on the object: You can get there from two directions: from Kalnitsa there is a paved road, closed for cars from Yavorets and on the other side - from the road Dolzhytsia-Terka from the parking lots Lopienka and Sine Wiry between the villages Buk and Polanka. Roads are well marked, paved, smooth and available to all. There are rain shelters and information boards along the road.

Possibilities of using the object: Sine Wiry is an ideal offer for a pleasant time spending for families with children due to its easy access and asphalt road, comfortable driving even in adverse weather conditions. Along the way you will be able to observe the rich world of plants and insects. The great attraction is the presence of numerous species of small birds. Access to the nature reserve "Sine Wiry" from Polanki.

Observation tower above Muczne


Nadleśnictwo Stuposiany

Introduction

Due to the multi-layered nature of cultural heritage, as well as the valuable natural resources of the regions, the Polish-Ukrainian cross-border area has a relatively high potential in the field of tourism.

Transcarpathian region is a unique ecological system of western Ukraine with diverse relief and climatic conditions due to the vertical zonation and diversity of landscapes. Its territory is protected from the north by the Carpathian ridge, from the northwest by the Tatras, from the south by the western Romanian mountains and the Maramures massif. About two thirds of the territory of Transcarpathia is occupied by mountains with the highest mountain in Ukraine (Hoverla, 2061 m). The region is located on the southwestern slopes of the Ukrainian Carpathians (Eastern Carpathians) and the adjacent Transcarpathian lowland, which is part of the Middle Danube lowland.

Most of the region is covered by the Ukrainian Carpathians, where unique areas of virgin forests, the largest in area in Europe, have been preserved. In order to further preserve and protect the Carpathian virgin forests, in 1968 with a government decree the Carpathian Biosphere Reserve was established. The unique ecosystems of this reserve are among the most valuable on the planet and belong to the international network of UNESCO biosphere reserves since 1993.

In Transcarpathian region 468 objects of nature reserve fund with a total area of 180.5 thousand hectares were registered. In general, there are four major protected areas in Transcarpathian region:

- Synevyr National Nature Park,

- Carpathian Biosphere Reserve,

- Uzhanskyi National Nature Park,

- National Nature Park „Zacharovanyi krai”.

Uzhanskyi National Nature Park is part of the world's first tripartite Ukrainian-Polish-Slovak International Biosphere Reserve "Eastern Carpathians", which is included in the UNESCO World Network of Biosphere Reserves. Uzhanskyi NNP consists of five environmental research departments and currently occupies an area of 39,159 hectares, including 14.9 thousand hectares of seized territory. Uzhanskyi National Natural Park is located in the western part of Transcarpathia in the basin of the river Uzh and stretches from the southwest from the village Zabrod (226 m.a.s.l.) to the north east to Uzhotskyi Pass (852 m.a.s.l.). Administratively territory belongs to Uzhhorod district of the

Transcarpathian region. The mountain landscape of the park belongs to the tier of gently sloping low mountain ranges.

Uzhansky NNP was established in September 1999 on the basis of protected objects that existed in the upper reaches of the river Uzh at the beginning of XX century. In particular, even in the times of Austria-Hungary in 1908, in order to protect virgin forests, the reserves "Stuzhytsia" and "Tychyi" were created here, which got their names from the nearest settlements - the villages of Stuzhytsia and Tychyi.

Today the border infrastructure in Transcarpathian region includes 19 checkpoints, 18 of which are located at the state borders with neighboring countries (Hungary, the Slovak Republic, Romania) and 1 checkpoint for air services located in Uzhhorod International Airport. There are no checkpoints on the Ukrainian-Polish section. The distance along the border line in the Transcarpathian region to the nearest checkpoint with Poland, located in the Lviv region - MAPP "Smilnytsia" is 120 km. It is offered to open the Lubnya-Volosate pedestrian and bicycle checkpoint on the Ukrainian-Polish border.

Transcarpathian Dark-Sky Park

On June 11, 2016 in the tract of Chorni Mlaky (Knyahynia village, Uzhhorod district) a memorandum on the establishment of the Transcarpathian Dark-Sky Park was signed. The Transcarpathian Dark-Sky Park (area of 46302 ha) includes the territory of Uzhanskyi National Natural Park (39159 ha) and allocated territories in the cadastral district of the villages of Sukhyi, Tykhyi, Husnyi, Lyuta, Ruskyi Mochar and part of the village of Velykyi Bereznyi.

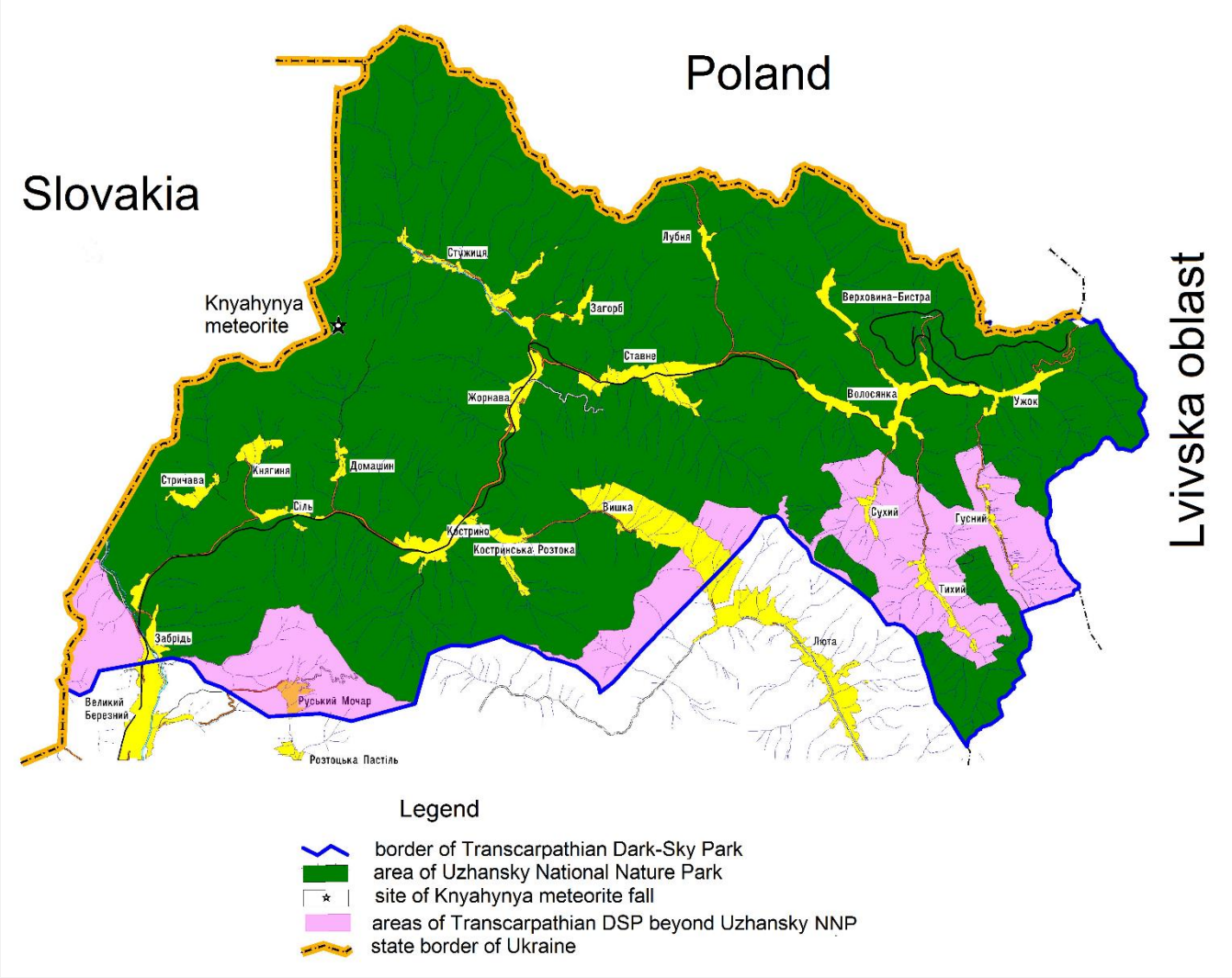
The Transcarpathian Dark Sky Park was proclaimed in order to inform both the general public and experts in the field of astronomy about the problems of light pollution of the night environment and environmental protection. The park area allows everyone to conduct astronomical observations on its territory, free of light pollution, promotes astronomy among children and youth, as well as the development of astrotourism in the Transcarpathian region.

On the occasion of the 150th anniversary of the fall of the Knyahynia meteorite in 2016, the East Carpathian Dark-Sky Tripark was proclaimed, which became the first in the world to be located on the territory of three states. The East Carpathian Dark-Sky Tripark (area 2,086.67 km2; 208,667 hectares) includes the territory of the Dark-Sky Park Poloniny in Slovakia (485.19 km2; 48,519 hectares), Bieszczady Starry Sky Park in Poland (1,138.46 km2; 113 846 ha) and the Transcarpathian Dark- Sky Park in Ukraine (463.02 km2; 46 302 ha).

Due to the unique natural and cultural heritage sites included in the UNESCO international lists, the convenient location near the borders of the European Union, the lack of sources of environmental pollution, the border region is extremely attractive for eco-tourism. The creation of the "Dark Sky Park" adds zest to this area and provides an opportunity to offer a new direction of tourism, bringing novelty to the tourist market

In addition to good infrastructure, one of the most important factors for the development of astrotourism in the region is the quality of the night sky. The natural night sky is our common and universal heritage, but it is quickly becoming unknown to new generations. An important part of solving the problem of light pollution and understanding the quality of the night sky is to measure the brightness of the night sky. As part of the Carpathian Starry Sky project, such measurements were carried out at various points in the Transcarpathian Dark Sky Park, resulting in the selection of locations for this guide, which combine rich natural heritage, historical past and, most importantly, excellent night sky

quality. Measurements were performed using an SQM device, purchased under the project. The indicators of the device are more than 21.00 magnitude per square second of the arc testifying to almost no light pollution.



The state of light pollution of the night sky in Transcarpathian Dark-Sky Park

To measure the brightness of the night sky in the Transcarpathian Dark-Sky Park the SQM-LU-DL device (Sky Quality Meter with narrow Field-of-View - lens, USB connectivity - datalogging) was used. The device was purchased under the project "Carpathian Starry Sky" (project №PLBU.01.02-00-UA-0809/19-00) that is implemented and co-financed within the framework of the Cross-Border Cooperation Program Poland-Belarus-Ukraine 2014-2020.

One of the goals of the project was to start the process of registration of the Transcarpathian Dark-Sky Park in the International Association of Dark Sky Parks (IDA). For of this, night sky brightness measurements were performed according to the instructions provided by IDA within the Transcarpathian Dark-Sky Park. All measurements were performed on the night when the Moon passes the following phases of illumination: New Moon. Measurements were carried out along the perimeter of the Transcarpathian Dark-Sky Park, namely: on Mount Yavirnyk (near the town of Velykyi Bereznyi), as well as near the following settlements: Lubnia, village Knyahynia, village Uzhok and village Vyshka.

In all places of the Transcarpathian Dark Sky Park where brightness measurements were made, the average value of the night sky was equal to or greater 21.50 magnitude per square second of the arc, which makes this place suitable for astronomical observations and astrophotography. Continuous monitoring of the brightness of the night sky allows you to record specific light pollution in each place, taking into account differences in weather conditions, climate and different phases of the moon, as well as the ability to study long-term trends.

The modal value of the brightness of the night sky varied from 19.73 magnitude per square second of the arc (in Uzhgorod, where measurements were made for comparison) to 21.92 magnitude per square second of the arc (in the Transcarpathian Dark-Sky Park), which confirms the high variability of light pollution depending on the location of the site, in particular the height of the site, its distance from major sources of pollution, and various climate changes that play an important role.

Photo by: Ramesh (Stanislav Shulga)

Photo by: Ramesh (Stanislav Shulga)

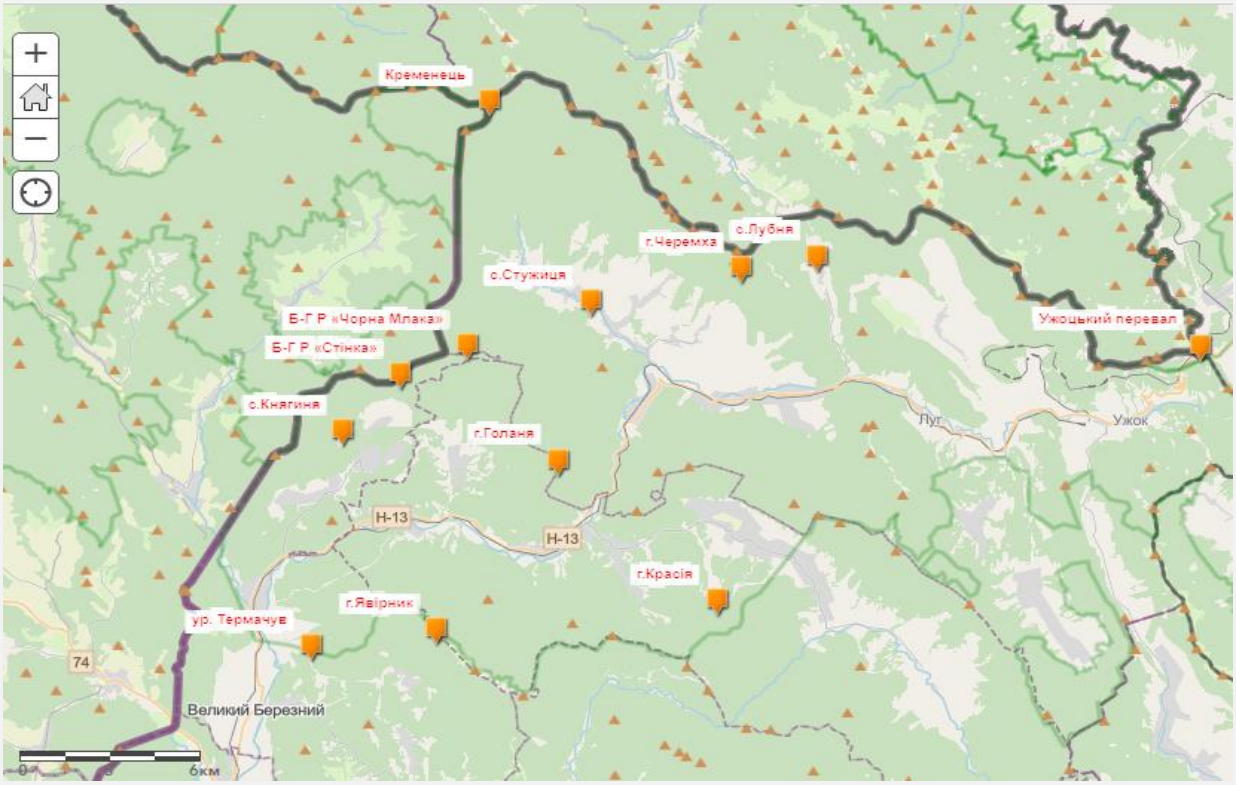
Suggestions of places for astrotourism and natural tourism in the Transcarpathian Dark-Sky Park

Suggestions of observation and astrophotography places

1. Uzhotskyi pass
2. Village Stuzhytsia, Kremenets Mountain
3. Village Lubnia
4. Krasiya Mountain
5. Village Knyahynia
6. Yavirnyk Mountain
7. Cheremkha Mountain
8. Golania Mountain
9. Termachuv tract

Suggestions of places for nature tourism

1. Cheremkha mountain
2. Botanical and Geological Reserve "Stinka"
3. Botanical and Geomorphological Reserve "Chorna Mlaka"
4. Golania mountain
5. Kremenets mountain and forest nature monument of national importance "Stuzhytsia"



1. Uzhotskyi pass

Coordinates: 49°00'29.6"N 22°53'38.4"E

Uzhotskyi Pass is a pass through the watershed of the Carpathians (on the watershed of the Vistula, Danube and Dnister basins, 883 m) in the High Beskids.

The pass is located on the border of Lviv and Transcarpathian regions, near the border with Poland. The railway connecting Lviv with Uzhhorod passes through Uzhotskyi pass.

The picturesque route that runs through the pass covers the landscape zone from the village of Turka to Uzhgorod and crosses the Upper Dniester Beskids with beech and fir-beech forests, Polonynsky ridge with mostly beech forests and Vygorlat-Gutynsky ridge with beech and oak-beech forests. From here opens a beautiful panorama of the Polonyna Ravka,1269 m (Eastern Beskids) and Ostra, 1408 m (Polonyn Carpathians).

Along the route there are many reserves, monuments of nature and architecture, and the pass itself is part of Uzhansky National Nature Park, which is part of the world's only tripartite International Biosphere Reserve "Eastern Carpathians". Uzhotskyi pass is included in the programs of numerous tourist routes. The picturesque area with steep serpentines leaves no one indifferent.

Uzhotskyi pass has a rich history. During the Middle Ages there was a trade route from Kievan Rus to the Danube basin. Most of the area around the pass belongs to the lands of the Lemkos - a small ethnic group of Ukrainians who live in the mountains and are characterized by original life and wooden architecture. Unique monuments of wooden architecture – temples of 17-18 st. - have been preserved in the settlements of Uzhok, Salt, Kostryna, Sukhyi, Husnyi. Nearby there is the village of Uzhok, where unique wooden churches are located, in particular the famous church of St. Michael the Archangel XVII century, which inscribed on the UNESCO World Heritage List. Uzhok itself once housed a well-known spa resort in Austria-Hungary.

In 1872 a railway was put into operation on the pass, connecting Budapest with Eastern Galicia. In 70s – 90s of the 19th century the railway Uzhhorod-Velykyi Bereznyi and Uzhhorod-Przemysl-Lviv railways were built. Uzhotskyi Pass was the administrative border of Hungary and Galicia as part of Austria-Hungary and became the site of bloody fighting during the First World War. During 1914–1915 several times it was captured by

Russian troops, but eventually remained in the hands of the Austro-Hungarian army. More than 650 soldiers of the Austro-Hungarian armies and Russia was buried on the pass. A memorial pyramid was erected on the site of the mass burial of soldiers on Mount Cheremkha as a sign of respect.

No less difficult, bloody battles took place here and during World War II. In particular, the famous 600-kilometer defensive Arpad line was stretched across the pass, created by Hungarian troops in the Carpathians in 1943-1944. In those times 30 concrete and 60 wooden-earth bunkers were built on the pass. Today on the mountain tops of the Carpathians and in the dense forests you can still see the remains of trenches, fortifications, trenches, even weapons or ammunition were found. The obelisk to the soldiers of the Soviet army who died here in 1944 still remains about those events.

Uzhotsky pass is a great place for astronomical observations. During the day you can enjoy the breathtaking views of the Eastern Beskids and Polonyn Carpathians, and at night watch the starry sky. As part of the Carpathian Starry Sky project, measurements of the night sky brightness were performed at this location using an SQM device. The maximum value shown by the device is 21.67 magnitudes per square second of arc. This indicator on Uzhotskyi pass fully satisfies the conditions of entry of the Transcarpathian Dark-Sky Park into the International Association of Dark Sky Parks (IDA), and is therefore optimal for astronomical observations. One of the best places for observations on the Uzhotsky Pass is an observation deck (48 ° 59'45.6 "N 22 ° 52'56.7" E). 3.7 km from the observation deck there is a health complex on the site, where you can stay overnigh

Routes of Uzhansky NNP which can be visited without obligatory support:

• Uzhotskyi pass - the source of the river Uzh - Uzhok,
• Uzhotskyi pass - Old abandoned tunnel (Shcherbin).

Tourist routes and facilities located in the area between the state border and the line of border engineering structures:

• Uzhotskyi pass - the source of the San River – Uzhotskyi Pass,
• Uzhotskyi pass - Kinchyk Bukovskyi - Rozsypanets - Verkhovyna - Bystra,
• Uzhotskyi pass - Kinchyk Bukovskyi - Uzhotskyi pass.

To visit these routes, located in the area between the state border and the line of border engineering structures, you must obtain a special permit. To obtain a special permit, you must contact the park and provide information about visitors (name, series / passport number, place of registration (residence) on mail: uzhanskij@gmail.com (sample filling in the information in the application). Information on persons to pass along the specified route for the line of border engineering structures shall be provided two weeks before the date of passing the route.

If the route runs from Uzhgorod, you can use the suburban train 6519-6520 Mukachevo-Sianky. Using this train you can travel from Uzhgorod to the village Uzhok. Travel time

will be about 2 hours 40 minutes. Current Mukachevo-Sianky train schedule includes 3 trains connecting these stations, among which there are morning and day trains.

Photo by: Konstantin Balabano

2. Village Stuzhytsia, Kremenets Mountain

Coordinates of Kremenets Mountain: 49°05'16.6"N 22°33'56.7"E
Coordinates of Stuzhytsia village: 49°01'22.4"N 22°36'44.8"E

Uzhansky National Nature Park is located on the territory of Uzhhorod district of Transcarpathian region, within which three states "meet" - Ukraine, Poland and Slovakia. It is at the top of Kremenets that the state borders of the three countries intersect. The south-eastern slopes of the mountain lie on the territory of Ukraine, the northern slopes - on the territory of Poland, the south-western - in Slovakia. The national natural parks of these states border here as well.

Mount Kremenets (1221 meters high) is one of the peaks of Bukivskyi tops. It is located in the north-west of the Transcarpathian region, it is possible to climb it from the Ukrainian side from the village of Stuzhytsia in the Velykobereznyanshchyna region. The route Stuzytsia village - Kremenets mountain - Stuzhytsia village runs along the state borders of Poland and Slovakia. There is a border post in the village.

Tourists wishing to climb Kremenets must register in advance with the State Border Guard Service, provide their personal data and obtain a pass from the Border Guard Service. The length of the route is almost 17 km and a duration of about 7 hours. The route was opened to tourists a few years ago and it passes through Uzhansky National Nature Park, created by the Decree of the President of Ukraine in 1999. Detailed

directions on the route can be found at linkhttps://karpaty.rocks/region/gora-kremenec Tourists from Poland and Slovakia can often be met on the trails to the top of Kreminets. Almost on the ridge at the height 1121 m.a.s.l. a unique spring with healing water is located. The Holy Well, which means Holy Spring in the local dialect, got its name for the crystal purity and inexhaustibility of its waters. For several centuries, the source has been regularly consecrated by representatives of the clergy of Ukraine and Poland

The highlight of the nature park is the oldest oaks in Ukraine. In the village Stuzhytsia legendary "Oak Champion" aged 1300 years and "Dido-oak" aged 1100- 1200 years grow. These are giant trees 25-30 meters high and have a trunk girth over 9 meters each.

"Oak Champion" in Stuzhytsia village

In 1912, in order to preserve and study the zonally distributed in Carpathians beech and fir-beech virgin forests, the reserve "Stuzhytsia" was created on the square of 331.8 hectares, which included the remains of virgin forest systems. Today they are preserved in a limited area and serve as natural eco-models for sound sustainable forestry.

Routes of Uzhansky NNP which can be visited without obligatory support:

• Stuzhytsia village – Chorni Mlaky tract - Stuzhytsia village.

Tourist routes and facilities located in the area between the state border and the line of border engineering structures:

• Stuzhytsia village - Kremenets - Stuzhytsia village.

An advantage for astronomical observations on the route Stuzhytsia - Kremenets is a quality of dark sky in this area. Within Carpathian Starry Sky project, measurements of the night sky brightness were performed at this location with the help of an SQM device. The maximum value it showed - 21.82 magnitudes per square second of arc. Such an indicator of the night sky brightness on Mount Kremenets fully satisfies the conditions of entry of the Transcarpathian Dark-Sky Park into the International Association of Dark Sky Parks (IDA), and is therefore optimal for astronomical observations.

From Uzhgorod you can get a bus Uzhgorod - Sambir - Lviv (departure from Uzhgorod at 06-15 Kyiv time) with a stop in the village Zhornava, and from there to the village Stuzhytsia 5 km. You can also get by train Mukachevo - Syanky with a stop in the village Zhornava. There is a campsite 5.5 km from Kremenets.

Photo by:Ramesh (Stanislav Shulga)

3. Village Lubnia

Coordinates: 49°02'15"N 22°43'02"E

Lubnia is a village in Uzhhorod district of the Transcarpathian region. Population is 212 people. The village is located in the valley of the river Lubnia, a right tributary of the river Uzh. The village is located in the most northern mountainous part of the district. It is located 42km from the town of Velykyi Bereznyi, near the border with Poland, 7 km from railway station Stavne.

Lubnia is mentioned in documents from 1631. The first written mention of it was in 1631 under the name Lubnya. Then the village was mentioned in 1808 (Lubnya, Lubná), in 1851 (Lubnya), in 1913 (Kiesvölgy). According to folklore, the name of the village comes from the fact that the first settlers here made a bast (rim) for sieves. The village belonged to the Uzhhorod state dominion. Its inhabitants mostly grazed cattle and worked in forestry.

In the village there is the church of St. Elijah since 1991. A small wooden church built on the site of an old church that burned down in 1990. Donations for construction were collected throughout the Uzhanska valley, and local craftsmen worked on the building. The construction was organized by a priest from Stavne, Fr. Ivan Dupin. In early June 1990, wood was brought from the village of Borynia in the Lviv region, and works began on July 17. The greatest efforts were made by the head of the collective farm M. Piukal, the craftman from Stuzhytsia Petro Holubka, the roofer Borys Polyansky, M. Mushak, and V. Kuchirka. Bells were set on March 25, 1991, the iconostasis was painted by Vladimir Sokhanych, and the lower tier by Mykola Andrashko. The walls and vaults were painted by Oleksiy Varahoba.

In 1999, the Uzhansky National Nature Park was established in this area, which is part of the Polish-Slovak-Ukrainian International Biosphere Reserve "Eastern Carpathians". Negotiations have been underway for many years between the Ukrainian and Polish sides about the openning of an international bicycle and pedestrian border crossing point Lubnya-Volosate, which will give an additional impetus to the development of ecotourism in the region. 4 km from the village Lubnia, on the Polish territory, there is village

Volosate. Up to 4 thousand people per day pass the tourist route which starts in Volosate (Poland). Poland's Bieszczady National Park complains about excessive tourist load. The opening of the Lubnia-Volosate checkpoint can help unload Bieszczady Park, redistribute tourist flows and develop new tourist routes in Ukraine and give a chance to the economic development of local communities

Routes of Uzhansky NNP which can be visited without obligatory support:

- village Verkhovyna Bystra - Plishka mountain - village Lubnia,
- village Stavne – Cheremkha - village Lubnia,
- village Lubnia – Vezha mountain - village Lubnia,
- village Lubnia - Cheremkha – Menchul - village Lubnia.

Tourist routes and facilities located in the area between the state border and the line of border engineering structures:

- village Lubnia - Border - village Lubnia.

The opening of the Lubnia-Volosate crossing may be an impetus for the development of astrotourism in the Polish-Ukrainian cross-border area. Astro-shows are taking place on the territory of Bieszczady Starry Sky Park - displays of the starry sky, which are actively visited by astronomers and amateurs, astrophotographers and tourists. The village of Lubnia, located in the Transcarpathian Dark-Sky Park, has excellent potential for the development of astrotourism in Ukraine. As part of the Carpathian Starry Sky project, night sky brightness measurements were performed in the village Lubnia with the help of an SQM device. The maximum value shown by the device is 21.91 magnitudes per square second of arc. This indicator of the night sky brightness in the village Lubnia fully satisfies the conditions of entry of the Transcarpathian Dark-Sky Park into the International Association of Dark Sky Parks (IDA), and is therefore optimal for conducting astronomical observations.

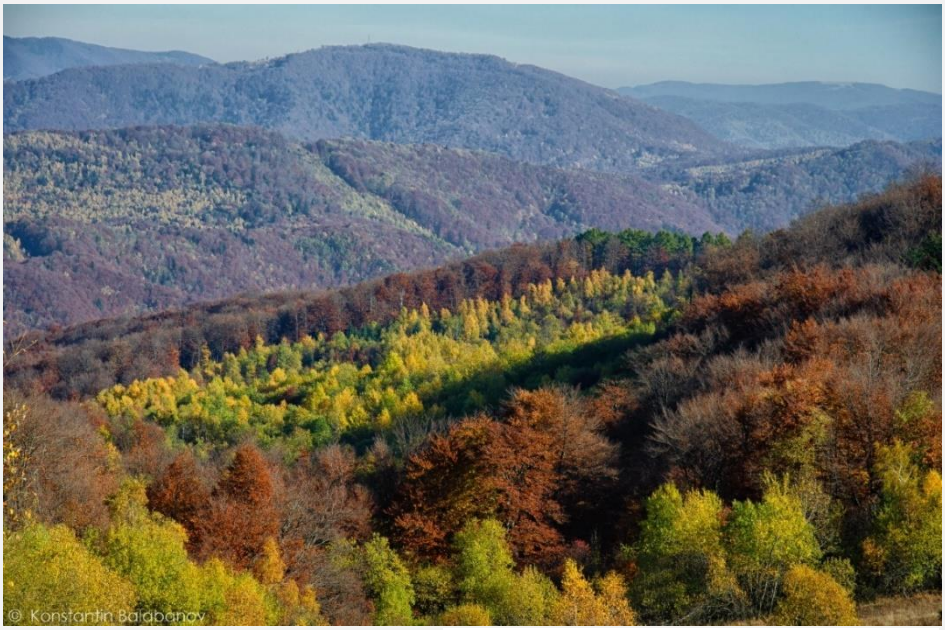
The nearest place to spend the night is in the village Stavne - a holiday home 8.2 km from the observation point in the village Lubnia. From Uzhgorod you can travel by a regular bus Uzhgorod - Sambir - Lviv (departure from Uzhgorod in 06.15 Kyiv time) with a stop at Stavne village, and from there it is 3 km to the village Lubnia. You can also get there by train Mukachevo - Sianky with a stop in the village Stavne.

Photo by: Konstantin Balabanov

Photo by: Ramesh (Stanislav Shulga

4. Krasiya Mountain, village Vyshka

Coordinates of Krasiya Mountain: 48°55'29.7"N 22°40'14.9"E



Автор фото: Костянтин Балабанов

The village Vyshka is located in a mountainous area in the valley of the river Uzh, 25 km from the village Velykyi Bereznyi, 70 km from the regional center - Uzhgorod and 7 km from the railway station Kostryno on the line Chop-Sambir. Vyshka River originates in this village, the left tributary of the Uzh. The first written mention of the village refers to 1602. Names: 1773 - Viska, Wisky, 1800 - Viszka, 1808 - Viska, Wysska.

The village was founded by two soltis and settlers at the beginning of XVII century on territory that belonged to the Uzhhorod-Nevytsia castle dominion of the Counts of Druhelites. In 1632 there were 40 families in the village. In 1715 there were already 22 households.

St. Michael's Church is a wooden church, an architectural monument of national importance, located in the village of Vyshka. The building is built in the style of the folk school of wooden architecture. It contains transitional elements from Boyko's architecture to Lemko's. For the construction of the building, firs were cut down on the slopes of Krasiya Mountain. According to other sources, beech beams were used. Nails were not used. St. Michael's Church stands on a stone foundation. It is a three-story church. The church has preserved some examples of decorative arts of the beginning of 18th century. The dimensions of the modern church are 5.1x15.7 meters.

In the village, on the eponymous mountain Krasiya (1036 m) is the famous ski resort Krasiya. Back in the 80s of the last century, it was one of the favorite ski resorts for both professionals and novice outdoor enthusiasts. There are many slopes for skiing, where you can go down not only on skis but also on snowboards or sleds. On the mountain Krasiya there are chair lifts (single -1980 m, double - 1114 m and four-seater - 1585 m.), tow lifts - 470 m, 650 m, private multilift - 300 m., as well as ski equipment rental. The

width of the tracks is 100-250 meters. There are also motels and private estates for rent in the village.

Routes of Uzhansky NNP which can be visited without obligatory support

• village Vyshka - Krasiya- village Vyshka.

In addition to excellent conditions for skiing, Krasiya Mountain is a great place for astronomical observations. As part of the Carpathian Starry Sky project, measurements of the night sky brightness were performed on Krasiya Mountain with the help of an SQM device. The maximum value shown by the device is 21.60 magnitudes per square second of arc. This indicator shown on Krasiya Mountain fully satisfies the conditions of entry of the Transcarpathian Dark-Sky Park into the International Association of Dark Sky Parks (IDA), and therefore is optimal for astronomical observations.

If you travel from Uzhgorod, there is a railway line Lviv-Sambir-Uzhgorod with the stop „village Kostrino”. From the train station it is 10 km, there is also a bus from Velykyi Bereznyi to the village Lyuta. You need to get off at the stop in the village Vyshka, or "Krasiya". There is also a regular bus from Uzhgorod (Bus station "Uzhgorod-2 ", Fedintsa Street; house 61 or Central Bus Station, Stantsiyna Street; house2) to the village Vyshka.

Автор фото: Костянтин Балабанов

5. Village Knyahynia

Coordinates: 48°58'49.3"N 22°29'53.5"E

Mentioned for the first time in 1602 and in the deeds of 1770-1772 under the name Kniahynicza, derived from the name of the local mountain. Other names: Knyahinya (1773), Knyahinya1851),Csillagfalva (1913).

On June 9, 1866, a meteor shower fell here. The events unfolded between ridges Stinka and Yavirnyk. Up to a thousand massive meteorite fragments were collected. The largest fragment of the Knyahynia meteorite (when falling, it splited in half), weighing 279,766 kg, was found in the tract "Chorni Mlaky", is considered the largest meteorite in Europe and is stored in the Natural History Museum in Vienna.

Due to a rare natural phenomenon (falling of a meteorite in 1866) the village became known throughout Europe. A description of this event, witnessed by the Czech government official Antonin Pokorny, an inspector of state forests in Velykyi Bereznyi, has survived to this day: “On that day, June 9, 1866, - describes an eyewitness, - I was in the Knyahynia on official business. A meteorite with a terrible roar and a fiery flash fell on the western outskirts of the village below the Stinka ridge. Pieces of meteorite scattered over large areas. I sent one of these fragments the size of a human head to Emperor Franz Joseph. It is now housed in the Vienna State Museum.

The meteorite appeared as a fireball over the town of Liptovský Mikuláš, flew in an easterly direction over the Slovak cities of Šariš, Zemplin, Prešov and, having covered a distance of more 200 km, broke near the village of Princess at an altitude of 40 km. A real "stone rain" took place in a large area. Stones were mainly found in fields, roads, and streets of the villages of Kniahynia, Stuzytsia (Ukraine), and Zboy (Slovakia). But most fell into the woods, where they were not found. The number of stones was very large. In the first days, the local population found more than 60 stones. A total of 1,200 stones fell. The largest fragment was found on the slope of Stinka Mountain, in the tract "Chorni Mlaky".

According to eyewitnesses, this meteorite was found by a peasant Vasyl Kryvianyk. Every year he mowed the grass in the glade in the tract "Chorni Mlaky ". A few days after the meteorite fell, he went out on the hayfield and saw a hole in the meadow, which did not

exist before. Digging the soil in this place deeper 2 meters, he found a large fragment of a meteorite weighing 279 kg 766 g falling it split into two pieces of weight 141 kg 833 g and 137 kg 933 g in his turn, from the latter one broke off another one, smaller, weighing 2 kg 350 g. About the finding learned Anton Pokornyi, a forester from Velykyi Bereznyi, who, according to him, bought this fragment from Vasyl Kryvianyk for a couple of oxen and resold it to the Imperial Museum in Vienna, where the meteorite is still located.

Meteorite "Knyahynia", photo by Igor Melika

To celebrate the 150th anniversary of the fall of Europe's largest meteorite "Knyahynia" at the appropriate level Uzhansky NNP has established tourist indicators, a special pedestal with a stone symbolizing the meteorite, a stand with information about the fall of "Knyahynia", as well as gazebos for tourists. In addition, the employees of the National Park have significantly improved 12 kilometers of forest road leading from the village Knyahynia to Chorni Mlaky. If earlier only the military all-terrain vehicle "GAZ-66" could pass here, now it is possible to get to the place of falling of a meteorite with a car.

In the tract "Chorni Mlaky" there is the only small sphagnum swamp on the territory of Uzhansky NNP, with an area of about 0.02 hectares, where you can see typical wetland plants - downy mildew (Eriophorum vaginatum L.), black sedge (Carex nigra), sphagnum moss (Sphagnum). The latter is the cause of the upland swamp in this place; moss reliably retains any atmospheric moisture and itself forms the ecosystem it needs.

In the village there is the Church of the Nativity of the Virgin (1840). In Knyahynia in 1751 year wooden church of St. Nicholas the Wonderworker, which had two bells is mentioned. The modern brick typical basilica church of the Nativity of the Blessed Virgin Mary was built in 1840. A stone cross was erected near the church in 1905. It was built by the inhabitants of three villages - Knyahynia, Domashyn and Strychava, and stones were transported from Kamyanytsia. In 1934

the church was renovated by masters from Velykyi Bereznyi. The last repair and repainting of walls and icons took place in 1987.

Routes of Uzhansky NNP which can be visited without obligatory support:

• village Stuzhitsa - tract "Chorni Mlaky" - village Stuzhitsa

• village Knyahynia - tract "Chorni Mlaky" - Camp "Dubovyi Hay"

Tourist routes and facilities located in the area between the state border and the line of border engineering structures:

• village Knyahynia –Stinka ridge - meteorite Knyahynia - village Knyahynia (village Stuzhytsia).

History itself connects the village of Knyahynia with astronomy. At the present stage, the development of astrotourism in this area is quite possible and necessary, as evidenced by studies of the quality of the night sky. As part of the Carpathian Starry Sky project, measurements of the night sky brightness were performed in the village Knyaginya with the help of an SQM device. The maximum value shown by the device is 21.62 magnitudes per square second of arc. This indicator of the night sky brightness in the village Knyahynia fully satisfies the conditions of entry of the Transcarpathian Dark-Sky Park into the International Association of Dark Sky Parks (IDA), and therefore is optimal for astronomical observations.

From Uzhgorod you can get a regular bus Uzhgorod - Sambir - Lviv (departure from Uzhgorod in 06:15 Kyiv time) with a stop in the village Sil, and from there it is 7 km to the village Knyahynia. You can also get to by Mukachevo - Syanky train with a stop in the village Sil.

For those traveling from Lviv or through Lviv, the shortest route is through Turka, another option - through Uzhgorod (international route Kyiv-Lviv-Chop), and then - the route P - 39 to village Knyahynia. In the village Knyahynia there is a hotel where you can stay for the night, the distance to it from the specified coordinates is 1.5 km.

6. Yavirnyk Mountain

Coordinates: 48°54'56.7"N 22°32'27.6"E
Yavirnyk mountain range in the north-west of Transcarpathia is one of the most popular locations in the Ukrainian Carpathians. Good logistics location, natural landscapes, the presence of tourist shelters and routes, attracts travelers here. The northern slopes of the ridge are located within the Uzhansky National Nature Park. A trip to Yavirnyk gives you the opportunity to see the natural biodiversity of Uzhanska Verkhovyna from the river valley of Uzh to the mountain meadow at the top of the ridge, as well as to join the cultural heritage of the region. The total length of the route is 15.4 km, altitude is 751 m. It is a one-day trip of medium difficulty. Mount Yavirnyk is a 1017-meter peak of the Ukrainian Carpathians, which located within the Polonynsky Beskids. It is located in Uzhhorod district of Transcarpathian region, in the eastern direction from the village Velykyi Bereznyi.
The mountain has the shape of an elongated ridge about 10 kilometers long. The peak is located on the border of the protection zone of Uzhansky National Nature Park. Despite the low height of the ridge, its top is overgrown with alpine grasses, blueberry and raspberry bushes. The slopes of Mount Yavirnyk are mostly covered with beech and maple thickets, partly - coniferous. Northeastern slopes at an altitude 600–800 m are covered with beech virgin, in which individual specimens of trees reach 40–45 m.

Beech virgin reserve - "Yavirnyk" with an area of 100 hectares is located in high-altitude belt of beech forests on the north-western slope of the mountain Yavirnyk (1017 m above sea level) within the altitudes 600 - 750 m asl. It's cool, moist climatic zone, is optimal for the formation of climax beech forests. On flysch rocks made of shales and fine-grained sandstones, powerful gray, mountain-forest brown soils were formed, which ensures high productivity of stands. There has been no anthropogenic impact here for the last century, so the natural state is well preserved. A reserve has been created to protect valuable beech and fir-beech virgin forests on the upper edge of the forest.

Yavirnyk Mountain is a popular object of hiking, both summer and winter. The main routes to Yavirnyk Mountain include climbing from the village Velykyi Bereznyi in the direction of the village of Ruskyi Mochar, then either in the direction of a tourist shelter or to the TV tower.

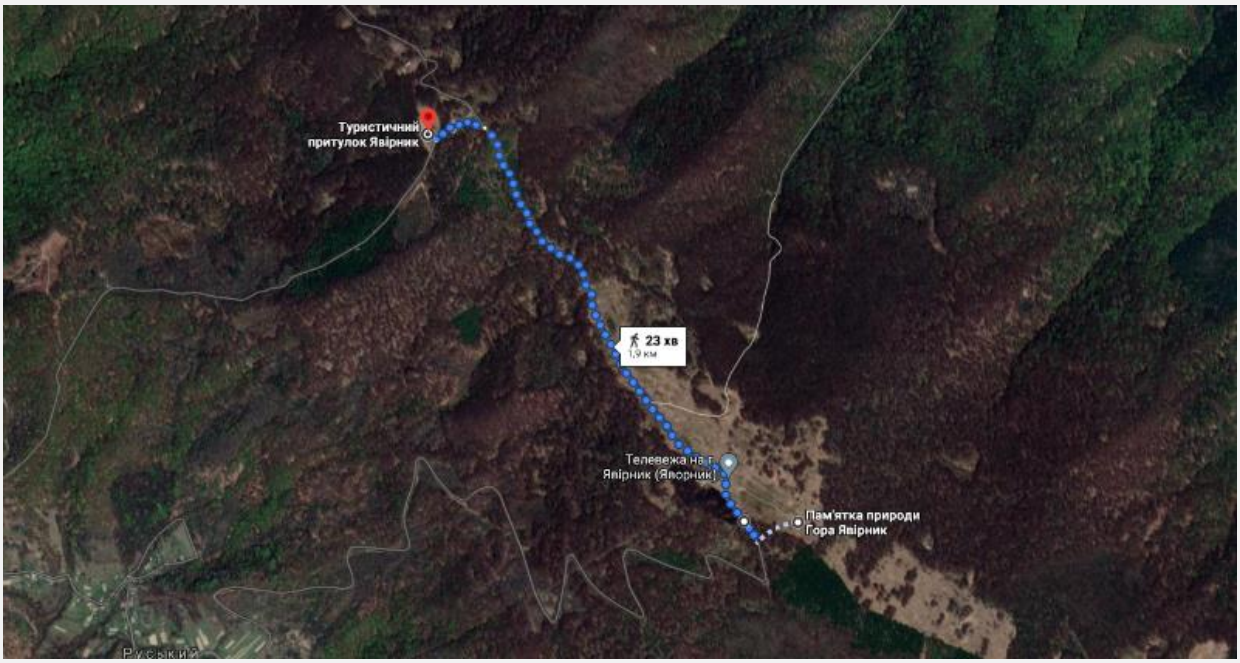
Another route: from the beginning of the village Kostryna. You need to cross the river Uzh, then the trail passes through the field, enters the forest and climbs to the top of Kichera Mountain, turns right to the stream Ternovskyi. Then it runs through the beech forest, all the way to the tourist shelter.

On the slopes of Yavirnyk Mountain, near the village of Rusky Mochar and the village of

Velykyi Bereznyi is located mountain shelter "Yavirnyk" (48.9154181N, 22.5408861E), which can accommodate 25 tourists at a time, has 6 hostel type rooms: 3 doubles, 1 triple, 1 six-bed and 1 ten-bed room. Showers and toilets for public use are in a separate room. There is a place for tents and a large gazebo. In 2015 the shelter was destroyed by fire, but within a few years it was rebuilt by the Carpathian Trails Tourist Association which takes care of it is now.

200 meters north of the shelter is another tourist house (48.9172689N, 22.5399389E). Its owner is Yanko Derevlianyi, an artist and philosopher who builds and arranges a new tourist shelter in Yavirnyk with his own hands. Near the Yanko`s shelter you can see a beech virgin forest, where the trees reach heights of 40-45 m. Also there you can see the giant sycamores that gave the mountain its name.

A new educational and tourist route "Carpathian Starry Path" was created within the framework of the project "Carpathian Starry Sky", which is implemented and co-financed under the Cross-Border Cooperation Program Poland-Belarus Ukraine2014-2020 (project №PLBU.01.02-00-UA-0809/19-00). The tourist route is located on the ridge of Mount Yavirnyk, which begins near the shelter "Yavirnik" and ends with the sign of the highest point of the ridge Yavirnik (1017 m).



The expert on the creation of educational and tourist route justified the choice of this site by a number of its advantages:

1. There are several good observation decks, from which you can see almost the entire starry sky.
2. This tourist route is located near the shelter "Yavirnyk", where there are all necessary conditions for tourists to stop.
3. The route passes along the ridge, from which you can see a beautiful landscape. From there you can see the astronomical observatory on the Kolonitsky saddle near the village of Kolonitsa (Slovakia), as well as the top of the Carpathian Mountains.

The light pollution expert together with the project team measured the brightness of the night sky with the help of an SQM device on this route. The maximum value shown by the device on Mount Yavirnyk is 21.61 magnitudes per square second of arc (for comparison - 19.72 magnitudes per square second of the arc in Uzhhorod).

The new educational and tourist route "Carpathian Starry Path" will help diversify tourist products in the region, as well as promote astrotourism and active recreation.

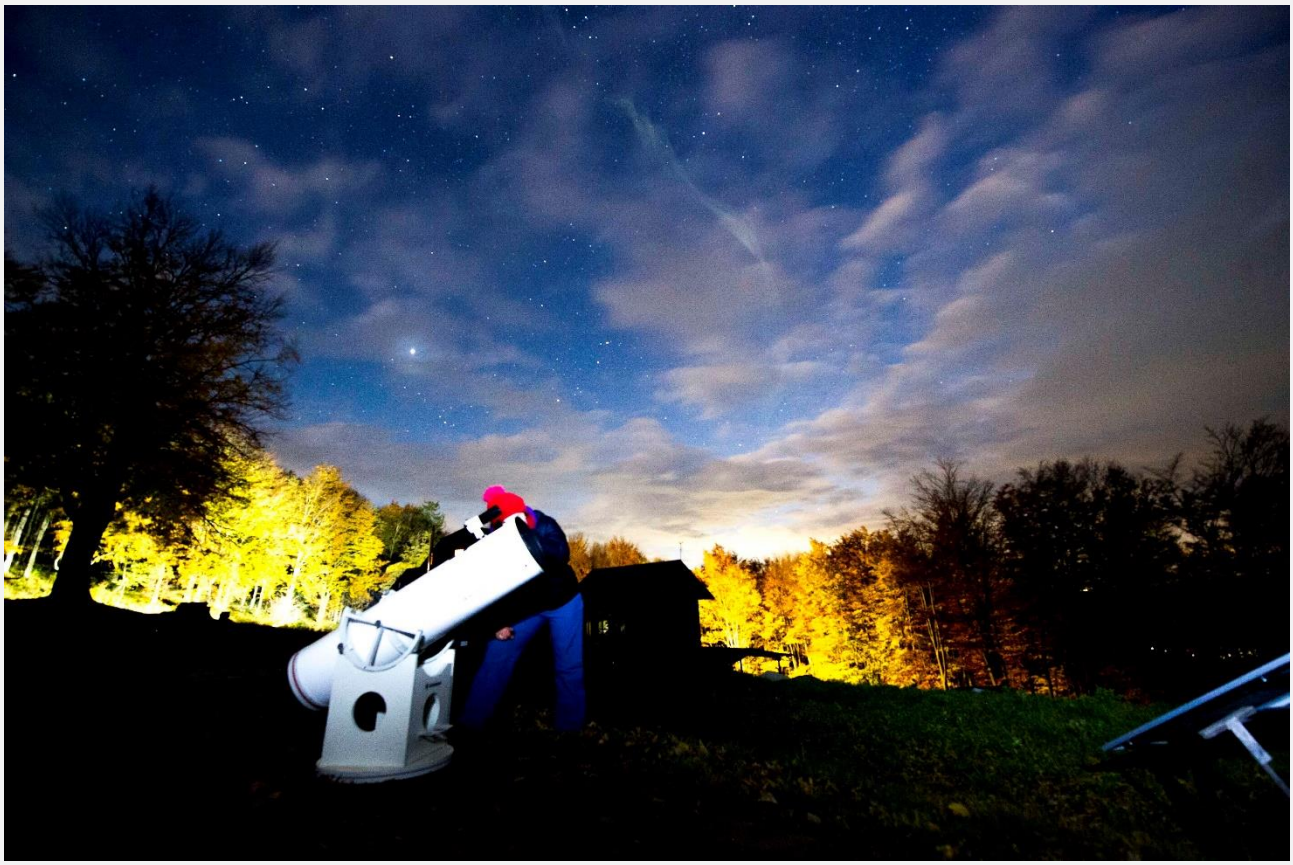
Routes of Uzhansky NNP which can be visited without obligatory support

- village Kostryno - Yavirnyk - village Rusky Mochar

For those who get from Uzhgorod there is a regular bus from Uzhgorod (Bus station

"Uzhgorod-2 ", Fedintsa Street; building 61 or Bus Station "Central", Stantsiyna street; house 2) to the village Velykyi Bereznyi. From Velykyi Bereznyi to Yavirnyk it is 8.6 km.

Photo by: Konstantin Balabanov



7. Cheremkha Mountain

Coordinates: 49°02'01"N 22°40'54.2"E

Автор фото: Костянтин Балабанов

Cheremkha Mountain has historical significance. Cheremkha Mountain is an arena of the First World War (1914-1917). On this mountain were difficult battles between Russian and Austro-Hungarian-German troops. Russian troops under the command of General Brusilov, as a result of a rapid offensive, conquered this height and kept the defense here for about six months. From this mountain the Russian troops in a short time built roads towards the villages of Sianky, Sil, Uzhok. The top of this mountain is a subalpine meadow (Sq.10.7 hectares), which became fraternal grave for many soldiers. Here is the military cemetery of the First World War.

The historical and botanical route village Stavne - mountain Cheremkha - village Lubnia (length 8 km, red mark) passes through the Cheremkha Mountain. The route starts from the village Stavne, from the recreational point. From here we go up, turn left and go up the eastern slope through the forest, where beech, sycamore, sweet cherry grow, white fir and spruce are also found. Of the herbaceous plants here you will find large astrantia, common circa, Petasites albus, Sanicula europaea, Impatiens parviflora, Galeobdolon luteum, Epilobium montanum. Having passed2/3 of the route, we go to the picturesque meadow in the tract "Bagno" (Sq.5.6 hectares), which houses a holiday home. On meadows - a whole range of rare species of plants: snowdrop, carniola scopolia,

belladonna, forest lily, lunaria reviving, bear onion, Platanthera bifolia, Orchis mascula (orchid family). And then, in the meadows, grows a lot of blueberries. After crossing the Antalova tract, we climb the forest to the top of Cheremkha mountain.

From the top you can go down to the village Zagorb or return to the tract "Bagno" and go down to the village Lubnia, where In 1751 the wooden church of St. Nicholas is mentioned with three bells, decorated with local old images and apostles on canvas. According to the schematism 1915, wooden church of St. Nicholas was built in 1778, burned down in 1876, and in that place a wooden chapel was put, which was consecrated in 1876. The place in the cemetery where the church stood is called "Under the Oak", although the oak itself no more exists.

In Stavne there is a typical brick basilica church, built by the efforts of the faithful and the pastor Fr. Victor Popovich, who collected for construction 5 thousand koruns, and dedicated it to Bishop Julius Firtsak August 29, 1906. The bells were bought by the brothers Kornutyaky in 1885-1887. At the same time they bought the Gospel and other books for the church. Big renovation in the middle of the 1980s was conducted by curator Mykhailo Monyak and Ilko Farkash. Then the repairs were done in 1995-1996 by priest I. Dupin, curator V. Lenko, churchman A. Tsinkanych, cashier I. Byrnyak. The iconostasis, made by carvers from Zolotarev, is placed in 1993 and the following year was sanctified. The painting of the walls was done by a local artist O. Varahoba. The vaults were painted in 1996. The altar was renovated in 1998 at the expense of the village local M. Ivanitsa, who lives in the United States and 57 years was not in his native village.

Photo by: Ramesh (Stanislav Shulga)

Routes of Uzhansky NNP which can be visited without obligatory support:

• village Stavne – Cheremkha Mountain - village Lubnia

• village Lubnia - Cheremkha Mountain – Menchul Mountain - village Lubnia

Cheremkha Mountain has not only a rich historical past, but also good conditions for astronomical observations. As part of the Carpathian Starry Sky project, measurements of the night sky brightness were performed on the Cheremkha mountain with the help of an SQM device. The maximum value shown by the device is 21.91 magnitudes per square second of arc. This indicator on Mount Cheremkha fully satisfies the conditions of entry of the Transcarpathian Night Sky Park into the International Association of Dark Sky Parks (IDA), and therefore is optimal for astronomical observations.

If your route starts from Uzhgorod, you can use the suburban train 6519-6520 Mukachevo-Sianky. Current train schedule Uzhhorod - Stavne includes 3 trains that connect these stations, among which are morning and evening trains. The fastest train is recommended, which departs at 20 h 15 min from Uzhhorod station and arrives at Stavne station at 22 h 20 min. You can also find a holiday home in Stavne.

Photo by: Konstantin Balabanov

Photo by: Konstantin Balabanov

Photo by: Konstantin Balabanov

8. Golania Mountain

Coordinates:
48°58'15"N 22°35'50"E

Photo by: Konstantin Balabanov

The start of the route to Golania Mountain is near the village Zhornava. The village Zhornava itself is located in a beautiful valley between the picturesque mountains. However, for a long time no one dared to settle here forever and start farming: the surrounding peaks inspired fear and danger. But once 5 people stopped near the Dubrova tract and lit a fire. These were fugitives from Uzhgorod, who did not like Knyaz Laborets and his order. It seemed that they settled for a short time in this picturesque area, and the inhabitants of the surrounding villages watched as the men tried to make a living. One day the aliens began to zealously carve large stones. After a while, round boulders were visible. Interesting neighbors soon learned that the fugitives were making millstones for the mill. Merchants from the surrounding villages began to visit, seeking to buy a millstone. The fame of the masters spread quite quickly. They sold their products easily, because there were mills in every village. In addition, it was soon said that the best millstones could be bought in this small settlement. Uzhhorod masters got married, started their own businesses, organized something like a workshop. Things settled down, life went on peacefully.

So, from all over, buyers of millstones came to the valley between the mountains. They told everyone that they went to the millstnoners or to Zhornava. Hence the name of the settlements. Zhornava has always been a village where millstones were used not only for mills, but also for all kinds of production and trade. It was here that sawmills and a railway station were built, and later a lumber mill was organized.

Under the canopy of the forest are the fortifications of World War II "Arpad Line", created by Hungarian troops. However, the fighting bypassed them and only in the postwar years they were damaged. The trail climbs a slope among the beech forest in a westerly direction. 2 km from the beginning of the trail route turns south and climbs the serpentine to the top of Golania Mountain.

On the slopes of Golania Mountain is a reserve of green ash. Continuing to move, we reach the very top of Golania Mountain (854m), where is a fairly spacious meadow and

there are only a few beech and spruce trees. Among the herbs of many blueberry bushes are rare species of plants. From the mountain a beautiful landscape opens and you can see the tops of the mountains: in the east - Yavirnyk, Borsuchy, Krasiya, in the north - Kremenets, Ravka, Kanchova. Nearby is the ridge Stinka.

As part of the Carpathian Starry Sky project, measurements of the night sky brightness were performed on Golania Mountain with the help of SQM device. Maximum value which the device showed was 21.60 magnitudes per square second of arc. Such indicator of the night sky brightness on Golania Mountain fully satisfies the conditions for the Transcarpathian Dark-Sky Park to join the International Association of Dark Sky Parks (IDA), and therefore is optimal for astronomical observations.

Routes of Uzhansky NNP which can be visited without obligatory support:

- village Zhornava- Golania Mountain - village Zhornava
- Camp "Dubovyi Hay" - Golania Mountain - village Kostrino.

If the route runs from Uzhgorod, you can use the suburban train 6519-6520 Mukachevo-Sianky. Current train schedule Uzhhorod - Zhornava includes 3 trains that connect these stations, among which are morning and evening trains. The fastest train departures at 20 h 15 min from Uzhhorod station and arrives at Zhornava station at 22 h 04 min. From village Zhornava it is 4.6 km to Golania Mountain. 9.7 km from village Zhornava is the nearest hotel where you can stay overnight.

Photo by: Ramesh (Stanislav Shulga))

9. Termachuv tract

Coordinates: 48°54'36.7"N 22°29'00.4"E

Photo by: Konstantin Balabanov

In winter people ski here, in summer various cultural, sporting and health events are held here. Every resident of Velykyi Bereznyi and the district knows about the Termachuv tract, and not just knows, but enjoys spending time here.

The tract is located just two kilometers from the center of Velykyi Bereznyi. Velykyi Bereznyi is located on the right bank of the river Uzh, at the foot of the mountains. The Uzhhorod-Lviv highway and railway pass through Velykyi Bereznyi.

Velykyi Bereznyi is located on the ethnic territory of Lemko region. The first mention of the settlement, which is named after the birch tree, falls on 1409. At that time the elder Boncha brought the perpetrator to justice for a crime, and he was tried. In the state tax list for 1427 it is said that Velykyi Bereznyi belongs to the possessions Uzhhorod dominion of Counts Drugets.

Due to the opening of the Uzhhorod-Velykyi Bereznyi railway section in 1897 and the construction of the line to Uzhok there is an intensive growth of the population of Velykyi Bereznyi. According to the latest censuses, the population of the village is about 7,100 people.

The village has a park of exotic and relict plants, laid at the end of XIX century. In Velykyi Bereznyi there is an architectural monument - the Church of St. Trinity. Hundreds of

people come to the Termachuv tract every year to watch the stunning jumps of motorcyclists. Motocross competitions in the "Termachuv" tract near Velykyi Bereznyi have already become traditional for Berezny residents and guests of the village.

The „Bereznyanska Bitsiglya" bicycle festival is also held in the Termachuv tract. In 2017, the premiere of this festival was held. Organizers and the participants of the festival hope that cycling competitions will become as good tradition as the annual motocross competition.

Another promising area of tourism development in the Termachuv tract is astrotourism. The tract has many outdoor areas where you can place equipment for astronomical observations, as well as the necessary infrastructure nearby. As part of the Carpathian Starry Sky project, measurements of the night sky brightness were performed in the Termachuv tract with the help of SQM. The maximum value shown by the device was 21.57 magnitudes per square second of arc. This indicator of the night sky brightness in Termachuv tract fully satisfies the conditions of entry of the Transcarpathian Dark-Sky Park into the International Association of Dark Sky Parks (IDA), and is therefore optimal for conducting astronomical observations.

For those who travel from Uzhgorod there is a regular bus from Uzhgorod (Bus station "Uzhgorod-2 ", Fedintsa Street; building 61 or Bus Station "Central", Stantsiyna Street; building 2) to the village of Velykyi Bereznyi. In Termachuv tract there is a cottage where you can stay overnight.

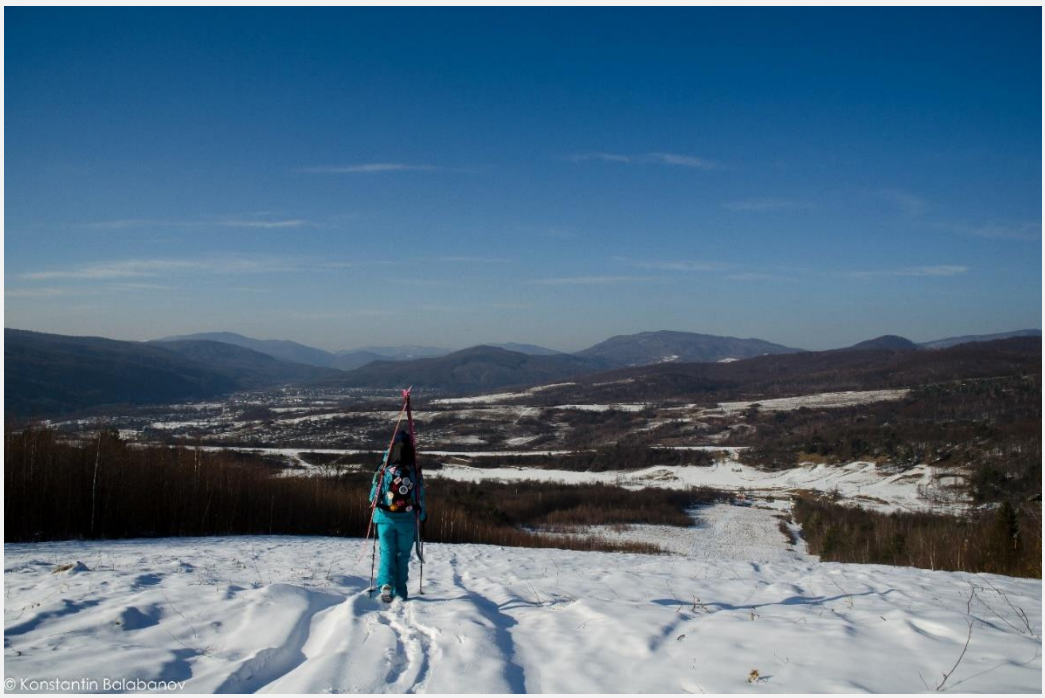


Photo by: Konstantin Balabanov

Photo by: Konstantin Balabanov

Photo by: Ramesh (Stanislav Shulga)

Suggestions of places for nature tourism

The flora of Uzhansky Park has characteristic features of the Eastern Beskids. The relatively low altitude of the mountains and the moderately warm and humid climate affect the formation of vegetation zonation. There are only three phytocoenotic bands, or plant belts: foothills (up to height of 500 m above sea level), lower mountain (forest), which is within the altitudes 500 - 1000 m asl and subalpine (Polonin), located at altitudes above 1100 - 1150 m asl. The upper mountain belt, which is typical for the whole territory of the Eastern Carpathians are formed mainly by coniferous forests, not represented here. The second feature of the vertical zonation is that the vegetation of the valleys was formed here extrazonal, on 100 - 150 m below its phytocenotic strip.
On the territory of the park (Buben Mountain, Prikryi Mountain) there are relict spruce areas (Picea abies), which have survived here since the postglacial period, when beech forests began to displace them. In the subalpine zone on the town of Mala Ravka the remains of the green alder crooked forest have been preserved (Alnus viridis), which is no longer present in the Western Carpathians. On the right bank of the river Uzh near the village of Kostryno a relict center of the sessile oak (Quércus pétraea) was found, which has been preserved from the warm period of the Middle Holocene, and in the vicinity of the village of Kostrynska Roztoka thickets of the Eastern Carpathian endemic - Hungarian lilac (Syringa josikaea) were found. In total, more than 20 rare phytocenoses of the park are included in the Green Book of Ukraine, among which there are many rare, endemic and valuable reference groups that need protection.

On the park area over 3000 hectares unique for the East Europe virgin forests have been preserved. The history of preserving virgin forests in this part of the Carpathians dates back to the Austro-Hungarian Empire, when two reserves were established to protect fir-beech ("Tykhyi") and beech forests ("Yasin"). In the 30s of the past century at the initiative of the famous Czech forester Professor Alantois Zlatnik, these reserves were expanded and a new one was created on the slopes of Mount Javirnik, where he conducted research to study the patterns of virgin forest ecosystems. Subsequently, these reserves, as well as other remnants of virgin forests in the upper reaches of the Uzh became part of the Uzhansky NNP. The virgin forests on the slopes of Mount Kremenets (formerly the „Yasin” Reserve), located along the border with Slovakia, in 2007 obtained international status as "Stuzhitsa" integral part of UNESCO heritage site "Beech virgin forests of the Carpathians". The virgin ecosystems are included in the protected core of the park and are protected as a unique natural phenomenon.

1. Cheremkha Mountain

Coordinates: 49°02'01"N 22°40'54.2"E

Refers to Stuzhytsky forestry, area is 100 hectares. Cheremkha Mountain is a historical and botanical object (1130 m). Since the First World War, when the fighting took place here, a military cemetery was preserved. The surrounding slopes are covered with subalpine meadows and beech forest. There is a rich group of subalpine species, numbering about 30 plants. They usually common in mountain meadows and rocky outcrops at altitudes above 1000 m a.s.l., but sometimes go down the streams and a little lower into the forest belt. Among the most interesting of them, which deserve local protection, are monk's-rhubarb (Rumex alpinus),mountain-ash (Sorbus aucupariasubsp. Glabrata),Epilobium alpestre, Adenostyles alliariae, alpine cicerbit (Cicerbita alpina), Solidago virgaureasubsp. Alpestris, white hellebore (Veratrum album), Calamagrostis villosa,buttercup (Ranunculus platanifolius), Melampyrum saxosum. In the lower part of the mountain slope, rare beeches are formed, dominated by the grass-shrub tier of Festuca altissima.

Antalova tract is a botanical reserve. Characteristic such species as the fragrant orchid (Gymnadenia conopsea), several species of orchids: early-purple orchid (Orchis mascula), lesser butterfly-orchid (Platanthera bifolia).The forest consists of such species like beech (Fagus sylvatica), sycamore (Acer pseudoplatanus), European spruce is also found (Picea abies) and silver fir (Abies alba). Among herbaceous plants you can find great masterwort (Astrantia major), broad-leaved enchanter's nightshade (Circaea lutetiana), white butterbur (Petasites albus), wood sanicle (Sanícula europaea), small balsam (Impatiens parviflora),belladonna (Atropa belladonna),forest lily(Lilium martagon), perennial honesty (Lunaria rediviva), straw foxglove (Digitalis lutea), European blueberry (Vaccinium myrtillus) etc.

- early-purple orchid (Orchis mascula). Orchidaceae.

Conservation status of the species: Vulnerabl

2.Botanical and Geological Reserve "Stinka"

(Kostrynske forestry, 133 hectares).

Coordinates: 48°59'56.1"N 22°31'29.6"E

Created to protect the rare species of plants listed in the Red Book, populations of which have survived on limestone rocks. Among them are beard of Jupiter (Jovibarba hirta), oblong woodsia (Woodsia ilvensis), arrow-jointed broom (Genistella sagittalis), Festuca saxatilis, Conioselinum vaginatum, Lathyrus laevigatus etc.

• beard of Jupiter (Jovibarba hirta), belongs to Crassulaceae.

Conservation status of the species: Rare.

Scientific significance: Carpathian endemic species.

Habitat conditions: Upper forest and subalpine belts. Grows among of limestone outcrops on shelves, in cracks in rocks, among gravelly rubble, on steep slopes (20–50 °) southeast and south-west expositions. Obligatory calcephile, succulent.

General biomorphological characteristics:Hamefit. Perennial herb plant 20-30 cm tall with a basal rosette of star-deployed thick leaves. Stem strong, protruding-hairy. Inflorescence is many-flowered, dense. Petals are 15-18 mm long, greenish-yellow, linear-elliptical. Stamens by third shorter than the petals. It blooms in July - August. Fruits in August-September. Propagated by seeds and vegetatively. There is one known location in the tract Stinka.

• oblong woodsia (Woodsia ilvensis) belongs to Woodsiaceae.

Conservation status of the species: Disappearing.

Scientific significance: Relict holarctic species.

Habitat conditions: In slightly shaded crevices of rocks formed by acid breeds. Mesophyte, chasmophyte, acidophile.

General biomorphological characteristics: Perennial herbaceous plant up to 20 cm tall. Forms a rosette of wai, departing from the short rhizome. Vaya plate with elongated ovate segments of the first order, with 3-7 pairs of lateral blades, narrowed to the top. Petiole and plate densely pubescent with brown scales and articulated hairs. Sporades in July - September. Propagated by spores. There is one known location in the tract Stinka on the rocks.

•Festuca saxatilis, belongs to Poaceae (Gramineae).

Conservation status of the species: Unrated. Scientific significance:A rare species of the eastern and southern Carpathians. Number and structure of populations:It grows as separate turf on rocks and forms groups in the highlands, occupying areas from20 to 300 m2. Reasons for changes in numbers:In the highlands - overgrazing and trampling, and on the limestone rocks in the middle mountains - shading due to overgrowing of rocks

with shrubs and trees. Habitat conditions:In the subalpine belt at altitude 1400–1800 m asl. On south-east and south-west slopes of limestone and andesite rocks, on scree, carbonate-rich sandstones, gravelly low-power soils, mesoxerophyte.

General biomorphological characteristics: Perennial dense turf cereal 25–40 cm tall. Leaves are gray-green, 15-30 cm long (from 1/2 height stems to the panicle), almost naked on the outside. The panicle is not dense,5-8 cm long, axis and twigs smooth, rarely rough. Spikelets are 3-5-flowered. Blooms in June– July, bears fruit in July-August. Propagated by seeds. A well-known location in the tract of Maikova Luka on Stinka Mountain.

3.„Chorni Mlaky” Botanical and Geomorphological Reserve

(Kostrynske forestry, 10 hectares).
Coordinates: 49°00'30.9"N 22°33'20.1"E

In this area in 1866 fell the so-called meteorite Kniahynia - one of the largest in Europe. Its fragments were found all around the village Kniahynia, but the largest stone with weight of 279,766 kg was found in Chorni Mlaky. In Chorni Mlaky tract there is upper sphagnum swamp, the only one small swamp on the territory of Uzhansky NNP, with an area of about 0.02 ha, where you can see typical marsh plants - Eriophorum vaginatum L., Carex nigra, peat moss (Sphagnum). The latter is the cause of this place being the upper swamp; moss reliably retains any atmospheric moisture and forms the ecosystem it needs by itself.

In addition to swamp species in the tract there is a large number of meadow plants: ragwort (Senecio jacobaea), Gladiolus imbricatus, oregano (Oregano vulgare), Achyrophorus uniflorus, white hellebore (Veratrum album), hawkweed (Hieracium). Among the Red Book species: autumn lady's-tresses (Spiranthes spiralis), lesser butterfly-orchid (Platanthera bifolia), martagon lily (Lilium martagon).

4. Yavirnyk Mountain

(Kostrynske forestry, 121.8 ha)

Coordinates: 48°54'56.7"N 22°32'27.6"E

Beech virgin reserve "Yavirnyk" with area 100 hectares is located in high-altitude belt of beech forests on the north-western slope of the mountain Yavirnyk (1017 m above sea level) within the altitudes 600 - 750 m asl. It's cool, moist climatic zone, is optimal for the formation of climax beech forests. On flysch rocks made of shales and fine-grained sandstones, powerful gray, mountain-forest brown soils were formed, which ensures high productivity of trees. There has been no anthropogenic impact here for the last century, so the natural state of beeches is well preserved. A reserve has been created to protect valuable beech and fir-beech virgin forests on the upper edge of the forest.

Optimal for beech growth is a strip of pure beech forests, where it forms multi-tiered stands with single specimens of sycamore, maple, ash, mountain elm. Beech, due to the shade tolerance, forms mostly pure or almost pure climacteric groups. Only in less favorable climatic conditions - on the border with the belts of oak and spruce forests, as well as in extreme edaphic conditions (rocky soils, steep slopes), it forms mixed stands.

With altitude, the conditions for beech growth deteriorate (soil fertility decreases, their graveliness increases, and the climate becomes cooler). Above the border of beech forests, a high belt of fir-beech and beech-fir forests is formed (Abieto-Fagetum, Fageto-Abietum). Due to felling fir, these mixed forests gradually transformed into monodominant beeches. Polydominant fir-beech forests occur in fragments in Uzhansky NNP (Yavirnyk).

Array "Yavirnyk" (1021 m asl), located in the middle part of the Uzh basin between the Gola Obruch and Solyanskyi Potok ridges, is interesting for study of natural forests, on the mountain slopes of which mono- and polydominant beeches have zonal distribution. A. Zlatnik (1932) planned to conduct here in the framework of Institute of forest economy a long-term stationary research study of the coenotic structure of natural forests and the soil-forming process in them.

To this end, he proposed to create a virgin forest reserve in Yavirnyk 130.2 ha, for which two areas were selected - on the ridge of Gola Obruch (37.3 ha) and in the upper reaches of the Solyanskyi stream (92.9 ha). There were performed stationary phytocoenotic, taxonomic studies, the results of which are published in 1938 monograph on the virgin forests of Transcarpathia.

The greatest value has beech-maple virgin with admixtures of sycamore (Acer pseudoplatanus), elm (Ulmus) and ash (Fraxinus) over 160-200 years of age.

5. Golania Mountain

(Zhornavske forestry,89.4 ha).

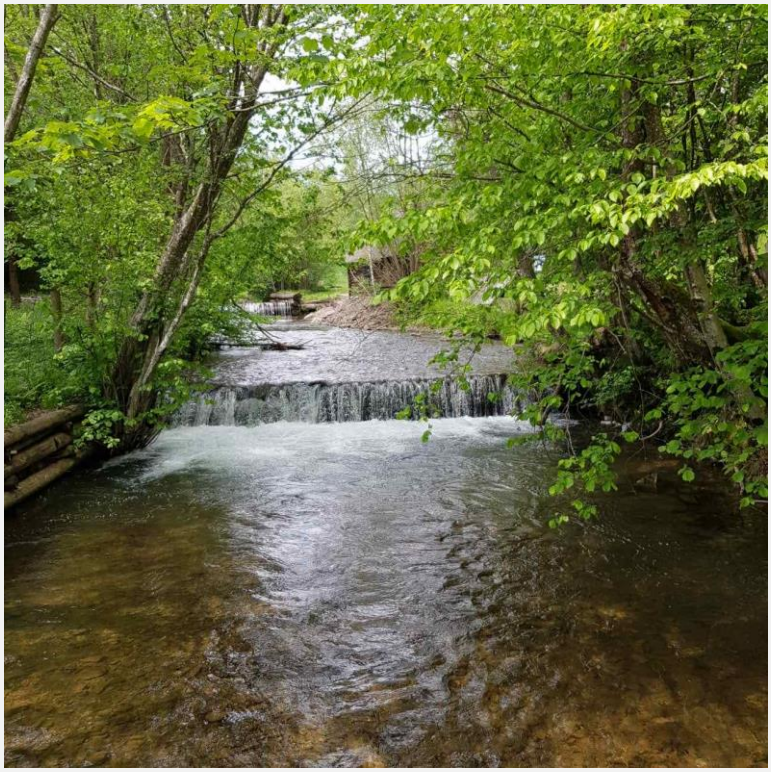
Coordinates: 48°58'15"N 22°35'50"E

Remains of beech, cherry-beech, ash-beech and fir-beech virgin forests, which have a reference value, have been preserved here. Golania Mountain (854 m n.r..m.) is the place of growth of henbane bell (Scopolia carniolica Jacq) - a tertiary period relic. At the top of the mountain is a fairly spacious meadow, where you can see such species as: peach-leaved bellflower (Campanula persicifolia), clustered bellflower (Campanula glomerata), ox-eye daisy (Leucanthemum vulgare), common kidneyvetch (Anthyllis vulneraria), maiden pink (Dianthus deltoides), martagon lily (Lilium martagon).

On the slopes of Golania a green ash reserve is located (Fraxinus viridi). Some of the species listed in the third edition of The Red Book of Ukraine are found here: Traunsteiner globe, narrow-leaved helleborine (Cephalanthera longifolia), early spring orchis (Orchis signifera), European scopolia (Scopolia carniolica), Lathyrus laevigatus.

At the top of the mountain there is a large meadow, where you can see such species as: Campanula persicifolia, Campanula glomerata, Leucanthemum vulgare, Anthyllis vulneraria, Lilium martagon.

6. Kremenets Mountain and a forest natural monument of national importance "Stuzhytsia"



(Stuzhytsia forestry, 92 ha)

Coordinates of Kremenets Mountain: 49°05'16.6"N 22°33'56.7"E
Coordinates of the Stuzhytsia reserve: 49°01'48.6"N 22°35'28.1"E

Mount Kremenets is unique in terms of geographical location: the south-eastern slopes of the mountain lie on the territory of Ukraine, the northern slopes - on the territory of Poland, the south-western - in Slovakia. The national natural parks of these states border here

In 1912, in order to preserve and study the zonally distributed in the Carpathians beech and fir-beech virgin forests, a reserve "Stuzhytsia" was created on the square 331.8 hectares, which included the remains of virgin forest systems. Today they are preserved in a limited area and serve as natural eco-models for sound sustainable forestry.

The reserve is located in the area of beech and fir-beech forests within the altitudes 500 - 1200 m asl and covers the natural forests from the slope of Yasen Mountain in the upper reaches of Bystryanskyi and Kamyanistyi streams up to the upper border of the forest on Kremenets Mountain (1221 m asl). Indigenous beech and fir-beech forests with admixtures of maple, ash and elm are typical of the Eastern Beskids. The upper limit of the forest is represented by beech forest, the total area of which is about 55 ha.

Some of the Red Book plants can be found here: Asonitum lasiocarpum, northern firmoss (Huperzia selago), common twayblade (Listera ovata), Pseudorchis albida and others.

Fauna

The relative preservation of forest landscapes in the park and low population contributes to the spread of predators (more than 40 species). Mammals live here: brown bear (Ursus arctos), deer (Cervus elaphus), wild boar (Sus scrofa), wild cat (Felis sylvestris), lynx (Felis lynx), wolf (Canis lupus), marten forest (Martes martes), badger (Meles meles), Eurasian otter (Lutra lutra), alpine shrew (Sorex alpinus). The rare species of avifauna are also represented: the golden eagle (Aquila chrysaetos), Ural owl (Strix uralensis), Aguila longa,

A. pomarina, short-toed snake eagle (Circaetus gallius), Eurasian three-toed woodpecker (Picoides tridactylus), black stork (Ciconia nigra). Among amphibians and reptiles common are Carpathian newt (Triturus montadoni), Salamandra salamandra, agile frog (Rana dalmatina), Aesculapian snake (Elaphe longissima).


Екологічна стежка "Праліси Стужиці"
The ecological path "Virgin Forests of Stuzhytsya"
Зупинки екологічної стежки "Праліси Стужиці"

Additional information

Important contacts

Association for Innovation and Technology Transfer "Horizons", Rzeszow
horyzonty@man.rzeszow.pl, phone: +48 69 760 26 08

Institute of Development of Carpathian Region, Uzhhorod

http://www.idcr.info , phone: +380 (50) 141 17 21

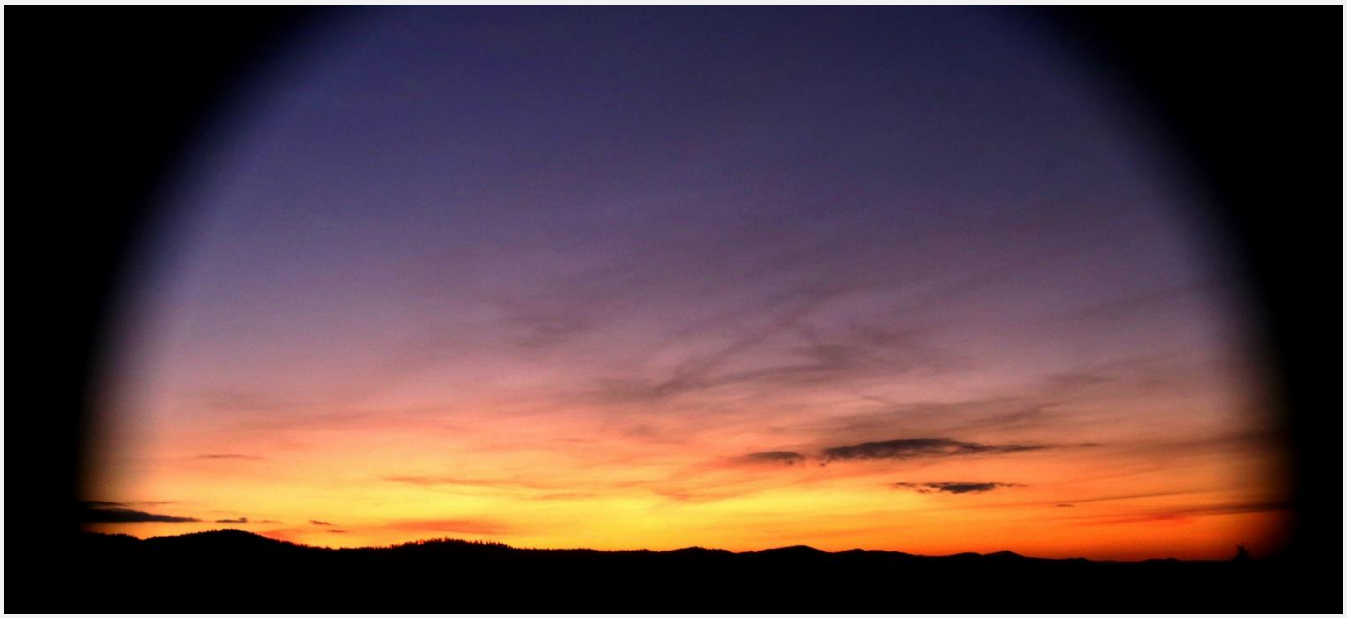
School Astronomical Observatory in Lesko - http://www.lo.lesko.pl/

Otrytska Astronomical Observatory at the Sociologist's House Hostel in Otrytsia.

https://www.otryt.bieszczady.pl/

Astronomical Observatory on the Kolonice Pass (Slovakia)

www.astrokolonica.sk/



Artificial light pollution

Light pollution is the sum of the harmful effects of artificial lighting on the environment. The source of this pollution is man-made light for artificial lighting of night darkness, and, above all, light that shines not where it is needed (for the road or sidewalk), but shines in the sky, in the woods or in the windows of houses.

It adversely affects humans, animals and plants. In humans, it causes a loss of synchronization of circadian rhythms of the body, which leads to insomnia, fatigue, stress and neurosis, headaches and more. This can increase the incidence of cancer, high blood pressure, diabetes, obesity and gallstones. Due to the lack of natural darkness, birds, insects, reptiles and amphibians suffer the most. Light pollution disrupts existing ecosystems and their internal connections.

Unnecessary night light also deprives us of our cultural and natural heritage, which is the night sky full of stars.

"Future generations have the right to an untouched Earth, including the right to a clear sky. The dark sky is the cultural, scientific and environmental heritage of mankind."

UNESCO International Declaration (Tenerife, 1994, La Palma, 2007)

Information sources

«Carpathian Starry Sky» project
https://carpathiansky.com/ (UA, PL and EN versions)

http://www.horyzonty.man.rzeszow.pl/kgn-opis.html (PL version)
These pages also contain electronic publications of the project, promotional films, photo galleries documenting the project activities, etc.

Bieszczady Starry Sky Park: www.gwiezdnebieszczady.pl

Poloniny Dark-Sky Park (Park tmavej oblohy Poloniny) Slovakia:

https://pl-pl.facebook.com/poloninydsp/

cs.wikipedia.org/wiki/Park_tmavé_oblohy_Poloniny

Bieszczady National Park: www.bdpn.pl

Uzhanskyi National Nature Park: https://unpp.uz.ua/

International Dark Sky Association: www.darksky.org