

The Biebrza National Park protects the biggest and the best preserved in the European Union complex of peatland of marshy, lowland river valley. It covers 59 223 ha, and it is the largest national park in Poland. The very unique diversity of plant and animal species and almost natural ecosystems managed to survive in the Biebrza River valley. Here 280 species of birds have been recorded; among them 178 breed in the Biebrza wetlands. 48 mammal species with the biggest population of Elk (about 600 individuals) in Poland as well as more than 1000 vascular plants species have been observed in the area. Any region in Poland has larger population of Lady's Slipper orchid.



It is an important breeding, feeding and stop over site for many waterfowl and wetland birds. According to Bird Life International, it is the birds' refuge of global significance. The Biebrza National Park was added to the RAMSAR Convention list in 1995, as one of the most important world wetland sites. The Biebrza Valley was also incorporated into the European Ecological Natura 2000 Network, which protects the most valuable nature ecosystems in the European Union. As the result many species of flora and fauna including: birds - Spotted Eagle, Black Grouse, Great Snipe, Aquatic Warbler, mammals - Beaver, Otter, Wolf as well as plants - Fen Orchid, Marsh Saxifrage and Eastern Pasque Flower are particularly protected at the Biebrza River.



Warsaw University
of Life Sciences

Biebrza National Park

Institute for Land Reclamation
and Grassland Farming
in Falenty

Mammal Research Institute
of Polish Academy of Sciences
in Białowieża

Norwegian Institute
for Agricultural
and Environmental Research

Centre for Ecological Research
of Polish Academy of Sciences
in Łomianki

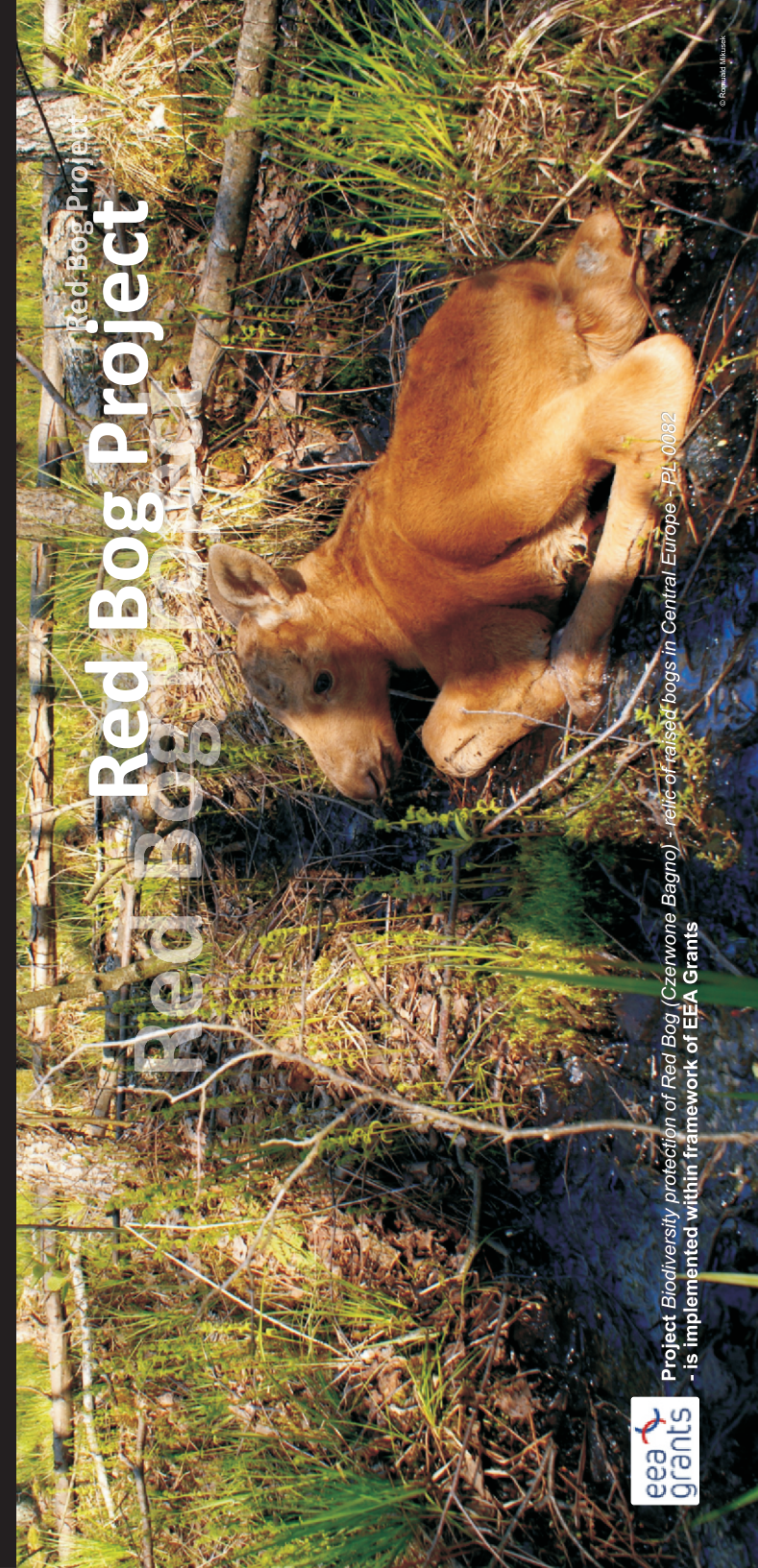
University of Wrocław

University of Antwerp

Utrecht University

<http://redbog.sggw.pl>

All photographs courtesy of Romuald Mikusek and Piotr Talałaj



Red Bog Project
Project Biodiversity protection of Red Bog (Czerwone Bagno) - relic of raised bogs in Central Europe - PL-0082
- is implemented within framework of EEA Grants



The **Red Bog** reserve is the second biggest raised bog in Poland with regard to its area and probably the only big bog of this type preserved in natural state in the entire country. Due to wide-spread endanger of wetland habitats by eutrophication and drying up, investigation of ecological relationships on the relatively little transformed sites is getting a lot of importance and causes that the Red Bog is area of unique value on the European scale.



© Romuald Mikusek

Regardless of non-questionable nature value and primary assessment and analysis of the scientific research results conducted in this area, the Red Bog reserve is not yet scientifically documented and mapped in methodological way. Moreover, we are not able to ascertain, how stabile is this unique system (considerable development of Alder buckthorn (*Frangula alnus*) and pine forest may indicate some significant changes in water recharge mechanism of the bog). Therefore, the **direct aim** of the project is the recognition of ecological relationships that decide about biodiversity of raised and transitional bogs. Description of relationships between water and soil (including soil-forming processes) conditions and plant communities and relationships between ungulates herbivorous and large predators will enable for formulating of raised and transitional bogs protection and restoration principles. At the European scale, elaboration of efficient restoration and protection methods of raised bogs priority habitats of EU is the need of the moment.

Proposed activities of the project implementation cover three main themes: (1) recognition and documentation of existing state of the system, (2) formulation of protection strategy, (3) study on ecological relations. Those tasks will be implemented by seven research teams which are specialized in the following fields: hydrology and hydrogeology, meteorology, hydrogenic sites and peat soils, botany - forest and non forest plants, mammals, birds and insects. The additional team will be responsible for GIS and data bases documentation.



© Romuald Mikusek

Project goals

Biebrza National Park harbours a unique in Poland community of ungulates, dominated by moose. The Red Bog has been the only place, where the relic Central-European population of moose survived the 20th-century decline in numbers. However, the ongoing expansion of red deer into BNP may influence moose population by interspecific competition. On the other hand, predation by wolves, which prefer hunting for red deer, may release that competition.

The aim of the study is to find out, whether selective predation by wolves on red deer effectively lowers its share in the ungulate community of Biebrza National Park, and thus promotes biodiversity of the local ungulate community.

The main methods include censuses of ungulates and wolves, search for prey remains and scats of wolves for diet analysis, and year-round recording of ungulate carcasses. The study has been conducted by the team of ecologists from Mammal Research Institute, Polish Academy of Sciences in Białowieża in cooperation with the staff of Biebrza National Park.

One of the project goals is to gain the impression of habitat and soil conditions, occurring in Red Bog area during particular Holocene climatic phases. The abiotic conditions will be assessed indirectly by the character and requirements of relevant fossil peat forming plant communities identified based on an analysis of the peat botanical composition. For the peat deposits of the deepest part of the Red Bog, located in the centre of the mire, the pollen and spore analysis will be carried out. An absolute age of the organic material will be defined by radiocarbon method C^{14} . Particular attention will be given to the peat upper layer due to assessment of possible significant changes in peat accumulation during last few centuries, so during days when human seriously start to interfere with natural environment of Biebrza valley.

Planned soil research, among the other, should give an answer to the question: what kinds of soil processes currently predominate in Red Bog area and what is their intensity? Apart from mentioned above issues, the physico-hydrological soil properties will be measured to define retention-infiltration balance and soil ability to provide plants with sufficient water volume. Chemical soil analysis will be carried out in the scope enabling to assess nutrients availability.

The Red Bog area as strict reserve is closed for visitors. This special status of the area has imposed on researcher an additional task of key results dissemination in ordered and easily accessible way. To achieve this task, within the Project framework, a dedicated information system will be launched. The system is based on entering the monitoring results directly in the field in a digital way and their automatic transfer into internet databases. An implementation of such system shall significantly reduce a number of wrong measurements and restrict to minimum time needed for data processing. Additionally, after the Project will terminate, the employees of BNP, trained in the course of the Project, will be able to use and modify the system for the new tasks. Highly advanced GPS receivers are one of the system core elements. They are adjusted to work in extremely difficult weather conditions and under the forest canopy, equipped in audio and video recorders, which makes range of possible collected data much wider. Expected high data integrity should accelerate scientific analysis of this unique area.

Wetlands are of great importance as carbon sink, but also as a source for CH_4 emissions.

The objective of this part of the project is to monitor CH_4 emission in relation to influencing factors as peat properties, temperature, moisture and red-ox condition. The study will be carried out at four sites representing the prevailing vegetation types of the Red bog. Gas samples will be taken from dark plastic chambers; three chambers per site. About 20 campaigns for gas sampling have been planned for the project period. For each campaign, three gas samples will be taken from each chamber, after 0, 10 and 30 minutes. The CH_4 concentration will be analysed in laboratory by gas chromatography.

Project Red Bog

Ornithological research of the Red Bog conducted within the Project includes:

- counts of the breeding birds at 4 selected study plots these will be the first data ever on densities of common bird species in the different habitats of the Red Bog;
- bird counts along the permanent transects collected data will be used for determining dynamics of bird communities in annual cycle;
- penetration of the entire strict reserve area aiming to determine number of rare breeding species, including evening and night owl's listening;
- radiotelemetric research of the selected species.

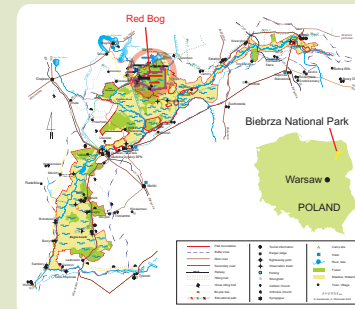
Uniqueness of wetland habitats of the Red Bog strict reserve causes that many of rare, often endangered by extinction, bird species are nesting there. It is already known that the Red Bog area is valuable refuge for White-backed Woodpecker (*Dendrocopos leucotos*), also Spotted Eagle (*Aquila clanga*) and Eagle Owl (*Bubo bubo*) are nesting here. Whereas Crane (*Grus grus*) reaches peak densities in wet deciduous bushes and forests. Abundance of old pines hollowed out by Black Woodpeckers (*Dryocopus martius*) are used, among other, by Tawny Owl (*Strix aluco*) and Stock Pigeon (*Columba oenas*). On the waste areas covered by low birch shrubs, systematically grazed by elks, Red-backed Shrike (*Lanius collurio*), Barred Warbler (*Sylvia nisoria*) and Common Snipe (*Gallinago gallinago*) are nesting in large numbers.

Vegetation pattern of the Red Bog reflects zonal, roughly concentric, arrangement of mire habitats. The outer fen zone, characterised by groundwater feeding, is occupied by alder woods, willow and dwarf birch communities and sedge beds. The next zone, with mixed ground- and rainwater feeding, is covered with birch and pine swamp forests. Typical bog pine woods are localised in the central, most elevated part, with predominance of rainwater feeding. One on the main aims of the project is verification of the ecophysiological basis of this vegetation zonation, both in reference to plant communities and to ranges of occurrence of particular plant species.

The uniqueness of Red Bog's vegetation is in particular due to its strict protection for the 80 years. There is no comparable peatland landscapes in Central Europe, in which natural vegetation zonation has not been disturbed by some sort of management. Therefore, the Red Bog is particularly valuable reference area, an analysis of which can help to understand processes occurring in other peatlands. Investigations of plant remnants preserved in peat will be basis for describing the development of the peatland and understanding succession of plant communities. On the other hand, an assessment of vegetation dynamics and its changes during several last decades, on the basis of present recognition and historical materials, should allow for estimating the impact of regional processes (especially hydrological changes) as well as global ones (e.g. climate changes) on the mire ecosystem. Another research problem is the assessment of the impact of large herbivores, especially elk, on vegetation structure in Red Bog.

Hydrological and hydrogeological research is conducted in two directions: an identification of the hydrological situation and water feeding system; and, characteristics of general hydrological relations that forms moisture conditions of the Red Bog area.

Currently, a hydrogeological research is performed on identification of hydrogeology of the area. Dozen of drillings and soil soundings are done for determination of the depth of peat and type of the soil layer below the peat. In the characteristic locations selected on hydrogeological research results, the piezometers are installed. They are equipped with the Diver sensor, a tool for measurement and collecting data on groundwater level changes in time. The measuring program is scheduled for two years of observation. Obtained data will allow for characterizing the dynamic of the moisture condition of the Red Bog area in this period. The entire conducted investigations shall enable an explanation of the dynamic and magnitude of the groundwater feeding of the Red Bog area. Additionally, the water samples are collected from the installed piezometers for quality water analyses.



The Red Bog strict protection zone

It is one of the oldest and the most famous protected area in Poland. It is probably named after red colour of water observed between tussocks of sedge and moss. The Red Bog forest reserve was established in 1925 with the area of 2.179 ha. According to prof. Władysław Szafer (1932) "the bog pine forest with transition to the birch forest" covered the area. Its aim was to protect the one of the last Elk (*Alces alces*) refuge in Poland. It is a spot where Elk, in number of several individuals, survived the World War II. Thoughtful care allowed successful rebuilding of Polish population of that species.

This reserve, with adjoining Grzędy reserve, were made into one nature reserve with the total area of about 12,000 ha and was named Red Bog (Czerwone Bagno) in 1981. It become part of the Biebrza National Park, in the year of establishment (1993).

The Red Bog strict protection zone covers about 3000 ha according to the data from 2007. Only indispensable scientific researches are carried out here. Neither the economic activities nor the tourist traffic take place in the zone. Nevertheless, the educational trail along the boardwalk leading to the observation platform allows seeing fragments of this precious area.



© Piotr Talaaj

<http://redbog.sggw.pl>

