IOŚ-PIB Environmental Protection and Natural Resources
Ochrona Środowiska i Zasobów Naturalnych
sciendo Vol. 30 No 1(79): 11-18
DOI 10.2478/oszn-2019-0003

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Database "Protected areas in Poland" and possibilities of its use in education and raising environmental awareness of the society

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Keywords:
protected areas, forms of nature conservation, national park, landscape park, nature reserve, protected landscape area, data resources, nature conservation, education

Abstract
The article focuses on the presentation of database "Protected areas in Poland," complete with information resources and available options for data collecting, storing, sharing, and searching. Possibilities for using the database as a tool for ecological education of young people were presented. Utility of the database was discussed as a comprehensive source of information for other social groups and representatives of professions that deal with environmental resources and their management.

1. INTRODUCTION

Poland is a country where, despite the pressure of economic activities, the wealth of natural environment is still significant. This is not only due to the considerable diversity of landscapes and other natural assets, but also the result of many years of efforts undertaken to develop the legal basis for nature conservation and to build a coherent system of protected areas covering the whole country. The present system of protected areas in Poland is rich and includes various conservation forms, differing in rank and protection regime. The principles underlying this system include maintaining spatial connectivity of all areas, surrounding areas of higher conservation status with those of lower rank, and linking protected areas by ecological corridors.

Information on protected areas in Poland has been for many years gathered by the Nature Conservation Department of the Institute of Environmental Protection—National Research Institute (IOS-PIB), based on the results of numerous scientific and research works related to this field of environmental protection. Over the years, a large amount of information on protected areas has been collected. Starting in 1998, the information has been organized, verified, and introduced into the database structures. This resulted in the present database "Protected Areas in Poland," which constitutes a comprehensive source of information about designated areas and protection forms in Poland and an important element of the Polish geoinformation resources.

At the same time, it should be noted that, regrettably, the level of knowledge about valuable natural areas protected in Poland, their values, and benefits they provide to people is highly insufficient among the society. This is even more puzzling given the fact that protected areas are important components of our little "homelands," whereas their presence confers upon a region both a rank and a distinctive climate and facilitates its identification locally and nationally. Therefore, a continuous public education is necessary, especially that focusing on younger generation, in order to consolidate the awareness that protecting the immediate environment serves primarily the people themselves [Rąkowski G. et al. 2018].

2. DATABASE "PROTECTED AREAS IN POLAND," STRUCTURE AND DATA RESOURCES, TECHNICAL DATA

The database "Protected areas in Poland" is a project carried out at the Nature Conservation Department of IOS-PIB. As a result of the regularly conducted, multiannual work, a modern and user-friendly tool has been created, which enables collection, presentation, and processing of data on protected areas in Poland. The Internet browser

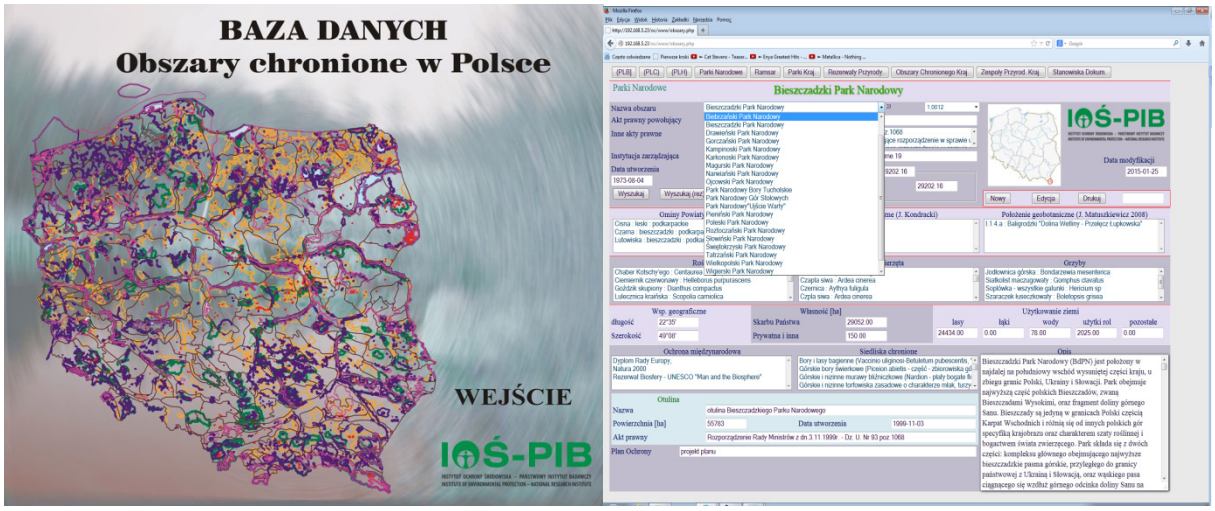

Diagram 1. Content of the descriptive database: view of the home page and presentation of descriptive data *(Source: IOS-PIB database Protected areas in Poland)*

coupled with the database, which operates at the IOS-PIB website, makes it possible to share the collected data with a wider range of users and provides a great educational tool, allowing people interested in nature to broaden their knowledge about protected areas in Poland.

Continuous development of the protected area network in Poland requires a systematic update of information on all forms of nature protection emerging in the country. An efficient system of gathering and processing information on the nature, adjusted to international requirements and standards, both technical and substantive, has become compulsory following Poland's accession to the European Union and the adoption of obligations concerning the observation of EU laws and providing access to information [Walczak 2012, Walczak 2013, Walczak 2015].

The database content has been substantially extended in recent years because of modernization, validation, and updation as well as enrichment with valuable data on natural assets (M. Walczak, sources: IOŚ-PIB publications on protected areas in Poland). It has also been technically modernized (author: M. Leszczyński). At the beginning of 2017, a new database interface was developed and installed at the IOS-PIB website, thanks to which a wealth of data about protected areas in Poland, collected over the years, has been rendered available to a wide audience (http://ios.edu.pl/bazy_danych/obszary-chronione/).

a. Base structure

Currently, the database "Protected areas in Poland" has two interfaces:

- The interface for entering and searching data available on the IOS-PIB server, only for the institute's employees
- The Internet interface placed on the IOS-PIB website, available to the public, developed for the purpose of presenting, browsing, and searching data on protected areas

Data resources function as two interconnected bases, the graphical and the descriptive ones. Each object in the descriptive database has its own graphic image in the form of polygons or points placed on thematic layers. Because the General Directorate of Environmental Protection has published the reference geospatial data for all forms of nature protection in Poland (publicly available) (https://gdos.gov.pl/dane-i-metadane), the reference layers in the graphic database at IOS-PIB operate in the SHAPE format and 1992 geographic coordinate system.

b. Data resources

Currently, the database contains graphical and descriptive information about almost all forms of nature protection (except those that are most numerous, such as natural monuments and ecologically valuable sites), provided for in the Nature Conservation Act of 16 April 2004 [Journal of Laws No. 92, item 880, as amended], as well as Ramsar international protection areas, designated under the Convention on Wetlands of International Importance, especially as Waterfowl Habitat.

The database "Protected areas in Poland" contains information on nature, as well as the administrative and graphic data for the following protected areas:

- 23 national parks and buffer zones
- 122 landscape parks and buffer zones
- 1498 nature reserves and buffer zones
- 402 protected landscape areas
- 260 nature and landscape complexes
- 174 documentation stands

Interface for data entry

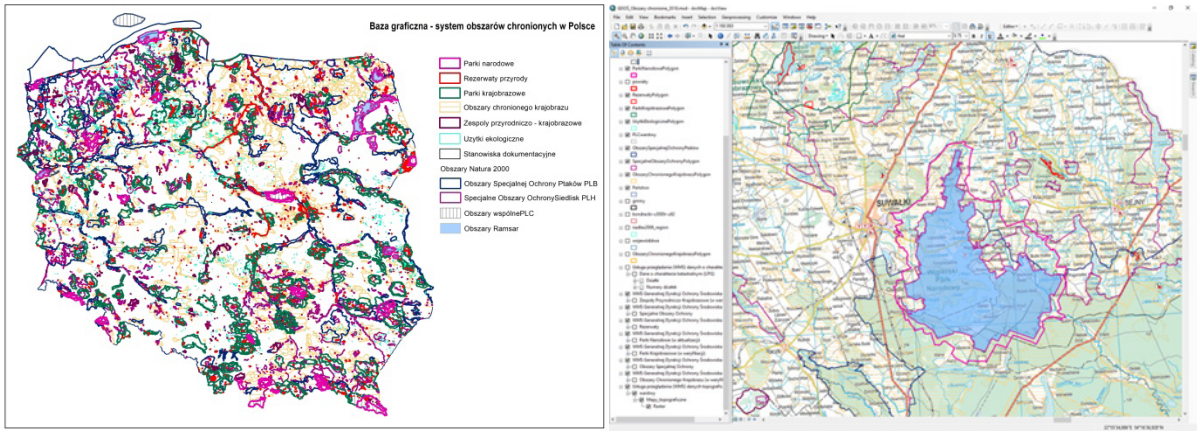

Diagram 2. Content of the graphic database: reference layers with protected areas in Poland *(Source: IOS-PIB database Protected areas in Poland)*

Internet interface—browser

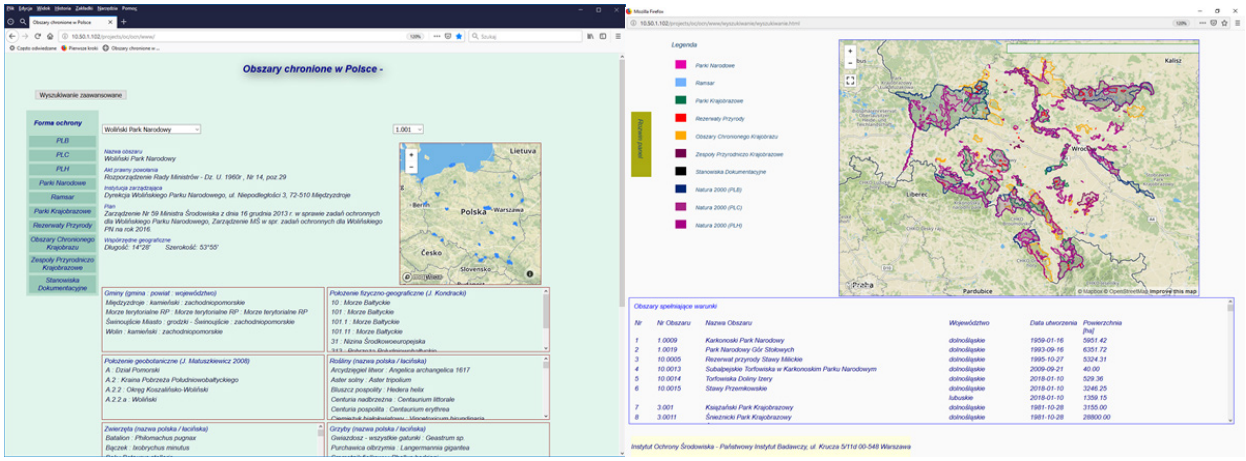

Diagram 3. Presentation and retrieval of information using a web browser *(source: IOS-PIB database Protected areas in Poland)*

- 138 SPAs (special protection areas [PLB]) designated under the Birds Directive 79/409/CEE
- 843 SACs (special areas of conservation (PLH)] designated under the Habitats Directive 92/43/CEE
- 7 overlapping areas (SPAs and SACs within common boundaries, PLHs)
- 16 Ramsar sites

For each protection form, a wide range of natural data are collected, including species of flora, fauna, fungi, protected habitats, description of the natural values of the area, types of reserves (e.g., forest, peat bog, rock, bird) as well as a number of other data: administrative location, geographical, and geobotanical location in the forest district, surface area, legal acts, protection plans, managing authorities, and international designation.
In the database, there is an option to select plant species from the list of 1614 plants. These embrace species commonly found in the Polish flora, as well as those listed in Annex II of the Habitats Directive (numerical codes, bold and asterisk mean priority species).
Animal species can be selected from a list of 763 animals, species commonly found in the Polish fauna and species listed in Annex II of the Habitat Directive.
List of habitats covers the most valuable natural habitats occurring in Poland (81), listed in Annex I of the Habitat Directive.

c. Technical data of the database

- In the data entry interface, the database has been installed at the IOS-PIB server. For its construction, a modern MySQL version 5.7 relational database management system was utilized. Data entering,

viewing, and editing are conducted with the use of a web browser, and PHP programming language (version 7.0) and JavaScript with the jQuery library were used in the database service.
- The browsing interface has been designed for data sharing in the Internet (for public access), at the IOS-PIB website. In the construction of the new interface, the following programming tools were used: HTML, CSS, PHP, JavaScript, MySql, jQuery, and MapBox.

The software used for data handling enables generation and printing of reports with a given information scope. Data search in the web browser is done using the "Advanced search" tab and is possible according to the following criteria:
- Forms of protection
- Administrative location
- Designation date
- Species of plants, animals, and fungi, protected habitats
- Forms of international designation

3. INTERFACE FOR VIEWING AND SEARCHING DATA (IOS-PIB WEBSITE), AS A TOOL FOR ECOLOGICAL EDUCATION

Providing knowledge gathered in the database to a wide range of users enhances understanding of the natural and landscape values of the most important and the most valuable designated conservation areas in Poland. It is believed that the increased awareness of protected objects situated in the close or further neighborhood of a human being, and the opportunity to learn about their values, gives hope for positive changes in people's behavior toward the nature, which is particularly important in the face of unfavorable changes in the environment. Promoting knowledge about biodiversity of protected areas in Poland is, therefore, an investment in the future, because without conscious public involvement in the protection of native nature, no activities in this area will be fully effective.

A very important place for shaping social acceptance for nature conservation is school. Through the knowledge passed on to students, it is possible to influence the attitude of all members of local communities. Therefore, the role of teachers in natural sciences, including biology, becomes even more important; the involvement of teachers will make it possible to communicate to schoolchildren the issues related to biodiversity and its cultural and economic significance, in an accessible and attractive way.

The database browser, available at the IOS-PIB website, is a perfect and attractive tool for teachers and students to learn about the natural and landscape values of Poland. Detailed and reliable descriptions of natural assets of protected areas are consistent with the knowledge that has been collected in the Department of Nature Conservation as a result of many years of work (sources: IOS-PIB publishing house about protected areas in Poland) and provide a lot of valuable information about areas that are of interest to users.

a. Opportunities of using the database for ecological education of the society

Ample possibilities of finding information relating to nature of a protected area and its management can help teachers to prepare active lessons on nature, for example, planning excursions. Some examples are given here of how to use the web browser skills to prepare such lessons.

Theme 1. What protected areas are located in the vicinity of our school? (Advanced selection: all areas in a given commune). As a result of searching, we will receive a list of protected areas within a given commune, together with a map showing where exactly they are located and where their boundaries are. The description of natural assets allows you to get an idea of the natural and landscape values of each area and choose the most interesting to be discussed during the trip. Lists of species of plants, animals, fungi, and habitats occurring in the area will make it easier for teachers to provide children the knowledge about local natural values during the excursion (Diagram 4).

Theme 2. Where to plan a trip, to show the young people the characteristic features, landscape, and natural values of the protected habitats of interest, for example, swamp coniferous forest, transitional bog, xerothermic grassland or cliff on the Baltic coast (advanced search: selected from the list of habitat/Natura 2000 sites, in nature reserves and landscape parks, e.g., in the Janów Lubelski region) (Diagram 5).

Theme 3. Rare and protected species of plants, animals, and fungi in the reserve nearest to our place of residence. The possibility of selection allows for planning a trip to demonstrate concrete species of plants, animals, or fungi (Diagram 6).

Theme 4. Native and invasive species in protected areas. In the lists of species of plants occurring in a given protected area, students identify examples of alien and invasive species and suggest different ways of limiting or controlling them.

The information gathered in the database can also support teachers and students in preparing lessons on a given topic, as well as to broaden indispensable knowledge to participate in student contests or other knowledge competitions. Independent searching for necessary information and solving problems completed by giving correct answers brings the students a lot of satisfaction, teaches to act independently, and helps to memorize the knowledge acquired for a longer time period.

The educational role of the base is not limited only to teachers and students. It applies to all people who are interested in natural science and expanding their knowledge about protected areas in Poland. Other target groups for which the database may be a valuable source of information, an educational or work facilitating tool, include the following:

1. Lecturers and students of natural sciences: the database gives them the opportunity to perform interesting

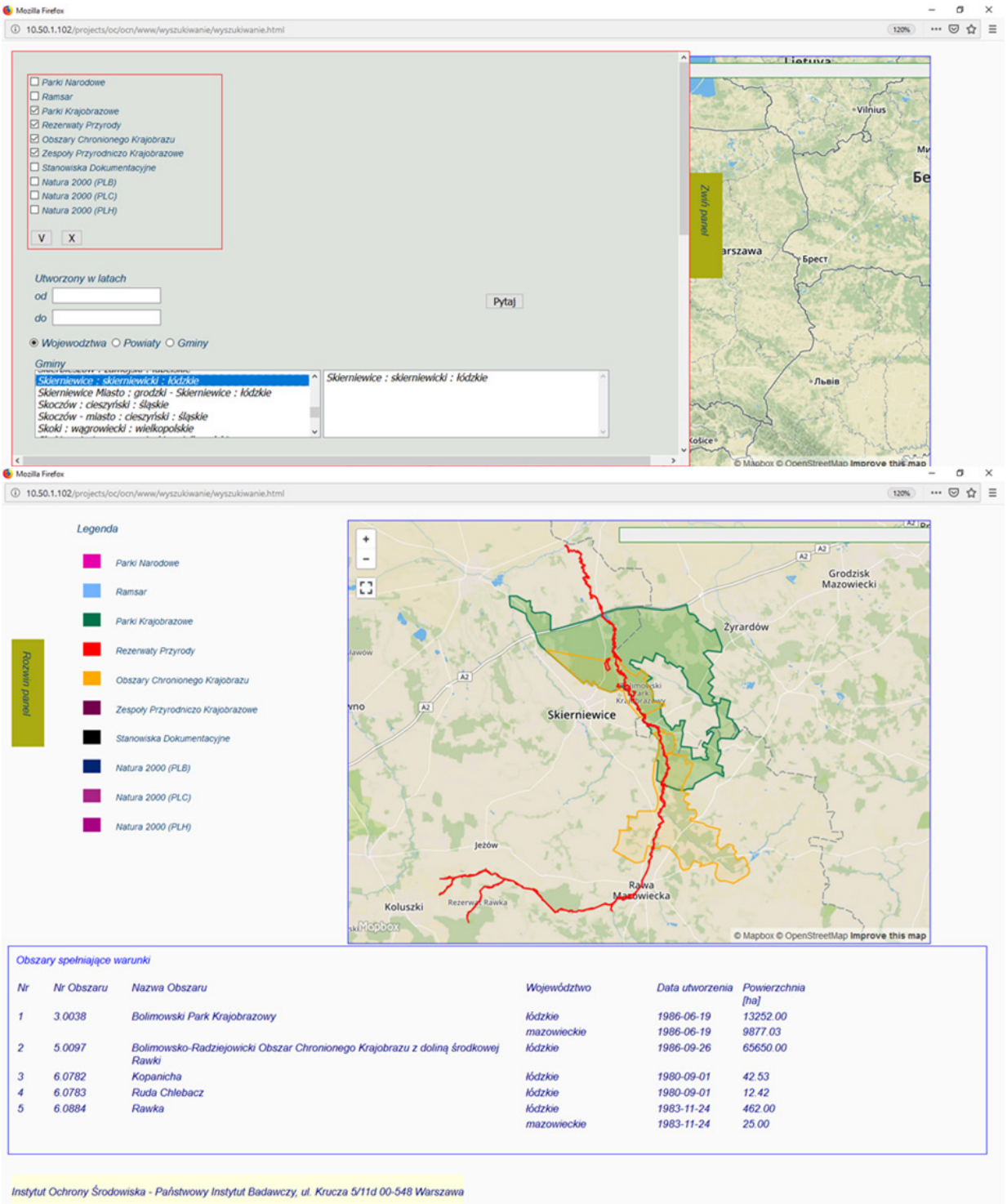

Diagram 4. Information search: protected areas in the Skierniewice commune *(source: IOS-PIB database Protected areas in Poland)*

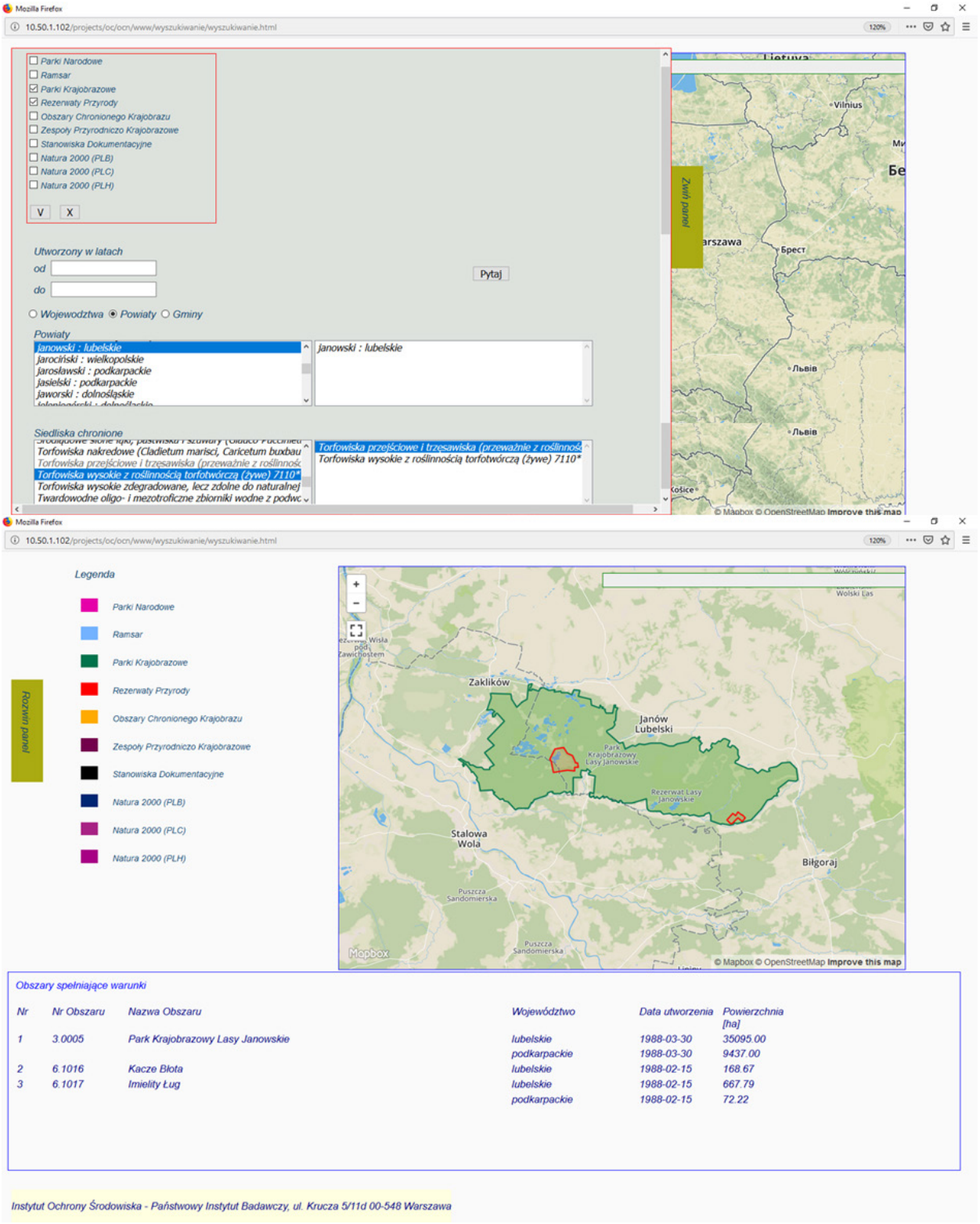

Diagram 5. Information search: protected areas in the Lublin province, where there are interesting peat bog habitats (*source: IOS-PIB database Protected areas in Poland)*

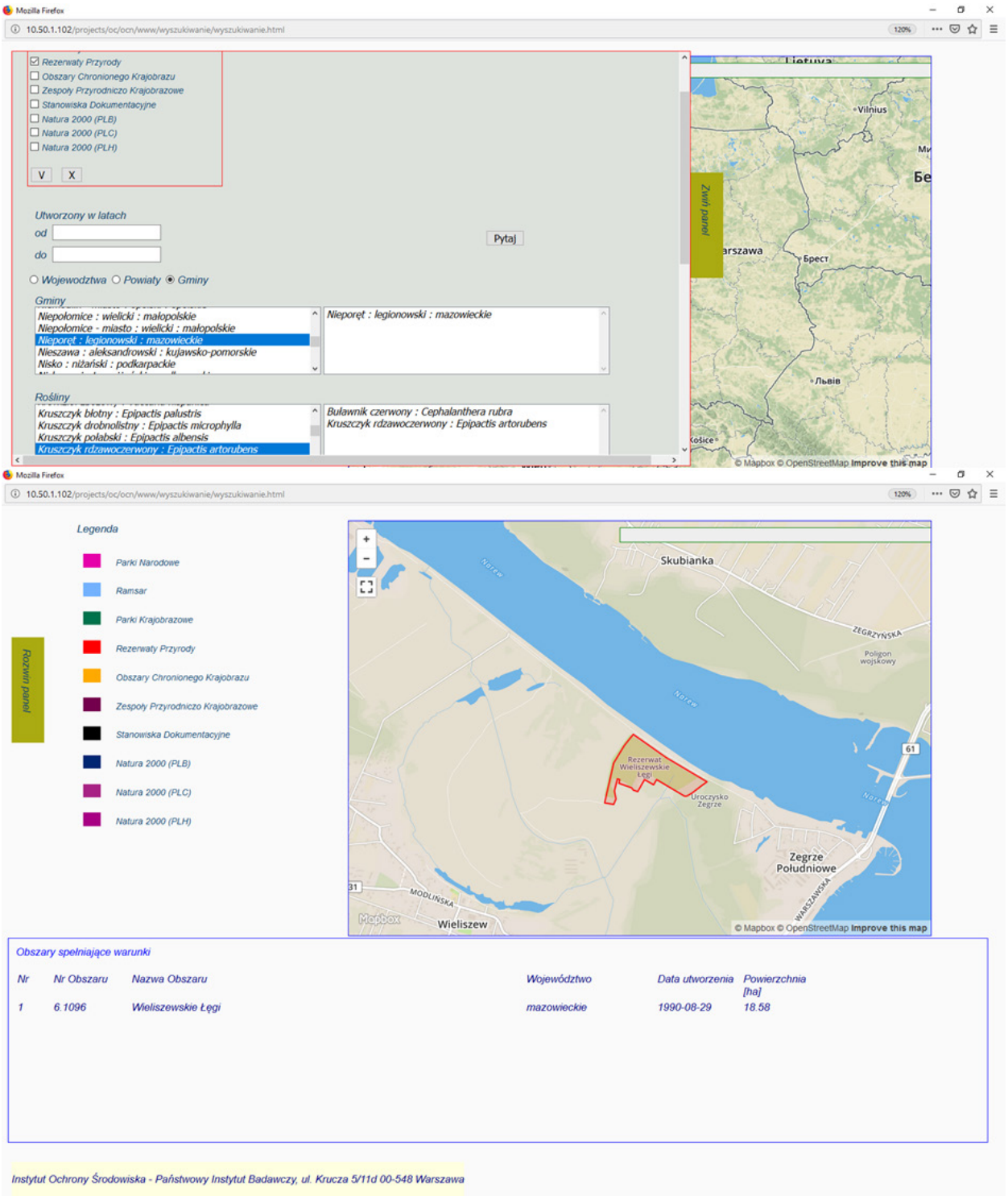

Diagram 6. Information search: a reserve in the Nieporęt commune within which there are rare species of orchids (*source: IOS-PIB database Protected areas in Poland*)

analyses of the natural values of protected areas, such as
   - occurrence of valuable protected habitats, listed in Annex I of the Habitats Directive, in the Polish national parks, landscape parks, and nature reserves—the most numerous and rarest Natura 2000 habitats,
   - occurrence of rare species of animals, plants, and fungi in national parks, landscape parks, and nature reserves,
   - designated internationally protected areas (such as UNESCO World Heritage Sites/biosphere reserves/ HELCOM areas).
2. Foresters and farmers: Knowledge about protected areas located in a given area will facilitate planning and identifying type of economic activity.
3. Representatives of the state and local government administration at various levels: Access to the source of information on the location and the rank of protected areas will facilitate decision taking as regards the land use management in a given area and means to protect its natural values.
4. Planners, including spatial planners, authors of strategic documents, including those on adaptation to climate change, management/protection planning in protected areas, and environmental impact assessments.
5. Employees of the administration of protected areas and ecological education centers.
6. Members of ecological nongovernmental organizations.
7. All other people interested in nature protection and in learning about the natural and landscape values in our country, for example, tourists, who will be able to expediently plan their excursions.

4. CONCLUSIONS

- A browser for the database "Protected areas in Poland" developed and functioning on the IOS-PIB website allows for sharing the collected data with a wide range of users.
- It constitutes an important tool for ecological education: It allows to understand better the natural and landscape values of the most important and most valuable areas of protected nature on the country and local scales, which gives hope for positive changes in people's attitudes toward nature. Raising the level of knowledge about areas, important from the natural point of view, is prerequisite for increasing the effectiveness of activities aimed at preventing the negative effects of environmental degradation.
- A proper recognition of natural values within protected areas facilitates the identification and location of elements of the natural environment most exposed/ sensitive to degradation.
- The database is an important source of information and provides opportunity to conduct analyses of the network of protected areas, from the point of view of both their quantity and structure, and the dynamics of changes over several decades. The rich database and technical capacities of the serving application make the database "Protected areas in Poland" unique as compared to other registers and databases available in Poland.
- The database is a tool that provides decision makers, investors, and planners with information that allows taking into account protected areas and their values in spatial planning and investment design process and provides support in assessing impacts of investments on the natural environment.

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INTERNET SOURCES

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