Experience in Realizing the Educational Potential of Specially Protected Natural Areas of Malovishersky District, Novgorod Region

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Abstract. A systematic immersion of students in the knowledge on the biodiversity of the place of residence, scientific methods of biological research, design of ecological trails and tours can help overcome the existing barriers to the implementation of the federal project “Ecology”. The research was carried out from 2008 to 2020 on the territory of specially protected natural areas of the Malovishersky district, Novgorod region, by the creative association “Mirror of Nature” with the participation of schoolchildren. A total of 52 visits were made. Since 2009, the activities on educating the local residents and guests of the area about the environmental status have been organized. The boards with noticeable information signs about nature monuments were designed, made and installed. During the research period, rare and endangered representatives of 11 families were discovered, recorded and described; they will be added to the passports of protected areas. The disturbance of the vegetation cover was assessed; it reaches two points in all protected areas. The highest three points’ degree of synanthropization of phytocenoses was noted in the village of Okulovo. The maximum degree of disturbance of the tree stand is observed in the village of Krasnoye, it corresponds to four points. The sanitary condition of the trees is satisfactory. First of all, it is necessary to restore the nature monument “Plantation of Rumelian pine near the village of Krasnoe”. A guide has been compiled, including a description of the ecological trails “Miracle Lake”, “In search of ammonites”, “In search of Rumelian pine”, and two guided tours “Estate park in the village of Okulovo” and “Spassky mosses”. The results of biodiversity research and developments are handed over to the Committee for Nature Protection of the Novgorod Region, Valdai National Park, and the administration of the Malovishersky district.

1. Introduction

The UNESCO Sustainable Development Concept continues to prioritize the development of society as and transformations in education. The latter is expected to form a holistic ecological worldview as a moral and activity norm [1].

Commitment to a place of residence and awareness of its ecological significance strongly influence the development of pro-ecological behavior. Taken together, an empirical experience of visiting locations and understanding the meaning makes environmental education most efficient [2]. In this context, the development of knowledge and organizing students’ visits to places that are unique in terms of biodiversity has acquired the utmost importance at the state level. Among other 11 federal projects,
The national project “Ecology” includes the “Preserving biological diversity and ecological tourism development” project highlighting a positive correlation between biodiversity of species and socio-economic data on human well-being [3].

The key constraints to the implementation of the national project, among others, include the lack of highly qualified personnel [4, 5] and the low ecological culture of the population [6, 7]. To ensure the sustainable development of the territories through ecological tourism [8], it is necessary to provide systematic education starting at the school level through immersion in the knowledge on biodiversity of the place of residence, scientific methods of biological research, the design of ecological trails and tours.

2. Materials and methods

The research was carried out from 2008 to 2020 on the territory of specially protected natural areas (hereinafter – SPNA) of the Malovishersky district, Novgorod region (table 1, figure 1) by the creative association “Mirror of Nature” with the direct participation of schoolchildren of the MAEI “Secondary School no. 4” located in the town of Malaya Vishera.

| Nature monument | Area, ha | Settlement | Type of a water body |
|-----------------|---------|------------|----------------------|
| Plantation of Rumelian pine | scattered | v. Krasnoye | riv. Lanoschenka |
| Landscape of the surroundings | 25 | v. L’zi | riv. Msta |
| Landscape of the valley | 595 | v. Zapolek | riv. Verebushka |
| The estate park | 4.6 | v. Okulovo | riv. Msta |

Figure 1. SPNA of Malovishersky district (1. Plantation of Rumelian pine at the village of Krasnaya; 2. Landscape of the L’zi village surroundings; 3. Landscape of the Verebushka river valley; 4. Estate park of the Okulovo village).

The research methods used include:
- analysis of theoretical material, including cadastral descriptions and passports of protected areas;
- route method of biodiversity registration;
- observation (including photo taking), description, identification and classification;
- design.
The assessment of the vegetation condition was carried out according to the guidelines developed by Perm State University [9].

3. Research results
Since 2008, the creative association “Mirror of Nature” has been conducting regular research expeditions for schoolchildren and developing ecological trails for certain locations in SPNAs. Certification of Malovishersky district SPNA done in 1993 by specialists from Novgorod State University contained a significant number of records “Not assessed, no data available” in regards to biodiversity characteristics. Besides, even with a protected status, there is a possibility of changes at SPNA, including its degradation.

Only regular work on finding and describing species can be effective. From 2008 to 2020, 52 visits were made in total: 9 visits to the park of the Okulovo village and 16 visits to the plantation of Rumelian pine.

Several generations of school students have been involved in research; it makes them aware of the value of their district; thus, this involvement serves ecological and patriotic education. Awareness of the uniqueness and fragility of rare species through a living example teaches respect for the environment.

![Graph showing frequency of visits to the SPNA of the Malovishersky district]

1. Rumelian pine. 2. Landscape of the L’zi village 3. Landscape of the Verebushka river 4. Estate park in the village of Okulovo

Figure 2. Frequency of visits to the SPNA of the Malovishersky district.

In 2009, the education of the residents and guests of the area about the environmental status of the first three indicated objects started. Boards with noticeable information signs about nature monuments were designed, made and installed. The control over the condition of the boards was carried out annually; in 2012 and 2017, they were renewed.

In 2012, the board was installed in the estate park of the Okulovo village. The installation was made later than in other places because of the difficulties in accessing the location due to the lack of a crossing over the Msta river. This is also the reason for the long lack of attention to this monument. In addition, the park was rapidly losing its significance after the World War II due to the sawing of trees by local residents.

Just as the local residents’ control is becoming increasingly important for the control of bird biodiversity [10], it can become a valuable source for SPNA inventory activities if public attention is attracted. Each student, who at least once participated in expeditions, knows how to search for rare...
species, what details are essential for fixing and transferring to nature preservation structures; a student can teach other students, acquaintances and, in the future, his/her children and students.

During the work with cadastral descriptions, the columns “no information” were marked; it became possible to fill them with the results of expeditions and to replenish the data bank about SPNAs. Ecological and educational activities can be supported with the notice “The creative association “Mirror of Nature” is the patron of the nature monument”. During the research period, rare and endangered representatives of 11 families were discovered, recorded and described (table 2), they could be added to the “List of rare plant species registered in SPNA”.

**Table 2.** The discovered rare plant species.

| Nature monument                                | Rare plant species                                                                 |
|-----------------------------------------------|-----------------------------------------------------------------------------------|
| Plantation of Rumelian pine at the village of Krasnaya | liverwort, European hazelwort, corydalis intermediate, Baltic spotleaf orchis, butterfly orchid |
| Landscape of the L’zi village surroundings     | butterfly orchid, Baltic spotleaf orchis, great bellflower, pulmonary gentian, green-flowered maidenstears |
| Landscape of the Verebushka river valley       | Baltic spotleaf orchis, northern wolf’s-bane (tall), pulmonary gentian, great bellflower |
| Estate park of the Okulovo village             | Balsam fir                                                                        |

Almost every year, the list is replenished with new species; already discovered locations are checked for preservation condition.

Since biocenoses are living, changeable formations, natural processes and processes initiated by anthropogenic activity can lead to certain changes in them. In this regard, during expeditions, a regular survey of the current state of the studied territories is carried out (figure 3).

There is a disturbance of the vegetation cover in all protected areas at the level of two points. The vegetation cover in some areas is disturbed; the total area of such locations is not more than 2–3%. The highest degree of synanthropization of phytocenoses was noted at the level of three points in the village of Okulovo. At the same time, synanthropic species form at least half of the crown density of the shrub layer.

The maximum degree of disturbance of the stand is observed in the village of Krasnoye, which corresponds to four points. The stand is partially disturbed; there are dead woods, dry tops; it is almost absent in the villages of L’zi and Zapolek.

The sanitary condition of coniferous and deciduous species is characterized as satisfactory.

It is necessary to take urgent measures to restore the nature monument “Plantation of Rumelian pine near the village of Krasnoe”. Now it is easily accessed by visitors who gather rare pine cones, also there is a large amount of dead wood. In 2014 and 2017, the creative association cleared dead wood, made sanitary felling of bushes, and installed birdhouses.
In the estate park of the Okulovo village, it is recommended to carry out sanitary felling and planting in accordance with the historical and ecological context.

One of the ways to reduce the negative impact was the development and organization of ecological trails. Students, as developers, could study the theoretical material in more details, structure their practical results, and successfully present them in competitions at various levels, which increase the students’ motivation to participate in the activities of a creative association.

The result of the work was the publication of a guidebook, including a description of the ecological trails: “Miracle-Lake”, 7 km long with 12 stations; “In Search of Ammonites” 5.5 km long with 10 stations; “In search of the Rumelian pine” 6 km long with 10 stations. Two tours “Park estate of the village of Okulovo” and “Spassky mosses” are included in the same guidebook and allow travelers to independently master these routes.

Each trail and tour was passed by students, which once again confirms their accessibility for people with an average level of physical fitness.

The results of biodiversity research and developments are handed over to the Committee for Nature Protection of the Novgorod Region, Valdai National Park, and the administration of the Malovishersky district.

Thus, since 2008, the systematic work of the creative association “Mirror of Nature” helped schoolchildren in Malovishersky district:

• to learn about the nature of their native land and form a sense of responsibility for it;
• to master the scientific methods of studying biology and methods of scientific argumentation;
• to carry out project activities having practical importance;
• to study legislative acts in the sphere of ecology;
• to learn how to interact with environmental and administrative structures.

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