

# The Role of the Ecological Aspects of Sustainability in the Creation of Environment-Conscious Attitude

## The Phytocenology of the Sudds in 'Őrség' Region

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### **Abstract**

The decrease of biodiversity is the largest global problem on the Earth. In order to stop or reduce it, we should create such environmental behaviour that promotes a lifestyle strategy responsible for the environment in the complex system of both the teaching and the studying process. One pillar of this is gaining knowledge about the natural environment, exploring biotic and abiotic connections, as well as the reasons for various ecosystems. It is especially important for grammar-school students to find out about ecological processes, especially the natural, regional cultural historical values of the nearby dwelling-places. In case of Vas County, Őrség gives an opportunity for some special ecological examinations and ground practices.

**Keywords:** biodiversity, sustainability, environmental education, environment-conscious behaviour, key competences, ecology, sudds, Őrség National Park.

### **Introduction**

The essential condition of the awakening of natural sciences and environmental education and also that of ecological attitude, environmental protection as a value, in each level of pedagogy, is harmonizing practice with theory. Therefore the shaping attitude is necessarily forming the environment-conscious behaviour based on the stable pillars of sustainability. In order to achieve this aim we can have the environment pedagogy as the synthesis of environmental sciences and pedagogy. The National Core Curriculum<sup>1</sup> says that key-competencies contribute to individual prosperity and the civic welfare in society. The greatest problem of the Earth is the reduction of biodiversity. To be able to slow down or to stop this process it is necessary for our students to understand the operation of ecosystems and also to get to know and to protect our narrower environment.

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1 110/2012.(VI.4.) Government decree on the National Core Curriculum. Hungarian Gazette, No. 66, 10635-10848 p.

## The general presentation of the sudds in 'Órség'2 region

On the basis of the law on environment protection (1996. year, LIII. law, 23§, 2. paragraph), the sudds are protected ex lege (by law) without special protection declaring procedure. "In pursuance of this law all sources, sudds, caves, sumps, natron lakes, barrows and earthworks. In this preface these protected natural areas are considered to be of national importance." In "Órség" region the sudds are in a great number because of the special climate. As a result of climate changes, their state and racial diversity are more and more decreasing. It is very important to note the fact that in Órség the extent of sudds is small thus they can be vulnerated (Balogh 2001, 292). Their economic value is low while in Órség there are no sudds for turf mining. The reason for the development of sudds is the sub-alpine climate. The annual precipitation is 750–1000 mm, in summer frequently in the form of thunder storm hail. The number of the sunny hours is low; the annual average temperature is 9–10 °C. In Órség there is frequent stagnant water, an eroded soil surface and also we have a lot of springs owing to the clay banks crawling in the valleys among the hills. The springs are feeding many brooks alimenting Rába, Kerka and Zala streams. (Rakonczay 1996, 230) The National Park of Órség is bordered by the river Rába. It has been included in the List of the Wildwaters of International Importance<sup>3</sup> since 2006 so it is defended by the Ramsari Agreement.

The sudds of Rábás ebb-tides were realized by an infilling succession. Beside Alsószölnök village there is a willow-sudd being the greatest and of outstanding diversity. Some sudd circumstances came well as around the springs. In the region Órség and Vendvidék<sup>4</sup> (Wend) there are lots of sudds because the number of springs reaches 400.

## The first description of sudds in Hungarian language

The first Hungarian landscape monograph was written by Nemes-Népi Zakál György (1762–1822) of lower nobility, a reformed presbyter, a forest bailiff and a writer. The title of his book: "The Description of Órség Namely: its Nature, History, Inhabitants' Customs, Idiomatic Uses Having been Collected by Nemes-Népi Zakál György in 1818." This book was issued only in 1985. In his work he writes about the hydrography of Órség as follows: *"Allo vizek nintsenek Eörségben ollyak a'mellyek különös emlittést érdemelnének. Vagynak ugyan itt ott a' Völgyekbe vizállások, mint p.o. Eör Sz. Péteren a' Bárkás Tó, Szalafőn a' Fekete Tó, a' melly a' Hegyek közt egy ollyan le Süllyedő motsar, melybe a' leg hosszabb le szurt fa sem ér*

2 Historical-ethnographical landscape in the south-west part of Vas 'County'

3 Agreement approved in Ramsar on February 2nd, 1971. Its basic principle not the prohibition but the sustainable economy by protecting areas.

4 Ethnographic landscape in Vas County, in the small area of Szentgotthárd, beside the Rába river. It got its name about the inhabitants, the Slovene of Hungary.

*kemény feneket, Hideg völgy satb de ezek tsak ollyak hogy nagy melegbe ki Szárod-nak; Ugy szintén a berkekben, fölképpen a' Kerka mellett Sok illyetény álló vizek találatnak, a' mellyek közönségessen Ér-nek és Molákának nevezettnek.*" It has archaic Hungarian language so it can be translated as follows: No standing water to be mentioned in Őrség. But there are some waters in valleys e.g. Bârkás Lake in Őriszentpéter, Black Lake in Szalafő. Some of them become dry in very hot weather. In marshes with groves there is also standing water beside Kerka. They are called rills. The manuscript can be found in the library of the Hungarian Academy of Sciences. Nowadays it is one of the most complete works on Őrség.

## The sudds from the point of environmental protection

Because of the nearby Alps, the climate is wet and of Subalpine character. In addition to Subalpine effects, the Atlantic, the Continental and the Sub-Mediterranean appear as well. In the special microclimatic areas of Őrség and Vendvidék some peculiar, temporary sudds with sphagnum have been shaped. These small but unique associations keep hiding some rare plant species in Hungary. Associations with sphagnum include the following: Caricetum rostratae Osvalk 1923 em. Dierssen 1982; Caricetum nigrae Braun 1915; Carici Echinatae Sphagnetum Soó 1954; Sphagno fallaci-Caicetum elatae Lájér 1998; Carici flavae-Eriophoretum latifolii Soó 1944; Sphagno flexuosi-Eriophoretumangus-tifolii Lájér 1988. In Szőce<sup>5</sup> village the only association (Sphagno tenelli-Rhynchos poretum albae Oswald 1923 em. dierssen 1982) in Hungary, which was destroyed in the 80s. (Borhidi-Sánta 1999, 203)

## The most important sudd-species

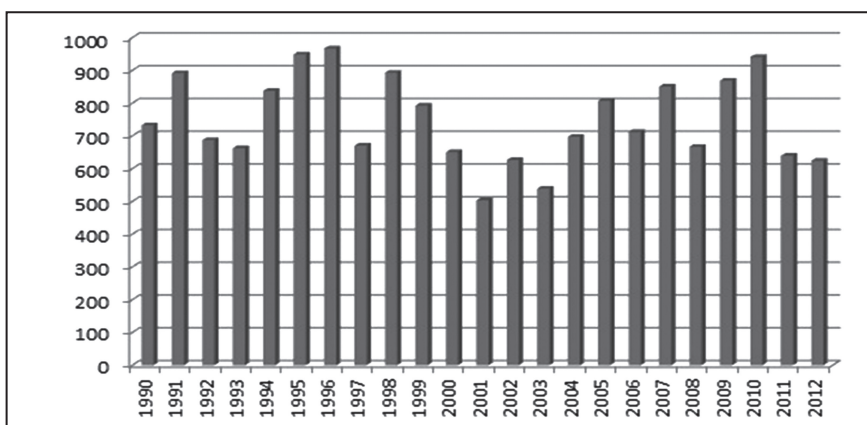
The greatest species of the sudds with sphagnum are the buck-bean (*Menyanthes trifoliata*) the sundew with circular leaves (*Drosera rotundifolia*).

The cotton grass with wide leaf (*Eriophorum latifolium*) and the cotton grass with narrow leaf (*Eriophorum angustifolium*) are frequent around the Vendvidék. From the rare and protected sedge species several ones can be found: *Carex nigra*, *Carex canescens*, *Carex rostrata*, *Carex davalliana*, *Carex echinata* and *Carex hartmanii*. Each Sphagnum is protected; there are 20 species in the flora of Hungary. Of these there are 14 species in the sudds of Őrség as follow: *Sphagnum fallax* *Sphagnum fallax*, *Sphagnum flexuosum*, *Sphagnum palustre*, *Sphagnum cuspidatum*, *Sphagnum contortum*, *Sphagnum subsecundum*, *Sphagnum angustifolium*, *Sphagnum obtusum*, *Sphagnum platyphyllum*, *Sphagnum recurvum*, *Sphagnum nemoreum*, *Sphagnum magellanicum*, *Sphagnum fimbriatum*.

<sup>5</sup> A village in Vas County, in the small area of Őriszentpéter.

## Endangered sudds

The sudds are very peculiar geomorphological forms. They are called marshes and their free-moving, broken off parts are named wandering sudds (Balogh 2000, 14). The sudds are not only interesting from the point of floristics, phytocenology and hydro-geomorphology but because of their succession process as well. Owing to climatic changes their condition, specific diversity are always decreasing. In the neighbourhood of the springs the sudds are small-sized and are also very endangered by natural draining (Lájer 1998, 101). In Őrség and Vendvidék the annual precipitation shows a declining tendency looking backward to a 20 years period in most years thus its yearly frequency is also unfavourable for the sudds. In spring after thawing of snow the surface waters multiply in the clayey dips, the water shines or trickles. At the beginning of summer they become dry, some additional water would be needed, but in the second half of the growth season it keeps us waiting. The amount of precipitation<sup>6</sup> turned less with 200-300 mm in the last few years. (Fig.1.) There was a great drought between 2000–2005.



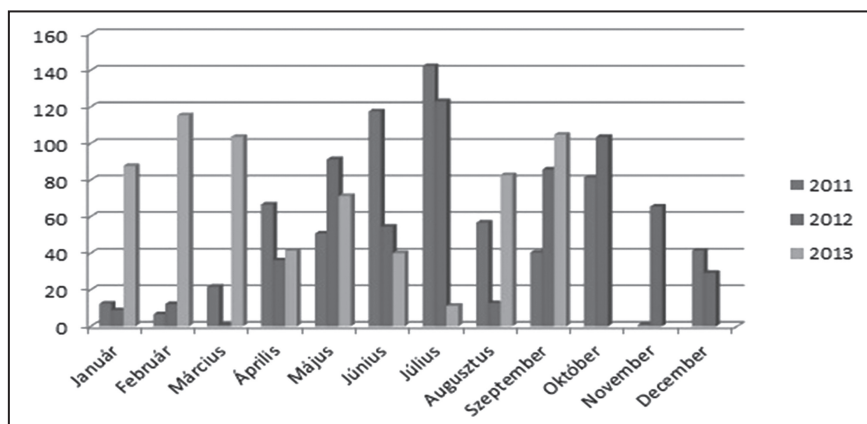
**Fig. 1.** The annual precipitation of Szalafő village /source: my figure/

The proper yearly distribution of precipitation in Őrség from the annual 750–1000 mm amount at least 600 mm fall of fin the growth season. Szalafő village can be found in the territory of Belső-Őrség. The name Szalafő is linked with Zala river-head and Zala is pronounced Szala in Őrség. The monthly precipitation amounts from 2011 to 2013<sup>7</sup> are indicated in Figure 2. Based on this diagram it can be concluded that summer is extremely dry. The temperature is

<sup>6</sup> OMSZ, Szalafő mérőállomás (National Meteorological Service, Measuring Station in Szalafő).

<sup>7</sup> OMSZ, Szalafő mérőállomás (National Meteorological Service, Measuring Station in Szalafő).

35–40 °C in summer and the long-lasting drought is dangerous for the diversity of sudds and their existence. The fore-mentioned facts justify that protection of decreasing sudds being endangered is an outstanding task in Hungary.



**Fig. 2.** The annual amount of precipitation (2011–2013) in Szalafő /source: my figure/

## The most valuable areas of sudds

The sudds along Zala river extend from Szalafő to Felsőjánosfa. The most diversified sudds are the spring sudds of Grajka stream, at Templomdomb the spring sudds near Apátistvánfalva, the sudds of Hársas, Zsidai and Szőce brooks. The most valuable associations are as follow: in Ivánc along the stagnant water of Rába river and beside Moláka; the spring sudds of Ezüsthegy and Kakasdomb in Felsőszölnök as well as the willow-sudd of Alsószölnök. The spring-sudds of Kétvölgy, the Fekete-tó of Orfalu, the Sásos-tó of Farkasfa, the Vadkacsás-tó around Viszák and Ördög-tó of Máriaújfalu represent a great natural value. (Bodonczai 2003, 70)

## The key competencies of the National Core Curriculum and environmental education

The key competencies of the National Core Curriculum make an essential condition for an individual to become an even-tempered, active and responsible citizen of society (Kovátsné–P. Somogyi 2010, 182). We can react to the global challenges of the 21<sup>st</sup> century by just renewing our moral values. Why is not environmental education a key competence? Why are not there any lessons for field practice, at least during biology education? How can most students sit for final examination without taking part in a field practice in their high school studies? The students learn the wooded and unwooded areas of Hungary in 9th

class during the time of ecology education. Their natural and environmental protection knowledge becomes scientifically grounded because they already have some plant-organic and biological-systemic knowledge at this time. But the necessary condition of awaking to the consciousness of natural and environmental protection knowledge and also that of the ecological attitude is the personal experience-obtaining and practice based on theories. Thus knowledge can become a conviction. The joint use of theory and practice gives the only possibility of the environment-conscious attitude shaping which changes race so it is a tool for reaching the purpose (Horváth 2011, 371). During the time of field practice the phytocenological examinations mean a true challenge for students to be able to understand connections of succession or degradation processes. Before testing the historical-ecological review, the type of environment-protection is needed while the landscape usage also has an impact on species combination, and the diversity of a given area. In the framework of the field practice of biological specialization, the students of grammar school do the phytocenological test of Ördög-tó. By this method, students are able to tell the extent of endangering as a result of phytocenological and vegetation-dynamic examinations.

## The aspects of the examination method

### 1. Description of the area

The Ördög-tó was formed along the road connecting Szentgotthárd-Farkasfa and Máriaújfalu on a hilltop. (Fig. 3) The open water is surrounded by a clump<sup>8</sup> (because of rainfall shortage it became dry several times in droughty years). The swampy ring is covered with sphagnum under which there is a thick turf-layer. During wet years the clump was also becoming sudd. The edge of the sudd will be wooded on spots. On the shore beside the sudd some spruces (*Picea abies*) were standing at one tike beyond which the sphagnum parts can be seen farther as well.

### 2. The historical-ecological analysis

The aim of the historical-ecological analysis is to be able to discover connections between the landscape usage and the sudds, temporal changes by the phytocenological and vegetation-dynamic examinations. And also they can see the influence of abiotic factors (amount of precipitation temperature) on associations in the course of diversity and succession<sup>9</sup>. In herbaria<sup>10</sup> the plant species linked with sudds also discover the one-time state of Ördög-tó with the help of making a catalogue.

8 Rising formation about the sudds developing in thick bunches.

9 Owing to the one-way changes in biocoenosis the populations of association will be exchanged

10 Collection of plants for scientific purpose having been made by pressing or drying.



**Fig. 3.** At the edge of Ördög-tó – the students of Bolyai Grammar School



**Fig.4.** Exploring the herbaria of Savaria Museum with Dr. Lajos Balogh botanist

### 3. Exploring the current state

After indicating a model land, phytocenological examinations were made. In case of cover estimation  $A^{11}$ - $D^{12}$  values were given in tables. Then the students measured the abiotic factors, the water temperature of soil and fen windows<sup>13</sup> as well as their pH value. The pH value of fen windows is 5,3 that sphagnum cushions are between 3,9 and 4,2.

### 4. Presentation of outstanding natural values

5 sphagnum species (*Sphagnum palusre*, *Sphagnum recurvum*, *Sphagnum nemoreum*, *Sphagnum fimbriatum*, *Sphagnum magellanicum*) were determined by the students along

the sudd-edge of Ördög-tó. *Salix aurita* living on the edge of the willow – and sphagnum sudds was also present here as well as *Dryopteris carthusiana*, which is protected.

### 5. Data evaluation

During the field-practice of grammar school students, the A-D individual number counting<sup>14</sup> (abundancia-dominancia) on model lands can be applied excellently in case of the vegetation-dynamic evaluations of different associations. This method can be used easily, quickly and with relatively few errors. (Fig.6.). In phytocenological tests, the Simon environmental protection value-categories (TVK) and the Borhidi social behaviour types and naturalness values (SZMT, P) were shown. Analysing covering values and species combination we can say that the natural state diversity of Ördög-tó is appropriate (Mátyás 1996, 261). Thus we can see the second phase of the succession process of the sudd realization from clump. Here the clumps and the fen windows are already covered with thick sphagnum.

11 Individual number = abundancia

12 Covering = dominancia

13 Temporal depth covered with water among clumps

14 Josias Braun-Blanquet introduced a parameter drawing together the individual number and the cover at the beginning of 1900 years which became a generally used index in European associations' science.



**Fig. 5.** On the edge of Ördög-tó we cited Nemes-Népi Zakál György

Scientific name	Dominancia %	Abundancia-dominancia AD value	Simon- types TVK	Borhidi- types SZMT,P
Sphagnum palustre	21	2	-	-
Sphagnum recurvum	7	2	-	-
Sphagnum nemoreum	2	1	-	-
Sphagnum magellanicum	3	1	-	-
Sphagnum fimbriatum	1	+	-	-
Polytrichastrum formosum	2	1	-	-
Dryopteris carthusiana	3	1	V	G(4)
Dryopteris filix- mas	1	+	K	G(4)
Athyrium filix- femina	1	+	K	G(4)
Juncus inflexus	2	1	TZ	DT(2)
Juncus effusus	2	1	TZ	DT(2)
Scirpus sylvaticus	25	2	E	G(4)
Salix aurita	2	1	V	S(6)
Salyc cinerea	25	3	E	C(5)
Alnus glutinosa	2	1	E	C(5)
Calluna vulgaris	1	3	K	G(4)

**Fig. 6.** Sample land A-D value /source: my figure/

While the water level of lake fluctuates or fully disappears, the clump pillars are quickly rotting because of ventilation. By artificial water supplement this process can be stopped. At the end of the examination we tried to justify that the historical description of the sudds by Nemes-Népi Zakál György<sup>15</sup> is realistic concerning the Ördög-tó: "*Süllyedő motsar, melybe a' leg hosszabb le szurt fa sem ér kemény feneket.*"<sup>16</sup> – really the dry stick went down very easily. (Fig.5)

## 6. The description of endangering factors

Along the Ördög-tó there were old spruces standing, and a part of them was cut out. It cannot be experienced yet that the sphagnum coming out of the lake had disappeared. The precipitation shortage in the past years led to the reduction of the sudd's water supply. The open water often disappeared. The sphagnum cushions climbed for the trunk of *Alnus glutinosa*, *Salix aurita* and *Salix cinerea* whitened, dried by creating clumps. It is important to note there should not be any making for the lake for tourists, because they can cause the decay of sphagnum while the Ördög-tó is very close to the public road.

## Summary

The phytocenological and vegetation-dynamic examinations of field-practices form deep knowledge and responsible thinking for the natural environment. (Berki 2011, 279). The recognition of the natural values in Órség can be done by education, the teaching of natural sciences with integrated attitude. (Csermely 1999, 29) Just broad-minded educated subject teachers are capable of this task. The grammar school age-group is able to see beauty in nature, motions and arts. Therefore it is extremely important for them to get to know their own narrower environment, the natural and cultural-historical values of Vas County. The maintenance and protection of a habitat is possible just by knowing and understanding the history of its development as a result of the succession and degradation process (Standovár-Primack 2001, 41). The demand for the recognition of the natural environment originates from the personal modelling of a subject teacher. The beauty, the characteristic features of a landscape, its botanical and zoological values can be said but the substantial content of the words becomes belief only by personal experience and its penetrating emotion.

<sup>15</sup> Author of the first landscape monograph in Hungarian language.

<sup>16</sup> Quote from Nemes-Népi Zakál György's book titled "Órségnek leírása" (1818)

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