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MEADOW ECOLOGICAL ROUTES OF THE REPUBLICAN BIOLOGICAL RESERVE "DNEPRO-SOZHSKY" AS A BASIS FOR CARRYING OUT EDUCATIONAL ACTIVITIES WITH PUPILS

Ecological tourism is one of the types of active recreation which contributes to the increase of children's and adults' interest in the topic of nature and ecology. This type of tourism has big prospects for the education and training of pupils. Participation of children, their parents and teachers in educational events is a starting point for enhancing the creative and cognitive activities of the population, the formation of an environmental culture, education of citizens, the ability to preserve and improve the environmental conditions.

The Republican Biological Reserve "Dnepro-Sozhsky" was established in 2005. It is located between the Dnieper and Sozh rivers on the territory of Loev district, Gomel oblast. The territory of the Reserve is 14,556 hectares. The reserve is unique in its natural conditions. It is original and interesting in terms of geomorphology, climate, geobotany, flora and fauna.

The vegetation of the Reserve is represented by forests, meadows, forest swamps, bushes and water areas. It covers about 12 thousand hectares (80% of the territory). The forested area is 6,913 hectares (48% of the total territory). Previously widespread floodplain and upland oak forests as well as old primary sub-climax pine forests have been preserved here.

Numerous lakes, inflows, channels and oxbows (floodplain lakes) diversify the landscape of the Reserve.

Numerous species of forest, grass, coastal water and aquatic ecosystems contributed to the richness of the flora and fauna of the Reserve.

The objectives of the Reserve are to preserve a valuable landscape natural complex including separate areas of old floodplain and upland oak forests, sub-climax pine forests and rare meadow ecosystems with rich floristic composition in the floodplain lakes of the Dnieper and Sozh, populations of rare endangered species, domestically beneficial plants and animals as well as to manage tourist activities and environmental education of the population.

In terms of the structure of the Reserve's land areas, natural grass communities occupy about 30% of the total area. They are mainly concentrated in the left-bank floodplain of the Dnieper and right-bank floodplain of the Sozh. An insignificant percentage is made up of watershed herbaceous communities (communities of open swamps, forest and lowland meadows). Numerous herbaceous species appeared due to the diversified ecological conditions of the interfluve and its floristic richness.

In meadows and grassy swamps, there are 330 species of herbaceous plants, 22 wood shrub species and 27 shrub species, 16 moss species and 5 lichen species. Flora and phytocenoses have a prominent regionalilty peculiar to Polesie-Dnieper area of the sub-zone of broad-leaved pine forests. Xerothermic species are abundantly represented here that form communities of steppe meadows which are rare in Belarus [2].

The largest areas of floodplain meadows are located in the left-bank part of the floodplain of the Dnieper (up to the village of Pervomaysk). The floodplain is flat here with sparse ridges, flat high plains, deep interridge plains and wide lowlands. Meadow ecosystems on high ridges, flat elevated plots (a high level) have the form of steppe meadows. According to the information in the sources [3, 4],

we have categorised them as Poo angustifolii-Festucetum valesiacea Sapegin 2002; Poetum angustifolii (Domin 1943) Shelag-Sosonko et.al.1986, Poo angustifolii-Agrostietum vinealis ass. nov. prov. (slopes of the ridges, flat lows of the central floodplain (middle level); meadow communities of hygromeso-and mesohygrophytes occupy Poo palustris – Alopecuretum pratensis (Sapegin 1986) Shelyg-Sosonko et.al.1987. Deep interridge lows, wide lows of the central and riverbed floodplain (a low level) are covered with the communities of hygrophytes Glycerio maximae-Caricetum acutae Sapegin 1986, Carici acutae- Glycerietum maximae Shelag-Sosonko et.al.1985, Caricetum gracilis (Almguist 1924) R. Tx. 1937, Glycerietum maximae Hueck 1931, Phalaridetum arundinaceae Libb 1931, Caricetum vesicariae Br.-Bl. et Den. 1926, Phalaroido arundinaceae – Caricetum acutae ass. nov. prov.

A similar floodplain landscape with similar meadow vegetation is peculiar to for the rest of the floodplain of the Dnieper and right-bank floodplain of the Sozh on the territory of the Reserve.

In the floodplains of the Dnieper and the Sozh, natural highly productive and economically valuable hygromesophytic and mesophytic grass stands of meadows have been preserved on the territory of the Reserve. Likewise, steppe and other communities of damp rich meadows, they can serve as a masterpiece for carrying out monitoring phytocoenological studies.

The flora of the Reserve is a complex combination of taiga, nemoral, forest-steppe and other floristic elements. Along with typical representatives of the taiga flora, representatives of European deciduous forests are often found. At the same time, there is a large number of forest-steppe species which occur sporadically or do not grow at all elsewhere in Belarus.

All in all, there are 656 species of higher vascular plants from 338 genera and 104 families on this territory including 3 lycopod species, 6 horsetail species, 7 fern species, 1 gymnosperm species and 639 angiosperm species. In the forests, there are 26 tree species, 44 shrub and dwarf shrub species,

586 herbaceous and semi-shrubby species. There are many domestically beneficial plant species in the flora of the studied region: medicinal, food, forage, melliferous, decorative and technical [5].

There are 15 plant species growing on the territory of the Reserve which belong to the group of rare and endangered plants and are listed in the Red Book of the Republic of Belarus [6]: lily-leaved ladybell - *Adenophora liliifolia*, snowdrop anemone - *Anemone sylvestris*, ground clematis - *Clematis recta*, Deptford pink - *Dianthus armeria*, swamp violet - *Viola uliginosa*, caltrop - *Trapa natans*, riverine groundsel - *Senecio fluviatilis*, large naiad - *Najas major*, curly lily - *Lilium martogon*, shadow sedge - *Carex umbrosa*, meadow fescue - *Festuca altissima*, Siberian iris - *Iris sibirica*, white water lily - *Nymphaea alba*, bear's onion - *Allium ursinum*. Moreover, there are 11 species included in the list of plants in need of preventive protection and rational use: superb pink - *Dianthus superbus*, peach-leaved bellflower - *Campanula persicifolia*, culverwort - *Aquilegia vulgaris*, pasqueflower - *Pulsatilla patens*, large-flowered foxglove - *Digitalis grandiflor*, Lithuanian catchfly - *Silene lithuanica*, lily-of-the-valley - *Convallaria majalis*, Solomon's seal - *Polygonatum odoratum*, helleborine - *Epipactis helleborine*, swamp helleborine - *Epipactis palustris*, butterfly orchid - *Platanthera bifolia*. Latin names of plants are given according to the key [7]. Attention is drawn to the unusually large and sometimes abundant populations of some protected plant species.

The first meadow tourist ecological route runs along Chaplinsko-Stradubsky floodplain meadow of the Dnieper. It starts on the left bank of the Dnieper near Lake Glushets; it continues along the left bank of the Dnieper along a floodplain meadow near Lake Domashnee. Then it runs along the forest and finishes near Lake Glushets.

There are bushes of the almond-leaved willow covering the bank of the old riverbed of the Dnieper. A floodplain meadow starts there and goes downstream on a flat elevated plain of the central floodplain of the Dnieper.

The common aspect of the meadow vegetation of the flat elevated plain is the ash-green colour of inflorescences of the co-dominant species of Valissian fescue (*Festuca valesiaca*) and narrow-leaved bluegrass (*Poa angustifolia*). Its vegetation cover is represented by fragments of *Poo angustifolii – Festucetum valesiacae ass. nov. prov.* and *Poetum angustifoliaea (Domin 1943) Shelyag – Sosonko et al. 1986.* The following plants participate in the grass stand apart: couch grass (*Elytrigia repens*), timothy grass (*Phleum pratense*), meadow foxtail (*Alopecurus pratensis*), valerian (*Valeriana officinalis*), pyramidic sorrel (*Rumex thyrsiflorus*), common yarrow (*Achillea millefolium*), field buttercup (*Ranunculus acris*), garden asparagus (*Asparagus officinalis*), Borbash's cartnation (*Dianthus orbasii*), Delavign's June grass (*Koeleria delavignei*), common cerastium (*Cerastium holosteoides*), hoary alyssum (*Berteroa incana*), fourseed vetch (*Vicia tetrasperma*), etc.

As we can see, there is an integrated character of the vegetation of the community of two associations *Poo angustifolii: Festucetum valesiacae* and *Poetum angustifoliae*.

Along the route, there are flat lows covered by meadow vegetation *Poo palustris-Alopecuretum pratensis (Sapegin 1986) Shelyag – Sosonko et al. 1987.* The participation of fox sedge in the grass stand gives ground to distinguish the *Carex vulpina* variant in the association. The aspect of the grass stand is ash-green from vegetative organs of plants and inflorescences of meadow foxtail. The basis of the grass stand is made up of co-dominant species of meadow foxtail, marsh bluegrass and fox sedge. Among the various grass species, the early marsh orchid (*Dactiylorhiza incarnata*) is noted.

Lower places of the central left-bank floodplain of the Dnieper are covered with acute sedge. They form communities of *Caricetum gracilis (Almquist 1929) R.Tx. 1937.* Along lower plots, acute sedge mixes with

thickets of reed sweet grass (*Glyceria maxima; Glycerietum maximae Hueck 1931)* or transitional states between acute sedge and reed sweet grass *Glycerio maximae – Caricetum acutae Sapegin 1986* and *acc. Carici acutae – Glycerietum maximae Shelyag-Sosonko et al. 1985).*

Fragments of floodplain oak forests (*Quercetum graminoso-fluviatilis*) are found on flat elevated plains of the left-bank central floodplain. The floodplain oak forest of route #1 is original in terms of its floristic composition of the ground grass cover formed by the lily of the valley (*Convallaria majali*s) with a slight addition of other species: white swallow-wort (*Vincetoxicum hirundinacea*), common loosestrife (*Lysimachia vulgaris*), meadow horsetail (*Equisetum pratense*), barbate skullcup herb *(Scutellaria hastifloria)*, knotted scrofula *(Scrophularia nodosa)*, oak bluegrass (*Poa nemoralis*), meadow foxtail (*Alopecurus pratensis*), northern bedstraw (*Galium boreale*), hedge hyssop (*Gratiola officinalis*), common tansy (*Tanacetum vulgare*), asparagus (*Asparagus officinalis*), Borbash's cartnation (*Dianthus borbasii*) и др.

In front of the floodplain oak forest to the left of the road, attention is drawn to thickets of acute sedge (*Caricetum gracilis (Almquist 1929) R.Tx. 1937*) with yellow meadow rue (*Thalictrum flavum*), northern bedstraw (*Galium boreale*), reed canary grass (*Phalaroides arundinacea*), meadowsweet (*Filipendula ulmaria*), bird vetch (*Vicia racca*), light meadow rue (*Thalictrum lucidum*), knitback (*Symphytum officinale*), rainbowweed (*Lythrum salicaria*).

Behind the floodplain oak forest to the right of the road, there are fragments of thickets of reed canary grass (*Phalaridetum arundinaceae Libb.1931*), awnless brome (*Bromopsietum inermis Shvergunova et. al. 1984*).

Along the route, there is a ridge of the central floodplain with a grass cover *Poo angustifolii-Festucetum valesiacae* which is replaced by a wide

low dominated by acute sedge (*Carex acuta* (*Caricetum gracilis (Almquist 1929) R.Tx. 1937*) and bushes of almond-leaved willow (*Salix triandra*) along the slope of the low. The low is followed by a flat elevated plain with a characteristic vegetation cover of *Poo angustifolii– Festucetum valesiacae*. It adjoins Podrechitsky with low banks overgrown with acute sedge (*Caricetum gracilis*) with willow (*Salix triandra, S.cinerea*). Further, the route approaches Lake Glushets with bank thickets of aquatic floating plants - yellow pond lily (*Nuphar lutea*), curly-leaved pondweed (*Potamogeton crispus*), caltrop (*Trapa natans*) and semi-aquatic species – water dropwort (*Oenanthe aquatica),* great bulrush (*Schoenoplectus lacustris*), acute sedge (*Carex acuta*).

The length of the first meadow ecological route is 7 km.

The second meadow ecological route runs along Kazimirovskoe floodplain meadow of the Dnieper (see the scheme). It starts from a forest (sq. 95) in the direction of a former pumping station on the left bank of the Dnieper. It continues along the left bank of the Dnieper up to "Kazimirovsky" and runs along the bank of the Dnieper with a length of 2 km to the old riverbed "Podrechitskoe". The total length of the route is 6 km.

The route begins with a flat lowered plain of the left-bank central floodplain of the Dnieper with separate willow bushes (*Salix triandra*) up to 150 m wide.

The grass stand of the flat lowered plain is bright green with an ashy tint from reed canary grass inflorescences (*Phalaroides arundinacea*). The grass stand cover is 100%; the height is 100 (180) cm. The basis of the grass stand of the meadow ecosystem is the dominating reed canary grass. There are poorly abundant plants in the grass stand that include marsh bluegrass (*Poa palustris*), couch grass (*Elytrigia repens*), common loosestrife (*Lysimachia vulgaris*), water parsnip (*Sium latifolium*), scorpioid forget-me-not (*Myosotis scorpioides*), creeping buttercup (*Ranunculus repens*), clump

speedwell (*Veronica longifolia*), curly-leaved sorrel (*Rumex crispus*), etc. According to the ecological-floristic classification [3, 4], the meadow ecosystem belongs to *Phalaridetum arundinaceae Libb. 1931*.

Along the route, there is a wider lowered plain of the left-bank floodplain of Kazimirovsky meadow. Its grass stand is dark green from the vegetative organs of the co-dominant species of the acute sedge (*Carex acuta*) and reed canary grass (*Phalaroides arundinacea*). The total project grass stand cover is 90%; the height is – 50 (130) cm. The basis of the grass stand consists of the acute sedge and reed canary grass. There is rare occurrence of such plants as water parsnip (*Sium latifolium*), creeping buttercup (*Ranunculus repens*), scorpioid forget-me-not (*Myosotis scorpioides*), water plantain (*Alisma plantago-aquatica*), marsh cress (*Rorippa palustris*), etc. This meadow ecosystem has been preliminarily assigned to *Phalaroido arundinaceae – Caricetum acutae ass. nov. prov.* in accordance with Braun-Blanquet classification [3, 4].

The wide lowered plain along the ecological route is replaced by a ridge of the central floodplain up to 20 m wide. Its grass stand is characterized by a brownish-green aspect. The project cover of the grass stand is 70%; the height of the grass stand is 20 (60) cm. Co-dominants of the grass stand are the vineal bentgrass (*Agrostis vinealis*) and the narrow-leaved bluegrass (*Poa angustifolia*). There is rare occurence of the following plants in the grass stand: pyramidic sorrel (*Rumex crispus*), fleawort (*Galium verum*), Siberian iris (*Iris sibirica*), angle onion (*Allium angulosum*), live-forever (*Hylotelephyum triphyllum*), common yarrow (*Achillea millefolium*), field buttercup (*Ranunculus acris*), goldilocks (*Ranunculus auricomus*), strict forget-me-not (*Myosotis stricta*), fleawort (*Gallium verum*), Silene flos-cuculi (*Coronaria flos-cuculi*), doubted cadenia (*Kadenia dubia*), common all-heal (*Prunella vulgaris*), narrow-leaved plantain (*Plantago lanceolata*), summer rattle (*Rhinantus aestivalis*), soft brome grass (*Bromus*

Mollis), etc. According to the ecological-floristic classification, we attributed this meadow ecosystem to *Poo angustifolii – Agristietum vinealis ass. nov. prov.*

Along the ecological route, the meadow ecosystem on the ridge of the central floodplain gives way to a meadow ecosystem on a flat lowered plain up to 150 m wide. Its grass stand is characterized by a dark green aspect. The total project cover of the grass stand of the meadow ecosystem is 90%; the height is 50 (90) cm. The basis of the grass stand is formed by co-dominants: meadow foxtail (*Alopecurus pratensis*) and marsh bluegrass (*Poa palustris*) with considerate participation of fox sedge (*Carex vulpina*). According to the ecological-floristic classification, it is assigned to *Poo palustris-Alopecuretum pratensis (Sapegin 1986) Shelyag-Sosonko et. al. 1987 Carex vulpina var.*

The next meadow ecosystem of the ecological route covers a wide flat lowland (up to 200 m). Its grass stand is characterized by a bright green aspect and a project cover of 90% up to 100 cm high. This is an almost single-species thicket of acute sedge (*Carex acuta*) - 80% with insignificant participation of reed canary grass (*Phalaroides arundinacea*), knitback (*Symphytum officinale*), shining spurge (*Euphorbia lucida*), marsh bedstraw (*Galium palustris*), creeping buttercup (*Ranunculus repens*), scorpioid forget-me-not (*Myiosotis scorpioides*), water parsnip (*Sium latifolium*), etc. According to the ecological-floristic classification, this meadow ecosystem is assigned to *Caricetum gratilis (Almquist 1928) R. Tx. 1937*.

Along the route on the right, Lake Domashnee with typical bank aquatic vegetation. There’s great bulrush covering the lake's banks: *Schoenoplectus lacustris* (*Scirpetum lacustris Schmale 1939*), broadleaved cattail (*Typha latifolia; Typhetum latifoliae G. Long 1973*), water fennel (*Oenanthe aquqtica)*. White water lily (*Nymphaea alba*), yellow water lily (*Nuphar lutea*), water nut and caltrop (*Trapa natans*) grow on the surface of the water.

Along the meadow route, flat ridges alternate with herbaceous vegetation of fragments of *Poo angustifolii – Agrostietum vinealis*; on

slight elevations of the rigdes, there are fragments of plants *Poo angustifolii – Festucetum valesiacae* (steppificated meadow communities, high level). Slopes and flat areas of the floodplain (middle level) are covered with grass vegetation *Poo – Festucetum pratensis Sapegin 1986*. On wide interridge lows of the central floodplain (low level), meadow vegetation is represented by acute sedge *Caricetum gracilis (Almquist 1928) R. Tx. 1937* with fragments on slight elevations *Phalaridetum arundinaceae Libb. 1931;* on slight lows - Glycerio *maximae – Caricetum acutae Sapegin 1986* and *Carici acutae – Glycerietum maximae Shelyag – Sosonko et. al. 1987* represent an example of integrated meadow vegetation. The length of the second meadow route is about 6 km.

Therefore, passing along these meadow routes, pupils have the opportunity to get acquainted with plants growing in different ecological conditions of the floodplain (on ridges, interridge lows, elevated and lowered plains), to get informed about their ecological and biological characteristics, the economic value of medicinal, and to learn about spicy-aromatic plants.

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