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Scientific Rationale for Inclusion of A New Nature Complex Belyj Kolodez (Russia, Belgorod Region) Into the Emerald Network.

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ABSTRACT

The article shows that there are resources for extending the national list of potential Areas of Special Conservation Interest (ASCI's) of the Emerald network in densely populated and old-developed regions. The representativeness of the Belyj Kolodez nature complex (Russia, Belgorod region) is substantiated. Based on the survey of the territory, the types of priority habitats were identified according to the EUNIR classification, their floral characteristics are given taking into consideration the geographical features of the European Russia, Central Black Soil Region and the region under consideration, a list of priority species of vascular plants is given.

Keywords: Emerald network, species of European importance, territory of special nature conservation, priority habitats.

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INTRODUCTION

In 1979 the Bern Convention on the Conservation of European Wildlife and Natural Habitats was adopted. The Standing Committee of the Bern Convention conferred the status of potential Emerald network areas to 740 Russian ASCI's. In the Belgorod region, nine areas were given such status [1-5].

The Strategic Plan for Biodiversity 2011-2020 adopted within the Convention on Biological Diversity provides for the formation of a representative system of Areas of Special Conservation Interest covering at least 17 per cent of the terrestrial and inland water areas of the relevant geographic allotment (of a state, region, etc.). Such areas should be numerous and they should be located "densely" enough to maintain the ecological relationships between them. The task of conservation of the priority species in situ means the conservation of a species within the whole habitat and the distribution of ASCI's all over the habitat of the species [3, 4]. The differentiation of the landscape conditions both in the natural environment [6], and on the man-made structures [7, 8] determines the interdependent development of the vegetation and soils, which is complicates by the climatic periods of different duration [9].

Previously, an effective approach was tested for the formation of Emerald Network representative areas by moving from the center of high biodiversity to a holistic polystructural Core Area, the outline of which is based on the landscape boundaries [5].

As a result of a floristic survey of the territory of the Novooskolskiy district of the Belgorod region, we have found some reserves for increasing the number of potential Emerald network of ASCI's.

The goal of the completed survey is to determine the representativeness of the Belyj Kolodez nature complex (Russia, the Belgorod region).

The object of the survey was the White Kolodec nature complex, while the subject – the priority habitat (according to the EUNIR classification); vascular plants of the European importance, protected at the federal, regional, endemic and relict species, determining the landscape diversity and its representativeness. This information is intended for inclusion into the database of potential areas of the Emerald network.

MATERIALS AND RESEARCH METHODS

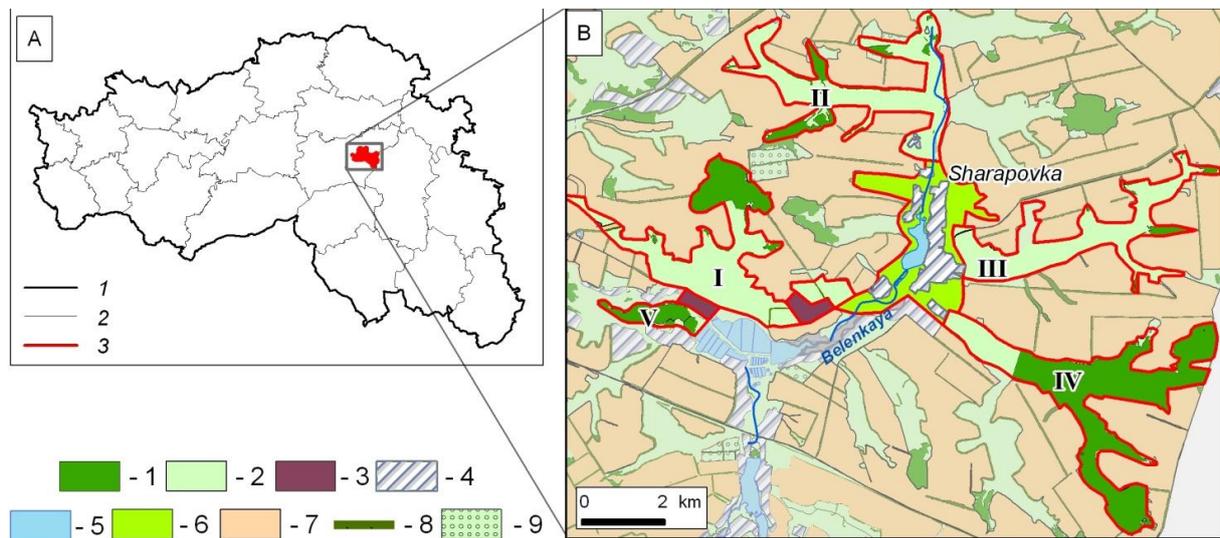


Figure: Belyj Kolodez nature complex:

A – location: 1 – the Belgorod region boundary, 2 – the boundaries of municipal districts, 3 – the nature complex boundary;

B – core ASCI's: I – Ravine Hanova, II – Ravine Osennjaja Jaruzhka, III – Ravine Suhoj Log, IV – Ravine Smutnyj Log, V – Nechaevskaja Olha; 1 – forest tracts, 2 – meadow and steppe areas, 3 – restoration zones, 4 – populated areas, 5 – ponds, 6 – ecological corridor (the valley of the River Belenkaya), 7 – tilled area, 8 – forest belts, 9 – orchards

The nature complex of gullies and hollows is situated in the basin of the River Belenkaja (the left-side tributary of the River Oskol), 3 km to the East of Novyj Oskol (Fig.). The territory belongs to the forest-steppe province of the Central Russian Upland, to the sub-zone of typical forest-steppe, and is situated within the Oskol-Donets cretaceous region [13]. Area – 2010 ha. Includes the following ravines: “Ravine Hanova”, “Ravine Osennjaja Jaruzhka”, “Ravine Suhoj Log”, “Ravine Smutnyj Log”, “Nechaevskaja Olha” – the places of growth and habitat of relic, rare and disappearing species of plants and animals.

The materials resulted from the field expeditions of 1998-2015. The priority habitats were identified in the course of route surveys. The species composition of vascular plants and their spreading was studied using the traditional methods of botanical and geobotanical studies. The belonging of species was determined under field and laboratory conditions, while clarifying difficult taxonomic types was carried out using the BSU, LE, VOR, VORG herbaria. About 600 herbarium leaf were collected and processed. The Latin names of vascular plants are given based on the data provided by P.F. Mayevsky and S.K. Cherepanov [14, 15].

CONCLUSION

“Ravine Hanova”. Area – 570 ha. It includes slopes of all exposures with motley grass-grasses and feather grass, sandy steppe, outcrops of Cretaceous rocks, ravine oak forests of the Novooskolskij forestry: “Degtjarka” (area of 129 ha) and “Hanovo” (area of 5 ha); field-protecting forest belts.

“Ravine Osennjaja Jaruzhka”. Area – 534 ha. A rockmat steppe is dominating on the south slope exposures. The specific feature is the presence of *Haplophyllum suaveolens* in the local flora (DC) G. Don. According to “The Flora of the Eastern Europe”, the habitat of the species covers Moldova, the Black Sea region, Lower Don, the Crimea, and the north of its continuous habitat reaches the latitude of Dnepropetrovsk [12, 16]. In the Central Black Soil region it was found only in the Nocooskolskij district of the Belgorod region [13, 17-20].

“Ravine Suhoj Log”. Area – 405 ha. The specific feature is the presence in the local flora of *Pulsatilla pratensis* (L.) Mill. s. l., and of *Clausia aprica* (Stephan) Korn.-Tr., which is rare for the regional flora and is not found in other areas [21].

“Ravine Smutnyj Log”. Area – 412 ha. The specific feature is the presence in the local flora of *Bulbocodium versicolor* (Ker-Gawl.) Spreng, which is not found in other areas.

The calciphilous steppe flora is attributed to the altitude of 160-200m above the sea level. The absolute elevation of the watershed is 225m [22, 23].

We identified eight types of priority habitats on the territory of these ravines. These include:

- E1.2. Perennial calcareous grassland and basic steppes;
- E6.2. Continental inland salt steppes and associated salt-tolerant grass communities;
- H3.2 Basic and ultra-basic inland cliffs (opencast deposits of chalk, limestone and marl);
- F3.247 Ponto-Sarmatic deciduous thickets (steppe brush);
- F4.2. European dry heaths. Xerophilic or mesoxerophilic heaths on silicate soils (sand steppes);
- F7.51. Tomillars on chalk outcrops of eastern Europe (petrophitic steppes);
- G1.A4. Mixed ravine and slope woodland;
- X18. Wooded steppe (Wooded steppe – habitat complex).

“Nechaevskaja Olha” – a nature object playing an important part in maintaining the hydrological regime of the River, Belenkaja. Area – 89 ha. On the south-east, it borders with “Ravine Hanova” and occupies a riparian lowland swamp. It includes a sticky alder forest (parcel 127 of the Novooskolskij forestry) with small floodplain lakes, slow streams, springs, with the blackberry, marsh marigold, Dutchman's pipe, nettle, reed, mixed herbs and other associations. *Dactylorhiza incarnata* (L.) Soo. is found in the local flora. Four types of habitats are represented in the ravine's territory:

E5.4113. *Althaea officinalis* L. watercourse screens;

E5.414. Continental river bank tall-herb communities dominated by *Filipendula*;
 G1.11. Riverine *Salix* woodland;
 G1.414. Steppe swamp *Alnus glutinosa* woods.

The list of priority and protected species [16, 24-27] of the ravine is given in the table:

Table: Priority and protected species of vascular plants of the Belyj Kolodez nature complex

Species of European importance
<i>Agrimonia pilosa</i> Ledeb., <i>Crambe tataria</i> Sebeok, <i>Iris aphylla</i> L., <i>Pulsatilla patens</i> (L.) Mill., <i>Serratula lycopifolia</i> (Vill.) A. Kerner, <i>Thesium ebracteatum</i> Hayne
Species in the Red book of the Russian Federation
Category I status – a decreasing species
<i>Iris aphylla</i>
Category II status – a species decreasing in numbers
<i>Bulbocodium versicolor</i>
Category III status – a rare species
<i>Androsace koso-poljanskii</i> Ovcz., <i>Fritillaria ruthenica</i> Wikstr., <i>Genista tanaïtica</i> P. Smirn., <i>Hedysarum grandiflorum</i> Pall., <i>Hyssopus cretaceus</i> Dub., <i>Pulsatilla pratensis</i> , <i>Stipa pennata</i> L. s. str., <i>S. pulcherrima</i> C. Koch
Species in the regional list of the Red book of the Belgorod region
Category II status – a species decreasing in numbers and prevalence
<i>Aconitum anthora</i> L., <i>Amygdalus nana</i> L., <i>Krascheninnikovia ceratoides</i> (L.) Gueldenst.
Category III status – a rare species
<i>Adonis volgensis</i> Stev. ex DC., <i>Ajuga laxmannii</i> (L.) Benth., <i>Allium flavescens</i> Bess., <i>Anemone sylvestris</i> L., <i>Asyneuma canescens</i> (Waldst. et Kit.) Griseb. et Schenk, <i>Centaurea orientalis</i> L., <i>C. ruthenica</i> Lam., <i>Clausia aprica</i> , <i>Clematis lathyrifolia</i> Bess. ex Trautv., <i>Dracocephalum ruyschianum</i> L., <i>Ephedra distachya</i> L., <i>Epipactis helleborine</i> (L.) Crantz, <i>Gentiana cruciata</i> L., <i>Goniolimon tataricum</i> (L.) Boiss., <i>Haplophyllum suaveolens</i> , <i>Iris pineticola</i> Klok., <i>Linum ucrainicum</i> Czern., <i>Ornithogalum kochii</i> Parl., <i>Pedicularis kaufmannii</i> Pinzger, <i>Polygala sibirica</i> L., <i>Potentilla alba</i> L., <i>Poterium sanguisorba</i> L., <i>Prunella grandiflora</i> (L.) Scholl., <i>Salvia aethiopsis</i> L., <i>Scutellaria supina</i> L., <i>Senecio schvezovii</i> Korsh., <i>Spiraea crenata</i> L., <i>Stipa lessingiana</i> Trin. et Rupr.
Category IV status – an unexplored species (unidentified status)
<i>Sedum maximum</i> (L.) Hoffm. s. l.
Category V status – a vulnerable species
<i>Actaea spicata</i> L., <i>Allium inaequale</i> Janka, <i>Clematis integrifolia</i> L., <i>Crambe tataria</i> Sebeok, <i>Galatella villosa</i> (L.) Reichenb. fil., <i>Hyacinthella leucophaea</i> (C. Koch) Schur, <i>Monotropa hypopitys</i> L., <i>Linum perenne</i> L., <i>Primula veris</i> , <i>Pulsatilla patens</i> (L.) Mill., <i>Scorzonera purpurea</i> L., <i>Trinia multicaulis</i> (Poir.) Schischk., <i>Valeriana rossica</i> P. Smirn., <i>V. tuberosa</i> L., <i>Veratrum nigrum</i> L., <i>Verbascum phoeniceum</i> L., <i>Vinca herbacea</i> Waldst. et Kit.
Category VI status – an especially valuable species
<i>Adonis vernalis</i> L., <i>Asperula tephrocarpa</i> Czern. ex Pop. M. et Chrshan., <i>Astragalus albicaulis</i> DC., <i>Carex humilis</i> Leyss., <i>Cephalaria uralensis</i> (Murr.) Schrad. ex Roem. et Schult., <i>Diplotaxis cretacea</i> Kotov, <i>Linum flavum</i> L., <i>Onosma tanaïtica</i> Klok., <i>Pedicularis kaufmannii</i> Pinzger, <i>Teucrium polium</i> L., <i>Thymus cretaceus</i> Klok. et Shost., <i>Silene supina</i> Bieb., <i>Helianthemum nummularium</i> (L.) Mill.
Require enhanced security measures – candidates for inclusion into the Red Book of the Belgorod region
<i>Astragalus varius</i> S.G. Gmel., <i>Neottia nidus-avis</i> (L.) Rich., <i>Gagea bulbifera</i> (Pall.) Salisb., <i>Centaureum pulchellum</i> (Sw.) Druce, <i>Campanula persicifolia</i> L., <i>Linum hirsutum</i> L., <i>Allium paczoskianum</i> Tuzson, <i>Ranunculus illyricus</i> L., <i>Echinops ruthenicus</i> Bieb., <i>Helictitrichon desertorum</i> (Less.) Nevski, <i>Carex pediformis</i> C.A. Mey., <i>Oxytropis pilosa</i> (L.) DC., <i>Chamaecytisus austriacus</i> (L.) Link, <i>Galatella angustifolia</i> (Tausch) Novopokr., <i>Galatella linoisyris</i> (L.) Reichenb. fil., <i>Trinia ucrainica</i> Bieb., <i>Rosa villosa</i> L.

SUMMARY

The floristic research results show the representativeness of the Belyj Kolodec nature complex, which meets the requirements to potential ASCI's of the Emerald network:

- as to the size of the territory (area – 2010 ha);
- as to the number of priority types of habitats (twelve types according to the UINIS classification);
- as to the diversity of the flora:

Six species of vascular plants of the European importance;

Ten species of vascular plants entered into the Red Book of the Russian Federation;

Sixty two species of vascular plants of the regional list;

Seventeen species of vascular plants requiring enhanced protection measures for the candidates for the Red Book of the Belgorod region;

- As to the presence of relic groups among the plant communities: “low Alps” [28], thymes, hyssops.

REFERENCES

- [1] Gusev, A.V., 2014. “Areas of special conservation interest of the Emerald network in the Belgorod region”, in *Landshaftnye i geojekologicheskie issledovaniya prirodnyh i antropogennyh geosistem (k 80-letiju so dnja rozhdenija N.I. Dudnika)* [Landscape and geo-ecological study of natural and anthropogenic geosystems (On N.I. Dudnik 80th anniversary)]. Tambov: Publ. TSU. G.R. Derzhavin, pp. 244–248 (in Russian).
- [2] European strategy of preservation of plants, 2003. Council of Europe and “Planet Europe”. [European strategy of preservation of plants. Council of Europe and “Planet Europe”]. Moscow: Publishing house of Representation of the World Union of Conservation (IUCN) for the CIS countries, pp: 39 (in Russian).
- [3] Sobolev, N.A., 2013. “A malachite frame for the Emerald network”, *Stepnoy byulleten'* [Steppe bulletin], 37, pp. 9–11 (in Russian).
- [4] Sobolev, N.A. and E.A. Belonovskaya, 2011–2013. “Izumrudnaya kniga Rossiyskoy Federatsii. Territorii osobogo prirodookhrannogo znacheniya Evropeyskoy Rossii. Predlozheniya po vyyavleniyu”. Ch. 1. [Emerald book of the Russian Federation. Territories of special nature protection value of the European Russia. Offers on identification. P.1]. Moscow: Institute of Geography, Russian Academy of Sciences (Publ.), pp: 307.
- [5] Gusev, A.V., Lisetskii, F.N. and E.I. Ermakova, 2016. “Principles and experience of justification of ecological representativeness of Emerald network potential sites”, *Research Journal of Pharmaceutical, Biological and Chemical Sciences*, 7(2), pp. 1178–1189.
- [6] Lisetskii, F.N., 1998. “Autogenic succession of steppe vegetation in postantique landscapes”, *Russ. J. Ecol.*, 29(4), pp. 217–219.
- [7] Lisetskii, F.N., Stolba, V.F., Ergina, E.I., Rodionova, M.E. and E.A. Terekhin, 2013. “Post-agrogenic evolution of soils in ancient Greek land use areas in the Herakleian Peninsula, southwestern Crimea”, *The Holocene*, 23(4), pp. 504–514. DOI: 10.1177/0959683612463098.
- [8] Lisetskii, F.N., Sudnik-Wojcikowska B. and I.I. Moysiyenko, 2016. “Flora Differentiation among Local Ecotopes in the Transzonal Study of Forest-Steppe and Steppe Mounds”, *Biology Bulletin*, 43(2), pp. 169–176. DOI: 10.1134/S1062359016010106.
- [9] Ivanov, I.V. and F.N. Lisetskiy, 1996. “Correlation of soil formation rhythms with periodicity of solar activity over the last 5000 years”, *Transactions (Doklady) of the Russian Academy of Sciences. Earth science sections*, 340 (1), pp. 189–194.
- [10] Gusev, A.V., 1999. “Materials on the formation Novooskolskiy Natural Park”, in *Fal'cfejnovskie chteniya [Pfalzveynovskie readings]*. Herson: Ajlant (Publ.), pp. 56–59 (in Russian).
- [11] Gusev, A.V., 2012. “The current state of PA Beam Khanova (Belgorod region)”, in *Rezhimy stepnyh osobo ohranjaemyh prirodnyh territorij [Modes of steppe specially protected areas]*, Int. scientific-practical Conf. for prof. V.V. Aljohin 130 anniversary. Kursk, pp. 48–51 (in Russian).
- [12] Gusev, A.V., and E.I. Ermakova, 2005. “Analysis flora of the natural complex “Beam Khanova”, in *Teoreticheskie i prikladnye issledovaniya v botanike i metodike prepodavanija [Theoretical and applied research in botany and methods of teaching]*, Int. scientific-practical Conf. Belgorod, pp. 39–41 (in Russian).
- [13] Milkov, F.N., 1974. “Main geographical regularities of a slope mikrozonality of landscapes”, in: *Sklonovaya mikrozonality landshaftov [Slope microzonality of landscapes]*. Voronezh, pp. 5–11 (in Russian).
- [14] Maevskij, P.F., 2014. “Flora srednej polosy evropejskoj chasti Rossii” [Flora of the middle belt of the European part of Russia]. Moscow: Tovarishhestvo nauchnyh izdanij KMK (Publ.), pp: 635 (in Russian).

- [15] Cherepanov, S.K., 1995. "Sosudistye rasteniya Rossii i sopredel'nykh gosudarstv (v predelakh byvshego SSSR)". [Vascular plants of Russia and the adjacent states (within the former USSR)]. SPb.: Mir i sem'ya-95 (Publ.), pp: 990 (in Russian).
- [16] Gusev, A.V., 2014. "Species of the Red Book of the Russian Federation in the flora of the Belgorod region (materials for the new edition of the Red Book of the Belgorod region)", Nauchnye vedomosti BelGU. Serija Estestvennyye nauki [Scientific statements BSU. Series Science], 26 (3), pp. 27–38 (in Russian).
- [17] Gusev, A.V., 2002. "Finding Haplophyllum suaveolens (DC.) G. Don, in Novy Oskol Districts in Belgorod Region", in Flora i rastitel'nost' Central'nogo Chernozem'ja [Flora and vegetation of the Central Chernozem]. Scientific Conf. Kursk, pp. 7–8 (in Russian).
- [18] Gusev, A.V., 2004. "The floristic composition of the stokers Novooskolskiy district", in Flora i rastitel'nost' Central'nogo Chernozem'ja [Flora and vegetation of the Central Chernozem]. Scientific Conf. Kursk, pp. 65–68 (in Russian).
- [19] Stankov, S.S., Taliev V.I. Opredelitel' vysshih rastenij Evropejskoj chasti SSSR [The determinant of higher plants of the European part of the USSR]. Moscow: Sovetskaja nauka (Publ.) (in Russian).
- [20] "Flora Vostochnoj Evropy " [Flora of Eastern Europe], 1996. Ed. N.N. Cvelev. SPb: Mir i sem'ja- 95 (Publ.), pp: 333 (in Russian).
- [21] Gusev, A.V., 2009. "Flora beams "Vague Log" (left bank of the river. Oskol, Belgorod region)", in Flora i rastitel'nost' Central'nogo Chernozem'ja [Flora and vegetation of the Central Chernozem]. Scientific Conf. Kursk, pp. 20–22 (in Russian).
- [22] Gusev, A.V., 2000. "Brief description of the natural areas, complexes, anthropogenic landscape elements that require giving them the status of specially protected natural areas and the inclusion in the existing protected areas network Novooskolskiy district", in Jekologicheskaja bezopasnost' i zdorov'e ljudej v XXI veke [Environmental health and safety of people in XXI century:]. VI All-Russia scientific-practical Conf. Belgorod, pp. 28–31 (in Russian).
- [23] Gusev, A.V., 2009. "Flora of steppe areas south-east of the Belgorod region", in Stepi Severnoj Evrazii [Steppes of Northern Eurasia], Ed. A.A. Chibiljov. V Int. Symposium. Orenburg: Gazprompechat (Publ.), Orenburggazpromservis (Publ.), pp. 257–259 (in Russian).
- [24] Gusev, A.V., 2013. "Additions and updates to the flora of the Belgorod region", Bjulleten' MOIP. Otdelenie biologicheskoe [MOIP newsletter. Department of biological], 118 (6), pp. 67 (in Russian).
- [25] Prisniy, A.V. (obsch. nauch. red.), 2005. "Krasnaja kniga Belgorodskoj oblasti. Redkie i ischezajushhie rastenija, griby, lishajniki i zhivotnye" [Red book of Belgorod region. Rare and endangered plants, fungi, lichens and animals]. Belgorod, Belgorodskaja oblastnaja tipografija (Publ.), pp: 532 (in Russian).
- [26] Trutnev, Yu.P. et al. (edit.), 2008. "Krasnaya kniga Rossijskoj Federatsii (rasteniya i griby)" [Red List of the Russian Federation (plants and mushrooms)]. Moscow: Tovarishchestvo nauchnykh izdaniy KMK (Publ.), pp: 855 (in Russian).
- [27] Resolution No. 6 (1998) of the Standing Committee listing the species requiring specific habitat conservation measures (adopted by the Standing Committee on 4 December 1998).
- [28] Golicyn, S.V., 1965. "Snizhennye Al'py" i melovye issopniki Srednerusskoj vozvyshebnosti" ["Reducing Alps" and Cretaceous stokers Central Russian Upland]: PhD thesis. Voronezh, p: 16 (in Russian).