ECOLOGIA BALKANICA

2015, Vol. 7, Issue 1 June 2015 pp. 13-19

Distribution and Assessment of the Nature Conservational Status of the Nature Habitat 91Z0 „Moesian Silver Lime Forests" in SCI „Svishtovska Gora" (BG0000576), Bulgaria

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Abstract. The protected zones or Site of community importance (SCI) are Natura 2000 areas which aim is to assure conditions for protection and survival of the most valuable and threatened species and habitats in Europe. Protected area BG0000576 „Svishtovska gora" is a part of Natura 2000 network in Bulgaria. It is declared mainly for the protection of habitat 91Z0 „Moesian silver lime forests" which is 5.7% from its area. The habitat includes forests with domination or co-domination of silver lime (*Tilia tomentosa* Moench.). In Bulgaria the silver lime forests are distributed mainly in Danube Hilly Plane and Northeast Bulgaria (Ludogorie). The main threats for this type of habitat are illegal cuttings, after the restitution of the forests. The aim of the present investigation is to assess the status of the habitat and to make a map of its location in the zone. The methodology for mapping and assessment of the nature conservation status of the natural habitats developed under the project: „Mapping and determining of the natural conservational status of the nature habitats and species - phase I" were used in the present research. As a result of the study the habitat distribution map (112.36 ha) was produced and its conservational status was assessed as unfavorable-unsatisfactory.

Key words: protected zone, SCI, natural habitat, mapping, assessment, state, Natura 2000.

Introduction

The Natura 2000 sites are established according to two basic for the biodiversity conservation European Council Directives - Directive 92/43/EEC for the conservation of natural habitats, wild fauna and flora and Directive 79/409/EEC for the conservation of wild birds.

The „Environment 2007 - 2013" operational program is the document, which sets the country strategic objectives and priorities in environment sector that will be financed by the European funds. It is directed to the implementation of commitments taken in the negotiation process in the sector and achievement of compliance with the EU requirements in the field of environment (EU/EDRF/CF, 2007). One of the program's priorities is axis 3: „Conservation and restoration of the biodiversity". The assessment of state, geographical distribution and mapping of Natura 2000 habitats as well as report preparation for conservation status of species and habitats included into Directive 92/43/EEC are some aims of the mentioned axis. The project „Mapping and determining of the environment conservational status of natural habitats and species - phase I", funded by Bulgarian Ministry of

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Environment and Water (MOEW), covered the same targets. The present research is conducted in the frame of this project.

The aim of the current study is to assess the status and to make a map of Natura 2000 habitat 91Z0 „Moesian silver lime forests" distributed in Bulgarian protected zone BG0000576 „Svishtovska gora".

The silver lime communities in Bulgaria were subject of investigation of different authors, such as: BONDEV (1991), who determines three types lime communities – *Tilia tomentosa* forest; mixed forest of *Tilia tomentosa*, *Carpinus betulus* or *Quercus cerris*; mixed forest of *Tilia tomentosa*, *Carpinus betulus* and *Fraxinus ornus*; KALMUKOV (1987, Sofia, pers. comm.), who made investigation over breeding of the species and TZONEV (2003), who presents the syntaxonomy of silver lime communities in Bulgaria.

The results of present research are going to help National directorate for nature conservation in MOEW for continuing of the process of setting up and management of the Natura 2000 network. Habitat's distribution area and state ensure information for the aims of the assessment of the compatibility of the investment proposals, plans, programs and projects with the aims of conservation in the protected zones. Also they ensure basic data for monitoring of the biodiversity and for developing of plans for management of the protected zones.

Materials and Methods

The object of investigation is the natural habitat 91Z0 „Moesian silver lime forests" in BG0000576 "Svishtovska gora" protected zone (Fig. 1). The studied area (1917.2 ha) has a relation with BG0002083 "Svishtovsko belenska nizina" protected zone. The site is located south from the town of Svishtov and its geographical coordinates are: E 25° 35' 25" longitude and N 43°35' 29" latitude. The average altitude of the site is 141 m. The altitude of the lowest point is 33 m and of the highest - 232 m. The site is related to continental biogeographic region and it is important "stepping stone" of broadleaf forest in Danube Hilly Plane. The protected zone also falls into a developing agricultural region.

The site is declared to protect unique for the region more compact well preserved lime forests – habitat 91Z0, situated between the rivers of Osam and Yantra, which is a bridge towards the bigger massifs found in the Ludogorie. The site includes also loess steppe grasslands – habitat 6250 „Panonic loess steppe grasslands" which takes 2.3% of the site and habitat 91H0 „Panonic forests with *Quercus pubescens"*, occupying 0.05% of the site (Standard data form, MOEW).

The habitat includes forests with domination or co-domination of silver lime (*Tilia tomentosa* Moench.). In Bulgaria the silver lime forests are distributed mainly in Danube Hilly Plane and Northeast Bulgaria (Ludogorie) as well as more restricted in East Balkan at 50-60 to 800-1000 m a.s.l. They can be found in the hilly regions over loess or limestone. They occupy mainly the hills with north and east exposition with slope of 5 to 45°. The soils are Kastanik chernozems, Phaeozems and Luvisols. They have a well-developed humus horizon with high moisture. There is not real summer drought in these forests because of the lower evaporation and lower summer temperatures. Their high coverage does not allow forming of rich herb layer which could increase the transpiration and the soil drying additionally. Depending on local conditions these plant communities can be mesoxerophytic to xerophytic. The lime forests are mainly mono dominant. The main species in the tree layer is *Tilia tomentosa* and relatively often *Acer campestre*, *Fraxinus ornus*, *Quercus cerris*, *Q. robur* can be observed. The shrub layer isn't formed, only *Staphylea pinnata* as shade tolerant species can be seen more often at the slopes of the humid ravines. The other shrub species which participate in the composition of the lime communities are: *Berberis vulgaris*, *Cornus mas*, *C. sanguinea*, *Corylus avellana*, *Crataegus monogyna*, *Ligustrum vulgare*, *Viburnum lantana*. The herb layer is not developed, except some shade tolerant species as: *Arum maculatum*, *Buglossoides purpurocaerulea*, *Dactylis glomerata*, *Hedera helix*, *Geum urbanum*, *Melica uniflora*, *Melittis*

melissophyllum, *Ruscus aculeatus*, *Ruscus hypoglossum*. The mass development of spring ephemerides as *Anemone ranunculoides*, *Convallaria majalis*, *Corydalis bulbosa*, *Ranunculus ficaria* and others is very typical. Some geophytes of this group are developed at the end of the spring, as: *Cephalanthera damassonium*, *Lilium martagon*, *Limodorum abortivum*, *Platanthera chlorantha*. The silver lime communities in Middle Danube Plane are represented by endemic association *Staphyleo-Tilietum tomentosae*. They are relicts of the time of maximum distribution of the mesophytic forest vegetation (during Atlantic period of Holocene) in the Danube plane (KAVRAKOVA *et al.*, 2009).

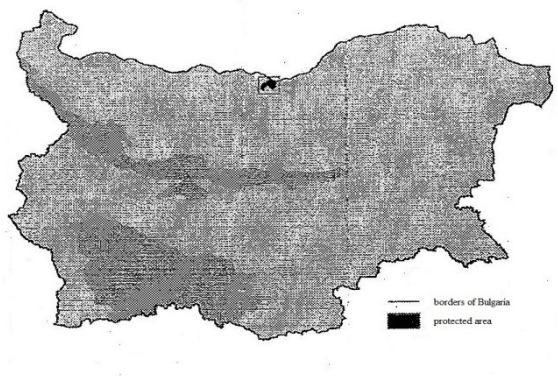

Fig. 1. Indicative map of Protected zone "Svishtovska gora" in Bulgaria.

Field work

The methodology of mapping and assessment of the nature conservation status of the habitats in Bulgaria is developed under the project: „Mapping and determining of the nature conservational status of the natural habitats and species - phase I" (GANEVA, 2013). The field work is carried out during 2011. Data of specific points and tracks were gathered at field and then polygons were built in GIS environment. The routes for field work were determined in advance because of the specification of distribution of the forest habitat in the zone. The habitat 91Z0 was ranged over the investigation of whole area located between villages of Oresh and Tzarevetc and Svishtov Town. The GPS coordinates were taken after checking 20 presented on the forest deductive model map sections. Relevés were carried out in selected typical parts of the habitat as well as some parameters for assessment of the nature conservational status were taken in the field work. The Braun - Blanquet (MAAREL, 1979) abundance assessment scale was used.

Methods of mapping

The preliminary created deduction model for the habitat distribution regarding the ecological criteria including: distribution (through the whole country), origin of the stand (seed or coppice stand), tree species (silver lime, first tree layer, density more than 40%) was used. The data is taken from the electronic database of Sylvicultural projects of Bulgarian forest territory, forest areas - level section, scale 1:10000. The field tracking around the zone was carried out to verify some areas of the deductive model. A map of the verified territory was made. The inductive model of the habitat distribution was generated on the base of taken during the field work information and also by using the obtained deductive model. For this purpose the following layers were used: GPS points where the habitat was registered – the centers of sample plots, where the plant communities' relevés were made or centers of verified forest sections, which confirm deduction model; all the habitat deduction models, which were done in the zone, without the checked polygons, which do not confirm the habitat presence. Free Maxent software for species habitat modeling, (PHILLIPS *et al.*, 2015) as well as: ESRI – ArcGIS Desktop 10 – ArcEditor, Spatial Analyst and Geostatistical Analyst (ESRI, 2011) were used for the created inductive model. The map of 91Z0 habitat distribution in the zone is created after topologic verification and joining the graphic polygons, built after the verification of polygons from deduction model during the field tracking. The mapped polygons on field and the received by the inductive model polygons are presented with different colour on the final habitat distribution map.

Methods of assessment of the nature conservational status

The assessment of the nature conservational status (NCS) was made on the base of specific criteria, presented by parameters with corresponding values. These values can be quantified or to be based on principle of "the best expert assessment". The obligatory criteria for determining of NCS at protected zone level are: habitat area in the zone, structure and functions, and future perspectives. If all parameters have favorable assessment than the assessment of the criterion is favorable. If one of the parameters is assessed as unfavorable – unsatisfactory or unfavorable – bad state than total assessment of the criterion is unfavorable – unsatisfactory or unfavorable – bad state respectively. And this determines the total assessment of the nature conservational status of the habitat in the zone.

Results and Discussion

The area of the 91Z0 nature habitat in the SCI "Svishtovska gora" is 112.43 ha according to the deduction model. The verified territory is 67.14 ha and 66.18 ha are confirmed as the area of 91Z0 natural habitat. The inductive model for distribution of the habitat is generated. There are not cases of fire recorded on the territory occupied by habitat (according to the information of GD "Fire Safety and Protection of Population", Bulgarian Ministry of Interior: Database of fires in Bulgaria, 2009 – 2011).

The created habitat distribution map in the borders of the zone is presented on Fig. 2. The total habitat area in the zone is determined of 112.36 ha. The areas generated after field investigations are shown with dark green color and they represent 59% from the total habitat territory. The territories obtained through inductive model which are 46.25 ha or 41% from the total habitat territory are given with light green color.

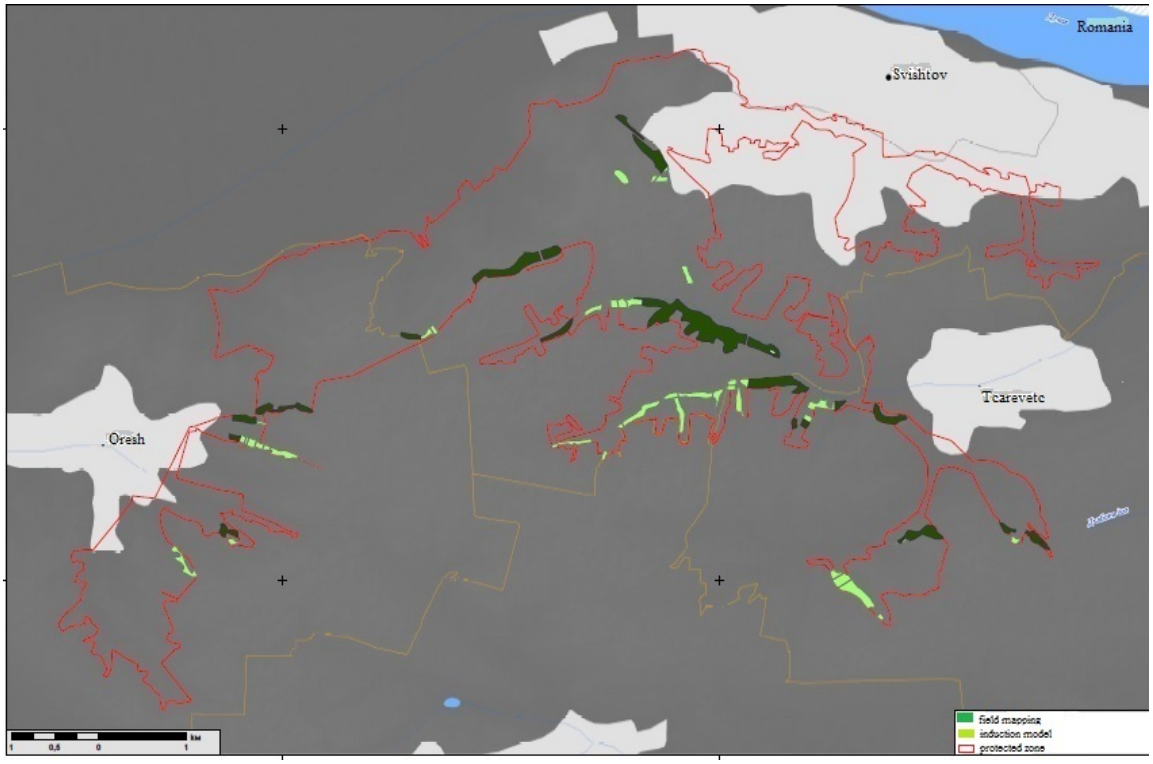

Fig. 2. Distribution of 91Z0 habitat in SCI "Svishtovska gora".

Assessment of the nature conservational status

Criterion 1. Area in the zone

Parameter 1.1. Habitat area in the zone

The present mapping showed that habitat 91Z0 is located on the area of 112.36 ha, which coincides with the referent value. The referent value for the distribution of 91Z0 in the zone according to the Standard data form is 112.4 ha (5.8% from 1917.2 ha). The assessment of this parameter shows favorable status as the area of the habitat is constant or not less than the referent area.

Criterion 2. Structure and functions

Parameter 2.1. Cover of the first tree layer

The coverage of tree layer is about 80%. It shows favorable state of the stands according to this parameter because the coverage is more than 60%. The assessment is favorable state.

Parameter 2.2. Composition of tree layer

The silver lime (*Tilia tomentosa* Moench.) is dominant in the tree layer composition with participation more than 5. In the layer composition take part also *Acer platanoides* L., *Acer campestre* L., *Fraxinus ornus* L. and *Acer tataricum* L. with lower than the dominant participation. The presence of typical species in opportune proportions is a base for the favorable assessment of parameter.

Parameter 2.3. Average age of tree layer

The average age of tree species in the first layer is around 60 years. It leads to assessment of their nature conservation status as unfavorable-unsatisfactory according to the recommendation of more than 60 years stand age for this type of forest.

Parameter 2.4. Old age forests

The old forests on the habitat's territory in the protected area were not observed that is not positive for the nature conservation status of studied habitat. The state of parameter can be modified in future by changing the land use management. This formulation enables us to assess the parameter as unfavorable-unsatisfactory state.

Parameter 2.5. Dead wood quantity

The age of the main tree species in the habitat is not enough for forming of essential quantities of dead wood. Around 6 m^3 of such wood were registered at some of visited polygons and about 6 numbers per ha were stand dead trees. These quantities however are not enough for giving the positive assessment. Regarding this parameter, assessment is unfavorable-unsatisfactory state.

Parameter 2.6. Presence of old trees (at least 20 years older than average stand age)

In the past incorrect high intensity cuttings had been carried on, which has determined to low age of the forest and lack of old trees. This parameter also can be changed in future through appropriate sylvicultural management that allows assessing the parameter as unfavorable-unsatisfactory state.

Parameter 2.7. Herb layer

The shrub layer is not formed. Only *Staphylea pinnata* L. and *Ligustrum vulgare* L. can be found more often at the humid slopes. The herb layer is not formed except some shade like species as: *Hedera helix* L., *Carex pilosa* Scop., *Polygonatum latifolium* (Jacq.) Desf., *Pulmonaria officinalis* L. These species are typical for this habitat. The given assessment in regards of this parameter is favorable state.

On the base of the assessed parameters the total assessment of criterion 2 is unfavorable-unsatisfactory state.

Criterion 3. Future perspectives (threats and influences)

Parameter 3.1. Incorrect cuttings; disturbances; poaching

Incorrect planned and done cuttings with high intensity were obtained in the habitat territory. The private forests occupy the most parts of area and the clear cuttings have been done at some places. This parameter is assessed as unfavorable-unsatisfactory state.

Parameter 3.2. Taking out of dead wood

The protected zone is poor of forest resources, very close to settlements that lead to utilizing of any inessential fall from the trees. The assessment of parameter is unfavorable-unsatisfactory state.

Parameter 3.3. Afforestation with exotic and alien species

Afforestation with exotic and alien species on the habitat territory was not observed. The experiments about changing of tree species with *Robinia pseudoacacia* L. were conducted at some places in the near past. These experiments were unsuccessful and *Robinia pseudoacacia* L. trees were withered. The habitat restored its typical species as *Tilia tomentosa* Moench. and *Fraxus ornus* L. The parameter assessment is favorable state.

Parameter 3.4. Fires

The territory of habitat is very close to settlements and is in a region with traditionally high summer temperatures, which can be theoretical prerequisite for rising of fires. However during the field visits the traces from fires were not observed. The assessment of NCS of 91Z0 regarding this parameter is favorable state.

Parameter 3.5. Recreation and tourism

The 91Z0 areas at protected zone are small parceled out forests located between agricultural lands and are not suitable for utilization for recreation and tourism. Because of this it can be reported absence of this threat for the habitat territory. So, the assessment of parameter is favorable state.

Parameter 3.6. Building and infrastructure

The habitat territory is not appropriate for building. There have not infrastructure objects on it. The state of 91Z0 regarding this parameter is assessed as favorable.

Parameter 3.7. Pasture

It was not established the usage of the habitat for pasture during the period of NCS assessment of 91Z0 habitat as well as traces from pasture at near past. Because of the lack of this threat, the assessment of parameter is favorable state.

Parameter 3.8. Nature disturbances and trends

Traces from windfalls, snowfalls, calamities and other nature disturbances were not observed on the territory of the habitat. The assessment of parameter is favorable state.

Parameter 3.9. Non regulated and incorrect gathering of non-wood forest resources (lime flowers)

Incorrect gathering of lime flowers on the habitat territory was not observed. The assessment of parameter is favorable state.

The total assessment according criterion 3 is unfavorable-unsatisfactory state on the base of the assessed parameters.

The total assessment of the status of the natural 91Z0 habitat in zone BG0000576 „Svishtovska gora" regarding the all three criteria is "unfavorable-unsatisfactory" state. The final assessment is due to the fact that criteria 2 and 3 are assessed as "unfavorable-unsatisfactory" and only criteria 1 is assessed as „favorable".

Conclusions

In regards of discussed parameters 91Z0 habitat in SCI "Svishtovska gora" is in unfavorable state. The observations during the field mapping have shown typical species composition of tree and herb layers. Not regulated gathering of non-wood forest resources, nature disturbances and using of the habitat for pasture have not been observed. The habitat area in the zone was not been threat by building and recreation pressure, and also by fires and afforestation with alien species. The coincidence of parameter "area of distribution" with reference value was observed. The protected area is poor of forest resources and is located very close to settlements. There were incorrect cuttings with high intensity in the new past. Because of that, the insufficient average stand age, lack of old forest, separate old trees, as well as insufficient quantity of dead wood were observed. All these negative status assessments are the result from the inappropriate management. To improve the natural conservational status of 91Z0 habitat in the zone the management of habitat territory has to be directed not only to wood utilization but also to maintaining of biodiversity, for example through leaving of old trees in quantity 10 numbers per ha and leaving of withered and fall trees after the relevant cuttings in quantity 8% of the stand volume.

Acknowledgements

The study was realized in the frame of the project: „Mapping and determination of nature conservational status of the nature habitats and species - phase I" with the financial support of the MOEW.

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Received: 29.01.2015
Accepted: 12.03.2015