

PRIORITIZATION OF NATURE CONSERVATION AND ANTHROPOGENIC ACTIVITIES: CASE OF ŠUMAVA NP

Tomáš Janík¹, Dušan Romportl²

¹ *Department of Spatial Ecology, The Silva Tarouca Research Institute for Landscape and Ornamental Gardening (VÚKOZ), Květnové náměstí 391, 252 43 Průhonice, Czechia*

² *Department of Physical Geography and Geoecology, Faculty of Science, Charles University, Albertov 6, 128 00 Praha 2, Czechia*

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Abstract

Sustainable development deals with environmental, societal and economic pillar. Regarding the spatial nature conservation within Central Europe, the environmental pillar has been threatened. Long lasting human pressure on landscape has created cultural landscape with only small fragments of close-to-nature habitats. Šumava National Park plays exceptional role, it is one of the largest protected and forested areas in the region. However, Šumava National Park administration has gone through various periods with different outcomes for its protection. Therefore, we applied prioritization concept to evaluate management of National Park and its zonation. We based it on objective data and statistical approaches. Our results were compared with data of anthropogenic structures and activities as built-up, recreational and developable areas. Somewhere, as we show in the article, problems between conservation priorities and human use of the area arises. By these analyses we stress the problem of sustainability in the most valuable protected natural areas of Central Europe, where also societal and economic interests are eminent.

Key words: Zonation, Management, Anthropogenic structures, Šumava National Park

Introduction

Šumava National Park was established to protect large areas of relatively natural environment in the Central Europe, which is otherwise strongly affected by human activities. Anthropogenic pressure resulting in habitat and biodiversity loss is present throughout the European landscape, therefore spatial nature protection should avoid these negative influences especially within the most valuable areas (Gordon et al., 2009; Di Minin, Moilanen, 2012; Moilanen, 2013; Pouzols et al., 2014; Romportl, 2017; Tschamntke et al., 2012).

In this article, we present Šumava National Park as a case for evaluating different aims of nature conservation and regional and local development, their spatial intersection respectively. First input is a layer of prioritization representing top-down approach and principle of national interest regarding nature conservation, second input represents bottom-up aims of local municipalities on social and economic development, which is depicted as built-up, recreational and developable areas.

Our aim was to analyse relationship between priorities of nature conservation and human-affected or potentially affected areas, because it can help in decision-making processes of permitting new anthropogenic activities and areas within national park.

Material and methods

We prepared prioritization of spatial nature protection of Šumava National Park. It is based on fifty habitat models showing potential habitat suitability for each of selected key and protected species. Majority of models were made in MaxEnt software (Philips et al., 2006) by using environmental variables characterizing area of Šumava National Park from geology towards anthropogenic activities and presence occurrence records only. In a few cases we have absence data too, thus we used GLM approach in R (R Core Team, 2018) to obtain models for these species. In addition to models, which show quality of environment from point of view of individual species, data from habitat mapping layers were used for description of habitats quality.

Prioritization was analysed by Zonation software (Moilanen et al., 2005), as inputs models and habitat mapping layers were used. This was done with resolution 10x10 m.

Layers of built-up and recreational areas was derived from topographic maps and aerial imageries capturing recent (2019) state. Developable areas were provided by regional authorities and was derived from spatial planning documents in similar recent period.

Result of prioritization was classified into ten zones according to level of priority, i.e. the most valuable 10% (100–90%) of area, the second 10% (90–80%) of the area and so on. This layer was intersected in ArcGIS software (ESRI, 2020) with abovementioned layers to obtain their areas within the zones

according to prioritization. More precisely, we used data of recreation and developable areas and 100m and 500m buffer outside built-up areas as localities threatened by human activities. To sum up, we statistically compared differences between areas of human-activities layers in each zone of prioritization (R software, Kolmogorov-Smirnov test, sig. level 0.05).

Results

Table 1 shows distribution of human-activities areas within ten zones of prioritization. We can see that in the zones with the lowest priority human activities is less present than in zones with mid-priority, in some cases human-activities layers are significantly present in the zones with higher priority, e.g. in case of developable areas. Furthermore, we counted difference between presence of human-activities areas within the 30% of the least and the most valuable areas. Results show significant difference with a larger area within the most valuable 30% of the Šumava National Park.

Fig. 1 and 2 are examples of valuable parts of open landscape affected by anthropogenic activities: Fig. 1 shows situation of developable areas in vicinity of Modrava and Filipova Huť and Fig. 2 is a ski slope in Strážný.

Tab. 1: Areas of human-activities layers within the zones of prioritization (1 = the lowest priority 10% of area, 10 = the highest priority 10% of area)

Zone	Developable areas		Recreational areas		Buffer 100m around built-up areas		Buffer 500m around built-up areas	
	Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)	Area (ha)	Area (%)
1	0,16	0,08	0	0	16,09	1,49	365,46	5,01
2	2,83	1,46	0	0	40,43	3,74	665,53	9,11
3	19,96	10,28	0,36	1,47	69,14	6,40	729,78	9,99
4	21,93	11,30	0,86	3,52	128,30	11,87	890,18	12,19
5	33,54	17,27	1,69	6,92	208,77	19,32	1001,53	13,72
6	22,02	11,34	3,77	15,48	169,65	15,70	896,80	12,28
7	22,08	11,37	11,34	46,52	125,19	11,58	741,82	10,16
8	20,02	10,31	3,08	12,62	124,90	11,56	711,32	9,74
9	27,10	13,96	0,99	4,06	90,66	8,39	626,62	8,58
10	24,52	12,63	2,29	9,41	107,67	9,96	672,51	9,21

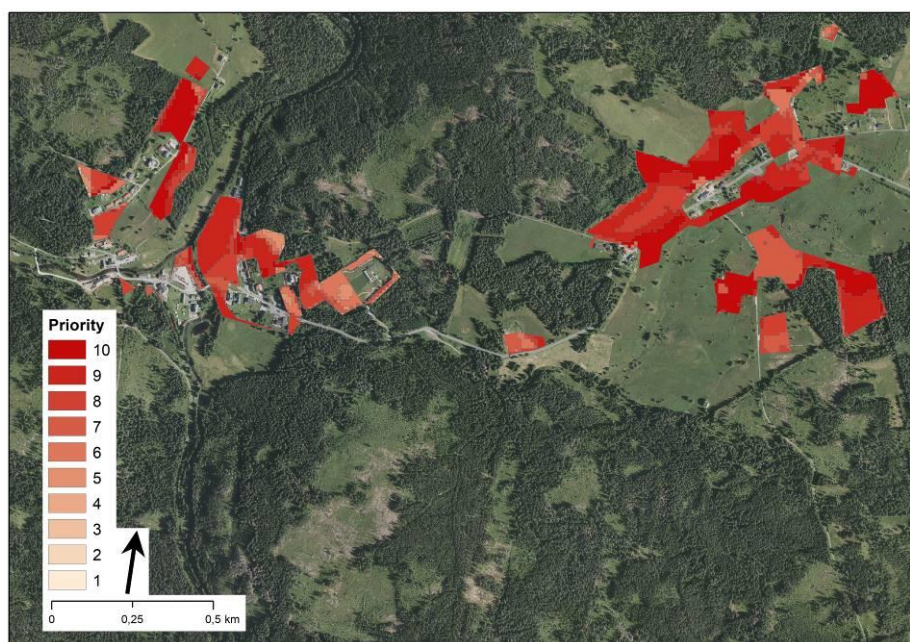


Fig. 1: Developable areas in vicinity of Modrava and Filipova Huť intersected with layer of prioritization

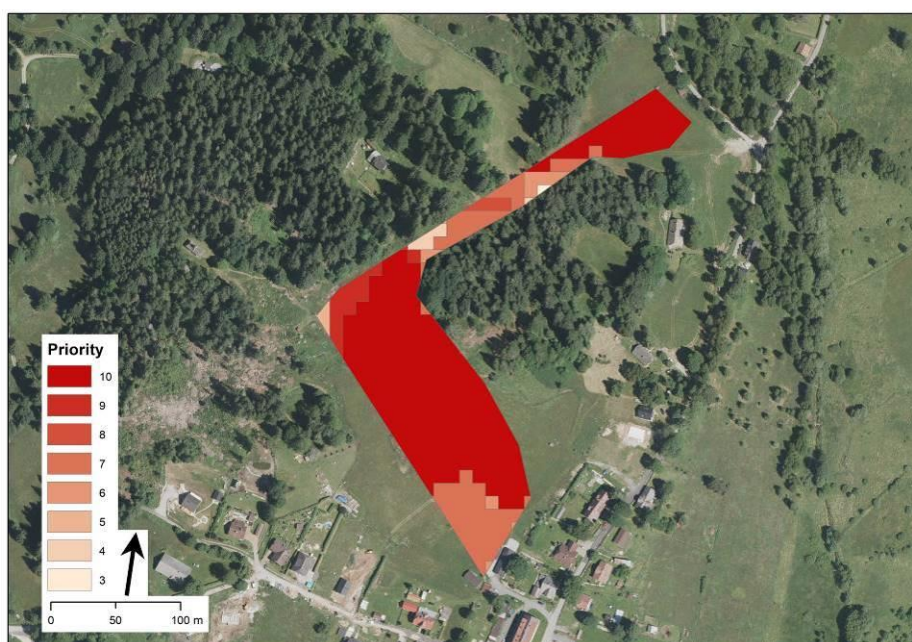


Fig. 2: Ski slope in Strážný intersected with layer of prioritization

Discussion

Central European landscape and nature is threatened by human activities; therefore, spatial nature protection is a tool for preventing from worsening condition of the most valuable pieces of landscape. Our evaluation of selected human activities in one of the largest and the most valuable protected areas in Czechia, the Šumava National Park, shows that anthropogenic structures and developable areas are present unevenly within zones of prioritization. They tended to be more present in the mid- and the most valuable zones.

Attractiveness of the nature in the most exclusive locations could be a reason for founding these areas, on the other hand, presence of structures like these lead to decline of values related to certain locality. Therefore, it is crucial to protect values by sufficient management of the area.

Conclusion

Despite the aim of the Šumava National Park to protect biodiversity and natural processes, human activities are present disproportionately largely in the priority zones regarding to our evaluation of natural values. We recommend to use this material for decision-making processes within the National Park.

References

- Gordon, A., Simondson, D., White, M., Moilanen, A., Bekessy, S. A. (2009). Integrating conservation planning and landuse planning in urban landscape. *Landscape and Urban Planning* 91, 183-194. doi:10.1016/j.landurbplan.2008.12.011.
- Di Minin, E., D., Moilanen, A. (2012). Empirical evidence for reduced protection levels across biodiversity features from target-based conservation planning. *Biological Conservation* 153, 187-191. <http://dx.doi.org/10.1016/j.biocon.2012.04.015>.
- ESRI (2020). ArcMap (Version 10.8). Redlands, CA.
- Moilanen, A. (2013). Planning impact avoidance and biodiversity offsetting using software for spatial conservation prioritisation. *Wildlife research* 40, 153-162. <http://dx.doi.org/10.1071/WR12083>.
- Moilanen, A., Franco A. M. A., Early R. I., Fox, R., Wintle, B., Thomas C. I. (2005). Prioritizing multiple-use landscapes for conservation: methods for large multi-species planning problems. *Proceedings of the Royal Society B* 272, 1885-1891. <https://doi.org/10.1098/rspb.2005.3164>.
- Montesino Pouzols, F., Toivonen, T., Di Minin, E., Kukkala, A. S., Kullberg, P., Kuusterä, J., Lehtomäki, J., Tenkanen, H., Verburg, P. H., Moilanen, A. (2014). Global protected area expansion is compromised by projected land-use and parochialism. *Nature*, 516(7531), 383–386. <https://doi.org/10.1038/nature14032>.
- Phillips, S. J., Anderson, R. P., Schapire, R. E. (2006). Maximum entropy modeling of species geographic distributions. *Ecological Modelling* 190, 231–259.

R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL <https://www.R-project.org/>.

Romportl D. (ed) (2017). Atlas fragmentace a konektivity terestrických ekosystémů v České republice [Atlas of landscape fragmentation and connectivity of terrestrial ecosystems in Czech Republic]. AOPK ČR, Praha, ISBN 978–80–88076–50–6.

Tscharntke, T., Tylianakis, J.M., Rand, T.A., Didham, R.K., Fahrig, L., Batáry, P., Bengtsson, J., Clough, Y., Crist, T.O., Dormann, C.F., Ewers, R.M., Fründ, J., Holt, R.D., Holzschuh, A., Klein, A.M., Kleijn, D., Kremen, C., Landis, D.A., Laurance, W., Lindenmayer, D., Scherber, C., Sodhi, N., Steffan-Dewenter, I., Thies, C., van der Putten, W.H. and Westphal, C. (2012). Landscape moderation of biodiversity patterns and processes - eight hypotheses. *Biological Reviews*, 87: 661-685. <https://doi.org/10.1111/j.1469-185X.2011.00216.x>.

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Souhrn

Náš příspěvek se zabývá dilematem mezi územní ochranou přírody a rozvojem předmětného území. Pro studium tohoto problému jsme si vybrali Národní park Šumava, jedno z největších ucelených chráněných území v rámci Česka i střední Evropy. Na území národního parku jsme aplikovali tzv. prioritizaci, která na základě dat popisující přírodní hodnotu prostředí prostřednictvím habitatových modelů klíčových a chráněných druhů a dat o kvalitě habitatů určuje prioritu pro územní ochranu. Takto vzniklou vrstvu jsme rozdělili do deseti stejně rozlehlých zón odstupňovaných podle priority ochrany od těch nejcennějších po těch nejméně cenných 10 % rozlohy Národního parku Šumava. Tato vrstva byla protnuta s vrstvami, které představují antropogenní tlak v území, konkrétně šlo o vrstvu zastavitelných ploch, rekreačních ploch a okolí zástavby s perimetrem 100 a 500 metrů. Díky tomuto protnutí bylo možné spočítat, jak je rozloha těchto vrstev distribuována v rámci zón podle priorit ochrany přírody. Z výsledků je patrné, že zmíněné vrstvy se ve větší míře nacházejí v zónách se střední a vyšší prioritou ochrany. Při srovnání nejméně a nejvíce prioritních 30 % území výsledky ukazují významný rozdíl s většími rozlohami ve 30 % nejvíce prioritního území. Ukazuje se tak, že v rámci Národního parku Šumava je antropogenní tlak disproporčně rozložen více do cennějších než méně cenných území. Takový závěr může být významným podkladem pro rozhodování a management území Národního parku, kde by přírodní procesy měly mít přednost před zájmy rozvoje území.

Contact

Mgr. et Mgr. Bc. Tomáš Janík
E-mail: janikt@vukoz.cz

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