Institute of Landscape Ecology, Slovak Academy of Sciences

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Landscape Europe Network

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Landscape Ecology: From Theory to Practice

16th International Symposium on Problems of Landscape Ecological Research on the Occasion of the 30th Anniversary of the Foundation of the International Association for Landscape Ecology and on the Occasion of the 45th Anniversary of the Foundation of the International Symposia

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Foreword

The tradition of landscape-ecological research in Slovakia has a history of more than 50 years. Slovak landscape ecologists have been always among those setting the trend of this scientific discipline. The activities of team of scientist around professor Ružička resulted to organization of the 1st International Symposium on Problems of Landscape ecological research in former Czechoslovakia. Tradition of international symposia in Slovakia still continues, where already 15. international symposia organized by Institute of Landscape ecology SAS took a place. These symposia represented significant contribution of Slovak landscape ecologists to international cooperation and establishment of IALE. Until 1989, these symposia began to act as a bridge between East and West. Thus the 16th International Symposium on Problems of Landscape Ecological Research has been organized on special occasion of the 30th Anniversary of the Foundation of the International Association for Landscape Ecology and the 45th Anniversary of the Foundation of the International Symposia organized by Institute of Landscape Ecology SAS. In this occasion we have invited researchers from field of landscape ecology, policy makers and stakeholders to bring and present new insights and perspectives in landscape ecology with special emphasis given to practical application and utilization of landscape-ecological knowledge.

Dr. Zita Izakovičová

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Wind farm as cross-border source of landscapes threats in eastern part of Sudety Foreland

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Wind farms with ca. 200 turbines are planned in the Eastern part of Sudety Foreland, near the border with the Czech Republic. Many wind farms are planned in the area of significant landscape impacts (up to 5 km). For the protection from noise, shadow flicker effects, ice throwing, non-ionising radiation, and in order to mitigate consequences of a construction disaster, no farms closer than 0.5 km from the border are planned.

The cross-border examination of the landscape structure and of the physiognomic qualities and effects thereon allowed formulation of the following conclusions:

1. Wind farm complexes planned in Poland are located in areas with generally poor wildlife and landscape qualities, related with agricultural loess plateau. Similar conditions prevail in the border area of the Czech Republic, which reduces potential conflicts resulting from the project.
2. Within the area of the significant potential effects, numerous protected areas and wildlife corridors have been identified in the territory of Poland and Czech Republic. The planned wind farms pose no direct threat to significant parts of the natural spatial system.
3. The closest farms are more than 500 m away from the wildlife corridors and node zones.
4. The farms are located outside the areas with high cultural values. Also the cultural landscape values in the territory of the Czech Republic are not high, except for the Opava Mountains area.
5. The landscapes in the area of the planned farms are typical and specific of the land with intense agricultural development at the Polish-Czech border (Głubczyce Plateau). As the land of greater value and higher risk small areas of river valleys with a mosaic of meadows and forests, serving as wildlife corridors, and forested areas of hilly border zone with the Opava Mountains should be considered. They are however more than 5 km distant.
6. Landscapes with greater physiognomic and natural values, located in the area of the potential cross-border impacts, are the large-area forested lands and mosaic valleys with water basins. No turbines and associated infrastructure are planned in those areas.
7. Among the main routes of active exposure, located along roads, significant impacts of the completed farms can be present only in the area of several roads in the territory of the Czech Republic. Physiognomic landscapes present there, however, have no valuable qualities, and the turbines will be located correctly, i.e. along the horizon line.
8. Other roads in the 5 km zone have limited landscape importance due to the presence of mountains, forests, roadside trees and river valleys.
9. In road sections within the developed areas, the premises of wind farms will not be visible due to dense building development.
10. The most valuable panoramas with the insight into the premises of the farms, present in the Southern part of the cross-border area with the Czech Republic, will not be significantly degraded because of the distance of landscape points and routes, above 5 km.

11. The major concern while assessing the cross-border impact of wind farms on the landscape is the lack of uniform procedures and methods for such assessment.

The biodiversity of urban parks in eastern part of Silesian Upland (southern Poland)

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The Silesian Upland is the most industrial region in southern Poland, which connected with occurrence of mineral resources especially black coal and they exploitation. Due to, in this region high level of environmental disturbances in natural system both in town areas under neighborhood. In this time increased the role of urban green and urban parks. Hence, within the cities was founded urban parks. In eastern part of Silesian Upland are a lot of urban parks and which played crucial function in term of ecological, recreational and cultural. The most important urban parks now days is places of high level of biodiversity (especially plant diversity).

The analyzed of biodiversity was conducted within 3 different parks (sizes, location, date of foundation) in the area of Sosnowiec (Sielec Park 19,68 ha), Będzin (Góra Zamkowa Park - 6,7 ha) and Czeladź cities (Grabek Park - 13 ha). Each mentioned has dissimilar origins. In the Sielec Park noticed occurrence of 180 vascular plants, including 82 species of shrubs and trees. Within Góra Zamkowa Park were found 210 vascular plants among them 19 trees and 14 shrubs. In case of Grabek Park was noticed participation of 329 vascular plants including 44 trees and 40 shrubs. The differentiation in dendroflora is significant in the each analyzed parks. The results of research shown that beside artificial introduced species the crucial role played the species which encroachment has spontaneous character. In this way are formed community in some part of parks and their species composition showed similar to plant association developing beyond urban landscapes. Preliminary results showed that the urban parks habitat for different ecological group of plant and exemplify mainstay of biodiversity.

The aim of study was to showed floristical differentiation of urban parks as mainstay of high biodiversity within urban landscape.

Conservation of the historical structures of agricultural landscape and protection their biodiversity in the Kysuce region

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In years 2009 till 2011 were realize countryside mapping of historical structures of the agricultural landscape (HSAL) according to methodology developed by the Institute of Landscape Ecology of the Slovak Academy of Sciences. The most important regions in the terms of representation and preservation HSAL of Slovakia are Kysuce Region. Observation

area was included of 29 cadastral territories called as Upper Kysuce. On the basis of observation from mapping were two types HSAL allocated. Within the framework of their, were allocated additional two subtypes. The first type (type 1) represented by the historical structures of the landscape with dispersed settlement: subtype 1a – typical dispersed settlement and subtype 1b – localities with specific type of settlement characteristics for Kysuce Region. Subtype 1b can be characterized as a set several of dispersed settlements – "kopanice", "osady", "dvory" – that not create closed community and are situated mostly in higher elevations of valleys or mountains. The second type (type 4) represented by historical structures of arable-meadow-grazing landscape. The largest representation has HSAL with typical forms of anthropogenic relief (subtype 4a). The large representation has HSAL with preserved forms of antropogenic relief and dominance by non-forest woody vegetation and forest vegetation (subtype 4b). Total HSAL in Kysuce Region occupied up to 12 % of the territory.

Distribution of the historical structures of agricultural landscape in dependence on geological substrate and slope processes in the Kysuce region

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Kysuce are singificant historical region of Slovakia. The characteristic feature is the predominance of the broken highland relief with flat ridges and numerous small depressions and grooves hilly country. The territory is characterized by high dissection, from 373 m a.s.l. (Danajov village) to 1236 m a.s.l. (Veľká Rača Mts.). The geological structure is created by units of Western Carpathian flysch zone (alternating layers of clay shale, claystone and sandstone). The most frequent geodynamic phenomena are slope deformation. The most of the territory has favourable conditions for their formation. There are a quarter of the territories. The most sensitive type of slope deformations are landslides (active, potential and stabilized). There are occupy 19 % of the total area, which represents 1512 landslides (14 834.8 ha). On the basis of the representation of types of historical structures of the agricultural landscape (HSAL) dominated by two types: HSAL of dispersed settlements and arable-meadow-grazing HSAL. The first type has the largest representation of the typical locations dispersed settlements ("kopanice", "lazy") – Zákopčie village, Dlhá nad Kysucou village, Turkov village, Olešná village and Svrčinovec village. These sites are built by Vsetín Member (characterized by predominance of clays over sands of 2:1 to 10:1). There are characterized by the absence or low representation of active landslides, but also low percentage of all landslides. The second type has the largest representation with the typical structures arable-meadow-grazing landscape and forms of anthropogenic relief. The most widespread are in the Lutiše village, Nová Bystrica village and Radôstka village. They build their Bystrica Member (claystones and sandstones positions). This formation is a relatively small resistant to tectonic depressions and erosion. There are occurring in narrow and long depressions. The highest of landslide area are cadasters of Nová Bystrica and Skalité.

Ecosystem services and energy crops – problems and solutions

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The enhanced cultivation of energy crops has both positive and negative economic, social and environmental effects, which can be assessed using the concept of ecosystem services (ES). Among the various instruments to regulate energy crop cultivation, to reduce the impact on ecosystems and landscapes, and to enhance sustainable land management, the ES concept can be seen as a useful tool since it includes economic, ecological and social aspects.

The methodological aproach will be exemplified by a case study in the district of Görlitz (2106 km², Saxony, Germany). We started with an indicator-based analysis of the present state of landscape functions or services (in the sense of the "supply" part in ES evaluations), e.g. biotic productivity of the site, soil erosion (water, wind), nitrate leaching / biocide decomposition, groundwater recharge, carbon sequestration, biodiversity, landscape aesthetics). The results were interpreted regarding an ecological risk assessment of the intensified agriculture in general and especially the enhanced cultivation of energy crops. By the use of reference units (biophysical units, so-called micro-geochores) it was possible to regionalize the results and to reveal spatial differences in terms of the carrying capacity or sensibility concerning an intensified cultivation.

The demand side was assessed by several approaches: For the provision service "renewable energy / biomass", the amount of biomass from energy crops (mostly maize) needed to feed the existing (and future – estimated by scenario analyses) numbers of biogas plants was calculated. In a series of workshops and expert interviews relevant core ES for local stakeholders (practitioners such as farmers, local planning authorities, representatives from the local agricultural authorities) in the Görlitz district were identified. These stakeholders mentioned as the most important ES food and feed production, soil fertility and ecology, provision of biodiversity and – surprisingly for us – ethical values. We also carried out standardized interviews with laypersons at different places throughout the district of Görlitz to identify preferences concerning ecosystem services. First results show that the provision of drinking water and biodiversity (wild animals and plants) are perceived to be the most important ones for this group. A majority of interviewees wants to spend more money for supporting such ES by shifting more tax money to nature conservation and landscape management.

Landscape management plans – European best practice

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European Landscape Convention, also called 'Florence Convention' aims to promote the protection, management and planning of European landscapes and organize European cooperation in this field. Among Convenion issues are the necessity to tackle natural and cultural landscapes' management issues in urban and peri-urban areas at an interregional level and in a sustainable way. In dense and contrasting urban environments, tackling the concept

of landscapes and its related issues will prevent their loss of specificity and identity, and help to make best use of these areas. In urban and peri-urban areas facing demographic changes, climate change issues, increasing economic constraints, environmental challenges,. Exchanges of good practices and expertise will help regional and local authorities to be more efficient in protecting, maintaining and enhancing their natural and cultural landscapes in a sustainable way.

The contribution brings the results of EUROSCAPES project where European partners had the ambitious objective of offering a new management model for these landscapes, as a milestone policy instrument to implement the European Landscape Convention treaty objectives.

Furthermore, complementarities in their tools, practices and policy instruments to deal with landscape management were identified, they have refined these complementarities, exchange and transfer good practices with a scientific support and use these good practices to develop new approach meant to become a real public policy at the regional/local level. These are based on an environmental, quality and economical approach in the maintenance and management of our natural and cultural landscapes integrating important education and sensitization dimensions and take into account the territorial strategy, urban master plans or others.

Sustainable development of protected areas in Lake Baikal region (Tunkinsky national park)

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Both the status of World Natural Heritage given to Lake Baikal in 1996 and adoption of the Federal Law "On Protection of Lake Baikal in 1999 determine the attitude of geographers to the environment of Lake Baikal, situated in the valley between the mountains. A growing interest in the recreational potential of Baikal landscapes, in the nature protection, in the rational use of natural resources and environmental issues is accordingly observed. Particular attention is paid to the study of protected areas.

The Baikal region is a popular recreational area in the Baikal region. It is characterized by diversity of landscapes, from alpine landscapes to steppe; diversity of flora and fauna; extensive network of protected areas, developed transport network and accessibility but although undisturbed natural areas. All this attracts a lot of nature lovers and tourists. Wild and unregulated tourism often leads to negative changes in geosystems, especially within the recreation areas.

The study of natural conditions of Tunkinskaya hollow and analysis of status and activity of Tunkinsky National Park to the following conclusions:

1. Modern taiga consists mainly of long-term steady-derived variants of subtaiga and mountain taiga coniferous geosystems. Most of the light-subtaiga geosystems is substituted by secondary larch-birch and birch forests. Mid taiga geosystems are damaged by deforestation, fires, hunting and fishing activities. Geosystems of Arshan and other places famous for its mineral springs are under load of significant recreational pressure.

2. Combination of diverse landscapes with relatively favorable natural conditions makes it possible for different types of recreational activities, but the use of territory for such purposes, and also the implementation of environmental activities must take account of landscape features of the territory. Development and support of various environmental protection measures should be based on a comprehensive assessment of the natural environment. The research of the state of recreational lands, minimization of the negative human impact on natural systems, which is inevitable, with the anticipated increase in the flow of tourists, it is necessary and timely.
3. The Park administration must solve some problems, especially related to illegal logging and hunting, to carry out a radical reorganization of the tourist centers to enhance the comfort of leisure, with the unconditional and simultaneous carrying out of various activities to conserve the natural environment, despite the difficult financial situation.

The digital elevation model and geographic information system in the river valleys landscape research

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An excellent object to study the relationship between the abiotic and biotic factors of the environment are river valleys, which integrate the structure, dynamics and function of all landscape components. The model objects were 3-4 km long break sections of two rivers – the Szum river and the Sopot river (both the Tanew river tributary), crossing the escarpment zone of the Central Roztocze Highlands, south-eastern Poland. The rivers differ in terms of direction of their course, valley width, deepness of valley incision, contribution of forest and non-forest vegetation, and floristic and phytocoenotic diversity. The aim of our study was to evaluate: (1) the correlations between the morphological characters of a small-scale river valleys (IV rank river) and ecological elements (vegetation and local flora) occurring in the valley, using the GIS and statistical methods, and (2) the usefulness of the Digital Elevation Model (DEM) in the studies of relationships between topographic and ecological features of linear structures of landscape.

The analysis of the area was based on the DEM and its devivatives, and were conducted in basic fields, i.e. 200-m-long sections of the valley (for the right and left banks separately), for which precise floristic carting was done. Spatial data were obtained from topographic maps at the 1:10 000 scale by successive digitization of contour lines, elevation points, valley edges and their height. The Topo to Raster tool was used to generate the DEM. Based on the DEM, topographic attributes were calculated in the form of rasters: primary – slope, aspect, planar and vertical curvature; and secondary – mean solar radiation, and the topographic wetness index. Subsequently, each raster was analysed by calculation of zone statistics. The zones were the individual sections of the valley in which field observations were carried out. Statistics for each section were calculated using the Zonal Statistics tool. The whole operation was carried out using the ArcGIS 10 software.

The next step in the analysis was determination of correlations of topographic attributes of the valleys, species richness and the Ellenberg indicator values (adaptated for the Polish vascular flora) for all species recognized in each section. We have taken into account the following 6 indicator values describing the most typical habitat conditions of the species: light, soil moisture, trophy, soil/water acidity (pH), soil granulometric, and organic matter content value.

Urban Ecosystem services on the local level
Urban green spaces as providers of urban ecosystem service

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Ecosystem services are provided on different scales. The local level is the basic unit for ecosystem services. These are landscape elements or basic ecosystems differing from their neighborhood by structure and functions. In urban areas the concept of urban (ecological) structural units (USU) has been approved to differentiate micro-climatic, biotic, soil and hydrological conditions (Breuste 2009, Pauleit, Breuste 2011). These USU can be used as basic concept of providers of urban ecosystem service. The USU dominated by biotic elements, the urban green spaces are investigated in their ability to provide these services in different qualities and quantities (James et al. 2009). The different urban green structure types like lawns, bushes, different tree covered areas etc. are effective to use for a semi-quantitative evaluation of its services instead of extreme resource consuming measurements (Breuste et al. 2008).

The study is based on general available knowledge on urban green functions and on example studies especially in Central Europe, but also in Latin America and China. This allows qualifying different urban green space types by its internal structure of vegetation, size, shape and location in relation to at least a semi-quantitative scaling of its urban ecosystem services under different cultural circumstances. The evaluated urban green spaces are street trees, neighborhood parks, district parks, city parks, urban forests and allotment gardens. The assessed urban ecosystem services are provisioning, regulating, supporting and cultural services (e.g. Priego et al. 2008). The URGE-manual (Baumgart et al. 2004), a tool developed by an inter-, transdisciplinary and international team to which the author belonged, is tested for its adaptability to the task of evaluation of urban ecosystem services on the local level for urban green spaces. The actual urban challenges, land use change, adaptation to climate change, demographic change and cultural diversity demand a systematic evaluation of urban ecosystem services with constant monitoring. A new planning paradigm related to urban ecosystem services is urgently needed to develop and to implement.

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Expansive spread of plants species in the disturbed forest ecosystem of the Bábsky les forest (SW Slovakia)

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This study is focused on research issues of incursion and spread of alien plant species of the lowland oak-hornbeam forest ecosystems (alliance: Carpinion betuli Issl. 1931). Fieldwork was concentrated in degraded forest areas in Bábsky les forest after timber harvesting. Part of this oak-hornbeam forest is using for produce wood, but there are relatively preserved natural forest communities, for this reason were part (30, 4 ha) proclaimed National Nature Reserve (NNR) Bábsky les forest. Part of the forest cover was included in the permanent site ILTER Báb forest Slovakia. The research was situated in a section of forest between NNR Bábsky les and Protected Area (PA) Bábsky park. Vegetation changes during the years 2008-2010 were studied using the phytosociological records for 6 study plots (size 10 x 10 m) lay out in two glades. During the three growing seasons were obtained 78 releves in these study plots, we recorded 126 plant species. Releves included 9 invasive, 4 potentially invasive and 6 expansive plant species. Intrusion and spread of non-native plant species have a significant impact anthropogenic activity, particularly harvesting of wood, mowing and a slightly different microclimate of plots. Most aggressive in this locality appear *Ailanthus altissima, Robinia pseudoacacia, Impatiens parviflora,* which also visibly suppressing domestic species. There were recorded another of the nonindigenous species e. g. *Ballota nigra*, *Lactuca serriola*, *Mahonia aquifolium*, *Aster lanceolatus*, *Stenactis annua*. These findings are important for proposing appropriate management of the area, with aim to eliminate the spread of invasive species into the NNR Bábsky les forest and all forest. This work is also included brief ecological characteristics of the most aggressive species founded in the area of interest and the possibility of biological control of these species.

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The changes of the non-forest woody vegetation in White Carpathians Mt. during the last 60years

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The present study investigates changes, development of the quantity of the non-forest woody vegetation and its binding on the environment condition in the landscape of the White Carpathians Mt. on the both side of the state boundary (in Moravia as well as in Slovakia) during the last 60 years. The non-forest woody vegetation is an important part of the landscape structure and a determining feature of the landscape character therefore it is necessary to pay it attention.

As source data historical aerial photographs from 1950, 1986 and 2006 were used. The method involved comparing of the three time horizons which was processed in the GIS environment. Except of the quantity and occurrence the study analyzes the influence of the altitude and slope on the non-forest woody vegetation as well as influence of the land use changes.

Results show that extent and distribution of the non-forest woody vegetation changed during the last 60 years, but the change was not as significant as in the lowlands. A major role played changes in political system and way of the farming (management).

Necessity to create the corridors of forage plants in agricultural landscape

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Habitat destruction and fragmentation are broadly deleterious to invertebrate pollinators. Loss of many blooming plants in natural ecosystems and the spread of large monocultures in agriculture cause environmental perturbations affecting bees.

In Europe declining of different *Apoidea* are documented in many countries (e.g Williams 1986, Banaszak 1992). Agricultural productivity is directly dependant on pollinators activity because over 80% of angiosperms crops requires insect pollination to produce seeds or fruits. The service of pollinators for crop production is quantifiable in some millions dollars. Service made by pollinators for spontaneous species, many of which are very important as e.g. medicinal herbs, protected species also depend on foraging insects. This service is not

quantifiable but has essential value to preserve environment and plants diversity. To date nectar secretion and pollen value of many single taxons has been established, both cultivated and in plant communities (e.g. Szklanowska, 1973; Wróblewska, 1992; Jabłoński and Kołtowski, 1993, 1996, 1999; Kołtowski, 2006; Bożek, 2002, 2003, 2008; Denisow, 2005, 2006, 2009, 2011; Denisow and Wrzesień, 2007). This knowledge could be the base for selection of most efficient forage flora for *Apis mellifera* and for wild *Apoidea*.

Bees and plants conservation need special politics especially in agro-environment as there are simple correlation between plants diversity and pollinators diversity. Selection, design and management should concern both the forage plants and nesting needs of bees. In pollinator conservation strategies the following features should be considered 1) the abundance of blooming, 2) the time and duration of blooming, 3) the abundance of nectar secretion and sugar production, 4) the amount of pollen production as source of protein, vitamins and hormones, 5) the seasonal continuity of forage blooming, and 6) the food preference of pollinators.

Forest landscape pattern in a nutshell: Local and continental applications of a four-families index set

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Measuring and monitoring landscape habitat fragmentation are an important first step to further study the relationship between pattern and ecological processes. This paper presents a standardised set of indices to characterise pattern and its application at varying spatial scales. A total of twelve indices is organised into four main families –general landscape composition, habitat morphology, edge interface mosaic context and connectivity –. Their implementation is based on three conceptual models which are partly revisited and combined (MSPA from GUIDOS software, Probability of Connectivity from Conefor Sensinode software, moving window based landscape mosaic model).

The application at local scale used the harmonized “General Habitat Categories” maps (based on life forms) over sixty five squares located in several environmental zones and available within the EBONE project (“European Biodiversity Observation NEtwork”). Habitat pattern layers and indices are made accessible through the web-based mapping client (http://forest.jrc.ec.europa.eu/ebone). The pattern of the focal forest phanerophyte habitat is presented with particular focus on its edge landscape context and the permeability of the habitat matrix.

The applications at regional and continental scale are framed within the on-going European forest research carried out at the Joint Research Centre. The status and temporal trends in forest pattern is characterised at two different scale of observation per 25 km x 25 km landscape units from two European-wide data: (1) the CORINE Land Cover data for broad-scale patterns in the time period 1990-2000-2006 and (2) for year 2006 only, the JRC forest type map (25 m) which show spatial details down to 1 ha (after filtering 16 pixels objects), relevant to identify hedgerows, woodland islets and perforations in large forest patches. Forest pattern layers can be viewed and queried on line from the European Forest Data Centre (EFDAC) map viewer at http://efdac.jrc.ec.europa.eu/pattern/map.

Based on this European-wide dataset, one regional application is presented on forest connectivity (both functional for species dispersal distances and structural with linear features and isolated islets) along the Danube River in the time period 1990-2006. The study shows landscape units with an increase in forest area and a significant benefit on connectivity (or vice versa) as well as units with no significant impact on connectivity. Trends in forest fragmentation mosaic pattern enabled to identify landscapes where forest shares in fragmented patterns have increased at the expenses of core natural pattern.

Keywords: Habitat Pattern, Landscape Mosaic, Morphology, Edge interface, Connectivity.

Ecosystem services used in evaluating the relations between the environment and humans

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The paper undertakes the subject of ecosystem services. The studied areas were selected according to the services which are provided there those which have to do with giving something (Latin *dare*), doing something (*facere*), not doing something (*non facere*) or enduring something (*pati*). During the course of study, the types of ecosystem services in the environmentally protected communes localised in the vicinity of Wrocław (Sobótka, Mietków, Kąty Wrocławskie Jordanów Śląski) were defined in the following categories: ecosystem services for the benefit of humans, human services for the benefit of the ecosystem (compensation), as well as preventive and retardant actions. The research involved an analysis of the planning documents defining spatial policy with regard to ecosystem services, followed by a statistical analysis of the results.

Keywords: ecosystem services, spatial policy

Morphodynamic classification of the Tatras' alpine lakes based on the evaluation of potential deposition sources

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Potential hydro-geomorphic processes responsible for alpine lake infilling were investigated for a sample of 85 lakes in the Tatra Mts. The elevation of lakes varies from 1490 to 2190 m a.s.l., which responds to subalpine and alpine vegetation belts. Additional morphometric, dimensional and landscape parameters of the lakes and catchments have been derived from

existing databases and newly produced GIS layers (lake polygons, DEMs, historical aerial photographs, land cover maps etc.). Accumulation potential of proluvial and fluvial processes, debris flows, rock/debris falls, and gliding avalanches was rated for each lake by means of morphometric and spatio-temporal land cover analyses of the catchments. The evaluated processes have been used as variables for cluster analysis (Ward's method) to classify lakes. The method has identified 4 clusters of different rates of deposition potential due to hydro-geomorphic processes: 1) lakes with very high deposition potential (9% from total number of 85 sampled lakes), 2) lakes with high deposition potential (18%), 3) lakes with moderate deposition potential (38%), and 4) lakes with low deposition potential (35%). The rating values of individual processes were summed to obtain the total deposition potential for each lake. The ordered data have been classified into 5 categories: i) zero potential (9% of 85 lakes), ii) low potential (28%), iii) moderate potential (32%), iv) high potential (18%), and v) very high potential (13%). The results of discriminant analysis show that the influence of individual descriptive variables (elevation, lake depth, lake area, catchment elevation amplitude, catchment mean slope, and catchment area) on lake classification is statistically significant only in case of elevation, lake depth, and catchment elevation amplitude. The error analysis has proved the classification accuracy of 55.3% only, which implies a modification of used methods. Some improvement is expected from more accurate land cover data and more precisely defined morphometric variables of the lake catchments.

Patterns and textures of the landscape archetypes of Slovakia as indicators of landscape diversity

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The landscape view being actualized by using the aerial and satellite shots enables to differentiate other dimensions of landscape changes and developmental cognition in the context of horizontal relations and physiognomic features that cannot be realized within the ordinary terrestrial mapping. The paper offers new knowledge in the field of landscape structure understood as the archetype. Concept of landscape archetypes arises from the idea of complex spatial structures allocation in the hierarchical and logical sequence, from the higher level to the lowest one (Hreško, Kanásová, Petrovič, 2009). The landscape archetype represents new approach in the complex cognition of the landscape development and processes understanding that used to be determined in the formation of the present landscape structure. The present literature does not offer the information about analogical procedures of landscape structures that are being understood as the landscape archetypes. As it results from the current knowledge, the most important and necessary is to develop methods of landscape structure classification leading to the cognition of changes and interactions of control and motive power on the principles of the holistic approach to the landscape. We have identified type examples of the archetypes from the lowlands up to the highlands of Slovakia, on the basis of several types of the landscape as well as according to the forms of landscape utilization. Selected model areas represent diversity of the landscape elements and the whole

scale of the human being influence on the landscape with the aim to mention and explain relation among the landscape structure, patterns of the landscape elements and determining processes. Archetype analysis has confirmed that the objective cognition of the landscape development requires integrated approach in the evaluation of factors and cognitions the landscape is being transformed in. It is important to take into consideration natural and spatial factors as well as historical and socially economic conditions determining the character of changes and spatial arrangement of landscape elements. If, according to Mičian (1977), the most intensive processes and phenomenon are being enacted at the edge of neighbouring spatial landscape units, the archetypes will represent parts of the landscape integrating mentioned borders. Borders of natural regions – abiocomplexes, landscape complexes or types are characteristic by broad range of processes with short-term and long-term changes of landscape cover following natural, semi-natural and anthropogenic processes. The character of selected regions usually copies the borders of geological structures and geo-relief forms, i.e. spatial units the borders of which have the character of discontinuity. Methods of geographical, geo-ecological and landscape-ecological synthesis that are still being used, delimit units on the principle of regionalization rules and criteria. In case of archetypes, it is represented by real landscape structures delimitation the basic feature of which is connectivity – connection of different regional units within one or more landscape types. Delimitation of landscape archetypes is based on the landscape attributes utilization, texture of the present landscape structure, arrangement of landscape cover and its patterns, morphogenesis and morphodynamic area.

Key words: landscape archetype, remote sensing, landscape changes, social-economical landscape development

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Serbian spruce (*Picea omorica /Panc./ Purkyne*) variability in the artificial population in Serbia

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A great part of the genetic variation and the potentials of Serbian spruce natural populations have been incorporated in several plantations in the Western Serbia at the site *Quercetum fraineto-cerris s.l.*, *Salicetum fragillis s.l.*, and *Pinetum nigre s. l.* In this way, it becomes much more available for the research and future utilization. The intensive research of the plantations started by the classification of trees into phenogroups which were considered to be significant for forestry and horticulture. The differences between flowering years, plantations and individual trees in the regularity and abundance of micro- and macrostrobiles are major indicator of genetics variability in Serbian spruce reproductive cycle. The interaction of environmental characteristics and genotypes of extreme and average trees illustrate the reproductive ability of Serbian spruce on different sites and indicates that this species achieves the coenological and not the ecological optimum at its natural sites. Application of

genetic/selection programs can lead to the production of planting stock of desired and defined properties, which could survive the stress environmental factors, thanks to its morphological and physiological properties.

Key words: Serbian spruce, variability, artificial populations

Landscape Ecology and Rural Roads: Traffic Calming for improving both landscape and ecology?

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Roads have several effects on nature, caused by the physical presence of the infrastructure section and its traffic flows. Together, these effects lead to habitat fragmentation, which could result in conditions where species are endangered and local populations might become extinct. This has become a major concern for society. Focusing on fauna, habitat fragmentation can be mitigated by improving the connectivity of the landscape through enlarging the habitat area that can be accessed without level crossing of busy roads. Two types of approaches can enhance connectivity: (1) to prevent wildlife to enter the road by fencing in combination with two-level crossings; and (2) to reduce traffic volumes and/or speeds. For motorways and major rural highways generally the first approach is applied. The second approach is more realistic for minor roads, by far the most occurring roads in a rural area. To be effective, both measures should be applied together in a sufficiently large area. The concept of traffic calming, that originally has been developed to improve road safety, can also be applied to improve connectivity when we combine these two approaches. Traffic calming differentiates between (1) roads for access only with low volumes and modest speeds *within* a traffic-calmed area and (2) roads for through traffic with bundled traffic flows located *around* this area. In an earlier study thresholds in the size of traffic-calmed areas and remaining traffic volumes on access roads that may allow persistent populations have been derived, using metapopulation theory. So far the usual approach in traffic calming is mainly focusing on a speed reduction on access roads, by means of technical-physical measures such as speed humps and chicanes. From a viewpoint of landscape governance such measures do not fit in most rural areas, so there seems to be a ‘conflict’ between improving ecological connectivity and decreasing landscape quality by implementation of a traffic calming scheme. We aim to show an alternative approach of implementing rural traffic calming, with speed reducing measures based on local landscape characteristics, such as hedgerows, plantings, and objects of cultural heritage. We therefore present examples from the Dutch practice where traffic calming measures have been applied as a landscape policy instrument. This ‘green’ approach can even be more cost effective than the traditional one and may also be promising from a landscape ecological viewpoint.

The importance of rural parks for the occurrence of the rook *Corvus frugilegus* in eastern part of Lublin region (E Poland)

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More than four hundred fifty countryside parks related to manors and palaces is situated in Lublin region (eastern Poland). Many of them were designed, decorated and cultivated by subsequent owners, and for that reason are now areas of valuable flora, mentioned many times in scientific literature. The role of parks as the refuge of biological diversity of animals, including birds, is less known. The survey analyses the importance of country parks for occurrence of colonies of the rook *Corvus frugilegus* in the area of eastern part of Lublin region (eastern Poland). The species' number tends to decrease over the territory of Poland. The results of the survey have shown colonies' size data in the eastern part of the region, compared to other colonies in the agricultural landscape and in the cities. Long term changes were shown for chosen colonies. The field research has shown that small colonies tend to disappear, while bigger ones are more stable. This study presents main forms of human pressure on Rook colonies found during the survey. The collected data enables cautious Rook colonies' condition forecast for next few years.

Local landscape-ecological initiatives in the Bratislava Self-Governing Region (examples from cities and municipalities)

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In the last 20 years due to the decentralization of public administration many tools for planning and sustainable management of the landscape had to be transferred to the local level, while the municipalities and cities have become responsible for their application. The scope of current competencies of municipalities and cities in land-use planning, environmental assessment of new intentions and strategic documents, elaboration of programs of economic and social development, territorial systems of ecological stability, landscape-ecological plans and other specific documents relating to the development of the territory can be evaluated positively. However, question is whether original and transferred competences of municipalities and cities have been performed on a professional level, and thus if the transfer of landscape knowledge into practice is efficient.

The aim of this paper is to evaluate existing tools, which ensure the fulfillment of statutory powers of municipalities and cities in the areas of planning and decision-making processes that require background documents about the landscape, to identify existing barriers in the transfer of scientific and professional knowledge into practice and to propose measures for improving the current situation. The study area for the evaluation is Bratislava Self-Governing Region (BSR). A special emphasis is put on local initiatives from selected municipalities and cities that contribute not only to fulfillment of statutory powers of municipalities and cities, but also provide other tasks relating to the protection, management, planning and creation of landscape. A set of evaluation criteria has been applied to assess the application of individual

tools within a few selected examples of municipalities and cities in the BSR. These criteria are based on the latest scientific knowledge of landscape sustainability and landscape governance. Evaluated examples present positive as well as negative experiences from practice. We conclude that the barriers and inefficiencies associated with the practical application of landscape-ecological documents in planning and decision-making processes are very similar in all municipalities and cities of all self-governing regions. Although research has been conducted only within the BSR methodical procedure and to a large extent, the results obtained can be generalized for the remaining territory of Slovakia.

The evaluation of ecological factors affecting environmental functions of the soils in area of traditional agrarian structures (on the example of the model area Liptovská Teplička)

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Cultural landscape can be seen as a result of hundred years of founding and sensitive cultivation of landscape structures respecting natural conditions. Specific geomorphological, climatic as well as social conditions enabled the conservation of original agrarian landscape structures mainly in the marginal regions of Slovakia. They are created by mosaic structures of extensively used small-scale landscape elements of permanent agricultural and arable land. One example of traditional agrarian way of using is foothill meadow-grazing landscape of the village Liptovská Teplička. By using the traditional extensive maintenance of the agricultural landscape, optimal environmental characteristics of soils were preserved. These were modified to some extent by the way of using and management. The submitted contribution is focused on:

- ***indication of environmental characteristics of soils***
- ***quantification of the influence of chosen environmental factors on these environmental functions.***

Seven research localities representing main types of the traditional landscape maintenance were chosen for needs of the research of soil and environmental conditions in a relation with the way of using the land and management. In given localities, we chose 21 sampling sites for secondary landscape structure, (according to the legend of project Corine Land Cover, 2000), geological, soil, physical, biochemical and chemical conditions evaluation.

Environmental functions indication was assessed in a following way: by assigning an amount of organic carbon (Cox) in a standard way (Fiala et al., 1999) for production functions, by assigning a ratio of granular fractions (pipetting method according to Novák) for retention functions. Buffering functions were evaluated potentiometrically by assigning an active soil reaction of pH (H2O) and exchange reaction of pH (KCl) in a soil.

Similarly as in other soil types, the amount of organic matter in cambisols and anthrosols depends mainly on the agricultural soil management. Measured values of Cox show that in comparison with arable lands, the organic carbon supplies of permanent grasslands are significantly higher. Arable lands, in comparison with grasslands, have characteristically lower supply of humus, as by plowing the grassland the natural balance is being disrupted and the humus content is significantly lowered as a result of intensive mineralization mainly in the Ap horizon (Barančíková, 2007). These facts are confirmed also by our monitoring in the model area of Liptovská Teplička. Highest values of Cox in the Ap horizon (7,67 %- 6,62%), as well as pH of the soil environment (pH/KCl 7,26-7,21, pH/H2O 7,69-7,68) were assigned to anthrosolic and cultisolic rendzinas of extensively used grasslands. On the contrary, the lowest monitored values of organic matter Cox (2,51% - 2,53%), as well as pH of the soil environment (pH/KCl 4,81 - 5,21) (pH/H2O 5,21 - 6,19) were indicated for soil subtypes anthrosols of the large fields and lithosol of the extensively used grasslands on non-carbonate substrates. Most favorable production and buffering soil properties were preserved in rendzinas on the carbonate substrates and extensively used meadows. Similarly, this type of soil on limestone used in a form of extensive meadows preserved also the most favorable retention functions according to the stated ratio of granularity fractions.

Quantification of the influence of chosen environmental factors on environmental functions were tested in program CANOCO (ter Braak, 1988) within full model Monte Carlo of the permutation test with 999 iterations with the significance level 0,05; relation $P < 0,05$ is evaluated as statistically relevant and $P < 0,01$ as statistically irrelevant.

Geological substrate and soil subtype were evaluated as the most important factors for retention and buffering functions of soils. Management and usage of the landscape was significant for optimal production function preservation.

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Treats and international tools for sustainable brown bear (*Ursus arctos*) management

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Negative relation between humans and large carnivores with unprofitable management caused decrease of large carnivores' abundance within natural habitats. Main reasons for human's negative attitudes toward large carnivores are damages, fear and unfamiliarity with their characteristics. Brown bear (*Ursus arctos*) is European autochthon large carnivore. Although a brown bear is not threatened at a global level, its abundance in Europe is limited on several populations. Protection has an important role in brown bears' conservation, since they face different treats, mainly caused by negative human activities. Conservation of brown bear is complicated due to overlapping its habitats with human environment and because

brown bears require large territories. In order to protect brown bears more efficiently it is important to identify treats and conduct species' protection by international recommendations and agreements. In this paper we analyzed brown bear distribution in Europe, abundance limitation factors and international conservation instruments.

Key words: brown bear, abundance, treats, international management tools

Douglas-fir provenance phenology observations

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Introduction of species involves adaptation, productivity and success in new types of environmental conditions. The introduction also includes confirmation to bring in, only species which are superior on their natural habitat. In Canada and western North America, Douglas fir (Pseudotsuga menziesii /Mirb./Franco) is one of the most ecologically and economically value trees. In Europe, New Zealand, Australia and Chile, Douglas-fir is important as an exotic fast growing timber species. Douglas-fir has one of the widest natural ranges of any tree species, extending from the Pacific Coast to the eastern slope of the Rocky Mountains and from 19°N in Mexico to 55°N in western Canada. In Serbia from the original seeds introduced from British Columbia and Canada the experimental Douglas-fir provenance is established in few location. One of the main dangers for the Douglas fir is sensitive to the occurrence of late frost in spring and early occurrence of frost in the autumn. The aim of the paper is to test the effect of environment on the expression of Douglas-fir seed transfer. Bud burst phenology is closely related to genecology of introduced species. Douglas-fir is susceptible to cold climate and most of its genetic structure and ability depends on its ecological adaptability.

In order to avoid errors introduction of Douglas fir provenances that are sensitive to the occurrence of extreme temperature, applied are researching for buds phenological changes

Douglas-fir, as an introduced species, has to be tested at the provenance level before introduction to the new sites in Serbia

Keywords: Douglas-fir, phenology, ecological adaptation, provenance, Serbia

Modelling allocation of agricultural land use to improve habitat structure

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To conserve and improve conditions for biodiversity in agricultural landscapes, it is crucial to maintain and improve habitat sizes and connectivity between existing habitat patches. Extensively managed land use, such as permanent grasslands, is well suited to function as corridors and buffer zones, which can increase the size and spatial connectivity of existing habitats. However, these functions are highly dependent on the spatial allocation of land use. At least in Denmark, existing regulations do not recognize the potential of land-use allocation to improve habitat structure. This paper presents a method which aims at spatially modelling scenarios for an optimised allocation of extensive land use. The model is based on spatial and

biophysical criteria which are prioritized in order to reach the most optimal allocation of extensive land uses. The model is dynamic in the sense that criteria for improved habitat structure can be adapted to different aims, such as optimising habitat sizes, optimising spatial connectivity or a combination. Furthermore, the model can be adapted to different species or species groups. For a study area in northern Zealand, the model was applied to test the outcome of an implementation of the greening of the CAP, which proposes that a minimum of 5% of agricultural land use is converted to extensive land use. Results show that habitat structure can be improved considerably if location-specific criteria are taken into account. Furthermore, results point at the necessity to implement regulations at a scale which involves several farms rather than at single farm scale.

Applying Landscape Ecology in Conservation and Management of the Floodplain Forests in the Czech Republic

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European floodplain forests of the temperate climatic zone are an example of an ecosystem in the cultural landscape characterized by an exceptionally high biodiversity. In the usually heavily deforested landscape of the Central and South European river floodplains which is subject to intensive agricultural use, the preserved geobiocenoses of floodplain forests represent important refuges for biotic biodiversity and are invaluable for the ecological landscape stability of the entire floodplain and the wider river basin. Unlike other Central European communities, whereby constant ecological conditions of habitats tend to be preserved even upon changes in biocenoses, the floodplain forests are characterized by a long-term continuous development of ecotopes conditioning the complex interconnected succession series of geobiocenoses. The ecological floodplain phenomenon is created by fluvial landscape processes and the conservation of the natural development dynamics of the said fluvial landscape processes is essential for its protection.

The landscape structure of floodplain forests is significantly affected by forest management measures, including regeneration methods, silvicultural measures and felling. Floodplain forest management radically affects the biodiversity of the given geobiocenoses which are listed among habitats of European concern in the Natura 2000 network. Since understanding of the biological nature of forest ecosystems is essential for landscape and ecological planning and sustainable forest management, it is imperative to study ecological processes taking place in the various floodplain forest biotopes in order to be able to define the principles of their management.

The presented arcticle aims to contribute to the process of formulating principles of biodiversity protection and the management strategies for floodplain forest geobiocenoses while applying some theories and methods of landscape ecology. The Results sections of the monograph come in the form of case studies for each topic and draws on original data which were published in scientific journals or presented at scientific conferences (see References). Part of the presented case studies focuses on the area of Litovelské Pomoraví Protected Landscape Area, where the author worked for twelve years in a state nature conservation institution.

Abandonment of agricultural land and landscape protection

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Abandonment of agricultural land is a widespread process in rural areas in Poland. The abandoned agricultural land is often subject to spontaneous vegetation succession which creates small landscape elements (woodlots, thickets, clumps of bushes, etc.) which can significantly improve the structure of the rural landscape and may contain rare and protected species of plants and fungi.

The intent of this paper is to give an overview of results of an ongoing study of abandonment of agricultural land in central Poland. The goal of this project, initiated in 2011, is to provide field-verified information to help answer the following questions:

1. What is the spatial distribution of abandoned agricultural land in central Poland? How is it related to biophysical features of the study area?
2. What are botanical characteristics of spontaneous vegetation succession in the abandoned agricultural lands?
3. Where are there most biologically valuable abandoned lands? What are their environmental determinants?
4. How do the abandoned lands correspond with existing protected areas? How can they be used to strengthen the ecological landscape structure of the central Poland and supplement the existing network of protected areas?

The paper will summarize the general study approach, and present some of the key results to date.

An inventory of the abandoned land was based on aerial photos (orthophotos) of the study area. The share of the abandoned land was assessed using square sample plots 500x500m large. The plots with the largest share of abandoned land were identified. Their location was compared to several types of existing protected areas with a view to supplement their network with the abandoned lands of high nature value.

Genetic potential assessment of Austrian pine trees growing on the clifs and the canyons

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The genetic potential of hardly accessible populations and individual trees growing on the cliffs and in the canyons, compared to the most productive sites of Austrian pine, (*Pinus nigra ssp.gočensis var. illyrica* /Djor./ Fuk.) was studied aiming at the directed utilization of this species in the production of planting stock for extremely dry sites. The study includes 40 lines of free pollination originating from 5 provenances: Sutjeska, Višegrad, Tara, Teslic and Durmitor. Two populations were selected from each provenance, i.e.: 5 lines of free pollination represent the population growing on the cliffs and 3 lines of free pollination represent the population growing at the best site of Austrian pine. The study is based on the

level of one-year old seedlings in nursery conditions (morph metric traits, contents of free and bound water and transpiration process), and the level of two-year old seedlings in different conditions of water deficit (dynamics of height increment, survival percentage and morph metric traits of seedlings).

Key words: Austrian pine, genetic potential, dry sites

Contact area of town Nitra and its potential

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Nitra town development tendency is tented on its hinterland at present. The research area consists of two parts. The first is the settlement part formed by city parts Zobor, Chrenová, Klokočina, Diely, Čermáň and Staré Mesto and hinterland part with villages neighbouring with town Nitra. The contact area is determined as 600 meters wide strip extending along the borderline between settlement part and its enclosed hinterland. Structure of this contact area is evaluated in two time horizons (1995 and 2010). In 2010 in the secondary landscape structure of contact area are occurrences these groups of elements: forest (16,2 %), arable crops (41,6 %), meadows and pastures (4,8 %), sub soils and raw soils (0,7 %), waters elements (1,8 %), elements of seats and recreation areas (24 %), technical elements (8,7 %), elements of transport (2,2 %). In 1995 are occurrences these groups of elements: forest (16 %), arable crops (47,8 %), meadows and pastures (5,9 %), sub soils and raw soils (0,8 %), waters elements (1,9 %), elements of seats and recreation areas (17,7 %), technical elements (7,5 %), elements of transport (2,4 %). Landscape structure and selected criteria are the bases for contact area classification. We distinguish 4 types of contact area: submontane forest (type A – total area 365,99 ha, 24 %), plane field (type B – total area 521,37 ha, 35 %), upland with arable crops (type C – total area 310, 17 ha, 21 %) and waved plain with settlement (type D – total area 303,01 ha, 20 %). In the process of evaluation of contact area were determinate four functions: a) technically producing that is being arranged by the functional elements from the group of elements connected with technical products and traffic, b) suburban agricultural production with dominant position and represented by large block fields (group of arable crops) and functional elements of farm and service yard fulfil (group of technical elements), c) recreational arranged by the group of elements in residential and recreational areas and d) residential in the form of collective or individual living with growing tendency at the expense of large block fields and transformation of vineyards and gardens. By method of synthesis were determined three zones: technically producing has been determined on the basis of the combination of two criteria: prevalence of technical elements in the contact area and the past satellite village residences as the surrounding type of landscape, suburban agricultural production that is also connected with the surrounding agricultural landscape and recreational surrounded by forest landscape in the north part of the contact area and two potential usages: recreation developed only in one part of contact area (behind of Agrokomplex exhibition) and agricultural usage which not be agriculturally utilized because of the confirmed and approved occupation of land resources.

Interpretation of the socio-economic phenomena in the landscape ecological research

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Socio-economic phenomena are interpreted in landscape ecological research as the endangered and endangering phenomena.

Endangered phenomena are positive elements which represent interests of nature protection and protection of the natural and historical resources. These elements increase significance, stability and biodiversity of the landscape and quality of environment and the quality of human life. Endangered phenomena are legislative measures of protected areas of nature and landscape nature reserve, national nature reserve, natural monument, national nature monument, national park, protected landscape area, the next protected area according to international convention – Ramsar Convention, biosphere reserve, protected species, protected trees, elements of NATURA 2000, elements of territorial system of the ecological stability, protected water resources, soil resources, protected forest resources, care of historical monuments and so on.

Endangering phenomena are negative elements which represent interest of production branches development. We called them stress factors which are endangering stability and biodiversity of the landscape and qualitative and quantitative parameters of the natural resources. Their negative influence is manifested in the endangering and damaging of environment and landscape. Among the Endangering phenomena there are industrial areas, animal farms, waste of damps, traffics, intensive transport, but also negative accompanying phenomena of pollution production – air pollution, soil and water contamination, destroying of vegetation etc.

Interpretation of socio-economic phenomena is very important because collisions between endangered and endangering phenomena aroused landscape ecological problems. According to the character are the problems divided in to the three basic groups:

- The landscape ecological problems of endangering of landscape stability and biodiversity
- The landscape ecological problems of endangering of natural resources
- The landscape ecological problems of endangering of environment and life quality

We use the results of the research socio-economic phenomena in the landscape ecological planning, landscape management, creation of the territorial system of the ecological stability end so on.

Key words: socio-economic phenomena, endangered phenomena, endangering phenomena, landscape ecological problems

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Dependence of douglas-fir mean height on geographic origin of Canadian provenances in seedling nursery conditions

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Seed and seedling tests, performed with the aim of acquiring knowledge of the genetic potential of selected provenances, are generally one of the first trials in a complex system of comparative examinations to be conducted upon introduction of alien tree species. This paper presents the results of the investigation of the dependence of the mean height of 14 Canadian origin Douglas-Fir provenances, originating from 49°10' to 51°35' latitude, 115°20 ' to 120°10' longitude and the altitude of 488 to 1,070m, on the geographic origin. Understanding the variability of a seedling mean height is of the major importance for acquiring knowledge of genetic potential of selected provenances, which is one of the key parameters for introduction of Douglas-fir into relevant forest sites in Serbia.

Key words: Douglas-fir, provenance, seedlings, mean height

Gene pool importance woody plants in the current landscape structure in the cadastral area of Žirany

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In the first part of this paper is assessment of the current landscape structure in the cadastral area of Žirany in Nitra region. In the second part of this paper, the occurrence of gene pool trees identified within the cadastral area is presented. Changes in the representation of landscape elements, their internal structure and surface-area spatial distribution of land is a reflection of property ownership relations, land use forms, especially forms of intensification in agriculture and socio-economic development of society. Landscape structure was evaluated from maps and field research of the current situation. The current landscape structure (CLS) in 2012 was evaluated using 9 groups and a total of 44 landscape elements. Attention was devoted on the spatial distribution of tree species and biodiversity in the group of non-forest woody vegetation (NFWV) during the mapping of the CLS features. In the formations of NFWV 6 species with important gene pool and above-standard biometry and age of trees have been identified with a total of 47 subjects within the land. These are the species: *Castanea sativa* Mill. (18 subjects) *Mespilus germanica* L. (1 subjects), *Quercus cerris* L. (1 subject), *Q. dalechampii* Ten. (2 subjects), *Q. petraea* (Mattusch.) Liebl. (23 subjects), *Q. polycarpa* Shur. (2 subjects). Genetically significant trees were also localized by GPS.

Key words: Žirany, current landscape structure, rare trees

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Landscape diversity and biodiversity of Fann Mountains (Tajikistan)

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The Fann Mountains is located in the Central Asia (north-west part of Tajikistan). They are located at the contact of two great mountain ranges – the Zeravshan and the Gissar – of the Western Pamir-Alay. The range extends roughly over 150 km, and its highest peaks are over 5 000 m (Chimtargha, 5495 m a.s.l.). Average width of the mountain range reaches 50 kilometers.

High-mountain ecosystems of Central Asia include in terms of biodiversity to the most valuable areas in the world called as hotspot, and also are exposed to intense human pressures causing the destruction of habitats. Vegetation landscapes of Fann Mountains are very divers according to high-mountain character of this area, local climatic conditions, topographic and habitats. That differentiation favors to biodiversity and formation of unique plant communities and endemic species. High level of endemism in Fann Mountains is connected to natural conditions like as geological structure, high-mountains ranges, climate conditions. This fact has a influence for forming of mosaic biotops, often isolated by orographic barriers. The vegetation landscapes in altitude order are represented by: forbs meadow steppe, thymes, low-grass meadow, swamp, broad-leaf forest, flood-plain small-leaved forest, tugai, light deciduous forest, mesophyllic shrub, high-grass, shrub, pistachio, forbs wormwood, almond, rare vegetation with cushion-shaped species, wormwood-eurotia, steppe, thorny grasses-shrub-steppe, rocks and taluses with rare vegetation.

The data was collected in years 2001-2010, partly with participate of researchers from Medical University in Dushanbe. Investigations was conducted in the area of central part of Zeravshan Botanical Region – Fann Mountains. The aim of study is presented of vegetation landscape diversity in the Fann Mountains area, in horizontal and vertical approach.

Potential habitat for afforestation scots pine (Pinus sylvestris L.) in Serbia

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The paper defines a potential habitat for the reforestation of Scots pine (*Pinus sylvestris* L.) in Serbia. Showing the range of Scots pine in Europe, Asia, and in Serbia describes in detail the research phytocoenological white pine.

Based on the example, in southwest Serbia, with detail is determined the potential vegetation of the ecological complexes, whose is the basis of geological substrates. The research results of differentiation of ecotypes of Scots pine have shown that there is apparent correlation of anatomical and morphological and ecophysiological characteristics of white pine with the character of their habitat.

The analysis of the differential character of the population are grouped into five ecotypes of Scots pine. For each defined afforestation potential is determined by the proposed community ecotype of white pine.

Key words: White pine, reforestation, Serbia, ecotype, potential habitat

Protection of landscape park in Poland – from theory to practice

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This case study looked at the possibilities of limiting anthropic pressurein the Puszcza Zielonka Landscape Park. On the basis of identification and evaluation of the most valuable natural areas, the attractiveness of the park landscape as a supra-ecosystem was determined. Basic spatial issues and signs of anthropic pressurewere presented. The park's attractiveness for tourists was judged using a score method of quality evaluation, which changes qualitative values into quantitative ones. The evaluation was carried out setting apart the zones of analogous natural values and determining the indexes of hemeroby. The fundamental problems were identified: leisure development and the growth of building structures, and secondary land division connected with the conversion of land use in the buffer zone. On the basis of the identified problems, a map of the functional and spatial division of the park was prepared. The division took into account protective, biocoenotic and scientific functions of the park as well as possibilities of leisure development, according to the sustainable development. The zones were each assigned a type of use. Strategic goals and the criteria of shaping protected area spatial structures should be correlated with the spatial development policy of an area.

Key words: landscape park, spatial planning, functional division, sustainable development, anthropopressure

The use of the multisensory valorisation to determination of the landscape zones with different needs of revitalization

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The aim of the multisensory valorisation of landscape was to identify areas that require value and revitalization. Multisensory approach was achieved by modifying the methodological studies of Kowalczyk (1992, 2000) and Wyrzykowski (1992). Developed landscape valorisation allowed for comprehensive analysis of the research area, which was Rusalka Lake in Poznan. The valorisation was based on the reception of impressions by all senses.

First, evaluated the aesthetic experience of landscape within the area of perceived visually. Landscape was estimated on the basis: the number of plans distinguished in the landscape, the number and diversity of elements building the landscape and the possibility of their identification, coexistence of landscape elements (harmony) and the vertical structure of the landscape (tab. 1).

Table 1. Criteria for assessing aesthetic values of landscape within the area of visually perceived
(own work based on modification of the method of Kowalczyk, 2000)

	Criterion	Points
I	The number of plans distinguished in the landscape:	
	three plans, and more	5
	two distinct plans with clearances of the third with no continuity	4
	the two plans	3
	one plan	1
II	Number of building elements of the landscape and the possibility of their identification:	
	varied landscape – more than 5 elements	5
	medium varied landscape – 3-5 elements	3
	poor landscape - less than 3 elements	1
III	The diversity of landscape and building elements identifiable	
	- water facilities:	
	dominant in the landscape	3
	noticeable (presence without dominating)	2
	lack of water objects	1
	- woody vegetation:	
	the presence of dense forest and individual trees or clusters of	3
	the presence of only a dense forest, individual trees or clusters of	2
	shrub vegetation	1
	lack of vegetation	0
	Individual or collective, natural or anthropogenic objects affecting the aesthetic value of landscape:	
	positively	10
	neutrally	5
	negatively	-5

	extremely negative	-10
IV	Coexistence of landscape elements (harmony): harmonious landscape the landscape of partially disturbed the harmony landscape with strongly disturbed the harmony landscape with a completely disordered harmony	 10 5 0 -5
V	The vertical structure of the landscape: a well-developed moderately developed poorly developed	 3 2 1

The next stage of the study was the multisensory valorisation of the landscape. The multisensory part of the study included the following stimuli: sunshine, the quantity of varied natural colors in the landscape, the smell, aeration, the feeling of moisture and the noise. To the each stimulus was attributed the punctual bonitation (tab. 2).

Table 2. Criteria for assessing aesthetic values of landscape seen all the senses

	Criterion	Points
I	Sunshine - of open space: large moderate weak - the area enclosed by the natural elements of landscape: large moderate weak	 5 3 1 1 3 5
II	Dominant, natural colors in the landscape: > 2 2 1 0	 3 2 1 0
III	Noticeable odors: large increase in the positive odor large increase in adverse odors moderate positive odor moderate negative odors weak positive odor intensity low intensity negative odors	 10 -10 5 -5 1 -1
IV	Aeration: large moderate weak	 3 2 1
V	The feeling of moisture: large moderate weak	 3 2 1
VI	Noise: severe moderate weak	 0 5 10

The use of the punctual bonitation helped to reduce the subjectivity of the valorisation of the landscape and allowed a comprehensive and complex assessment of the analyzed area. Thus designated zones indicated the places that need technical and planning procedures in order to improve their perception. The final effect is the concept of spatial planning, whose task is the complex device of the analysed area.

Spatial distribution of ecosystem services in landscapes of Mogilev region

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Mogilev region is situated in the eastern part of Belarus. The most common types of landscapes are secondary-moraine landscapes, moraine landscape with eroded hills, loess, moraine-sandr landscapes, secondary fluvial-glacial, the landscape of marshes, the landscapes of river valleys, alluvial terraces.

Zonal soil type is soddy-podzolic. Nitrogen, phosphorus, potassium and other nutrients are contained in a small amount, which ultimately determines the low primary productivity of natural and cultivated vegetation. Depending on the type of forest phytomass is: in the pine forests - 165-180 t / ha, mixed - 180-195 t / ha in deciduous - more than 195 tons / ha. The total forest area of Mogilev Region is 1231.0 thousand ha (13% of the total forest area of the country). Wooded of region is 36.4 % and varies from 15 % in the Gorki and Mstislavl districts up to 56 % in Klichev and Osipovichi districts. Production of timber is carried out in Kostiukovichi (177 thousand m ^{3}), Krasnopol'e (44.3 thousand m^3) and Chaussy (72.6 thousand m^3) districts.

Agricultural lands cover 51.1% of region, of which 35.7% - arable lands. In 2010 agricultural enterprises of the Mogilev region has been collected 943 250 tones of cereals and legumes, 70 900 tones of potatoes, 33 900 tones of vegetables, 7 700 tones flax fiber. Production of livestock and poultry in live weight are 127.6 thousand tons, milk - 701.3 thousand tons, eggs - 254.7 million units.

In the region there are 130 nature reserves and about 100 cultural sites including religious, historical and natural objects.

Methods of Historical Landscape's Structures Identification and Implementation into Landscape Studies

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Topic about evaluation of historical landscapes is very actual today. Slovakia has markedly rural character. Valuable historical rural landscapes are situated mainly in the Carpathian Mountains (Foresight Analysis of Rural Areas of Europe, 2007-2010, EEA report, 2010). Besides known rural agricultural landscapes in Slovakia, we would like to highlight the significance of historical mining ones. Authors developed and contributed to the research about historic landscape's structures (HLS) by several methods, as "Identification and

Typology of Historical Relief Forms" and typologies, like "Typology of Agrarian HLS (as landscape's patterns)". HLS we can identify as land-forms, components of land-cover structures and complexes of structures in landscape, and in all cases we assess them in visual landscape's appearance as signs which create characteristic landscape's features and contain values of landscape. Department of Landscape Planning and Design with co-operation of the Slovak Environmental Agency developed method "Characteristic Landscape's Appearance Identification and Assessment" in order to perform responsibilities resulting from the European Landscape Convention (Florence, 2000). Generally all mentioned methodical approaches are bringing new perspective on landscape's values identification in the field of landscape-ecology in Slovakia. They were applied in several landscape studies. The main aim of our contribution is comparison of HLS of the cadastral areas of Nižná Boca and Budiná which represent two different rural landscape's types and contain unique values, which are unknown. According to the Act of National Council of the Slovak republic no. 543/2002 Coll., valuable part of landscape can be preserved as "significant element" or "characteristic landscape's appearance". We evaluated attributes and parameters of: relief, visual-optometric parameters of landscape, landscape's types, land-cover structures, types of historical structures and we identified visual signs as characteristic features. Finally we defined value of the HLS and their significance for future tourism development in the studied areas. In both cases we present implementation of the maintenance regulations about the HLS preservation into the documentations of landscape's studies. We have to note that we co-operated with local inhabitants, municipalities and non-governmental organization in the studied areas. Active participation of public is necessary for sustainable development of the regions.

Key words: landscape, features, visual, historical, structures, land-forms, planning.

Minor rural road networks: connectivity and biodiversity values

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Roads and infrastructure corridors are a conspicuous part of most landscapes, which can have significant impacts on continuous forested and other ecosystems. Road corridors create barriers to animal movements, cause wildlife mortality, alter water and nutrient flows, change local microclimatic conditions, act as vectors for weeds and pest animals, and have far-reaching effects on adjacent environments. Not surprisingly, there is new attention by road and land managers to develop suitable methods to connect fragmented patches with various mitigation projects (e.g. underpasses, overpasses and culverts), and a key topic of landscape ecology conferences.

Within many human modified landscapes, roads corridors also provide vital habitat and connectivity functions for biodiversity. Particularly in fragmented farming landscapes, minor rural roads often provide refuge for threatened natives species and ecosystems. Knowledge of the ecology of minor rural roads is underpinned by various studies and contexts, from roadside environments in Australia and elsewhere, to field margins and hedgerows in much of Europe. Despite their different histories and management constructs, important commonalties have been highlighted in terms of their biodiversity values, and factors which may influence

these values. As such, minor rural road networks are vital in providing connected, functioning ecosystems within rural landscapes.
In Australia, a vast network of road reserves exist, which are narrow corridors of public land set aside in the late 19th century for future road transportation needs. These roads were surveyed at varying width depending on transport and stock use at the time of survey. In conjunction, a network of stock routes is interlaced into this network, some of which are up to ½ mile wide. Rather fortuitously, this process of road and stock route survey has resulted in the conservation of extensive tracts of remnant vegetation. As such, this existing green infrastructure is one of the most extensive networks of its kind in the world. However its biodiversity values are under continued pressure from a number of internal (e.g. road development) and external (e.g. adjacent farm inputs) threats.
Local government or road authorities are tasked with the dual roles of managing the road network (i.e. road maintenance, safety issues etc), whilst maintaining the environmental values of road reserves. In this paper, I will describe the Australian road reserve network, present day management challenges and constraints, and discuss the usefulness of the Australian 'model' for developing green infrastructure elsewhere, which integrates both the needs of transport and biodiversity concerns.

The disappearance of Barn Owl *Tyto alba* and Little Owl *Athene noctua* occurrence sites in farmland in south-eastern Poland

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The agricultural landscape of south-eastern Poland has passed through far-reaching transformation in last 20 years, involving the decrease of the intensity of agricultural production. Trends of populations' changes of Barn Owl *Tyto alba* and Little Owl *Athene noctua*, living in large-farm areas, was shown in the aspect of those changes. The impact of some factors on owls' number and appearance was discussed, including livestock production factors, e.g. decrease of cattle and swine numbers, reduction of grazing area and degradation of infrastructure, especially cessation of agricultural production in some farms or vast demolitions on the farm areas. The assessment was made in chosen locations to show the impact of changes in agricultural production in the two owl species' appearance. Preferences of occurrence areas of those species was analyzed, including ecological factors delimitating species' presence. The possible impact of small carnivore *Carnivora* and Tawny Owl *Strix aluco* on Barn Owl and Little Owl occurrence was assessed. Due to the progressive disappearance of the breeding sites of the two owl species, the possible forms of population management were pointed, which could lead to stopping this process. The survey enables making cautious owl number forecast for next few years on the study area.

Biotope mapping of extensive/intensive grassland supported by Remote Sensing and Mobile GIS in Eastern Styria (Austria)

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The government of Styria is generating a province wide biotope mapping. This very intensive mapping activity needs clearly organized field campaign and well prepared field mapping sheets. The main focus of this presented project (cooperation between a civil engineering bureau Kofler, Institute of Geography and Institute of Plant Sciences) was to support the intensive field work for the biotope monitoring mapping in several districts in Eastern Styria. By this way 3 topics (workflows) were selected to proof the possibilities of the integration of satellite images, special image processing tools and mobile GIS applications.

(1) The analyses of multitemporal Satellite images (ASTER/LANDSAT) can provide information about the level of greening/maturity (from March to July) of the grassland. By including an additional rule set (height, slope angle, shape of field, not suitable landuse categories like agricultural land, settlements, streets water bodies, etc.) it is possible to exclude intensive used grassland by means of satellite image analyses. The selection of an appropriate sensor (geometric, spectral and temporal resolution), data preprocessing (geometric and spectral enhancement), the setup of a rule set, and the classification of the (intensive grassland) excluding mask, and finally the evaluation process (field check) will be discussed in this paper.

(2) Conventional digital RGB orthophotographs can be hardly classified by means of image processing. Special image processing tools (object based classification) can provide landuse polygons in different levels of details even in spectral low resoluted images. These basic polygons can support and speed up the visual landuse mapping and can assist the field work, too.

(3) In addition to the methods already mentioned, industrial standard GIS-technology is used to integrate existing and future information layers within one consistent data container. The underlying database model is designed to meet the information needs of administrative instances as well as to implement the analytical tasks formulized by plant scientists and geo – specialists (possible fields of application: error propagation, time series analyses, pattern analyses, etc.); another advantages of this geodatabase driven approach are good scalability and the high portability of the developed desktop system to mobile mapping devices which provide an user friendly data acquisition environment.

Naturalness Analysis of Hungarian landscapes by CORINE Land Cover Data and Natural Capacity Index

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The level of naturalness (and its inverse the level of hemeroby) means the distance from the natural landscapes. For the evaluation of naturalness several methods are widely known (e.g., the analyses of the vegetation cover, landscape metrics and other GIS methods). For quantifying the level of naturalness the analyses of land cover and the main trends of the land cover change can also be applied. However the quality and quantity of naturalness cannot be identified directly on the basis of the land cover class datasets. For instance in case of the "forest" land cover category there are no information about the species diversity, vegetation pattern, or the level of natural protection etc. The exact definition of the role of different land cover/land use categories in the level of naturalness is problematic, thus the land cover categories can be hardly used as indicators of naturalness.

The aim of this research was to develop a new method to solve the above mentioned problems and to estimate the naturalness of landscape units by land cover based hemeroby calculations. The method was developed on landscape units, where both CORINE and Natural Capacity Index (NCI) data are available. The vegetation-based NCI provides good input data for the analysis, since it was calculated for most of the landscape units of Hungary in the framework of the Hungarian Vegetation Mapping Project (MÉTA 2000). All land cover category, which can found in Hungary was corresponded to a hemeroby class and connection was built up between the NCI and CORINE dataset, which can make possible to estimate the NCI value using only CORINE land cover classes.

As a result of these calculations the role of different land cover classes in the level of naturalness can be defined and NCI value can be provide for areas, where the detailed vegetation map is not available.

Keywords: Naturalness, Natural Capacity Index, CORINE Land cover

The significance of the landscape in terms of hydric characteristics

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Nowadays human activities influence water circulation in the landscape more negatively. It is proved by problems such as floods and droughts. The landscape has a certain capacity and ability to retain water and slow down the drain. It is the retention capacity of the landscape, which is determined by several factors, so-called hydric characteristics: hydrological characteristics, meteorological conditions, geomorphological features, soil conditions,

characteristics of forest and non-forest landscape, as well as nature conservation, landscape and natural resources. Knowledge of characteristics is the first step in dealing with flood protection. Based on the determination of these factors can be determine the impact of land use on runoff and the retention capacity. The landscape is divided into categories by degree of significance and subsequent precautions be propose in accord with the integrated river basin management.

Features of traditional agricultural landscape in Slovakia

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Traditional agricultural landscape (TAL) represents ecosystems that consist of a mosaic of small-scale arable fields and permanent agricultural cultivations such as grasslands, vineyards and high-trunk orchards. *Countryside inventory of TAL* was performed as a combination of methods of *visual interpretation* of aerial photos and field survey. On the basis of presence of dispersed settlements, vineyards, orchards we have distinguished four classes of TAL (Špulerová et al. 2011):

(1) Traditional Agricultural Landscape with Dispersed Settlements,
(2) Traditional Agricultural Landscape of Vineyards,
(3) Traditional Agricultural Landscape of Arable-Land, Grasslands and Orchards,
(4) Traditional Agricultural Landscape of Arable-Land and Grasslands.

From the GIS analysis and field mapping we built up the database of sites of traditional agricultural landscape of Slovakia. Altogether, a total of 3 010 TAL sites were identified across the whole Slovakia based on aerial photos. Out of that, 626 sites of TAL were validated in the field (20.6 %). The distribution of four classes of TAL throughout Slovakia is not balanced; they are mostly preserved in hilly and mountain regions. Following features of TAL were recorded in the field: intensity of management, cover of present land use elements (including non-forest woody vegetation), shape and position of parcels, threats to TAL, notes on the present land use and on parameters of present forms of anthropogenic relief (FAR). Special attention was paid to study the habitat diversity on FAR (including their species composition). Additional information about elements of small architecture and significant species and habitats aimed to provide increased knowledge on significance and on historical, cultural and natural values of TAL. Trends in management intensity in the TAL showed, that almost half of the TAL sites (51 %) are still regularly managed, being assigned to the first degree of management intensity. The most significant threats to the TAL and its biodiversity as recorded in the field were: succession in correlation with abandonment, increasing tourism, urban development and reforestation. Plant species composition on mapped FAR has showed high diversity of habitats with presence of rare and endangered species.

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Ecosystem Services of Traditional Agricultural Landscape of Arable-Land, Grasslands and Orchards

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Považský region is significant for presence a mosaic of orchards, grassland, arable fields and non-forest woody vegetation. Orchards are typical landscape feature connected with dispersed settlement. They have long old tradition mainly in this region, and they have to be preserved for next generation as memories of the past in the future. Natural and climate condition of this region open the way for occurrence of different plum cultivars, from which many of them are grown only in here. Other species presented in orchards, even less frequent are apple trees, pear trees, peach trees, cherry trees, walnut trees and apricot trees.

The aim of this contribution is to point to diversity of traditional agricultural landscape (TAL) with orchards and different ecosystem services that they provide for society. Following the classification of TAL (Špulerová et al. 2011) orchards may be present in three type of TAL: (1) Traditional Agricultural Landscape with Dispersed Settlement, (2) Traditional Agricultural Landscape of the Vineyards, (3) Traditional Agricultural Landscape of Arable-Land, Grasslands and Orchards. Significance of orchards as ecosystems in agricultural landscape for the protection of environment is multiple. Not excluding biodiversity point of view, they support also various ecosystem functions and provide ecosystem services that are necessary for society and have irreplaceable ecological, social-cultural and economical value (Hassan, Scholes, Ash eds., 2005). Interest of our study was focused on following ecosystem services: maintenance of productivity on arable land, pollination, maintenance of biological & genetic diversity, providing opportunities for cognitive development (attractive landscape features, variety in landscapes with (potential) recreational uses, variety in natural features with cultural and artistic value, variety in natural features with spiritual and historic value, variety in nature with scientific and educational value).

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The influence of landscape pattern on the distribution of farmland birds in the SW part of Slovakia

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Europe's farmland bird species continue to decrease over the last 30 years. Monitoring programmes have documented the negative population trends of different species living in open habitats. Despite this fact, the selection of protected areas and conservation measures has always preferred mountain areas characterised by low levels of human intervention.

Our aim was to use environmental data sets, including land use and relief (DMR), to model the current distribution of farmland bird species in the agriculture dominated areas of the SW part of Slovakia. The study area covers 359 km^2 and altitude ranges from 102 to 181 m a.s.l. We focus on an exploration of the effects of habitat availability, habitat alteration, change in habitat quality and habitat loss.

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Anthropogenic changes of Oder river valley landscape in Opole Silesia

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The river valleys management began in the earliest epochs. However, these processes have intensified in the eighteenth and nineteenth centuries, due to the intensive development of agriculture, industry, river transport, urbanization. The result of these processes was the transformation of the spatial structure of river valleys through housing development, expansion of the road network, agricultural expansion, channel regulation, construction of water drops, sluices, weirs, canals, and embankments of the river with the development of agriculture and settlement. This resulted in a change in the composition of the water and the land, and therefore the loss of natural plant communities characteristic of these ecosystems. In the twentieth century, with the advent of modern regulations to protect the nature, and river valleys also, the quality and intensity of these changes have changed.

Presented poster illustrates the results of the changes taking place in the landscape of the Oder valley in the twentieth century due to human activities. The studies was conducted using landscape metrics and qualitative and quantitative analysis of the structure of the landscape in the Oder valley. The studies shows that anthropogenic changes in the Oder valley landscape in Opole Silesia, in twentieth century, are mainly related to the disappearance of grassland

areas for arable land, reducing the surface and drainage natural old river-beds and taking over more and more areas for arable crops. One of the greatest threats to the natural river valleys related to agriculture are land reclamation drainage area and increase cultivation of monocultures. These factors result in drainage area and moving boundary fields in the direction of the river. The most threatened of drying and degradation are floodplains areas. Another important phenomenon are the processes of fragmentation of existing patches of natural ecosystems and changes in species composition of natural stands. The most intense anthropogenic changes have occurred on current shaped urban areas and in the immediate zone of influence of urban areas. These changes are not spatially extensive but very intensive in its effects and are not always visible in the small scale. Another important phenomenon is the disappearance of trees and shrubs belts midfield, such as those related the regulation of watercourses and the formation of large areas of agricultural crops. Further changes are associated with permanent water curing roads, replacement of existing water reservoirs and old river-beds for leisure complexes and overexploitation of natural aggregates. However, the exploitation of raw materials creates an chance to play aquatic ecosystems and wetlands by the direction of the quarry reclamation incurred after the extraction.

Transformation of chosen aspects of the cultural landscape of the Tunka Rift Valley (Republic of Buryatia, Russia) after the fall of the Soviet Union

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Tunka Rift Valley is located in Souther Baikal Region between Tunkinskie Gotsy Range and Khamar Daban Range. In this area of Buryatia a shamanism was a dominating religion through hundreds of years, all the way to the 17th century. At that time Tibetan Buddhism (Lamaism) arrived from Mongolia and then gradually started permeating to the area of today's Buryatia.

For the XVIII century it is already main religion of the region (besides the shamanism and the Orthodox faith), when it officially functioned 34 dacans with 13 768 lamas connected with them. The Buddhist dacans, stupas, dugans, sumes, gungarbaas, ahałar-suburgans, statues, zalsans, flags and prayer grinders and Buddhist graveyards became an integral part of the cultural landscape.

Such a state lasted till times of the October Revolution and 30-tych years when it reached closing and destroying religious objects, but the consequence to with decay of any tracks after Buriatian legacy. As a result of this politics for many years both in Buryatia, as well as the entire Soviet Union it wasn't of not a single one functioning Buddhist monastery. At the beginning of 90-tych years of the 20th century in Republic of Buryatia (that is during the fall of the Soviet Union) only Iwolginski Dacan was functional.

At present over 20 years from the fall of the USSR and the appearance of freedoms of religion is already taking place of reviving of the traditional Buddhism, the Orthodox faith and the shamanism. In the effect he is watching being formed or the reconstruction of many traditional typical objects earlier for Tunka Rift Valley. This article is describing changes which took place in the cultural landscape of the region from the fall of the Soviet Union.

Infrared Images and Land Cover in the Past

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Czech landscape is the old residential area used by humans since ancient times. Man has influenced it since arrival and various activities in different periods creates landscape layers called a palimpsest. At one point we can follow the traces of human activity from different periods and natural changes. Land Cover one location could change several times. The most important reason is meandering and subsequent straightening of rivers, deforestation, relocation and change in soil layers. These changes in the past affect the present management and it is important to identify them. A suitable tool for the determination of different sites are remote sensing in the infrared spectrum, which monitors changes in the vegetation, with the support of archival materials. These changes in vegetation are statistically significant and distinct sites with different histories of others. After identifying the different places you can search the archive materials, what was the land cover in the past. They have been used these archival materials: maps II. and III. military mapping, basic maps and other maps and historical aerial photographs. The Czech Republic has a national archive of aerial photographs maintained VGHMU Dobruska with aerial photographs from the thirties of last century. These images document the landscape before collectivization and the reclamation of the land, which dynamically changed the landscape cover. The studied area was documented by other aerial photographs from other time periods between 1959 and 1989 and mainly infrared images from present that were used as the main basis for determining the development of land cover. A comparative analysis of Land Cover shows the increases and decreases in agricultural land, changes in communication line elements, the impact of new methods of land use, erosion control restoration measures, changes in retention capacity, losses and increase forest, comparing the legal and actual status of the forest boundaries and their changes over time, changes in the built areas and links to the surrounding countryside. Land Cover of this study was created primarily as a visual interpretation of each area. Each area was compared with archival materials.

Transfer of landscape ecological knowledge from theory to practice as the multistage process (Selected theoretical and meta-scientific aspects)

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Successfulness and efficiency of the transfer of the landscape ecological knowledge from theory to practice is the complex scientific and social topic, which solution requests elaboration of suitable theoretical, meta-scientific and empirical -applied research approaches. In this context, the burning question is to what extent landscape ecology is prepared as the science with its theoretical basis, methodological infrastructure and quantitative-qualitative nature of empirical knowledge to solve effectively this fundamental problem.

The transfer of the landscape ecological knowledge from theory to practice is necessary to understand as a multistage process to bridge and short the distances between theoretical and

practical landscape ecological knowledge on the empirical, methodical, theoretical, meta-scientific, didactic and applied level and simultaneously as a great challenge for landscape ecology.

On the empirical level should be the input landscape ecological knowledge transformed as problem- and spatial-temporal oriented data, with their subsequent operation steps like collection, analysis and synthesis. On the methodical level is necessary to prepare the methodical processes of transformation of theoretical landscape ecological knowledge to the practical one.

On the theoretical level is very important the generalization of the empirical landscape ecological knowledge into new theoretical regularities and principles, which make easier its transfer to the practice.

On the applied level belong to the key transfer steps the interpretation, evaluation and implementation of empirical landscape ecological knowledge into the landscape ecological planning and management. Very important is the transformation from the scientific language of the results of empirical research to the language of practitioners and stakeholders.

On the didactic level play the role ability and skill of students to prepare, interpret and evaluate analytical landscape-ecological data necessary for the creation of problem-oriented syntheses, as well as to coordinate and cooperate for successful management of teams involved in the landscape-ecological planning and design.

On the meta-scientific level is most effective the convergence of ecological, economic and social sciences at the theoretic-methodological as well as empiric-practical level. This is necessary for the closer intra-, inter- and trans-disciplinary collaboration and for higher efficiency of their synergy in the research and solving the problems connected with transfer of landscape ecological knowledge from theory to practice. In this way is urgent to keep the qualitative and quantitative balance between theoretical and practical landscape ecological knowledge as one of the most important pre-conditions for the sustainable development of landscape ecology and for the strengthening of its social and scientific relevance.

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