POSSIBILITIES FOR THE USE OF HEAVY HORSES IN COUNTRYSIDE

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Abstract
This paper deals with the use of the heavy horses in today's cultural landscape, especially in forestry, agriculture, recreation activities and nature protection. There are presented new directions in agriculture technology for horses. Heavy horses have important role in soil protection against compaction.

Key words: forestry, agriculture, soil protection, nature protection

Introduction

Nowadays there is no use in conservation heavy horses very widespread. The main reason for this is little public awareness of modern art drawn by horses. There are a lot of machines and tools drawn sleigh and the consequent possibility of use in many areas of nature, which ranks among heavy horses work performed consistently friendly ways to care for the countryside. Only a few people are heavy horses as economically and nature friendly farming.
From the point of view of nature conservation and landscape work with heavy horses many advantages. Protection and care for nature and landscape not only in specially protected areas should therefore be exercised through the heavy horses; this work should not be a task only for tractors and heavy machinery.
When using the cultural landscape by human problem arises ubiquitous soil compaction. It grew bigger and more powerful tractors and machinery cause permanent and irreversible damage to the soil cover. Compaction is caused when driving these machines for land where there is excessive pressure on the ground. For forest land, the use of horses is much friendlier than working machinery and heavy equipment. Horses cause that is according to the circumstances, greater pressure on the contact area of land than large machinery, but the point compression horse's hoof has no significant environmental impact on the soil. Intensity (depth) deformation is not so important. Compared with surface soil compression tractors and mechanization, appears compaction horse hooves as preferable in terms of regeneration and renewal of soil animals. (Nadezhdina et al. 2012)
Soil compaction affects mainly soil gas and soil water. This effect is so negative that the soil can in extreme cases lead to the creation of anaerobic conditions. The manifestation of increased soil compaction is the increased production of CO_2, which escapes from the soil. (Neruda, Ulrich 2008)

Anaerobic conditions lead to an apparent reduction in the growth of the root system. The roots of the plants are not able to penetrate the compacted soil layer from which would otherwise have been able to draw the necessary nutrients and water. Due to the limitation of root growth is also unstable trees. Soil compaction leads to a reduction in the growth of trees, and increasing susceptibility to diseases and also wind tree falls. (Neruda et al. 2009)
The first studies of ongoing conservation projects using the heavy horses, and following the promising results of the research show clearly that this is the considerable potential for practical nature conservation and environmental protection as a whole. It is therefore desirable to use these general nature and soil-friendly farming methods in practical conservation. Equally desirable is also nature-friendly use and cultivation. (Herold et al. 2009)
There is another equally important contribution to the adoption of rare breeds of heavy execution of agricultural biodiversity and to sustain it. With the use of modern machinery drawn by horses in agriculture and forestry, will be, or are, horses used as working and draft animals. Extending their use and raise awareness of how to work with them can significantly contribute to saving these breeds. Therefore, it is necessary to broaden public awareness of the benefits of the use of heavy horses in forestry and agriculture. The use of horses in these fields is useful for several reasons. These reasons include economic factors and social factors.
Nowadays, the increasing criticism of bio fuels, it is urgently important to note the use of horses in modern agricultural production. It is also important in practice to show the public the use of heavy horses in altered cultural landscape.

Materials and methods
For the preparation of this article was to utilize professional literature. Furthermore, the evidence was used by Mr Hajtmar.
A field survey was carried out in Rovensko. Field research consisted of finding time-consuming individual work carried out using the harness with the workhorses for which was hitched up power unit or power wheelchair. It was also measured by the consumption of fuel consumed energy unit.

Results and Discussion
Working with horses Mr. Hajtmar in the woods all year, as this is a major activity and livelihoods. When agricultural activities are horses used from spring to autumn. Mr. Hajtmar with their horses participated several times a year various competitions and events focused on heavy horses. Participation in these events is subject to time constraints and distance. Mr. Hajtmar with their horses also involved in many folk festivals such as harvest festivals, relics, brewer's festivals and weddings.
The energy carried by the drive unit to the tractor implements, yokes, and the auxiliary single-axle chassis with three point linkage, on which hangs a tool is powered through cardan shaft from the power unit. Three-point hitch is hydraulically operated via hydraulic hand pump, located within easy reach of the driver. The energy unit is equipped with four wheels with tires.
Per unit of energy is harnessed counter-rotating tractor scythe with a working width of 2.40 m Another machine is a four rotor tedder with a working width of 4.80 m is raking hay into rows using hay raking, which has a working width 2.20 m manure is transported and scattered through the spreader RUR, which has a capacity of 3 tons. The treatment of the soil used tractor cultivator working width of 2.5 m. Pressing machine for smaller square bales is used for pressing of hay and straw.
Hydraulic cart is another machine used for agricultural works. The cart is not equipped with a motor. For this cart is working with gates with a working width of 4 m, then spun and tractor forks, which are loaded packages of food and bedding. This cart can involve roller on rolling fields. In the forest, hydraulic cart is used to lift the timber in the harness above the ground and its skidding on road side.
All tools can be carried by a yoke and a truck power unit. However, it is unnecessary for putting the truck engine accessories you need to drive your business. Therefore, this accessory is harnessed for hydraulic cart, motor does not and it's even easier.
Tab. 1 shows agricultural activity, the number of horses used in the work, time demands of the activity and fuel consumption. A power unit for horses can save up to 90 % of the fuel when mowing hay in comparison with consumption by a tractor, doing the same job. When using the power unit for horses, considerable savings in diesel or petrol. Through the use of heavy horses in agriculture can save the amount of energy per year, it corresponds to the equivalent of about 2400 l of diesel. (Herold et al. 2009)

One takes into account not only the need for clean energy job performance, takes into account the energy requirements for production, maintenance, and ultimately to the destruction of tractors and horses. Outgoing, or excluded from the operation of the horse is still used as human or animal food, or serve as a source of leather and glue, or as a source of fertilizer. The footprint of tractor in its manufacture, subsequent production, as well as the use and disposal of the tractor itself is clearly negative. From the perspective of Life Cycle Assessment and technology using horses based on better compared with tractors. (Engel 2012)
Tractors produce unlike horses fumes and soot that contaminate and degrade the environment. Among the most pollution environmental components include air. The use of heavy horses but climate-neutral because the carbon dioxide produced by the balance is zero. This aspect is also very important in global considerations in the use of horses as a renewable energy source.

Conclusion
For the Central European cultural landscape of great importance varied landscape structure and the various elements of the landscape, which together provide a small area of the key features for biodiversity and ecological richness and functionality. From an ecological point of view, the benefits of the use of heavy horses in the cultural landscape, inter alia, the protection of endangered species of animals and plants. Heavy horses are at work in comparison with the tractor slower pace of work. That is crucial as mowing meadows, where the animals have a

greater chance to escape. At high speeds, the drive agricultural tractors and several meters working width of agricultural implements animals have no chance to escape.
The combination of heavy horse and power unit can be recommended as an alternative method of propulsion certain agricultural machinery for arable land in ecologically sensitive areas with higher demands on nature protection, especially against soil compaction.

Tab 1: The time table of farm work

Agricultural activity The machine used	Time consumption (hour/ha)	Number of horses	Power unit/ Hydraulic cart	Fuel consumption (l/ha)
Mowing Counter-rotating cutter bar	1	2-3	Power unit	2
Turning hay 4 rotor tedder	0,3	2	Power unit	2,1
Hay raking Raking	1	2	Power unit	2,1
Spreading manure Spreader RUR 3	5	3	Power unit	2,6
Rolling after sowing Oak rollers	1,5	2	Hydraulic cart	0
Field burrowing Burrower	1,5	2	Hydraulic cart	0
Sowing Sowing machine Amazone	1,5	3	Hydraulic cart	0
Harrowing Harrow	1,5	2-3	Hydraulic cart	0

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Souhrn

Příspěvek popisuje málo známý způsob použití chladnokrevných koní při práci v kulturní krajině. Tento způsob spočívá v použití energetické jednotky za koně v kombinaci se zařízeními, které jsou taženy traktory. Inspirací pro kombinaci koní s traktorovým nářadím bylo Německo. Jeden

z kočích, který využívá této mechanizace za koně je pan Hajtmar z Rovenska. K práci na poli je využívána energetická jednotka s benzínovým motorem a hydraulický vozík, který je bez motoru. Energetická jednotka se používá v kombinacích s poháněnými zemědělskými stroji. Hydraulický vozík je určen pro kombinace se zemědělským nářadím, které nepotřebuje pohon. Výhodou hydraulického vozíku je nulová spotřeba paliva.
Kombinace chladnokrevných koní a pohonné jednotky lze doporučit jako alternativní způsob pohonu zemědělských strojů a nářadí pro kultivaci půdy v ekologicky citlivých oblastech s vyššími nároky na ochranu přírody, zejména proti zhutnění půdy. Vzhledem k nulové bilanci CO_2 lze na koně pohlížet jako na obnovitelný zdroj energie.

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POSSIBILITIES OF FOREST RECREATION IN FINLAND

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Abstract
The goal of this thesis is to present the possibilities of recreation in Finland, as well as the recreational planning, motivation of tourists and nature-friendly tourism. The main accent is taken on forest recreation, because forests form ¾ of Finland. The main part of the article is focused on the description of the recreational facilities most common used in Finnish forests, such as open wilderness huts, day trip huts, dugouts, Lapp pole tents, shelters and campfire sites.

Key words: recreational facilities, cottages, motivation of tourist

Introduction

Spending time in the national park is clearly beneficial for health, improving the body and mind condition. These findings are based on people's experiences and physiological measurements. Impacts of recreation do not depend on the length and intensity of any activities there - the most important is just to get out into nature.

Raija Laukkanen, Associate Professor, University of Oulu, 2011

Natural Heritage Services (Metsähallitus) systematically collects information about visit rates of national parks and other natural areas, as well as feedback from incoming visitors. This survey helps to plan effective management of these areas. Furthermore, this survey is beneficial for local businesses and companies who can plan their activities in the long term period, based on sustainable development close to nature tourism.

Joel Erkkonen, Metsähallitus, Senior Advisor, Rovaniemi, 2009

Social values of the forests and Everyman´s right

Forests are important as the cornerstone of Finnish culture. For many local communities, traditions which are associated with the forest, continues to form a significant part of the local way of life. Forests are important haven of rest for the Finns and the whole Finnish culture, where forests embody the social and psychological values. Social values of forests are the right of "Everyman's right", which is provided from the force of the Forest Act. This law ensures that everyone can walk freely through the forest and pick mushrooms and berries and breathe fresh air and therefore receive all the forest gifts (Korhonen,1998a).

Recreational functions of the Finnish forests

Recreational functions of the forests are under survey of the Natural Heritage Services (Department of Metsähallitus). Metsähallitus is a state institute and its activities are divided into commercial operation (forestry and real estate businesses) and public administration (services provided through the Natural Heritage Services - nature conservation, recreation and services related to recreation, hunting and fishing). These public services are largely financed from the state budget, such as maintain of hiking trails and visitor centers (col., 2011a).

Recreational use of the forests

Recreational use of forests can be viewed as the use of forest land for recreational purposes or for any physical activities in the forest, from which one gets the mental and physical gratifications. The most common forms of recreation in Finland are those, which can be done in neighbourhood, as part of everyday life. These activities include picking of wild berries and mushrooms, cycling, walking, Nordic walking, hiking, orienteering, running, skiing, fishing, hunting and nature watching (Korhonen, 1998b).

Recreational use and planning

Recreational use of the forests is in charge of Natural Heritage Service. Regional targets of recreational use are set out in the plans of natural resources. Special recreation areas and scenic areas are defined in landscape ecological plans. Special areas are proposed by special plans [3]. Natural Heritage Service will create special plans of natural tourism for long-term strategy of tourism in national parks. These plans include cooperation with local providers in tourism and they are also providing detailed ways of sustainable nature tourism. (col., 2010)

Projecting of recreational trails and routes is always planned in accordance with the biological diversity and the needs of protected fauna and flora in the recreation area. For example, if in the recreational area is situated near the eagle nesting site, recreational trail must be designed at a minimum distance of 1.1 km from the nest. On the one hand, the planning of recreational trails is limited by the occurrence of protected species. On the other hand, there is the opportunity for private companies to design their own tourist and recreational trails under contract with Metsähallitus, which are necessary for their business e.g. renting the cottages from Metsähallitus for running their business – dog sledges trips or snowmobiling.

Sustainability of tourism

National parks and other protected areas are popular destination for people who want to engage in leisure activities, travel and ecotourism at the same time being in nature. Therefore, it is especially important to understand the nature park visitors in order to minimize the impact of increased visit rate to the natural site and its resources. For this reason, it is necessary to develop educational programs and produce positive public relationships. It is also necessary to have established effective crisis management and marketing strategies for protected sites. Since the general objective of protected areas is to provide visitors with a quality experience in a way that does not harm the natural resources and that will be attractive to visitors to the area. (Konu, 2012)

The idea of sustainable tourism lies in the possibility to offer people a wonderful experience without damaging the natural and cultural heritage. Metsähallitus was involved in implementing the principles of sustainable tourism, which take into account the ecological, socio-cultural and economic aspects of sustainability. Ecological sustainability is the ability to maintain the biological diversity and balance despite the influence of human activities (recreation and tourism, which must not interfere in areas with high ecological and biological value). Socio-cultural sustainability involves taking care of the sustainability of cultural heritage area. Travel and tourism should promote local culture and heritage of the inheritance should also bring some benefits to the lives of local residents. Economic sustainability measure the impact of tourism in national parks and nature-friendly tourism impacts on the local economy in all tourism activities. Tourism brings financial benefits to the local shops, and also allows you to keep other means of livelihood and traditional way of life. For sustainable tourism contribute Metsähallitus, tourism businesses and local interest groups (Virrkunen, 2011).

Leisure and tourist motivations

Leisure time and tourism have in common motivation factors. The motivating factors include: the joy of nature and escape from civilization, the possibility of rest from daily routine and responsibility, physical exercise, creativity, relaxation, social contact when meeting new people, family, self-realization, organizing competitions and activity against boredom (Konu, 2012).

Motivations in nature-based tourism

Nature-based tourists are generally more interested in nature. They spend more time in the area and they are travelling more frequently and for longer distances. Differences are seen especially in comparison of motivation between ordinary tourists and wilderness travelers. Their behavior is closely linked to factors such as the needs, motivations, expectations and a sense of satisfaction. Motivations in the nature based tourism are the following: to be close to nature, enjoy nature, visit the natural attractions, do something new, to visit new places, learn something new about the new place, mentally relax, spend some time outside of civilization, get away from everyday life, to experience something adventurous, have fun, be with friends and relatives, have social contact with others, to gain new skills, improve their self-esteem (Konu, 2012).

Benefits from recreation

Finland is a sparsely populated country, so there is a common right of everyone to have free access to all natural areas. This privilege is deeply rooted in Finnish culture. In addition, national parks are financed from the state budget, and therefore are free of charge for citizens. So long as it guarantees the right to free public access to the countryside will be available to all people of the state-owned recreation areas. In Finland is normal not to pay for access to tourist areas, whether on private or public land. People's interest in recreation and values resulting from it should be taken into account in the landscape, land use and recreation planning of each area (Huhtala, 2004). It is estimated, that about two million tourists annually visit Finnish national parks and their recreation areas. Maintenance and basic services (fuel wood, waste disposal,

etc.) in these recreational areas are financed through the state budget. Analysis of the financial value of recreational services in forests is primarily motivated by the knowledge that enables effective allocation of government resources. It is equally important to know who is using recreational services (Huhtala, 2004). Studies have shown that public investments in national parks are returned more than ten times back in support of local economy. (col., 2012) It is estimated that each Euro invested by the government in national parks generate benefits for society with an average of 10 Euros, and in some cases up to 30 Euros (col., 2011b). Government investment in recreational facilities in national parks and tourist areas are returned in many ways - in terms of business and employment opportunities that this funding generates. The communities in most visited parks can expect a return of up to 20 Euros for every Euro invested in recreational park facilities. Public costs on recreation facilities were in the National Park Oulanka around € 700,000 per year, but visitors bring € 14.7 million per year to local economy. Public investment in conservation of nature and free services for visitors in natural areas provide a solid foundation for long-term development of nature-friendly tourism (col., 2009)

Recreational facilities

The Finnish national parks are known for their nature and number of huts and shelters which a lot of them can be used for free. They are also providing services for handicapped people. Needs of handicapped people are taken on mind when there is a new path planned. That´s why you can see consolidated paths suitable for people on wheelchairs, seniors with worse volubility and for families with baby buggies in many areas. In addition to free huts which are available in the parks, there are rental huts as well. If the rental hut is situated near the river or lake there is a big probability to use a sauna too.

Free and open huts

The most common and best known types of the huts are the open wilderness huts, which are free of charge. These huts are adjusted for overnighting. They are usually situated in the northern and eastern parts of Finland. Other open huts are day trip huts, which aren´t designed for staying overnight. Another places used for relaxation during the day are dugouts, Lap pole tents that can also be used for overnighting in exceptional cases (http://www.outdoors.fi/huts/Pages/Default.aspx)

Rental Wilderness Huts

These huts are locked and staying is for a fee. If the tourists pay the fee, they have booked their bed for overnighting. The fee is charged for booking hut, reservation of dugout and rental huts (http://www.outdoors.fi/huts/Pages/Default.aspx).

Types of huts[1]

Open Wilderness Huts

Open wilderness huts are simple objects designed for hikers, skiers, boaters, etc. These huts are a good place to stop and relax or even to sleep overnight. It is possible to stay there for one or two nights without any reservation. Accessories of open wilderness huts are usually plank beds for sleeping, table, benches, utensils, stove and dry toilet next to the hut. There is a woodhouse with an axe nearby.

Fig. 1: Open Wilderness Huts

Fig. 2: Dry toilets with woodhouse
http://www.panoramio.com/user/6992741?with_photo_id=74145381

[1] http://www.outdoors.fi/huts/typesofhuts/Pages/Default.aspx

Day Trip Huts

Day trip huts are very similar to open wilderness huts, which can serve as a rest places for tourists. The difference is that these huts aren´t designed for overnight stays as open wilderness huts. Day trip huts are usually located near the tourist centers. It is possible overnight there on the floor in case of emergency, because these types of huts don´t have a plank beds. The accessories of this hut include a table, benches, utensils, stove and dry toilet next to the hut. Next to the hut is a woodhouse with an axe.

Fig. 3 and 4: Day trip huts

Dugouts

Dugouts are small huts built partly under the ground. They have a roof made of grass. Some of them are only intended for use during the day, while in others it is possible to stay for one or two nights without paying a fee. The accessories in the dugouts are very simple. Some have plank beds to sleep in other dugouts tourist must sleep on the floor. Part of the dugout is fireplace or stove. Next to dugout is a dry toilet.

Fig. 5: Dugout
http://www.panoramio.com/photo/74145383

Lapp Pole Tents

Lapp pole tents serve as a resting place for tourists. Lapp pole tent is usually located near the marked trails. In case of emergency it is possible to stay overnight there. The fireplace is located in the middle of building, benches are around it. The floor is usually from concrete, sometimes it is made from planks. Next to Lapp pole tent are situated a woodshed with an axe and a dry toilet.

Fig. 6 and 7: Lapp pole tent in Pyhä Luosto National Park

Shelters
Shelters are used to protect against bad weather. Open fireplace and benches are built as a part of the shelter. There are dry toilet and a woodshed with an axe nearby.

Fig. 8 and 9: Shelter with open fireplace

Campfire sites
Campfire sites are open fireplaces surrounded by benches. ´The dry toilet and woodshed are usually located nearby.

Fig. 10: Campfire site

Fig. 11: Campfire site with shelter and woodhouse, consolidated path allows to enter a camp to handicapped people too.

Rental Huts
These huts are designed for hikers, skiers, boaters, etc. Huts are locked and their use is charged for overnight stays. These huts could be used only by visitors who have booked an overnight stay. They will receive a key to the hut after payment. Booking and paying of the fee can be paid in all tourist headquarters of the national parks. Bookable huts can be located near the open wilderness huts. These huts include plank beds, table, benches, kitchenware, stove and dry toilet nearby the hut, as well as a woodhouse with wood, an axe and saw.

Fig. 12: Reservable hut with sauna in Lemmenjoki National Park

Rental dugouts

These dugouts can be rented as a whole building for one or two nights. These dugouts can be rented only in Urho Kekkonen National Park. Large dugouts can accommodate 6 people, small dugouts 3 people. Dugouts are equipped by plank beds, table, benches, kitchenware, gas stove. Dry toilet and woodshed with an ax and a saw are nearby.

Fig. 13: Reservable dugout
http://www.outdoors.fi/Huts/lapland/easternlapland/vongoivareservableturfhut/Pages/Default.aspx

Rental Huts

Rental huts are for tourists, skiers, boaters, etc. They are locked and there is overnight fee. The huts are rented as a whole for the night or for several nights. Hut facilities include sleeping bunks, table, benches, kitchenware and stove. Dry toilet and a woodhouse with an axe and saw are situated nearby. Mattresses, blankets and pillows are usually included.

Fig. 14: Rental hut

Rental Lapp Pole Tents

Rental Lapp pole tents are designed for special interest groups, such as corporate parties, birthday celebrations with food and sitting near campfire, etc. Reservations can be made for a few hours or the whole day. Some Lapp pole tents are suitable for overnight stays. Lapp pole tents are equipped with a fireplace, benches and tables for food serving. Dry toilet and woodshed with an axe are situated nearby. The basic equipment includes a kettle for coffee preparing, but the tenants must bring their own dishes.

Fig. 15: Rental Lapp pole tent
(http://www.outdoors.fi/Huts/southernfinland/maakijareservablelapphutloghut/Pages/Default.aspx)

Conclusion
Recreation facilities that are available within the Finnish national parks, bring great inspiration to our Czech tourism and recreation. We are sorry to say, that we aren´t ready as a nation on using of open access wilderness huts in the Czech Republic. When the time comes, we will be enjoying this beautiful form of recreation in direct contact with forest nature. We hope, that in the future it will be possible to make this kind of forest recreation in the Czech Republic too.

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Souhrn
Cílem článku bylo popsat možnosti lesní rekreace ve Finsku. V první části se článek zaměřuje na sociální a rekreační funkce lesů, rekreační plánování, udržitelný rozvoj v turismu, přírodě blízký turismus, motivaci turistů a v neposlední řadě na přínosy z turismu. V druhé části článek popisuje rekreační vybavení národních parků v podobě volně přístupných nebo pronajímatelných chat, kot, zemljanek, přístřešků a doprovodných ohnišť.

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POSSIBILITIES OF THE RECREATIONAL FUNCTION OF FORESTS ASSESSMENT WITH USING OF THE COMPLEX METHODS OF FOREST FUNCTION EVALUATION

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Abstract
There are three complex methods of forests function evaluation useful in the Czech professional forest practice, the Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003), the of Method of Biotopes Apprising (Seják, Dejmal, 2003) and the Method of Social-economic Importance of Basic Non-wood Production Forests Functions Apprising (Šišák et al., 2002). Each of the methods have specific tool for the recreational forest function assessment with following apprising of this function. The results coming from using of mentioned methods are as well as the methodological approaches of them very different. Presented article is focused on the evaluation and apprising of recreational forest function of concrete forest stand (stands) and the description of differences among used methods.

Key words: recreational forest function, forest functions assessment, complex methods of forest functions assessment

Introduction

Recreational function of forests is one of the most obtained forest functions at present. Due to progressive development of human society and changing socio-demographic conditions people have more leisure time on one side but are exposed to more negative stress factors on the second one. In the Czech Republic recreational forest function is ensured in frame of standard forest management but owners of forests are not generally supported by public financial tool for it where one of the reasons is “impossibility” of recreational function correct financial expression. There exist methods which can be used for forest recreational function financial expression. Generally they are called “complex methods of forest function evaluation” because are able to evaluate and apprise whole complex of forest functions of course including recreational forest functions. As an example of the complex methods of forest function evaluation can be mentioned: the Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003), the of Method of Biotopes Apprising (Seják, Dejmal, 2003) and the Method of Social-economic Importance of Basic Non-wood Production Forests Functions Apprising (Šišák et al., 2002). Given article presents evaluation and apprising (financial expression) of recreational forest function of concrete forest stand (stands) with using two of mentioned methods and the description of differences among them. A lot of authors published works focused on the forest functions evaluation with using those methods also with special regards to recreational forest function. With respect to all of them are here cited only diploma theses made by authors supervising for example Ambrož, 2005, Karásek, 2011, Kotrla, 2012, Kučera, 2012, Kvaček, 2009, Matyáš, 2010, Nehyba, 2013 a Zemek, 2010.

Materials and methods

As model locality for evaluation of the recreational forest function was selected department 371 and its forests A, B and C in the area of Forest Training Enterprise of Mendel University in Brno. Locality is located close to Bílovice nad Svitavou (on the southeast and south border of village) on the left river bank of the Svitava River. Its area is 30,89 ha, locality is situated on the steep slopes with west and northwest exposition between the altitudes 235 and 334 m above the sea level. Prevailing tree species are sessile oak (*Quercus petraea*) 51%, Scott pine (*Pinus silvestris*) 21% and hornbeam (*Carpinus betulus*) 9%. The forest sites are generally reach of nutrients with lower content of water. Locality is situated close to important recreational points as for example Těsnohlídek Valley, Liška Bystrouška Forest cabin, Monument of S. K. Neumann and is surrounded by very intensively used bikeway Brno-Obřany – Bílovice nad Svitavou.

Recreational functions of forest stands on the model locality was elaborated with using the methods Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003) and Method of Social-economic Importance of Basic Non-wood Production Forests Functions Apprising (Šišák et al., 2002). Methodological process of forest function evaluation and financial expression or apprising is widely described in cited references, in following text are given only methodological points related to the evaluation of recreational forest function.

Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003) uses for financial expression of forest functions general formula:

$$FSE_{FL} = \frac{CD.PP.U}{3}.RP_{FL}.\frac{RE_{FL}}{100}.P$$

where

FSE_{FL} = financial expression of a value of the Real effect of a function in CZK

RP_{FL} = value (value degree) of the function Real potential (in case of recreational forest function is used Real potential of recreational forest function)

RE_{FL} = value of the function Real effect in % (in case of recreational forest function is used Real effect of recreational forest function)

CD = decennial average price of wood at the roadside in CZK per m^3 announced by the CR Ministry of Agriculture (812,- Kč)

PP = average annual potential production of forests in the Czech Republic in $m^3.ha^{-1}$ determined by a special directive (6.3 $m^3 . ha^{-1}$)

U = stand rotation

P = area of the unit (stand, stand part) in ha

Real potential of forest functions means quantified potential functional ability of forest in optimal ecosystem conditions and is elaborated and available for all main forest ecosystem units of the Czech Republic. It is expressed by so called value degree 0 – 6. Real effect is defined as calculated actual fulfilling of forest functions and is determined by current status of forest age, stocking and health status and expressed in %.

With using of the Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003) is necessary to evaluate all the smallest forest units. In case of presented article 22 forest units were evaluated and financially expressed.

Method of Social-economic Importance of Basic Non-wood Production Forests Functions Apprising (Šišák et al., 2002) appraises forest functions as the loss of forest functions production. It can be done in two levels, as annual, then is apprising as many years as forest functions are not fulfilled or as permanent, and then is apprising total amount of loss of forest functions. For both of the levels are prices available for defined special situations – quantitative characteristics of forests (for recreational forest function see Table 1). In opposite to the previous method the locality is evaluated completely not by particular forest units. It is determined if is valuated forest locality included to the one or more of the defined quantitative characteristics of forests.

Tab. 1: Quantitative characteristics of forests - recreational forest function

Quantitative characteristics of forests	Annual (CZK per ha)	Total (CZK per ha)
Public accessible forests	2573	128 650
Blackberries and cranberries forest types	7521	376 050
Suburban forests with special health function	7521	376 050
Spa forest	7521	376 050
Forests far 50 m from touristic paths	7521	376 050

Results

Next two tables (Table 2 and Table 3) present financial expression of social-recreational forest function with using the Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003) and apprising of recreational forest function with using Method of Social-economic Importance of Basic Non-wood Production Forests Functions Apprising (Šišák et al., 2002) of model locality department 371 and its forests A, B and C in the area of Forest Training Enterprise of Mendel University in Brno. The total financial expression of social-recreational forest function according to Vyskot´s method is 19 577 896 CZK (in the area of 30, 89 ha), total price of recreational forest function according to Šišák´s method is 5 544 889 CZK (in the area of 30, 89 ha). It is obvious that the difference between the methods is relatively high. The probable reasons why are discussed in the chapter discussion.

Tab. 2: Financial expression of social-recreational forest function with using the Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003)

Forest stand	Area	Real potential of social-recreational forest function	Real effect of social-recreational forest function (%)	Financial expression of forest functions (CZK)
371Aa1a	0,18	4	17,5	23 020
371Aa1b	0,11	4	35,5	28 538
371Aa1c	0,07	3	17,5	6 714
371Aa1d	0,32	4	17,5	40 925
371Aa3a	1,06	3	57	364 278
371Aa3b	0,44	3	57	164 956
371Aa4	0,82	3	76	375 734
371Aa7	2,54	4	91	1 858 088
371Aa10	0,2	5	100	182 700
371Aa11	0,18	5	100	197 316
371Aa15	0,34	3	76	169 955
371Ba1a	0,27	4	17,5	34 530
371Ba1b	0,51	4	17,5	65 224
371Ba1c	1,36	3	17,5	130 448
371Ba3	0,6	3	57	224 940
371Ba14	9,93	4	91	7 924 474
371Ca0	0,16	3	16,5	18 811
371Ca1a	0,74	3	17,5	85 175
371Ca1b	0,21	3	17,5	24 171
371Ca2	2,06	3	41	555 510
371Ca4	0,42	3	64	220 994
371Ca13	8,37	3	100	6 881 396
Total	30, 89			19 577 896

Tab. 3: Apprising of recreational forest function with using Method of Social-economic Importance of Basic Non-wood Production Forests Functions Apprising (Šišák et al., 2002)

Quantitative characteristics of forests	Total price (CZK per ha)	Included area (ha)	Price (CZK)
Public accessible forests	128 650	24,54	3 157 071
Forests far 50 m from touristic paths	376 050	6,35	2 387 818
Total		30,89	5 544 889

Discussion

As was shown in the previous chapter the difference between the results coming from used methods is relatively high (four times higher in case of results obtained with using the Vyskot´s method). The main reason probably consists in the different approach to the forest functions evaluation used in those methods. While Vyskot´s method uses so called “ecosystem approach” where forest functions are defined as socially realized natural effects of forests (and exceeding of functional production is defined as impermissible) Šišák´s method see the human society in the centre of interest and the interests of human society determine the requirements to the forest functions. There is also one more practical point, while the values of Real potentials and Real effects of forest functions (Vyskot, I. et all, 2003) was elaborated wit using the ecosystem analyses the prices of Quantitative characteristics of forests (Šišák et all, 2002) were obtained as an expert estimation mostly with using the method of willingness to pay (for ecosystem services).

Conclusion

The article presents evaluation, financial expression and apprising of the recreational forest function of forest in model locality of department 371 and its forests A, B and C in the area of Forest Training Enterprise of Mendel University in Brno close to the Bílovice nad Svitavou

village. For evaluation were used the Method of Quantification and Evaluation of Forest Functions (Vyskot, I. et al., 2003) and the Method of Social-economic Importance of Basic Non-wood Production Forests Functions Apprising (Šišák et al., 2002). Results presented in the article show that the difference of the financial expression of solved forest function is relatively high and is nearly four times higher in case of results obtained by the Vyskot´s method than in case of results coming from Šišák´s method. As a main reason of the difference was stated the different approach to the forest function evaluation in case of both of the methods.

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Souhrn

Článek popisuje hodnocení, finanční vyjádření a ocenění rekreační funkce lesa modelové lokality oddělení 371 a jeho dílců A, B a C na území ŠLP ML Křtiny, poblíž rekreačních tras v okolí obce Bílovce nad Svitavou. Pro vyjádření hodnoty rekreační funkce řešené lokality byly použity metody Kvantifikace a hodnocení funkcí lesů (Vyskot, I. a kol., 2003) a Oceňování společenské sociálně-ekonomické významnosti základních mimoprodukčních funkcí lesa (Šišák a kol, 2002). Dosažené výsledky ukazují, že rozdíl v hodnotě rekreační funkce lesa stanovené uvedenými metodami je relativně velmi vysoký, cca. čtyřikrát vyšší v případě nasazení Vyskotovy metody. Jako hlavní důvod takto vysokého rozdílu byla v článku konstatována významná ideová i metodická rozdílnost obou metod.

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PREDICTION OF SEDIMENT QUANTITY IN SMALL WATER RESERVOIRS USING GEOGRAPHIC INFORMATION SYSTEMS

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Abstract
Small water reservoirs are essential elements of an agricultural landscape. From natural, hydrological and economic point of view they play many important functions. The important problem of small water reservoirs in water management is their siltation with sediments that reduces or determines the loss of some specific functions.
The suitable tool to predict sediment quantities and their control are geographic information systems (GIS). They can be used for calculating the soil loss through water erosion, and also for the prediction of the water reservoir silting.
The paper is focused on the determination of sediment quantity in the small water reservoir Klusov through geographic information systems in dependence on the various crop rotations.

Key words: sediment, silting, recreational uses.

Introduction

River reservoirs are affected by silting, phenomenon that reduces or determines the loss of some their specific functions. The rate and intensity of reservoir's silting is generally determined by many factors, such as the intensity and amplitude of sediments erosion and transport processes, the physical-geographical characteristics of the drainage basin, manner of land use, the conception of reservoir's design, exploitation regime, silting coefficient, abrasion phenomenon etc. (Batuca, 2000, Šlezingr, 2012).
Sediments may carry pollutants into water systems and cause significant water quality problems. Sediment yields are also associated with waterway damages. Sediment deposition in streams reduces channel capacity and result in flooding damages. The water storage capacity of reservoirs can be depleted by accumulated sediment deposition. Sediment yield is a critical factor in identifying non-point source pollution as well as in the design of the construction such as dams and reservoirs (Ouyang, 1997). Prediction of soil erosion in watersheds and sediment quantity in water reservoirs is important in controlling sediments for sustainable natural resources development and environmental protection.
Although today the calculation of erosion processes is carried out almost exclusively with the help of computer technology, still the simple empirical models modified for erosion calculating using geographic information systems (GIS) are in application. Raster GIS allows quick calculation in addition to the appropriate presentation of results. Geographic information systems are a typical product of today, which requires the use of knowledge from various disciplines in almost all areas of life science and research.

Description of the study area

The Tisovec stream catchment is located in Eastern Slovakia in Bardejov district and covers 6.0 km^2. Natural conditions of this area are very colorful. Morphologically, the whole territory is characterized with substitution longitudinal ridges of the Carpathian direction with longitudinal depression. The average annual air temperature is 8.3 °C and the average annual rainfall is about 670 mm, with maximum in summer months.
In the study area, the small water reservoir Klusov is situated in the narrowest part of the Tisovec stream and it is located in rugged terrain with slopes of different inclinations. It was built in 1986 and its principal purpose should be the accumulation of water for irrigation of surrounding agricultural land, but it is also used as a fishery and for high water retention and suburban recreation. The total capacity of reservoir is 72,188 m^3, length is about 494 m and its maximum depth near the dam is 9.57 m (col., 2005). Land in reservoir's vicinity is used for farming, but about 40 % of this catchment is covered with forests.
The rugged nature of the topography of this region, climatic conditions and prevailing moderate soils representation classified this region between regions quite sensitive in terms of the incidence of water erosion. Eroded soil particles in this catchment also greatly affect the amount of sediments in the Klusov reservoir.

In 2004, Slovak Water Management Enterprise realized the siltation measurements of this reservoir (col., 2005). Measurements were carried out through ten cross profiles in a length of 238 meters from the dam (km 0.000) to the inflow (km 0.238) and were realized from the boat using theodolite. The water depth was measured using calibrated rope. According to the measuring it was detected that reservoir siltation processes during 19 years (1986-2004) resulted in the reduction of its useful capacity about 33 %. From 2005 to 2007 reservoir was drained and sediments were dredged. Since 2007, there is no information about the sediment volume in this reservoir.

Prediction of sediment quantity in the Klusov reservoir

Generally, soil erosion is the first step in the reservoir sedimentation processes which consist of erosion, transportation and deposition of sediments. Therefore, to determine the amount of sediments deposited in the Klusov reservoir, it was necessary to calculate the average annual soil loss in the Tisovec stream catchment (G) combining with the sediment delivery ratio (SDR) and reservoir trapping efficiency (A).

To evaluate quantitatively the water erosion in the catchment implementation of the USLE empirical equation (Wischmeier, 1978) in a raster GIS environment was used. The database used for estimating the annual rate of surface erosion was consisting of the basic background map at scale 1:10,000; map of pedo-ecological units; the land use map and the rainfall erosivity index map in Slovakia. Individual GIS layers of USLE factors were obtained by converting of vector digital map data to raster, and all factors were multiplied together for calculating the final map of soil loss. In this study, ArcGIS software was used to create the relevant thematic layers for the application of the USLE. "Raster Calculator" tool of the "Spatial Analyst" extension was used to build the following expression (1):

$$G = R * [K] * [C] * [P] * [LS] \qquad (1)$$

which, when applied to all polygons in a raster coverage of the Tisovec catchment, produced a map of soil loss (G) in one year.

Because the USLE predict "edge-of-field" erosion and do not account for the interaction among adjacent field plots, catchment erosion estimates were adjusted downward by a sediment delivery ratio (SDR) (Williams, 1977). Finally, the sediment yield from the catchment was reduced by reservoir sediment trap efficiency according to Dendy (Copenland, 1995) and the quantification of sediment trapping in the Klusov reservoir was calculated.

Through GIS also the prediction of reservoir silting with eroded soil particles at different types of land management was displayed graphically.

Results and discussion

The average annual soil loss in the Tisovec stream catchment

In order to derive the final soil erosion map, all USLE factors were calculated as grid layers after processing the original data and then they were multiplied together (according to the USLE).

The data layer for rainfall-runoff erosivity factor (R) was generated from the country R factor data, determined for investigated area according to statistical values obtained from historical weather records derived by Malisek (Malisek, 1990). This value is a constant entered in the final equation, and a value R = 22.43 $MJ.ha^{-1}.cm.hr^{-1}$ was used for region of Bardejov. Source material needed to create a K factor layer was the map of pedo-ecological unit (BPEJ). These data were georeferenced and the polygons that represent vector data were drawn. Polygon attribute table was created by using third and fourth place of the relevant evaluated pedo-ecological unit code (BPEJ). Than vector data for K factor were converted to a raster dataset using function "Feature to raster". The LS factor was computed according to Mitasova methodology (Mitasova, 1996) using "Raster Calculator" from the menu to build an expression for estimating LS, based on flow accumulation and slope steepness using equation (2), where resolution (pixel size of raster data) is 5 m (Garcia Rodriguez, 2010):

$$LS = (m+1) \cdot (\text{FlowAccumulation} \cdot \text{resolution}/22.1)^{m} \cdot (\sin(\text{slope} \cdot 0.01745)/0.09)^{n} \qquad (2)$$

The C factor GIS layer was created along with its corresponding attribute table. A relational join was performed to append the values to the land use theme using Tab. 1. This C factor GIS layer was then converted to a grid. In the Tisovec catchment there are no effective erosion control measures and as a result the P factor was set at 1.0. The average annual soil loss in the Tisovec catchment in 2011 and 2012 is illustrated in Fig. 1 and 2 and calculated values are given in Tab. 2. Sediment delivery ratio for followed catchment is 0.879 and the Klusov reservoir

sediment trap efficiency was determined as 74.3 % (Junakova, 2012). The amount of sediments deposited in the reservoir in followed years is shown in the same table.

Tab. 1: Crop rotation on the agricultural land in the catchment

Plot/Year	2011	2012
1004/1	potatoes	winter wheat
2003/1	corn silage	spring barley
2001/1	winter wheat	winter oilseed rape
3101/1	spring barley	triticale

To illustrate the reservoir silting, digital terrain model of the reservoir was created on the basis of the contours and cross profiles from the dam crest to 238 meters. Using “Create TIN” function in 3D Analyst, the layer of water reservoir terrain model was produced (Fig. 3). Subsequently, a layer of sediments at a certain altitude was created. After the overlying of these layers together, ArcGIS software using function “Cut/Fill” generated a volume of sediments that are trapped in the reservoir at a given altitude.

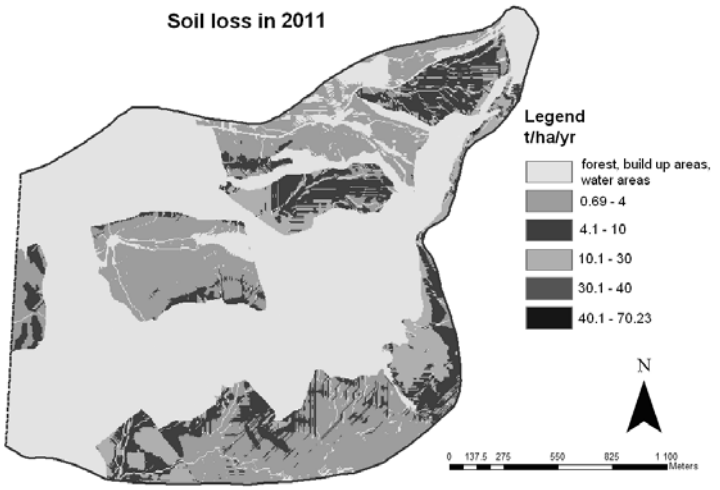

Fig. 1: Soil loss layer in the Tisovec catchment in 2011

Tab. 2 Land use on agricultural land in the catchment

Year	G [t/ha/yr]	SDR [-]	A [%]	Deposited sediments [t/yr; m^3/yr]
2011	1581.7	0.879	74.3	1033; 795
2012	1218.9			796; 612

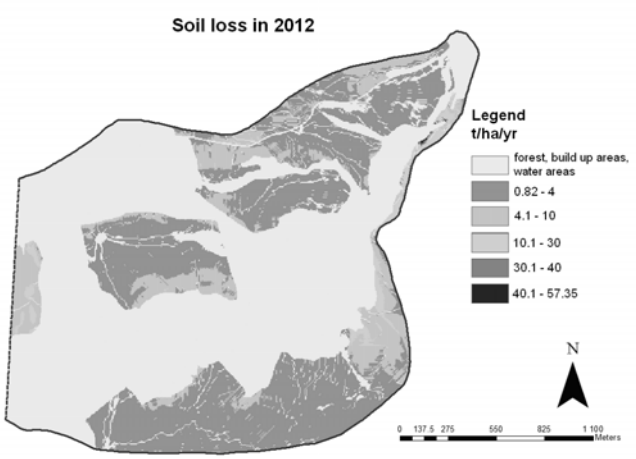

Fig. 2: Soil loss layer in the Tisovec catchment in 2012

Assuming that after reservoir desilting and refilling it again in 2007 reservoir siltation processes represents 750 m^3 per year depending on land use management in the catchment, there would be about 4,400 cubic meters of deposited sediment in 2013. Geographic information systems can be used for the prediction of siltation processes in reservoirs. For example, if the corn grown in the whole catchment on arable land (excluding permanent grass areas), sediment yield would represent a value of 1,740 m^3 per year. In such crop rotation, there would be deposited about 21,460 m^3 of sediments in the reservoir in 2028 (Fig. 4). When spring barley grown, sediment yield would be about 730 m^3 per year and in 2028 sediments trapped in the Klusov reservoir would represent about 11,540 cubic meters (Fig. 4).

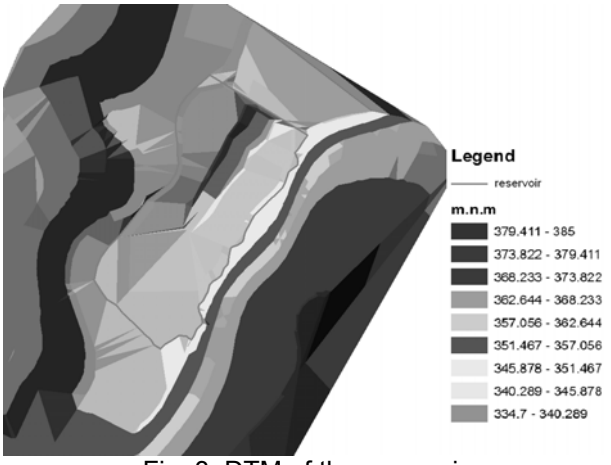

Fig. 3: DTM of the reservoir

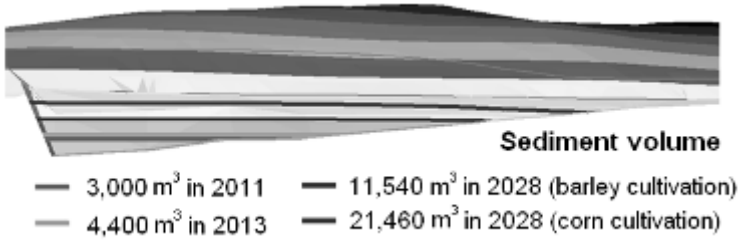

Fig. 4: Reservoir siltation process

Conclusion

Geographic information systems allow users to predict the effects that land use management in watersheds will have on the quantity of sediments deposited in water reservoirs. This contribution summarizes the modelling of sediment volume in the Klusov small water reservoir in dependence on the crop rotation applied in the catchment. Prediction of reservoir silting using

GIS shows that this reservoir should became silted to 30 % in 15 years when growing less suitable plants in the Tisovec stream catchment and to 16 % with growing plants with better erosion control effect.

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Souhrn

V současnosti došlo k rozvoji geoinformačních systémů, díky jejichž nástrojům jsme schopni předpovědět (modelovat) scénáře procesu zanášení nádrží.
Cílem tohoto článku bylo zhodnotit intenzitu erozních procesů vztažených k toku Tisovec (Slovensko) s využitím empirických vztahů USLE v rastrovém geografickém informačním systému životního prostředí s důrazem na předpověď zanášení malé vodní nádrži Klusov. Modelace ukazují jak je nádrž zanášena v závislosti na střídání plodin. Užitím různých druhů plodin v rámci osevních postupů dochází k poklesu eroze a zároveň snížení nánosů v nádrži.

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RESTORATION OF IMPORTANT LANDSCAPE ELEMENTS AND INFLUENCE ON THEIR ENVIRONS

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Abstract
The character of landscape has been seriously changed during several last decades due to the incidence of various effects. The paper describes transformation of the important landscape element and its restoration on practical example. This one deals with the cultural relic named Three Crosses which is situated on Kaplisko hill near the town of Nove Mesto na Morave. The hill had been successively covered by forest stand due to the failure of care of the dominant vicinity. There are several similar neighboring sacral objects which were visually connected with each other playing the role of important orientation points in the landscape. The paper discusses the design of measures aimed at forest stand reduction and locality accessing what leads to the relic revelation and the empowerment of its cultural and historical importance.

Key words: cultural relic, digital surface model, landscape, viewshed

Introduction
The study of the Three Crosses was worked out on demand of administration of Nove Mesto na Morave town as a submitter. The study is intended for purposes of upgrade of the development plan (Act no. 183/2006, Decree no 503/2006) of town inside the locality Kaplisko which is situated in southeast part of the cadastre.
The main objective is to access the locality for citizens and visitors for recreational activities with emphasis on cultural and historical value of the place. Forest stand reduction and locality revelation can cause that Three Crosses may be not only the dominant of the town again but also it can become the new registered important landscape element. According to the Act no. 114/1992 Coll., on Nature and landscape protection (Act no. 114/1992), the important landscape element is ecologically, geomorphologically or aesthetically valuable part of landscape which creates its typical appearance or upholds its stability.

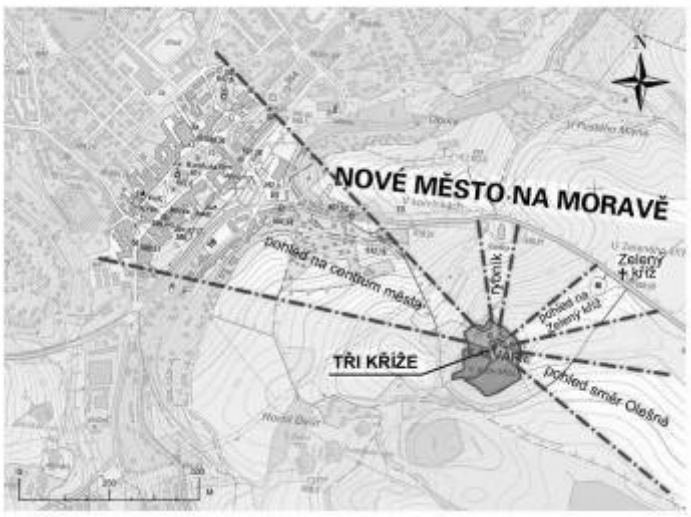

Fig. 1: Map of the Three Crosses locality – design of sights of the vicinity

The study observes the plan to change functional areas in valid development plan of the town. The forest will be changed into the other vegetation category in the northern part of locality with greater interventions (Šlezingr, 2010, Šlezingr, 2011). In the southern part of locality, the production forest will be changed into the forest of special purpose category with increased recreational function (Hanák, 2008).

Materials and methods
Three Crosses near the town of Nove Mesto na Morave represent the first significant point which could be seen when arriving to town from Olesna municipality. The relic is situated on the

top of the hill called Kaplisko with elevation of 674.9 m above sea level. Today the Three Crosses represent the immovable cultural relic with unique historical value. However the relic has been dissolving in adjacent forest stands in last decades. Thus the relic has been losing its importance due the mitigation of visual linkage with its neighborhood.
The crosses were built-up in 1680 as a gratitude to preservation from the pestilence. The crosses were reconstructed in 1832 and pilgrimages and worships have been executed there.
In 1928 the Alley of atonement was planted along the access path. Each tree symbolized the one citizen who died in the First World War.
The historical maps (II. + III. military survey, aerial photographing in 1953) show that Kaplisko had been maintained in the deforested estate due to the aesthetical function and different landscape management. Thus the Three Crosses, Alley of atonement and nearby Green cross had been representing visually connected sacral complex.

Fig. 2: Historical photo (1940) – Three Crosses on the hill called Kaplisko

The study workflow involved collecting of historical data and maps, documentation of current state, terrain survey and forest management analysis (Culek, 1996). The viewshed analysis was worked out in software AutoCAD Civil 3D, which is a comprehensive software suite for project preparation and management, and supports a wide range of civil engineering tasks. The application's program code is based on an object-oriented architecture. Thanks to this, dynamic relations exist between the individual project entities, which means, that related objects are properly updated after any modification (Autodesk, 2009). The data input was represented by hypsography of ZABAGED (Geographical Data Base of the Czech Republic). The final digital surface model (DSM) in the form of a TIN (triangular irregular network) was worked out containing the data from digital elevation model (DEM from ZABAGED) and data describing the forest stand height (forest management register). Finally the forestry measures were designed (Act no. 289/1995).

Results and discussion

The proposed solution represents the compromise between historical estate persisting up to 1950s (the vicinity of Three Crosses almost without forest stands) and today status when the cultural relic is fully hidden by adjacent forest stand.

Fig. 3: Three Crosses locality before the project realization (photo © Vladimír Kypet, 2013)

Stand reduction will be realized by degrees to ensure the stability of retained stands. Overall area of the forest stands on Kaplisko hill is 2.6 hectares however not all holdings are intended to ensure the forest functions. The falling will be accomplished on the area of 0.9 ha, situated in the less valuable parts of the forest. The extraction will progress contrary to the predominant wind direction. These ones are WNW and SSE. The underplanting of reinforcement and improvement tree species (Act no. 289/1995) will be realized to establish a stable stand envelope before the last falling phase.

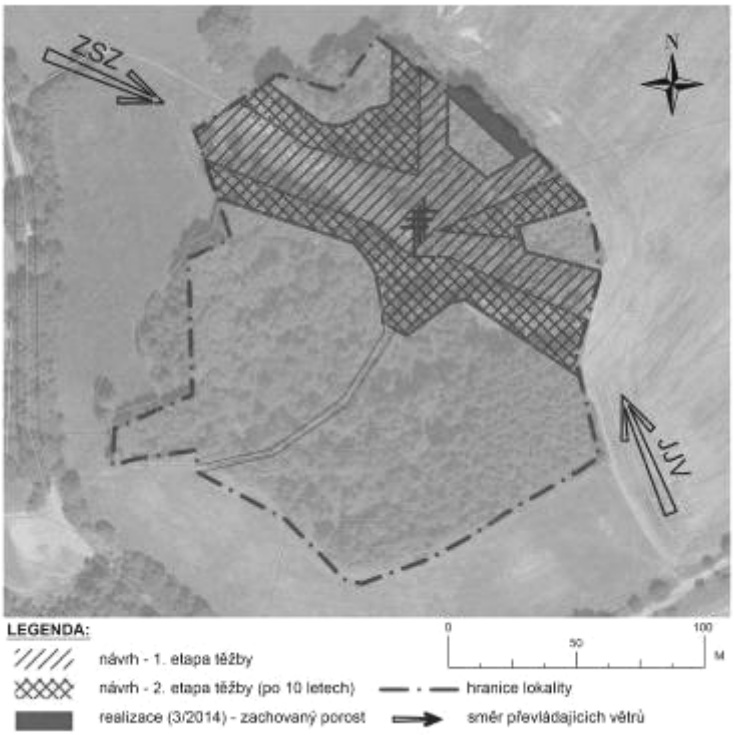

Fig. 4: Design of timber harvesting within the locality Three Crosses – phased

The south part of locality will be left without intervention. The forest aisles will be carried out in the northern parts corresponding to the important view axes. The main view axis will be represented by the southeast forest aisle from Nove Mesto na Morave across Three Crosses to Olesna municipality. Thus Three Crosses will be highlighted and become visible on the horizon without blending with adjacent forest stand. Further, several forest aisles are designed to reveal the crosses from the road connecting Olesna and Nove Mesto na Morave. The opening of sight from the road respects the historical heritage when the crosses on the hill without vegetation had been representing visual, cultural and aesthetic view point. The sight on Three Crosses is exposed from the forest near Olesna to the Green Cross and consequently this one is closed with two loopholes (the first one from the wetland and the second one from the Alley of atonement). The sight from the road beside Alley of atonement is opened due to the high setting of tree crowns. When get nearer to the parking lot the spectacle get closed and subsequently opens up just below the Three Crosses. The element of hiding and revealing grades the sights and inspires the curiosity of observer. In addition it does not restrict the existence of stand in the southern and southeast parts of forest.

The rural road from Green Cross (water-station object) respects the development plan and alley reconstruction which could be one-sided.

The sight on Three Crosses symbolizes from afar the town of Nove Mesto na Morave for the arrivals. Inhabitants consider Three Crosses as a reverent and penitence place (view from the town).

The change of categorization of remaining forest stands and adjustment of areas in the development plan is desirable due to the assumption of increase of attractiveness and recreational significance of locality. In the southern part of hill the entire stand will be held. These stands should be included in the forest of special purpose category, respectively as suburban forest with increased recreational function. In the northern part of hill there will remain

a few of smaller stands due to realized forest aisles. Deforested areas should be shifted into other vegetation category in the development plan.
After the forest aisles are realized, the stumps will be removed and coarse grading will be carried out on deforested places (outcrop remaining, benching of slopes, etc.). Consequently the clear extents will be grassed and planted by groups of shrub.
The project realization could be accomplished through three phases. The first one contains the forest aisles which ensure particular view axes. The falling is recommended to be divided into two steps by 5 years. Recommended species into the new stand envelopes: european silver fir (*Abies alba*), european beech (*Fagus sylvatica*), hazel (*Corylus avellana*), mezereon (*Daphne mezereum*), honeysuckle (*Lonicera nigra, Lonicera xylosteum*), european black elder (*Sambucus nigra*) and rowan (*Sorbus aucuparia subsp. aucuparia*). Stump removal, coarse grading, terrain modelling, grassing of deforested areas and shrub plantation will be provided within the frame of the second phase of realization. The final step contains the reparation of current tertiary roads and the design of new touristic trails around the hill Kaplisko with proper facilities for visitors (ČSN 73 6108, TP 170).

Realization of the project
Realization of the designed measures started during the finishing of the paper (March 2014). The timber harvesting was accomplished in order to revelation of the cultural relic Three Crosses and the development of the vistas on the town of Nove Mesto na Morave. However the realized measures do not agree with primary design thanks to their higher range and force. Timber harvesting of adjacent forest stands was divided into the several phases. The procedure was not respected and stand outskirts were not supplied by underplanting of improvement tree species. Total timber harvesting area is larger than designed. The stability of remaining stands becomes endangered within the meaning of wind action and other negative influences. Near future will show whether the damages will come to light. The realized intervention is an example of absolute disrespect of approbated measures which were designed.

Fig. 5: Three Crosses locality after the project realization (photo © Vladimír Kypet, 2014)

Conclusion
The landscape character and sensation of objects situated there should be changed by realization of sensitive and sophisticated measures in the landscape. Cultural relic Three Crosses is the important view point of the vicinity of Nove Mesto na Morave. The relic became hidden by adjacent forest stands due to the care disregard during the last several decades. The realization of several measures with the main objectives of forest stand reduction and locality access induced the relic revelation and reinforcement of its cultural and historical importance.

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Souhrn
Charakter okolní krajiny za posledních několik desítek let prošel působením různých vlivů řadou dramatických změn. Příspěvek popisuje na praktickém příkladu proměny významného krajinného prvku a jeho obnovu. Pojednává o kulturní památce Tři kříže, nacházející se na vrchu Kaplisko v blízkosti Nového Města na Moravě. Zanedbáním péče o okolí této dominanty došlo k postupnému pokrytí kopce lesním porostem. V okolí se nachází řada podobných sakrálních objektů, které byly mezi sebou vizuálně propojeny a byly významným orientačním prvkem v krajině. Článek pojednává o návrhu několika opatření, jejichž cílem je především redukce lesních porostů a zpřístupnění lokality, vedoucí ke zviditelnění památky a k posílení jejího kulturně historického významu. Redukcí lesních porostů a celkovým zprůhledněním lokality by se Tři kříže mohly stát opět dominantou města, ale i novým registrovaným významným krajinným prvkem (VKP). Dle zákona o ochraně přírody a krajiny č. 114/1992 Sb., § 3, odst. 1, písm. b tohoto zákona je VKP ekologicky, geomorfologicky nebo esteticky hodnotná část krajiny utvářející její typický vzhled nebo přispívající k udržení její stability. Navržená opatření jsou spojena také se změnou územního plánu města. V severní části území, kde dojde k redukci lesních porostů, se změní funkční plocha les na ostatní zeleň. Jižní část území, kde bude lesní porost zachován se zvýšenou rekreační funkcí, dojde ke změně ploch hospodářského lesa na les zvláštního určení.
Lokalita „Tři kříže“ se nachází v okrese Žďár nad Sázavou, asi 1 km jihovýchodně od Nového Města na Moravě. Jedná se o v současnosti zcela zalesněný vrchol s nadmořskou výškou 674,9 m. Rozloha lesních porostů činí asi 2,6 ha. Na vrcholu tohoto kopce se nachází kulturní památka „Tři kříže“. Vzhledem ke své poloze v blízkosti Nového Města na Moravě je lokalita hojně navštěvovaná jak místními obyvateli, tak i turisty jako místo vhodné k procházkám, odpočinku a relaxaci. Atraktivitu této lokality by měla výrazně zvýšit navrhovaná opatření.
Tři kříže u Nového města na Moravě jsou první signifikantní bod, který vidí člověk přijíždějící do města. Tři kříže v posledních desetiletích postupně zanikají v lesním porostu a ztrácejí na významu právě v důsledku snížení jejich vizuálních vazeb s okolím. Původně byly postaveny v roce 1680 tři dřevěné kříže a v roce 1832 byly obnoveny dřevěnými kříži na kamenných podstavcích. Kříže byly postaveny z vděčnosti za záchranu před morovou epidemií, na kterou nezemřel ani jeden obyvatel Nového města na Moravě. V této době se na místo Tří křížů konaly poutě a konaly se zde také polní mše. Kamenné podstavce se zde z této doby zachovaly. V roce 1928 byla ke Třem křížům vysázena Alej smíření, kde za každého mrtvého obyvatele z 1. světové války byl vysazen jeden strom. Z historických mapových podkladů je patrné, že oblast Tří křížů byla považována za významný sakrální komplex ve volné krajině. Odlesněná forma kopce i jejího okolí přetrvávala až do poloviny minulého století. Důvodem bezlesí byly estetické i hospodářské funkce krajiny.
Navrhované řešení představuje kompromis mezi historickým stavem a stavem současným, kdy je kulturní památka zcela zakrytá okolním lesním porostem. Redukce porostů by měla být realizována postupně, aby byla zachována stabilita ponechaných porostů. Těžba by měla probíhat proti směru převládajících větrů a měla by být provázena podsadbou zpevňujících dřevin, aby se vytvořil stabilní porostní plášť. Redukcí lesních porostů budou vytvořeny průseky ve směru významných pohledových os. Hlavní pohledovou osou bude průsek vedený jihovýchodním směrem od Nového Města na Moravě přes vrchol lokality Tři kříže směrem na obec Olešná. Vytvořením tohoto průseku se památné kamenné kříže zvýrazní a budou viditelné na horizontu, aniž by splývaly s kulisou okolního porostu.

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REVITALIZATION OF STREAMS IN COOPERATION WITH THE LANDSCAPE RECREOLOGY

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Abstract
The present article on the catchment area of a concrete revitalized flow, points to the lack of consideration of the suburban recreation in the revitalization of the project flow. Buchlovice brook is a stream whose watershed is within the "land use", as forest land, buildings and agricultural landscape. Cadastre of the municipality in whose territory the river basin is located, offers many tourist attractions-Buchlov Castle, BuchloviceChateauandpark. The stream is a part of the Chateau´s Park. Unfortunately, outside of this area is flow rather neglected landscape element. The stream in extravilan was in 1998-99 revitalized. The revitalization of the falls in the first generation and consists of inserting the revitalization's elements – reefs, bed drops, spurs, etc. The article points to the possible integration of the various elements of the revitalization with recreation. It offers specific solutions for the design of recreational elements with a connection just to stream, which is not only an important element of the landscape, but also a part of the suburban recreation.

Key words: stream revitalization, river basin, land use, recreation, extravilan

Introduction

Landscape as we know it today, is not the result of centuries or thousands of years of transformation. It developed much more. Without exaggeration to say that millions years. But when the powers of man began to significantly change its appearance. Just one it has changed beyond recognition in both the negative and positive sense. Those who managed always to appreciate the beauty of the landscape were artists, often conquerors and last in it were adventurers who are eager for new knowledge and new places.

Water as an integral part of the landscape and the conditions of life on the planet, for such travelers was a huge help. Explorers first served as a simple intermediary services as a source of livelihood and subsequently sung and appreciated as an aesthetic element. Even today it is often displayed on a series of photographs, postcards, paintings, posters. Some places are known only through natural dominant consisting primarily of aquatic ecosystems.

Within the article we are interested in water occurring in the wild water rivers, small rivers and streams. Water flow is the backbone of ecological stability and often dominate, valuable aesthetic element in an otherwise unsightly and sometimes purely agricultural land use.

When designing and implementing revitalization streams must be noted that the flow is constantly evolving and that it cannot be considered without links, but it is always an integral part of the area into which fits and which is linked to a number of natural constraints. Given that we live in a cultural landscape, it is no longer possible to return to a purely natural conditions, the flow already being used as a purely environmental, but also social, aesthetic, the landscape and recreational. Therefore, the project of revitalization of flow is always the result of numerous compromises all stakeholders. The recovery of river systems to remove or alter the negative effects of past wrong "regulation" modification of water flows in open country and restore the ecological functions, while keeping the flow of objective functions for which it was adapted.

In this article, we focus on a specific stream that was regulated in the past and subsequently revitalized. It will be evaluated, its link with the landscape and as such will be highlighted possible shortcomings that come with a given revitalization brought about even in terms of recreational use. The following are suggestions and concrete solutions for design recreational elements with links to the country itself and flow. The area is one of the interesting and nice places culturally valuable and correct adjustment of designed landscape can be enhanced landscape features - including aesthetic with recreational use.

Material and methods

As part of the survey conducted (2006 - 2014) on Buchlovice stream was studied channel, each object with a detailed focus and taken photographs. Given that in carrying out revitalization was not altered route trough is in the "original" modified axis, it was not necessary to perform precise geodetic survey of the entire section of the revitalized river bed. Measurements were made using a specific band slats. It was observed mainly width of channel, height of the water column,

the depth of the object, before and under the building, the width of the spillway at the edge of the steps and thresholds. Individual objects and partial channel were made photograph. Were evaluated and vegetation in the vicinity of the flow, particularly with regard to the possible aesthetic, landscape - ecological and recreational functions.

Buchlovice stream flows through the cadastral Buchlovice, district UherskéHradiště. The village Buchlovice located 8 km west of the UherskéHradiště on the eastern edge of the mountains of Chriby (see Fig. 1).

Fig. 1: Lokalization of Buchlovický brook

Basin is steep, especially in the upper part of which is forested. Middle and lower part of the catchment is used as agricultural land. Elevation of the entire area ranges from 215 to 350 meters above sea level. Forest cover is 35 %.

Stream was at the bottom of a shallow originally created numerous meanders. The site was up to 20 m wide shallowness causing repeated several times a year overflowing and wetting surrounding land. In the middle and upper section belarge river gradient, channel didn´t meander. There was a variable riparian vegetation with many species of trees, bushes and plants. The bed was uneven and create a variety of organisms living conditions for aquatic.

In 1968 the flow of completed river regulation, which resolved the lower part with a length 1,9 kilometers channel was straightened. The trough was recessed to 1,5 m, the bed was created from 1,0 to 1,5 meters wide and stabilization of beaching. The slopes of the banks were adjusted to slope of 1: 1,5 and heel captured by a double fence terephthalate, which is already destroyed the entire length.

This adjustment was established channel with prismatic shape where there is diversity of stream,alternating with stretches of quiet sections with rapid torrent flow. Water flowed as fast on the same level solved the whole section and not allow the development of organisms living in the bed of a flooded its banks.

When the flow boundaries of the village Buchlovice stream recently suffered the junction of sewage, which in summer at minimum flow rates produce a flow of smelly sewer.

Riparian vegetation consisted primarily of plantation poplar, which are not indigenous trees and fruit trees. The herbaceous vegetation was dominated by *Urtica dioica* and *Phragmites communis*, *Sambucus nigra*, The other tree and bush green was represented by *Salix alba*, *Salix caprea* and rarely *Euonymus europea*. Species diversity was very low, the vegetation was monotonous, species occurred in almost monocultures.

Revitalization was carried out in the period 1998 - 1999 and addressed the stretch of river from the point of inflow into long river after crossing the state road Uherské Hradiště - Brno.

The revitalization was divided into two stages: self adjusting flow and landscaping.

When you customize the flow were to increase the diversity of the aquatic environment using low (0.3 to 0.4 m) sills and bed drops of wood and stone, so that side pools interspersed with sections of torrent character. The grade line was determined by the current stabilization of bed by beaching or stone block paving. After the disintegration of the wooden fence, the banks were washing out in some sections. Non-stabilized bed heel, high bed slope and the high speed of the flowing water were still demaged. To reduce the erosive action of water, it was decided not stabilize bed heel again, but already mentioned sills and the bed drops to alleviate water velocity.

In total, in the revitalized section were built six stone bed drops, eight woody bed drops, five woody sills and were inserted eight parts with lonely stones. Further adjustment was made boulder chute before the junction of the flow and modification of the paved section of the state highway bridge Uherské Hradiště - Brno.

Overview of measures on the flow:
The stone bed drops were made of stone backfill. The sill crossing the stream was created from large stones (approx. 0.70 m) to withstand higher flows. In the case of smaller stones were shed with concrete. In the part of stilling basin, there were stabilized just banks, the bed was left of the original macadam.
In locations where the stones were used, there were inserted groups of stones of size 0.35 to 0.45 m into heel of slope. Between the groups of stones and opposite side of slope were left gap 0.4 m.
For the construction of wooden objects were used wooden logs with a diameter of 0.15 to 0.20 m. The bed drops were built with smaller stilling basin stabilized by stone block paving.
Existing boulder chute constitute a barrier to the movement of aquatic organisms, especially fishes. Because of its considerable length was an insurmountable obstacle. Thus was created a series of smaller pools of length 4 m and a depth of water 0.30 m, 0.40 m tall recessed sills for the construction of the weir. The sills were made of concrete B 20, face of stone.
In section under the bridge, there were inserted into heel of slope groups of stones with minimum size 0.3 m during the adjusting the paved section. Distance between the groups was chosen 4m. This spurs were supplemented by two stone sills, well made but over the entire width of the stream. Spurs and sills were secured against displacement by steel stakes, driven into the joints between the original paving or shed with concrete.
The revitalized part of the stream flows through intensively cultivated agricultural landscape. The species composition of riparian vegetation here did not correspond to specific groups biocen types and it has been suggested their addition and their modification by thinning. Planting trees and bushes were carried out in the clip bushes 1.5 x 1.5 m and trees 2,5 x 2,5 m

Total planted 104 trees:

Acer campestre	12 pcs	
Fraxinus excelsior		13 pcs
Alnus glutinosa	39 pcs	
Quercus robur	18 pcs	
Salix alba		13 pcs
Acer pseudoplatanus	9 pcs	

and 104 bushes:

Ligustrum vulgare		35 pcs
Swida sanguinea		26 pcs
Viburnum opulus		26 pcs
Rhamnus cathartica	17 pcs	

Fig. 2: Buchlovický brook, chute roughened by bed drops and stones (Marková 2007)

The fool-grown seedlings of trees and bushes were planted and protected against browsing animals. Reed and other herbs were before starting the technical work moved out.
The entire route channel from the 0,000 km to 1,400 km, is recessed, the bed of flow is about 1.5 to 2.5 m below the surrounding terrain. Width at the bed varies from 1 m to 3 m. Along the route we can see efforts to erode the right bank of the stream, which is most evident in the heel of slope. Here are a few places stripped the original stabilization heels by fences of laths.
The channel retains the simple trapezoid shape, slope is not uniform, the bed is mostly perpendicular towards the edge of the riparian the slope relieves.

Results
Detailed description of the current state of the channel:
km from 0.026 to 0.074 - adjusted boulder chute. Originally had this chute surface of the stone block pavement, in the revitalization of its surface was roughened by protruding stones. Currently there is a cascade of low bed drops. The channel between bed drops is roughened projecting stones (see Fig. 2).

In all described channel is 7 stone bed drops, 4 wooden bed drops with 1 which is in poor condition. 3 stone sills, 11 wooden sills and 3 sections with inserted stones in the bed. Two agricultural crossings are designed like bridges made of concrete panels.
In the 1.309 km to the flow outlet structure mouthed DN 300 waste water treatment plant (WWTP). Previously, it was evident at the site outfall pollution flow, accompanied grey-brown turbidity and increase algae. Now the water flowing from the WWTP is clear and even flow is not apparent contamination.
In the section of river km 1.393 to 1.479, there is channel stabilized by stone block paving with inserted stone spurs.
In 2008 in the reference section of the Buchlovický brook, there was stabilized heel of right slope by stone backfill. The stabilization was carried out in about 0.1 km - 0.2 km; 0.25 km - 0.35 km; 0.48 km - 0.6 km; 0.9 km - 1.25 km. This intervention has stabilized the right foot, where the apparent erosion processes and underwashing out the banks.
The channel is planted with poplars and fruit trees. Tree planting was carried out in the riparian line, it is a revitalization of the first generation. From the bushes, there are planed *Sambucus nigra, Euonymus europea*. The herbaceous vegetation is represented by *Urtica dioica* and Reed – *Phragmites comunis*. Next, are presented *Carex*, *Typha*, *Juncus*. Current vegetation is in very poor condition, there is overgrown banks and even self-seeding trees and bushes. The channel is substantially isolated from the surrounding countryside and becomes inaccessible to the human eye, and deer.

Fig. 4: View on Buchlov castle (Gernešová 2014)

Recently, there is an increase recreational activities, particularly in urban areas. Surroundings Buchlovice village is frequently visited areas through attractive landmarks, like the castle in the center and nearby Buchlov castle. Especially during the tourist season, there is a significant temporary increase of tourists. These are mainly short trips, where after visiting the castle tourists visit the village center with shops and restaurants and then they are leaving.
People permanently living in the village so often looking for a quieter and less visited places for their own short-term recreation. Such a place can be just around the watercourse. Even when the terrain recognition was made, there was observed occurrence of local citizens, mostly cyclists and mothers with children. Appropriate adjustments riparian vegetation, their thinning, creating looking holes into the river channel to allow access to the flow of the game and also gave passers-by view on the water. Location of benches to rest in places selected cross objects in the channel then also complement the experience of auditory perception bubbling water (see Fig. 3). These proposals relate to the left bank, which is flanked by paved roads marked as a bicycle path. Also on the other side of the road where there are agricultural lands would be appropriate to delay their border zones embedded grass, supplemented with suitable bushes and fruit trees. In this strip then could be placed benches for rest.

Fig. 3: Cross object in bed of channel (Gernešová 2014)

The right bank of the channel is intensively farmed to the bank- edge, it would be a good idea to set aside a wide strip at least 5 to 10 m. In this strip could also be implemented group

plantings accompanying vegetation. The created strip of green (grass, shrubs and trees) is also a kind of buffer zone to arable land, protect the riverbed before the runoff from the surrounding fields.
When we designing measures to attract revitalized flow and his surroundings there should be taken into account in the wider environment. Countryside views from the aforementioned bike paths are significant potential of this area. It is good to choose the place of rest and situating views not only with regard to the course, but also on the wider landscape and especially the views of the Buchlov castle (see Fig. 4).

Discussion
When designing any intervention in the landscape, it should be borne in mind that the carrying out of construction work does not stop there. It is necessary to integrate the building into the surrounding environment, and not wait until it makes its own nature.
For structures or partial adjustments is important account them into the surrounding landscape, using companion vegetation and building materials typical for the locality, to the newly created elements do not cause distraction. If we focus purely on landscaping, we must realize that a given treatment has been designed to perform a specific function (main function), but it carries a number of ancillary functions.
In our case, the flow on the left bank lined bike path that creates one side of the main functions of flow - recreation. The main feature is of course the flow of drainage from the site with dimensions non-destroying divert flood flows around Q5 = 6.0 m^3/s. But the secondary function must not be forget, for the reason that there is more secondary functions and all, including the main, follow each other and are interconnected.
Buchlovice stream is a specific example. In the context of its channel adjustment was made, which offers many visually interesting places (not only the channel but also the surrounding countryside), but passers-by and cyclists remain hidden behind the wall uncontrollably growing vegetation. The situation could be addressed much more convenient way, even without intervention in the riverbed itself. In the first place it would be necessary to open up the channel - do pruning, which would eliminate the inappropriate, ill and old trees, or planting of new suitable trees and bushes.
The other (left) side of the cycle path is lined with poor agricultural lands that slope down to the road and does not visually interesting places. Of the current map, but also the terrain recognition was recorded places with high level of underground water on land adjacent to the road. From the map of the fifties of the last century (before collectivization), it is clear that these parts were grassed. It would be good to return to this state. Creating grass strips causing to prevent wash-out in the flow and the subsequent clogging. The actual strip of grass could be planted with trees in groups or by creating avenues that would partially eclipsed the road itself. Furthermore, compromising the view of the purely agricultural landscape and creating visually diverse range.
Of course, if we open countryside greater number of tourists, we have to reckon with possible negative implications, such as vandalism, collision with animals and, last but not least, increase the possibility of the occurrence of garbage.

Conclusion
Monitored part of river was revitalized as part of the revitalization of first generation measures. Revitalization consisted of inserting cross objects into the bed of channel, editing boulder chute and embedded stones in the river bed. As part of the revitalization measures were proposed addition and modification of riparian vegetation. The revitalization took place in 1998, since the stands are left without much maintenance. Revitalized channel is currently hidden in the vegetation and the adjacent road is almost indistinct. Edit flow around a paved road - cycling could contribute to the attractiveness of locations for suburban recreation. The road is currently used by local walks and hikes (see Fig. 5). Casual treatment, especially thinning of existing vegetation in the immediate vicinity of the stream, adding strip of grace with trees and bushes on the opposite side of the road with a suitably circumstanced benches would contribute to increasing the attractiveness of the area and increase its recreational potential. On the right bank would be appropriate to establish strip with grasses and associated vegetation so as to avoid tillage and plowing to the edge of bank. Improvement cuttings should be accomplished with respect to the sightseeing on water table and ensuring the view into open landscape, e.g. on the dominant Buchlov castle.

Fig. 5: Using the bicycle path by local citizens (Marková, Gernešová, 2014)

Souhrn

Sledovaný úsek toku byl revitalizován a to v rámci revitalizačních opatření první generace. Revitalizace spočívala ve vložení příčných objektů do koryta, úpravy kamenného skluzu a vloženi kamenů do koryta. V rámci revitalizačních opatření bylo navrženo doplnění a úprava břehových porostů. Revitalizace proběhla v roce 1998, od té doby jsou porosty ponechány bez větší údržby. Revitalizované koryto je tak v současnosti skryté v porostu a z přiléhající komunikace je téměř nezřetelné. Úpravy v okolí toku a zpevněné komunikace – cyklostezky by mohly přispět k zatraktivnění lokality pro příměstskou rekreaci. Komunikace je v současnosti využívána místními k procházkám a výletům. Nenáročné úpravy, hlavně probírky ve stávajících porostech v bezprostřední blízkosti toku. Doplnění ozeleněného pásu na protilehlé straně komunikace s vhodně situovanými lavičkami by přispěly k zvýšení atraktivity území a zvýšení jeho rekreačního potenciálu. Na pravém břehu by pak bylo vhodné vysadit pás s travinami a doprovodnými porosty tak aby nedocházelo k obdělávání a orbě až na břehovou hranu. Probírky by měli být prováděny tak aby jednak umožnily pohled na hladinu toku a aby zajistily i výhled do širší krajiny, např. na dominantní hrad Buchlov.

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ROPE CENTRES AND ROPE PARKS

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Abstract
One possibility of recreation is overcoming obstacles in rope centers or parks.
Vacationers are looking for rope activities in their free time for a rest and entertainment. There are a variety of rope obstacles. We can sort them into different categories. The difference between the rope center and rope park consists in placing rope obstacles. Obstacles in rope centers are built on poles or other structures. Rope parks are located in a natural environment where the trees are used. The composition of obstacles in the rope park is then largely influenced by placement of the trees. Design and operation of the resorts must be safe but anchoring barriers and exploiting the natural environment shouldn't disrupt nature.

Key words: wooden structures, rope obstacles, cableway, safety

Introduction

Sports center with lots of rope obstacles in the countryside in the Czech Republic can be divided into two types according to the type of support systems - rope centers and rope parks. Rope centers have a rope obstacles attached on the wooden structures which are built for this purpose. They are fixed to the ground (Fig. 1). You can find these centers mainly in the city parks. The designer is not limited by surround distribution. From an aesthetic point of view rope centers may not be as attractive as a rope park in a natural environment. In rare cases, the support poles are placed between grown greenery. Rope obstacles in rope parks are tied to living trees (Fig. 2). They are situated in the forest or forest park. Rope barriers on the trees have a positive effect on the participant's perception of nature and develop its relationship to the environment. Types of obstacles in the rope park are largely influenced by the placement of trees.
Rope centers and rope parks are used for outdoor recreation, free time activities of children, to practice skills and for relax.
Security forces and sports clubs used rope activities such as training resources. Together with experts on psychological issues rope activities can be also used in therapeutic areas. Exercise serves as a means of treatment and remedies. Exercise is used to treat and remedy (Neuman, 1999).
In contrast to children playgrounds, ropes centers and parks have limited access and it is necessary to have supervision by an experienced instructor. He must guarantee that nobody exceed the maximum value of his subjective danger and did not get into the zone of negative stress, where run the risk of psychological harm.

Fig. 1: Rope centers

Materials and methods

For the rope obstacles are used mostly wood pieces that fit best into the natural environment. For load-bearing support systems (columns) is primarily used debarked pine logs with a diameter of 40-60cm and a length of 5-14meters, which are installed without drying.

These poles are in different places drilled through and fitted through by threaded rod which are used to attach ropes, anchoring ropes etc. Some wooden elements of the rope center are stored horizontally. In this case except of logs are used prisms size of the cross section 60 x 60mm up to size 160 x 160mm. Ultraviolet radiation, heat, rain, snow, frost and changes in humidity effect on wood with varying intensity, not only during the year but also during each day. Inevitably in the wood occurs to the shape and volume changes as a result of working wood. Wood may be at increased humidity exposed to biological agents - fungi and insect infestation. Therefore, it is necessary to design the wooden parts so that precipitation could flow freely and to avoid water retention. Wood elements are anchored to the ground in different ways, most commonly by steel anchors.

The use of metal shoes makes possible that at the member facing where there is the highest danger of the water penetration along the fibre, water does not accumulate and water, which penetrates into wood, can subsequently dry up (Havířová, 2005).

The durability can be substantially increased by suitable surface treatment. It refers particularly to special means, such as water-repellent solutions (for wood, which is permanently in contact with moisture), fungicides (from fungi) and algaecides (from the creation of algae). For wooden members intended for the external environment, pressure impregnation is recommended when substances protecting wood are forced in wood: from moisture, rot, fungi and wood-destroying insect.

Fig. 2: Rope parks

Results

If we consider a suitable coating it is necessary to evaluate and assess advantages and disadvantages of particular substances. For the forest environment, it is necessary to use ecological, environmentally-friendly means.

Development in this area continues and particular companies offer steadily new and more ecological means. Thus, we prefer products based on waxes, oils and solutions of resins. According to Reinprecht (2009), coatings with water-repellent effects prevent from the penetration of precipitation water into the construction, slow the transport of atmospheric moisture into wood and prevent from entering the germs of biological pests into wood. They should be sufficiently steam-permeable in order condensed and other water could not accumulate under them.

Trees used in rope parks must be reviewed by an expert (arboricultural expert), which provides mechanical and physiological condition of the trees that are used as supporting elements. The first assessment must be done before putting rope park in operation. It is recommended to perform that before the designated trees are cut off and fitted with equipment. It is also necessary to perform assessment annually to assess all changes of forest and supporting trees. The systems which are used to attach platforms, security management and other features must be designed to minimize damage on the trees. (ČSN EN 15567-1)

Direction of climbing on a rope obstacle can be vertical or horizontal. Vertical obstacles are often used as an access road to the horizontal high obstacles. Horizontal obstacles exist in rope parks and centers frequently, climbers are moving at a given height from one side to the other.

In addition to the basic obstacles in rope centers are also special obstacles (jumps, lifts, towers). Jumps and lifts are the most attractive part of the program, they are often the main reason to visit. Obstacles are divided into high and low. At low barriers Hanuš, Hrkal recommended height from 30cm to 150cm (Hanuš, Hrkal 1999), Svatoš, Lebeda says the height of 60-90cm (Svatoš, Lebeda 2005). High obstacles are being established at a height of 1.5meters and higher, the most common height is 5-12m above the ground. On these obstacles, it is necessary to use climbing equipment and a backup system to ensure maximum safety of climbers.

Discussion

Suitable positioning of these structures can guide human activity. Most vacationers is moving mainly in offered locations. It has its distinct advantages. They are defined some locations as tourist attractive, although they incur and exposed places, but it also creates much needed relaxation zone. Buildings must be sensitively integrated into the area.

Conclusion

Rope parks have to increase the attractiveness and recreational use of the natural environment, mainly forest. Rope barriers are popular among children and youth, but they are attractive also for adults. In contrast to other extreme sports (rock climbing, mountain bikes, motorcycles, horseback riding), resort and its surrounding are not environmentally burdened. There is no soil disturbance and thanks to this not soil erosion.

Before operation of the rope center, the equipment must be certified. It must be done visual inspection, functionality check and the bearing capacity of the structure. The rope parks where the elements are placed on trees, the certificate must be drawn on an assessment of trees carried out by the arboricultural expert. Before opening must be done normal visual inspection. Once a month up to three months must be performed the operational check when it is necessary to check the sharp edges, missing parts, excessive wear, the integrity of the safety system design, modification of terrain, purity, etc. Once a year, inspection authority with knowledge of the cableway, trees and forests must inspect the rope park. (ČSN EN 15567-1)

Rope parks must be designed not only as a safe design, but also the natural environment should not be damaged by the operation. It is possible to anchor the elements of the rope park to the living trees. Their condition must be firstly assessed by a specialist (arboricultural expert). Fixing elements, platforms and approaches must be made to avoid damage. In addition to the visual assessment it is necessary to obtain the required properties of the tree to use gentle methods, see ČSN EN 15567-1.

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Souhrn

Lanové parky mají zvýšit atraktivitu a rekreační využívání přírodního prostředí, převážně lesa. Lanové překážky jsou oblíbené, jak u dětí a mládeže, ale jsou přitažlivé i pro dospělé. Na rozdíl od jiných adrenalinových sportů (lezení po skalách, horská kola, motorky, jízda na koních), není při provozu areál a jeho okolí ekologicky zatěžován. Nedochází k narušení půdy a díky tomu ani k půdní erozi.

Pro lanové překážky se používají nejčastěji dřevěné prvky, které do přírodního prostředí nejlépe zapadají. Ultrafialové záření, teplo, déšť, sníh, mráz a změny vlhkosti působí na dřevo s rozdílnou intenzitou nejen v průběhu roku, ale i během každého dne. Je třeba navrhovat dřevěné části tak, aby srážky mohly volně odtékat a nedocházelo k zadržování vody, aby bylo

dřevo jen minimálně vystaveno zvýšené vlhkosti a tím i působení biologických činitelů - napadení houbami a napadení hmyzem.
Před zahájením provozu LC musí být zařízení certifikováno. Musí být provedena vizuální kontrola, kontrola funkčnosti, ověření nosnosti konstrukce. V případě lanových parků, kdy jsou jednotlivé prvky umístěny na stromech, musí být vypracován certifikát o posouzení stromů, kterou provádí arborista.
Před každým otevřením musí být provedena běžná vizuální kontrola. Jednou za měsíc až za 3 měsíce se provádí provozní kontrola. Je třeba kontrolovat ostré hrany, chybějící části, nadměrné opotřebení, neporušenost konstrukce bezpečnostního systému, úprava terénu, čistota apod. Jedenkrát za rok musí provádět kontrolu inspekční orgán se znalostmi o lanových drahách, stromech a lesích.
Lanové parky musí být navrhovány nejen jako bezpečné konstrukce, ale nesmí být jejich provozem poškozováno přírodní prostředí. Je možné jednotlivé prvky lanových parků kotvit k živým stromům. Jejich stav však musí být předem posouzen specialistou (arboristou). Upevnění prvků, plošin a přístupů musí být provedeno tak, aby nedocházelo k jejich poškození. Kromě vizuálního posouzení je třeba pro získání potřebných vlastností stromu využít šetrné, nejlépe nedestruktivní metody.

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SOME ECONOMIC VIEWS OF NATURE CONSERVATION AND ENVIRONMENT PROTECTION IN THE CZECH REPUBLIC

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Abstract
Various economic theories and authors addressed the combination of economics and the environment as well. The paper deals with the economic and social issues of environment protection, whose integral part is also the protection of forests and forest ecosystems. Using the ideas of the world's leading economists, it tries to shape a theoretical basis for the solution of current problems arising from a combination of economics with ecology, nature conservation and forest functions. Nature conservation in the Czech Republic is currently implemented primarily by establishing large-scale strictly protected areas. In this paper, we present some economic and social aspects related to the management of these areas. The paper is part of the work on research project of the Faculty of Forestry and Wood Technology.

Key words: environmental economics, economic theory, environment, forest ecosystems, sustainable development

Introduction

Governments and the public have started dealing more intensively with environmental issues and namely with environment protection since the 1960s. In 1972, the United Nation (UN) Conference on the Environment held in Stockholm became a milestone in the development of environment protection. The concept of sustainable development attempts at a functioning relation between environment protection and economic development. The definition of sustainable development was formulated in a so-called Brundland Report in 1987 (UN, 1987). The concept of sustainable development was generally adopted on the UN Conference on Environment and Development held in Rio de Janeiro in 1992. Following the Rio conference, the environment protection focused particularly on the integration of environmental requirements into all other activities possibly affecting the environment and global problems. The so far latest world summit on sustainable development Rio +20 was held in Rio de Janeiro in June 2012 with two themes in the limelight: green economy in the context of sustainable development and elimination of poverty together with the formation of a new institutional framework for sustainable development.

Act no. 17/1992 Coll. on the environment stipulates that constituents of the environment are atmosphere, water, rocks, soil, organisms, ecosystems (including forests) and energies. Act no. 289/1995 Coll. on forests (Forest Law) defines the forest (forest ecosystem) as a constituent of the environment. Protection of forest ecosystems can be considered as one of determining prehistoric attributes for coming into existence of forestry and development of forest legislation. Forest protection emerged as an independent forest scientific discipline at the beginning of the 19th century. Environmental science (the term "ecology" was first used by Ernst Haeckel as late as in 1866) emerged based on the knowledge and findings of other life sciences.

The connection of economy and ecology has been subject for various economic trends and authors. The paper deals with economic and philosophical issues of nature conservation and environment protection and using ideas of prominent world economists, it attempts at a formulation of theoretical foundations for the solution of topical problems following out from the connection of economics with nature conservation and environment protection. Since nature conservation in the Czech Republic is currently implemented by means of strictly protected areas of diverse size, the paper includes also the environmental, economic and social aspects of their management.

Materials and methods

The ever-increasing environment pollution in the 20th century was the main reason why economic aspects of the environment have been increasingly appearing in the centre of attention. In the middle of the 20th century, a freestanding discipline of environmental economics singled out. Key postulates of environmental economics dwell on publications of the authors of the so-called mainstream economics (e.g. Samuelson and Mr. and Mrs. Musgrave). There are two major trends that can be distinguished in the historical development of environmental economics – environmental economics and ecological economics. Beginnings of environmental

economics are connected with the endeavour to valuate costs and contributions of environmental policy, with the effort to evaluate individual projects and to compare individual types of tools applicable in environment protection. Environmental economics has drawn also from other economic streams. From representatives of the physiocratic school (e.g. Quesnay) it has taken over the theory of economic cycle. From classic economics, it was the theory of economic growth by Thomas Malthus and the theory of land rent by David Ricardo. Relations of economic growth and exploitation of natural resources started to appear in the literature somewhat later (Dasgupta and Heal, 1979; Mäler, 1974).
Relations between environment pollution and emergence of externalities were first characterized by Pigou (1920). His work was expanded in the 1960s by other authors, e.g. Coase (1960). These studies and the traditional neoclassic theory of well-being became a basis for neoclassic environmental theory the coming into existence of which dates back to the 1960s. This new trend was responded to by another approach, a so-called institution-oriented ecological economics (1970s). Representatives of this novel approach were Kenneth Boulding and Herman Daly. From the 1980s, their ideas were further developed by other authors who advocated integration of the analysis of institutions into environmental economics (e.g. Oran Young). Institutional ecological economics developed through the interconnection of ecological economics sustainability with elements of institutional economics (e.g. Jouni Paavola, Oran Young and Elinor Ostrom).
Market environmentalism is another approach dealing with relations between the environment and the society from the perspective of precisely defined proprietary rights to the natural environment. This approach emerged in the mid-1970s and is based on the tradition of the Austrian School and the Public Choice School. Main representatives are Terry L. Anderson and Donald R. Leal.
There is a wealth of interactive relations existing and developing between the environment and the economic system of human community, the qualitative and quantitative transformations of which become ever-faster (Moldan, 1997). This is how a very broad and complicated domain of mutual economic and social relations and determinations comes into existence. Issues of practical character come increasingly to the fore of environmental economics interests.
Many thoughts and methodological features of these modern economic sciences and trends can be found already in the Austrian School. It differs from other economic schools and thoughts namely by its methodology. Characteristic features can be concentrated into three domains in which it significantly differs namely apriorism, methodological subjectivism and value theory. In the above-mentioned meanings, the theory of sacrificed opportunity cost (Friedrich von Wieser) might appear as the most significant for assessing the economic aspects of nature conservation and environment protection.
One of the currently most discussed topics in nature conservation is landscape and biodiversity protection, which is in the CR ensured primarily through the decreed large-scale strictly protected areas (SPAs) – national parks and protected landscape areas (see MoE, 2012). Economics of SPAs is based on environmental economics and public economics, which represents a scientific discipline exploring the causes of existence, structures, and regularities of the functioning and effectiveness of this sector focused primarily not on profit taking and maximization but rather on meeting the public demand.
By means of the SWOT analysis of the environment in the CR, it is possible to identify strengths and weaknesses, opportunities and threats of the strictly protected areas and their management.

Results

Protected areas are acknowledged as the main tools in the conservation of species and ecosystems on both international and national scales. Thus, from the perspective of the SWOT analysis of the three pillars of sustainable management clearly dominate the strengths of the ecological pillar. SPAs should serve primarily for the conservation and enhancement of biological diversity in the area, and for ensuring ecosystem services for which they have been established. The SWOT analysis presented in Tab. 1 is a comprehensive view of all three sustainable development pillars in the strictly protected areas.
With regard to the extent of the paper will be further discussed only selected parts of SWOT analysis focused on the function of forests.
The conducted SWOT analysis may serve to draw conclusions for management and possible recommendations for the conservation and active exploitation of SPAs because the areas have been permanently inhabited already for long centuries and this is why the local population

cannot be excluded from the considerations. It is necessary to bear in mind that the existence of protected areas is a public order. As long as the local residents do not perceive the existence of SPAs as a positive and for them beneficial aspect of their environment, it will be difficult for the administrations of these area to plan their future management. Therefore, it is necessary that area use and protection coexist together and their cooperation brings advantages to both parties. Apart from the local population, the large-scale SPAs provide services to tourists and visitors. Tourism is one of factors with impact on the environment and it should be therefore restricted in the protected areas or subjected to tighter regulations than in the non-protected areas. From the socio-economic perspective, economic benefits from recreational activities go not only to the administrations of SPAs but also to local residents and entrepreneurs. Threat may be considered the worsening economic situation in the CR and namely the increasing taxation, which affects solvency of citizens and this, may contribute to decreased recreational use of the area.

Tab. 1: SWOT analysis of large-scale strictly protected areas

STRENGTHS	**WEAKNESSES**
- Conservation of biodiversity, ecological and evolutionary processes, halting the loss of biodiversity - Provision and preservation of ecosystem services, - High forest cover percentage in the territory, - Storehouse of food, drinking water, medicinal plants and biochemical components - Mitigation of the risk of unpredictable events and natural disasters - Preservation of existing natural values for future generations - Natural carbon sink, climate regulation - Provision of natural resources - Economic benefits from recreational activities - Coverage of the assets of organizations largely by own capital - Economic activities controlled by the state - Easier access to aid from public resources - Increase of employment and business opportunities in the region - Exploitation of natural resources by local population and utilization of the area for spiritual and physical regeneration	- Restricted management in SPAs forests due to the use of low-impact and nature-friendly technologies - Time constraints of management in SPAs forests - Limited access to resources - Low effectiveness of expenditure - Dependence on state budget - Increased management costs - Opportunity costs from economic activities - Impossibility of using standard methods of the financial analysis in assessing economy of SPAs administrations - Absence of economic methods for the quantification of SPAs benefits - Increased costs from employing nature-friendly methods of timber skidding - High cost of employee salaries in SPAs administrations - Limited utilization of the area by locals and visitors - Restricted business activities in SPAs
OPPORTUNITIES	**THREATS**
- Extension of zero-management zones - Enforcement of active management - Savings of management costs - Enhanced management efficiency - Valuation of ecosystem services - Establishment of the economic value of SPAs - Change in the legal form of organizations - Increased share of outsourcing in providing various kinds of service - Development of methodology for the economic valuation of the effectiveness of economic activities of SPAs administrations - Involvement of local people and entrepreneurs in SPA management - Change in the calculation of compensations for restricted management in SPAs forests - Media coverage of nature conservation problems and environmental education in the Czech Republic	- Hazard of forest systems disintegration - Damage to the environment - Natural impacts on forest management in national parks - Threat by economically-motivated activities - Impossible felling of bark beetle infested wood - Decreasing state budget expenditure and programme resources - Disproportion between the increasing costs of activities and the decreasing state budget expenditure - Need of searching for other financial resources - Staff outflow due to the extension of zero-management zones - Damages incurred to inhabitants and entrepreneurs due to bark beetle calamities in national parks - Fading recreation in the area due to worsening economic situation in the Czech Republic - Predominating influence of environmental movements on public opinion

Recreational function of SPAs represents only one of ecosystem services provided by these areas. SPAs provide a range of benefits from the ecological, economic and social point of view. Most of these benefits have not been economically quantified so far. Economic evaluation of benefits provided by the SPAs stems from the establishment of their economic value, which should be expressed based on the requirements, needs and value judgements made by man. Economic evaluation based on economic value measures market and non-market values assigned to SPAs by people. In market economies, the services of the nature are still used free of charge. Economists employ different approaches in the financial appraisal of SPAs. Most commonly used are preferential methods, which derive the price of the nature from the willingness of people to pay for its qualities. Recreational value of natural localities and ecosystems is established by using the travel cost method. The basic principle of this method can be considered a fact that in the situation when a consumer wants to use recreational services in a certain locality, he/she has to visit the locality and this is why travel costs expended for this visit can be considered as an alternative price of this visit. However, these relatively simple methods of converting the values of nature into money imply at the same time a risk of underestimating the ecological value of the area.

One of serious social and economic problems of SPAs from the perspective of forest owners is the restriction of their operations in the forest due to nature conservation reasons. In order to meet requirements of the Act on nature conservation and landscape protection as well as the Forest Law, it is necessary to apply environment-friendly and low-impact technologies combined with near-natural management methods on forest properties under the regime of strict nature conservation. The emphasis on nature conservation involves specific and costly management regimes, which limit forest owners in their methods of forest exploitation and reproduction, and hence reduce yields or increase costs of felling and tending operations. Pursuant to § 58 of the Act no. 114/1992 Coll., these restrictions are to be compensated. The institute of damage coverage for aggravated forest management should be perceived as a positive instrument of nature conservation. However, in real life it shows that the calculation of loss is inadequate, compensations are set incorrectly and that the existing enactment should be refined and specified more precisely.

From the economic perspective, the conducted analysis was focused primarily on the administrations of strictly protected areas, which provide for the management of these areas. SPAs administrations are organizations established for public goods provision and are therefore non-profit organizations – allowance organizations or organizational units of the state. In general, we can say that as public authorities, they tend to be inefficient since products coming from the protected areas are not merchandized at market price. A majority of their weaknesses were recorded from the economic perspective. The weaknesses of strictly protected areas include e.g. restricted management in connection with the employment of nature-friendly technologies. Other weaknesses comprise the dependence of SPAs administrations on the state budget, opportunity costs incurred from economic activities, increased management costs, high cost of staff salaries and limited area use by local inhabitants. Administrations of SPAs perform main activities defined in the deeds of foundation. A greater part of these activities is financed from expenditures of the state budget. The criterion of inefficiency has to be kept under review in allocating these public resources since it provides fundamental data for a possible comparison of different options of ensuring given public goods or service, and/or for decision whether the given public goods or service would be more effectively ensured by the public or private sector.

A challenge for the SPAs administrations in operating these areas is to apply active management based on the condition and requirements of ecosystems occurring in them.

Management of SPAs influences the public opinion, too. The opportunity is the ever- increasing media coverage of nature conservation issues in the CR, awareness of drawbacks in the assessment of SPAs management by the Ministry of the Environment (MoE) and expansion of environmental education.

A threat may be seen in the increasing influence of environmental movements, which can be traced for example in the effort focused on the extension of zero-management zones in national parks. Another threat is represented by reduced state budget expenditures for nature conservation and environment protection and hence by the need to search for other resources. The ever-decreasing state budget expenditure brings necessity to search for new sources of financing the SPAs. One of possibilities could be entrance fees. At present, the imposition of a fee for entering the SPAs is also hampered by Forest Act.

Discussion

There are ever more burning new questions that have emerged in connection with the blending of economics, ecology and environment protection: What is new that the society expects from nature conservation. What new values nature conservation should bring. Is a wide social and constructive dialogue with environmental organizations realistic at all? What are benefits and costs of protected areas? What methods should be used in forest management?

The solution of ecological problems requires making a choice. What we shall produce and how, what we shall consume and what energy sources we shall rely upon. These decisions will ultimately affect the people's lives. Therefore, they are essentially political decisions in the sense of fundamental social choices. In our opinion, it is much more useful to follow the principles of sustainable management in deciding upon the above-mentioned issues. A primary functional prerequisite for sustainable management in the landscape is observation of the balance between the content and values of three pillars – economic, social and ecological. In the ecosystem (i.e. existential) functional concept of management in the landscape significant part of which are forests, considerations are based on the nature of production life-giving effects for the human population. Disturbance of the system balance of these three pillars in favour of any particular of them logically brings about also the violation of sustainable management principles. This is how in many a case the significance of the ecological pillar is promoted over the economic pillar in the strictly protected areas on behalf of nature protection and immediately afterwards also over the social pillar as nearly all landscapes are inhabited by people.

In the genuine market approach, there is a conflict between economy and ecology. Conflicting in practice are also ideologized or professionally incorrect conclusions drawn within the two scientific disciplines, which both deal with highly complex and internally complicated systems and often employ only approximate models and other prediction tools as working methods, which quite logically put considerable limitations on their general explanatory power. It is therefore necessary to search new methods for evaluating and "measuring" ecological, economic and social aspects of the protected areas.

There are more questions emerging within considerations about the efficiency of protected areas: How much taxpayers have to pay for state nature conservation and/or for the management of strictly protected areas? Are the costs for the management of SPAs objectively justifiable? Currently, the SPAs are financed largely from public resources. The assessment of public expenditure effectiveness represents one of the most problematic fields of public economics – not only in the area of the environment.

Conclusion

The paper aims at outlining the current controversial issues and relations existing between economics and environment protection. In addition to theoretical considerations over the connection of these two different scientific disciplines, it attempts to address practical economic questions of nature conservation on the example of strictly protected areas. The final discussion analyzes the most urgent issues following out from the connection of economics and environment protection resp. nature conservation. The answers demonstrate that some topics have to be dealt with further on because some economic aspects of environment protection are far from having been explored in depth and the currently used methods are not accurate.

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Souhrn
Cílem příspěvku je nastínit současné problémy a vztahy mezi ekonomií a ochranou životního prostředí. Kromě teoretických úvah nad spojením těchto dvou odlišných vědeckých disciplín jsou řešeny praktické ekonomické otázky ochrany přírody a to na příkladu zvláště chráněných území (ZCHÚ). V závěrečné diskuzi jsou rozebrány nejpalčivější otázky, které ze spojení ekonomie a ochrany životního prostředí, resp. ochrany přírody vyplývají. Z odpovědí je zřejmé, že je nutné se některými tématy nadále zabývat, neboť některé ekonomické aspekty ochrany životního prostředí nejsou zdaleka prozkoumány a v současnosti používané metody nejsou přesné. Vztahy ekonomie, ochrany životního prostředí, ochrany přírody, ochrany lesa a lesních ekosystémů jsou analyzovány a popsány s využitím odkazů ekonomické teorie Rakouské školy a poznatků moderních ekonomických teorií, především environmentální ekonomie. V současné době je jedním z nejdiskutovanějších témat v ochraně životního prostředí ochrana biodiverzity a krajiny, která je zabezpečována především vyhlášenými velkoplošnými ZCHÚ. Ekonomika ZCHÚ vychází z ekonomie životního prostředí a veřejné ekonomie, která představuje vědní disciplínu zkoumající příčiny existence, struktury, zákonitostí fungování a efektivnosti neziskového sektoru. Při hospodaření ve ZCHÚ by měla být dodržena vyváženost tří pilířů trvale udržitelného rozvoje, tedy pilíře ekologického, ekonomického a sociálního. Pomocí SWOT analýzy lze identifikovat silné a slabé stránky, příležitosti a hrozby zvláště chráněných území a jejich správ. V souvislosti s prolínáním ekonomie s ekologií a ochranou životního prostředí a přírody vyvstávají nové otázky. Řešení ekologických problémů tak vyžaduje rozhodnutí volby. Co a jak budeme produkovat, co konzumovat, na jaké energetické zdroje se spolehneme. Tato rozhodnutí se v konečném důsledku dotknou života lidí. Jsou to tedy bytostně politická rozhodnutí ve smyslu fundamentálních sociálních voleb. Základním funkčním předpokladem udržitelného hospodaření v krajině je dodržení významové a hodnotové vyváženosti tří pilířů. V ekosystémovém (tedy existenčním) funkčním pojetí hospodaření v krajině, jejíž významnou součástí jsou lesy, se vychází z podstaty produkčních životodárných účinků pro lidskou populaci. V případě porušení systémové vyváženosti tří pilířů ve prospěch kteréhokoliv z nich, dochází zákonitě také k porušení principů trvale udržitelného hospodaření. V případě ZCHÚ tak mnohdy dochází v zájmu ochrany přírody (zachování či zvýšení biodiverzity, ochrana ohrožených druhů, významných lokalit, bezzásahovost) k významovému povýšení ekologického pilíře nad ekonomický a vzápětí na to i nad pilíř sociální, jelikož téměř v každé krajině žijí lidé.
Příspěvek slouží jako teoretické východisko pro dokončení prací na výzkumném projektu LDF Mendelu v Brně, který se zabývá ekonomickým hodnocením rekreačního potenciálu Školního lesního podniku Masarykův les Křtiny.

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STREAM REVITALIZATION IN THE AREA OF ORLICKÉ ZÁHOŘÍ AND THE MARKETING OF RECREATION

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Abstract
When planning leisure activities and designing facilities for recreational use of the landscape it is always necessary to include all target groups. A survey was conducted in the selected area of Orlické Záhoří in July, August and October 2013. Photos were taken, the condition of information boards was evaluated as well as their placement and accessibility by the public. The method of a questionnaire survey with a direct addressing of respondents was selected for its simplicity and possible fast evaluation.

Key words: QR codes, Nature Conservation Agency of the Czech Republic, educational trails, Orlicke Mts., Forests of the Czech Republic

Introduction

The environment is life-giving and it is really necessary to inform people on the issues of the environment, natural patterns, processes and links, to show them how important it is to protect the environment which is all around us. There are many ways to show people the options of environmental protection. Some are traditional, but there are new technologies, usable for leisure purposes and tourism.

When planning leisure activities and designing facilities for leisure use of the landscape it is always necessary to include all target groups. Not only in terms of access to land, but also the provision of information to the target groups. Using information providing we can purposefully influence the behaviour of people, their awareness of the target areas and also educate them in the field of environmental protection. It appears ideal to combine at least two forms of communication.

Some of the target groups are not able to receive information provided on the present typical information boards on nature trails, for example due to their position (e.g. hipotourists on the horse) or because of their handicapboard. On the other hand, retired people can encounter problems when getting acquainted with new technologies and thus they cannot gain information that is only obtainable through a bee tagg or GPS (linked to a cache). (Fialová, 2011)

The use of QR codes (quick response codes) and options of Google Earth were mentioned by Martinez-Grana (2013) stating that new technologies allow for the creation of a virtual database to support development of social needs within environmental education. Fig. 1 shows an example of a QR code.

Fig. 1: QR codes containing text “Orlicke Zahori” and a link to the webpage “Revitalizace” (source: http://qr.netfire.cz/?s=qr-generator)

According to Howard (1989), the passive recreational use of stream surroundings should be mainly developed in the form of bank educational trails. Using an example of educational trails in two places in Connecticut, Davis (2002) proved that the interest in these places and their protection from the perspective of the landscape and natural environment had increased considerably. Goncalves and Thomas (2012) emphasized the need to involve the public in the planning of riparian zones along streams and presented how the involvement of the topic of water in the environment can positively affect the society’s perception of and identification with the place itself. When designing an educational trail in the surroundings of the Divoká Orlice River, Loučková and Fialová (2010) considered the needs of persons with reduced mobility and designed elements for easy exercise and stretching directly in the area. The designed length of

the trail is suitable for persons with reduced mobility and the trail includes facilities that can improve the popularity of the area.
The research area in the surroundings of Orlické Záhoří was selected based on the fact that the Department of Landscape Formation and Protection had surveyed the condition of stream T12 there in 2008 and 2013. In this context and after negotiations with the stream administration and local inhabitants, a survey was done to explore the information available to the inhabitants and leisure makers about revitalizations and related modifications. Employees of the Forests of the Czech Republic (Lesy České republiky, s.p.) as well as employees of the Protected Landscape Area Orlické Mts. Administration see large gaps in the promotion and marketing of public services, for example in the area of stream revitalization and the understanding of their necessity from the social perspective.
Jakoubková (2012) stated that all stream revitalizations so far conducted in the Orlické ts. are located in the valley of the Divoká Orlice River. Due to the character of the valley, which is flat and located in the upper reaches of the river – in the area called Zaorlicko – the land was intensively used for agriculture in the past. Revitalizations started in 1998 and now other entities continue revitalizing the stream – the stream administrator, Lesy ČR, s.p., and the municipality Orlické Záhoří.
Stream T12 springs in the north-eastern slope of the Orlické Mts. and flows through forest stands with a relatively high gradient (Fig. 2). Then it comes to the area of Orlické Záhoří, which is characterized by long grassed slopes directed towards the Divoká Orlice River. Stream T12 is a right-bank tributary of the Divoka Orlice at km 120.8. The number in hydrological order is 1-02-01-001 and the mean long-term discharge is Q_a 57 l/s.
The goal of revitalization was to provide a stabilized state, if possible close to nature. The bed level was modified so that the stream depth was 0.4–0.6 m, which corresponds to the depth in natural stream sections. A floodplain was created, 8 m wide on the bed and 10 m wide at the crest. The inserted transverse stabilization constructions in the bottom gave rise to natural pools. (Mareš, 2001; Marková, 2013)

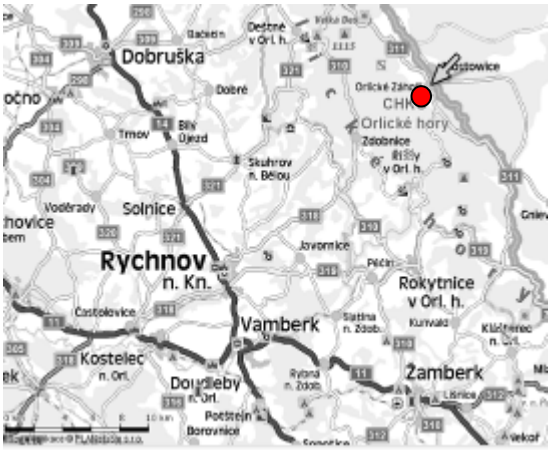

Fig. 2: Location of T12 (source: mapy.cz)

The revitalization of stream T12 started in 2003 and it was funded by the Program for Revitalization of River Systems and the following activity was funded by the Ministry of Environment, namely by the Landscape Maintenance Program. (Jakoubková, 2012)
The issue of stream revitalization in a cultivated and agriculturally used landscape was also covered by e.g. Fidler and Kuna (1997) who particularly mention the matter of ownership of and relationship to the water stream and the implementation of measures outside the water stream.
A detailed route survey of stream T12 in Orlické Záhoří was carried out by the staff of Mendel University Brno (for the first time in 2008). The banks were torn down with a slight slope to the surface and seeded in the revitalized section i.e. from the crossing with the Orlické Záhoří – Bartošovice road in direction to the estuary in the Divoká Orlice River. Sediments deposited in the riverbed and it became substantially overgrown during the summer season. During field checks a substantial occurrence of caddis flies was noticed in the riverbed, especially on timber reefs in the geotextile, according to Ondrejka (2013a,c) and Uhmannová (2013). The vegetation planted in the stream surroundings was in a poor condition. Probably some reduction measures had been taken due to the renowned bird area. In 2013 a detailed field survey took place again including a geodetic survey of the streambed, sediment sampling and newly also the conditions

of the wooden constructions in the stream were examined. Geodetic measurements were performed using THEOMAT WILD T 1000. The measurements were connected to the Czech Unified Trigonometric Cadastral Network (JTSK) and all the objects on the stream were surveyed especially (bridges, boulder chutes, timber reefs). Altogether 440 objects were surveyed. Subsequently the data were processed and the digital model of the area was created. (Marková,2013) The recreational use of the stream banks was connectes to the results of Ondrejka (2013b).

Materials and methods

As mentioned above, the research was carried out on the grounds of public demand and the need of optimizing the flow of funds for revitalization measures for the wide public. The opportunities for promotion of the revitalization activities to the wide public and the current state of promotion were consulted with the staff of the Tourist Information Centre Orlické Záhoří (hereinafter TIC), the staff of PLA Orlické Mts. Administration, and the staff of the Forests of the Czech Republic. The selected area was widely examined in July, August and October 2013. The photo-documentation was collected and the condition of information boards, their location and accessibility to the public were evaluated. The method of a questionnaire survey with a direct addressing of respondents was selected for its simplicity and possible fast evaluation. Both open and semi-open questions were used in the questionnaire. In case of further interest, the respondents could consult the issue with a competent person and provide even a verbal comment.

Based on the TIC staff recommendations the respondents were approached in August and September 2013 as these months are the most attractive for tourists. The questionnaires were distributed in two ways. The tourists were questioned by a representative of the Mendel University in Brno within four subsequent days (including a weekend). The questionnaires were also distributed by a TIC employee continuously in August and September 2013 and then sent to the Mendel University in Brno for evaluation. The results of evaluation were rewritten in Microsoft Excel into the table form and analyzed using contingency tables. Clear and easily interpretable graphs were created. The information acquired was to be verbally described to prevent misinterpretation. The verbal comments of the respondents given in person to the competent employee were a valuable source of information. Should the readers be interested in taking a look at the questionnaires, they are welcome to contact the authors of the article.

Results and discussion

After the discussion with the TIC employee it was found that the public and local residents of municipality Orlické Záhoří were acquainted with the implementation of the revitalization measures via web sites of the municipality www.orlickezahori.eu and an external official board in front of the Municipal Office. The individual proposed revitalization measures were discussed and consulted with the owners of the neighbouring plots directly at the Municipal Office. The information boards about the revitalization measures implemented are located on information boards in the area of the completed project.

There were two information boards placed in the surroundings of stream T12. In both cases these are individual boards that are not parts of any comprehensive educational trail informing about the revitalization completed. The board informs about the bird area established and based on the date given in the text it was erected in 2011. When evaluating the condition of the board it can be stated that both the choice of the location and the choice of the material were not the most appropriate. The pictures and the map placed on the board have gradually lost their original colours and thus they have also lost the information value and the ability to inform the passers-by about the need to preserve the environment and the landscape. For the general public the board is poorly accessible but a board with the same content is also located at the beginning of the revitalized section.

The board located at the beginning of the revitalized section informs of the stream revitalization and displays historic aerial photographs that clearly show the original condition and the water stream treatment. Given that the time difference between the two photos is 5 years, it can be stated that both the material of the board and also its placement in relation to the sun rays were selected appropriately. There are considerably adverse weather conditions in this area that often have a negative impact on the condition of the educative boards. In spite of this the board condition is satisfactory. As to the location of the board it was placed disregarding the surrounding terrain. The board is placed in the field depression that is waterlogged after rainfalls

and the vegetation around the board is not maintained so the access is not allowed for example for persons with reduced mobility.
In total 150 copies of the questionnaire were distributed but their return rate was less than 50%. 74 copies were returned for evaluation. There were 42 women and 32 men out of all the 74 respondents. 65 questionnaires were filled out by people in the productive age (in our evaluation 18–66 years). Almost one half of the respondents have had secondary education at the time of the research and more than a quarter of the respondents have had a university degree.
Only seven respondents stated that they were not acquainted with the term "revitalization" and they did not understand its meaning. Then the term was explained to them by a designated employee. Out of these, almost a half were active pupils of the elementary school and a half were people with vocational certificates. The fact that more than 90% of respondents knew the term and understood its meaning was very satisfactory. However, out of the total number of the respondents, 34% did not know and did not have any information that revitalization measures were implemented even in the area of Orlické Záhoří.
When asked about the source of information of the revitalization measures the most common answer was – educational trail, office board, information from friends and family. Only 38% out of the total number of the respondents stated that the information provided about the revitalization measures on the water streams in Orlické Záhoří is sufficient.
When asked about the purpose of their coming to the area, sports recreational activity was mostly mentioned - in more than 40% of answers. Taking a closer look at the answers we can conclude that besides sport activities women also mentioned relaxation and the cultural-educational purposes. Especially women are - in this case - a very suitable target group on which the public services marketing could be focused. None of the respondents had come to this area for the sake of environmentally-educative activities. This activity was, however, also mentioned in three cases especially by the elementary school pupils which is a very positive fact.
The respondents were further asked for their personal tip on how to inform and promote the public services in the most effective manner. They could select max. 3 out of 12 suggested options but they could also come up with their own ideas. The target group of children came up with ideas such as creation of topical colouring books, matching pairs, quartet game and topical cards. The option of colouring books was selected by only 5% of the respondents and 100% of them were women. Matching pairs and quartets were selected by 6 respondents with ratio 5/1 women/men. In our opinion, geocaching is quite a well known novelty in the entire Czech Republic. This option of promotion was chosen by 6 respondents and 5 of them were in the age group 26– 39. Facebook as a social network used by billion of people (http://www.abc.net.au/news/2014-02-04/facebook-turns-10-the-social-network-in-numbers/5237128) was mentioned in 15% of responses. More than a half of these responses came from the inhabitants of Prague. On the contrary, nobody out of the age group 54+ considered Facebook to be a possible source of information about the revitalization measures. It was interesting to find out that almost everyone who comes to the area more than 3 times a month would welcome a lecture given by an expert on this topic.
More than 65% suggested the educational trail boards as a suitable way of promotion. The option of a trail without boards only using QR codes was mentioned by one respondent. When taking a more detailed look at his other responses we can resume that it was an active sportsman in the age group 26–39 who also considered Facebook and advertising at the municipal website to be useful opportunities for promotion, just as more than 50% of all respondents.
More than a half of the respondents suggested the information centres as a tool and their employees as another tool. More than a half would welcome receiving an information map or a flyer, so they have the information always with them in case of need.
Out of the field research, the experience gained by the active participants distributing the questionnaires to the respondents, the questionnaires themselves and the experience of the employees of PLA Orlicke Mts. Administration and the Forests of the Czech Republic, the following recommendations can be concluded and generalized.
The information centre in the municipality plays an irreplaceable informative role for the tourists and local inhabitants where they can pick up a flyer or an informative brochure. The information in the brochures mostly contains general tourist tips such as typical tourist targets, etc. The questioned tourists would also not object to working with versatile media such as internet and mobile phones. These two above mentioned media can be quite effectively and relatively

cheaply connected using the QR code. The information flyer can contain the QR code that will include for example a link to the websites, Facebook, etc., where the tourists can read or listen to the information (via MP3 or MP4 link) that cannot be placed in the brochure. This form can be very useful for handicapped tourists of the area with not only reduced mobility but also the tourists with vision impairment. All the other information can be then available on the website including designs of implemented projects, photo galleries of the condition before and after the revitalization measures were taken. The QR code can also link to websites designed by the Department of Landscape Management: http://revitalizace.ldf.mendelu.cz/cz.

The educational boards of educational trails remain very popular such as those used in the revitalized section on stream T12. The condition of the boards is very good even in the weather conditions prevailing in the area. The educational boards can also be subsequently equipped with a table containing a QR code that can e.g. include a link to a competent stream administrator, phone number of tourist office, etc. A vital condition for reading the QR codes that has not been mentioned before is the availability of a smart phone with an application that enables reading the bar codes. The tourists are used to reading the information on the boards but a great disadvantage is their financially demanding update. In case of using QR codes, the elderly tourist generation could be affected as they do not have much experience with the smart mobile phones. However, for them there will always be the traditional board. A surprising discovery was that people who spend lot of time in the area would like to take specialized lectures given by the experts.

The local inhabitants always receive information about potential future revitalization activities when they talk to the land owners and owners of surrounding plots. Here, we can see a great opportunity for activity on the side of the stream administrator – Forests of the Czech Republic that could implement these activities under the Program 2020. .(https://www.lesycr.cz/volny-cas-v-lese/program-2020-lesu-ceske-republiky/Stranky/default.aspx)

The proposals should follow the EIA directions as mentioned in Galas (2014) if needed.

Conclusion

In the explored area of the Orlicke Mts. and especially their surroundings, where the revitalization activities had been performed, the potential and the current status of informing the tourists was evaluated. The preferred ways of passing information onto tourists were analysed and proposals for further marketing of public services were defined. A total number of 74 questionnaires were evaluated and it can be concluded that people are still accustomed to receiving information in the form of a flyer or a brochure. However, this material can be supplemented by an unlimited amount of information using QR codes.

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Souhrn
Životní prostředí je životodárné a odborníci by se měli snažit dostat lidi blíže k této problematice životního prostředí, přírodních zákonitostí, postupů a vazeb, a ukázat jim, jak důležité je maximálně chránit životního prostředí, které je všude kolem nás. V plánování rekreačních aktivit a možností návrhů pro rekreační využití krajiny je vždy nutné zahrnout všechny cílové skupiny. Nejen pokud jde o přístup do krajiny, ale také přenos informací k cílovým skupinám. V červenci, srpnu a říjnu 2014 probíhalo šetření přímo ve vybrané lokalitě v oblasti Orlického Záhoří. Byla pořizována fotodokumentace v lokalitě, byl vyhodnocen stav informačních tabulí, jejich umístění, přístupnost pro širokou veřejnost. Pro svou jednoduchost a možnosti rychlého vyhodnocení byla vybrána metoda dotazníkového šetření s přímým oslovováním respondentů. Celkem bylo rozdáno 150 kusů dotazníků v měsících srpnu a září 2014, ale jejich návratnost byla téměř poloviční. Respondenti byli například dotazování na jejich osobní doporučení na nejvhodnější způsob informování či propagace těchto veřejných služeb. Měli možnost vybrat si z navržených 12 možností, ale měli také možnost navrhnout svůj vlastní jiný způsob.

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TECHNOLOGICAL OPTIONS FOR RECONSTRUCTION OF RURAL ROADS USED BY THE NATIONAL STUD FARM KLADRUBY

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Abstract
The forest road network is an integral part of the forest environment and is primarily used for the forest management; however, it is often required to serve for multipurpose uses. In that case, the technology of construction, repair or maintenance that will suit all the demanded purposes has to be used. This paper focuses on a multipurpose use of the forest road network which is used by the National Stud Farm Kladruby nad Labem to ride horses or horse-drawn carriages. The current condition of the forest roads does not meet this requirement any more. Therefore, an overall forest road network reconstruction has been proposed. Due to the multiple uses, emphasis was laid on the reconstruction technology and the modification of spatial parameters of the forest roads, especially the cross section shape. The technology of unsealed layers was used to the maximum possible extent, especially mechanically reinforced aggregate (unbound mixtures - type 1) and the Bavarian reinforcement method. It was demanded that all types of reinforcement have an oval shape of the crown. The technology of mechanically reinforced aggregate (unbound mixtures - type 1) is called mineral concrete in the practice. Its elasticity combined with the natural appearance seems to be the most suitable solution for forest road surfacing where multipurpose use is demanded, naturally provided that all technological procedures are followed. A closure of the unsealed top by a grass layer of grass was proposed for the parts of forest roads that are often flooded to prevent washing out of small aggregate parts when the flood recedes.

Key words: forest road network, multipurpose use, carriage road

Introduction

The multipurpose use of a forest road network is a hot issue currently. One of the examples is the forest road network which passes through the forest property of the National Stud Farm Kladruby nad Labem and is used to ride horses or horse-drawn carriages. The current condition of the forest roads does not meet this requirement any more. Therefore, an overall forest road network reconstruction has been proposed. The technologies of mechanically reinforced aggregate (unbound mixtures - type 1) has been used to the maximum possible extent together with the Bavarian reinforcement method. It was demanded that all types of reinforcement have an oval shape of the crown. These technological procedures can be used as a model for the solution of similar requirements of multipurpose use of forest road networks.

Materials and methods

The main forest road network backbone was designed with the wearing course of mechanically reinforced aggregate (unbound mixtures - type 1).

- Mechanically reinforced aggregate (unbound mixtures - type 1) is a layer made of unsealed mixture of crushed stone with the optimum humidity, distributed and compacted under conditions ensuring maximum possible bearing capacity. We can say that it is a mixture of at least two fractions of natural or artificial crushed unsealed stone, small and coarse, with water. The granulometric composition, humidity of this mixture and the achieved level of compacting correspond to the theoretical optimum conditions for the given type of unsealed base layer. The optimum conditions are defined by the stone mixture ideal curve, which has to pass in narrow aggregate limits and the maximum volumetric mass achievable at a given optimum humidity established by Proctor test (736185) ČSN EN 13286-2. The mixture of mechanically reinforced aggregate has to be produced and supplied with the demanded humidity. The mixture production and installation are well-known at present and they need to be done in compliance with ČSN 73 6126-1.

The most widespread simple technology for forest road reinforcement used in western Europe is the “Bavarian method”. The main advantage of this technology is the usage of local materials and the following savings of road construction material and its transport as well as the simplicity of the technology. This technology has been proposed for the current rural roads that serve as

links between the main forest road network backbone. The technological requirements have been defined based on Hanák (2002):

- The bearing layer of the reinforcement is intensely compacted incoherent material of local soils, i.e. the material that is easy to compact, well permeable and non-freezing.
- An important feature of the reinforcement is the abnormal roof-shaped sloping of its surface - based on the longitudinal road gradient 3% to 7%, at the edges up to 15-25% forming a side of a triangular ditch.
- Reinforcement is constructed on a compacted subgrade with roof-shaped gradient of 2-4%; in subgrades with small bearing capacity (below 15% CBR - California bearing ratio) geotextiles are placed between the reinforcement lower side and the subgrade.
- The layer surface is fitted with protective wearing course, which is vibrated and at the last stage statically rolled on material of 0-4mm fraction. The protective wearing course provides the compacted surface with a protection against mechanical wear, undesirable drying, and erosion of the finest fractions by traffic.
- The bearing layer is usually made in a thickness between 30 and 50 cm, in dependence on the bearing capacity of subgrade soils, the size of the traffic load, and the composition of material used. Table 1 presents the optimum texture composition of materials with fractions 0-30, 0-45, 0-50 and 0-75 mm. Generally, the quality of the bearing layer increases with the uniformity level of the fraction proportions up to 75 mm; the size of the largest grains in the backfill should not exceed 2/3 of its thickness.

Tab. 1: Optimum composition of mixtures for the Bavarian method reinforcement

Grain size - mm	Percentage of fractions present - %			
	0 - 30 mm	0 - 45 mm	0 - 55 mm	0 - 75 mm
0	0	0	0	0
1	12 - 25	9-21	8-19	7 - 19
3	24 - 39	18 - 33	16 - 30	14 - 30
7	42 - 55	32 - 46	29 - 43	23 - 39
15	65 - 75	51 - 63	46 - 59	37 - 52
30	100	76 - 86	68 - 78	57 - 68
45		100	82 - 95	72 - 81
55			100	81 - 89
75				100

- The key stage of the Bavarian technology is compacting of the layer that has been installed and levelled by a grader into the roof-shaped sloping. It is necessary to use a compacting method that will compact the entire cross profile of the reinforcement formation, i.e. including shoulders. The installed layer has to be compacted intensely into 100 % Proctor standard.

A closure of the vibrated stone (unbound mixtures - type 2) ČSN 73 6126-2 by a grass layer was proposed for the parts of forest roads that are often flooded to prevent washing out of the material of the unsealed course.

- The composition of the grass layer needs to meet the following requirements: 60% of crushed stone, fraction 16-32 mm; 40% of vegetation substrate composed of silicon sand, grain size 1-2 mm, loam, and turf - ratio 2:1:1. The herbal layer needs to consist of load resistant species, e.g. *Lolium perenne*, *Poa nemoralis*.

Results

The construction tasks listed below appear most often within the proposed multipurpose reconstruction of the given forest road network, i.e. this is a general list usable for similar solutions. Three examples are used for the solution of the current state of forest road reinforcement: mechanically reinforced aggregate (unbound mixtures - type 1), Bavarian method, and reinforcement by vegetation.

The proposed method of forest road reinforcement by mechanically reinforced aggregate (unbound mixtures - type 1) (Fig. 1):

- Remove woody plants along the road to 2 m from both sides of the road in its entire length. This step enables the road to dry up more quickly and the period of reduced bearing capacity is thus shortened. In the case of long-term maintenance, it is necessary to remove the branches that reach to the forest road formation profile.
- Restore lateral draining ditches on both sides. The minimum ditch depth is 50 cm under the level of the subgrade so that water is drained from the road and because of high levels of groundwater. As a higher ditch capacity is required, the ditch has a trapezoid shape. If other reinforcement layers are to be installed, the soil from the ditch cannot be used to heighten the road formation. It has to be transported to a deposit.
- If mud covers the road surface, it has to be removed.
- The current road surface is to be modified by adding a levelling layer of coarse crushed stone 63-125 mm fraction with 100-200 mm thickness. The cross profile is changed into both-sided roof-shaped sloping with 3% inclination. Then the road formation is compacted.
- The modified, sloped and compacted surface is covered with a layer of gravel, 0-63 mm fraction, 200 mm thickness, and it is also sloped into a both-sided 3% cross sloping and compacted.
- The second reinforcing and also covering layer is mechanically reinforced aggregate (unbound mixtures - type 1) with 180 mm in thickness.
- This cover is enclosed in the wearing course of 40 kg/m^2 small crushed stone, 0-4 mm fraction.
- Waterlogged parts of the road are equipped with non-woven geotextile, 200 g/m2, in combination with three-axis polypropylene geogrid to improve the bearing capacity of the subgrade. In our case, we expect its usage for about 50% of the total length of the forest hauling road.

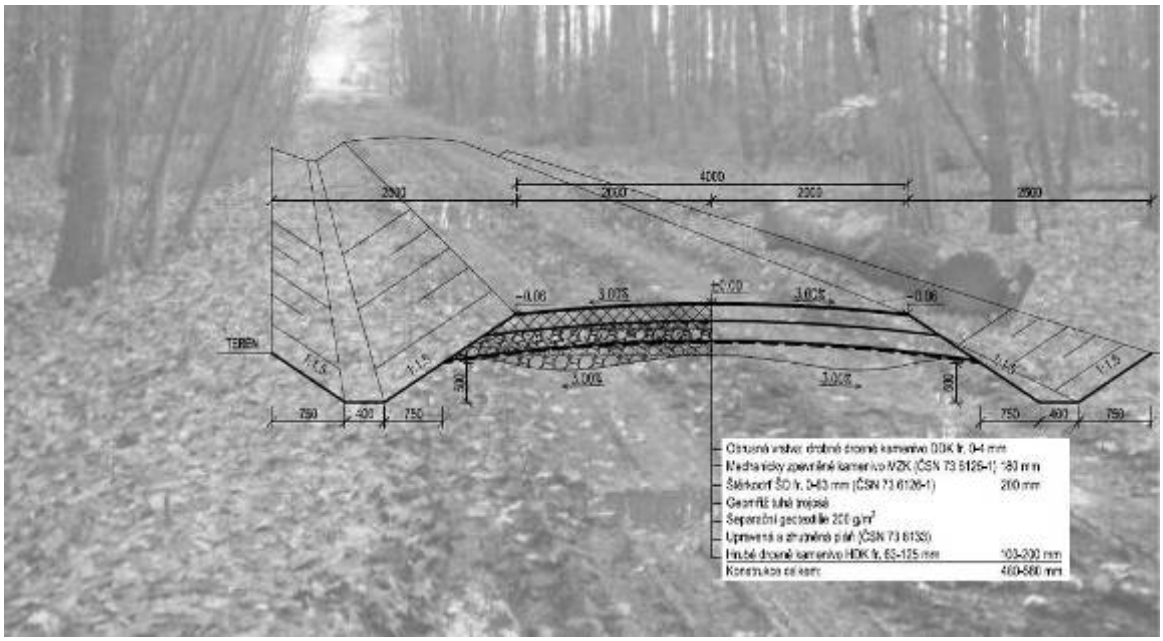

Fig. 1: Reinforcement by mechanically reinforced aggregate (unbound mixtures - type 1).

Reinforcement of the current forest roads by the “Bavarian method” (Fig. 2):

- First, the current surface has to be adapted to create a both-sided roof-shaped sloping of 3% and this has to be compacted.
- Then, broad trapezoid ditches, 50 cm deep need to be created on both sides.
- The ditch material can be used for another reinforcement layer that will be installed on a compacted and sloped current surface. A conspicuous feature of the newly formed reinforcement layer of the ditch material is the abnormal roof-shaped slope which changes from 3% in the road centre to 15% at the reinforcement edges and then gradually forms the adjacent sides of the trapezoid ditch.

— From the technological perspective, the material that is moved from the ditch to the current road surface has to freeze over winter - it means the ditch and material cross moving has to be done in autumn and the final stage of cross sloping and compacting have to be done in spring. The material has to be compacted in layers with a maximum thickness of 15 cm.

Reinforcement of current forest roads using a vegetation cover (Fig. 3):

— The layer of unsealed mixture of vibrated gravel is enclosed in grass layer 50 mm thick. The grass layer forms a coherent protective layer for the road surface resistant to flooding so that the reinforcement gravel layer is not damaged if water spills over it.

Conclusion

Multipurpose use of a forest road network has been and will be required more and more often with the economic development of the society. The former one-purpose approach to the utilization of forest hauling roads is not possible any more. The proposed technologies for forest road reconstruction are close to nature and behave on the principle of elastic deflection. For these reasons, they meet the above mentioned social requirement and are ideal for recreation activities.

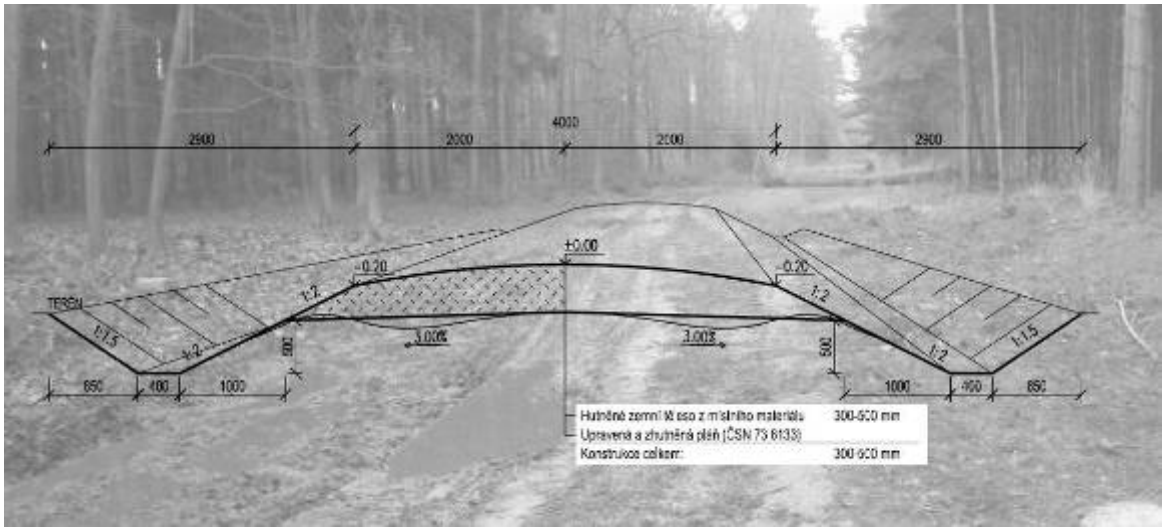

Fig. 2: Reinforcement of the current forest roads by the “Bavarian method”:

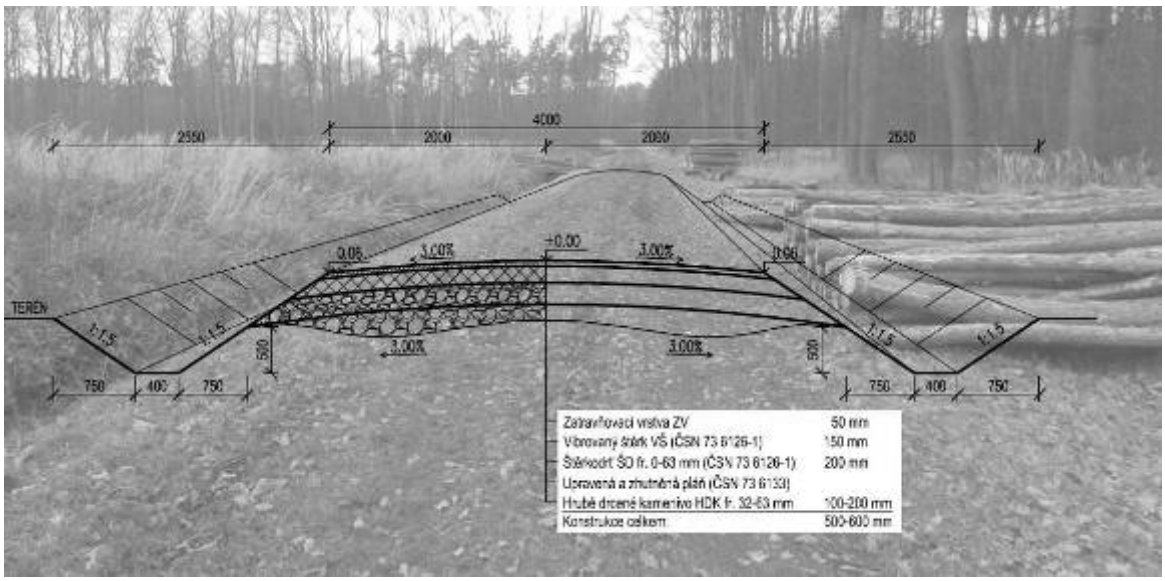

Fig. 3: Closure of the vibrated stone (unbound mixtures - type 2) by a grass layer.

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Souhrn
Lesní cestní síť je nedílnou součástí lesního prostředí a slouží primárně k obhospodařování lesa, v současné době je na ni ale často kladen požadavek víceúčelového využití. V takovém případě je vždy třeba hledat takové technologické způsoby výstavby, oprav a údržby, které budou vyhovovat všem způsobům požadovaného využití lesních cest. Tento článek je zaměřen na víceúčelové využití lesní cestní sítě Národního hřebčína Kladruby nad Labem, která je také využívaná k vyjížďkám, ať už na samotných koních nebo v kočárech. Současný stav jednotlivých lesních cest již neodpovídá požadavkům hřebčína a z toho důvodu byla navržena celková rekonstrukce lesní cestní sítě. Vzhledem ke způsobu využití byl kladen velký důraz na použité technologické řešení a úpravu prostorových parametrů lesních cest, zejména pak tvaru příčného řezu. V maximální míře zde byla navržena technologie nestmelených vrstev, a to zejména mechanicky zpevněného kameniva a bavorské metody zpevnění s požadavkem na obloukovitý tvar koruny všech typů zpevnění. Technologie mechanicky zpevněného kameniva je v provozní praxi nazývána minerální beton. Její pružnost se spolu s přirozeným vzhledem vrstvy při splnění požadovaných technologických postupů jeví jako nejvhodnější řešení pro zpevnění lesních cest s požadavkem na multifunkční využití. V úsecích lesních cest, které jsou často zaplavovány vodou, bylo navrženo uzavření nestmelené krycí vrstvy zatravněnou vrstvou z důvodu zamezení vyplavování drobného drceného kameniva při opadávání záplav.

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THE CURRENT STATE OF EVALUATION OF THE REVITALIZATION OF WATERCOURSES IN TERMS OF RECREATIONAL POTENTIAL

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Abstract
The current goal of revitalization measures in the landscape primarily consists of the optimization of landscape water regime, incl. flood control measures and the promotion of biodiversity, but the current philosophy speaks of multifunctional land usage. However, the revitalization is currently underappreciated in the Czech Republic and it is important to increase the recreational potential of the landscape. In the society there has been indicated the necessity for recreation, because a large part of the population lives in urban settlements and is employed in an artificial technical environment that has largely inadequate sanitary conditions (unfavourable microclimate, noise, dust, etc.). Recreation as a social phenomenon is therefore a permanent part of the lifestyle in economically developed countries. The submitted issue highlights the necessity for revitalization ofwatercourses in terms of recreation potential.

Key words revitalization measures, recreational value, evaluation methodology

Introduction

The river is a "green spine" of the city and helps to co-create it. It has its own special place in the city. Appropriately treated municipal water corridor fulfills a number of functions (social, recreational, environmental, migratory, etc.). Architects and implementers of the current adjustments of waterways in cities should seek between flood protection and revitalization. Flood protection has a priority status in built-up areas, but it still may be carried out in a sensitive and natural way. Of course, the possible options are given not only by the existing character of the river and its immediate surroundings, but also by the broader relationships within the catchment area. The proposed modifications may properly fit a watercourse into the urban structure and make it available to city residents. From the natural, ecological point of view the main goal of revitalization should be revival of the river and its surroundings.

Over the past years many different restoration actions have already taken place for which considerable financial resources have been spent. This is in accordance with Vrána (2004) one of the main reasons for the need to establish an objective method of effect evaluation of revitalization activities. It is desirable to develop a methodology for quantifying the success and effectiveness of restoration actions, which would clearly concretized the target state and the procedure to evaluate the effectiveness and success of implementation.In the first place it is, however,important to define the terms as revitalization success rate, revitalization success or effectiveness of restoration measures, as many authors perceive these terms differently.E.g. Kentula (2000) proposes to evaluate the three different categories of the concept of successful revitalization separately:

- Successful accomplishment (whether the revitalization was implemented as specified in the project),
- Functional success (assessment of whether ecological functions have been restored and whether the system is biologically functional and sustainable),
- Landscape success (the way the revitalization contributed to the ecological integrity of the region or the landscape, and how the goals were achieved, such as an increased species diversity).

Currently there are several methods to evaluate the revitalization effect. For the purpose of evaluating the revitalization success are mainly used methods of expert evaluation. These of course vary according to the specific objectives and the natureof revitalization measures (Holl and Cairns, 2002).

Kupec, Schneider, Šlezingr (2009) emphasize, however, that none of these measures apply universally, and it is always necessary to take into account local conditions, the purpose and scope of revitalization. For a successful evaluation of the revitalization project it is necessary to know the status of the site before the revitalization, but it is not always available. For this reason, most methods work with "reference state", or are based on the expertise of the evaluator.

Therefore the results of the methodologies are usually not quite exact. An objective assessment of the effect can be reached by evaluating the flow parameters before and after the

revitalization. When the flow is being rated, the following flow parameters are usually taken into account: river bed morphology, water flowrecovery, water quality in the watercourse, vegetation, incorporation of the landscape and other integration measures in the catchment area of the revitalized section.
The overview of the methodologies used to evaluate the revitalization effect actions on water elements are available, e.g. on the website of the Ministry of Environment.
The need for recreational potential of the landscape is based on the individual and societal demands of the population. It is more intensive in large cities where many people do not own large plots. In the concept of revitalization adjustments rivers and their surroundings can serve as public natural parks and gardens and replace the lack of contact of people with nature. The objective of revitalization measures in the landscape lies nowadays primarily in flood protection measures and the promotion of biodiversity. The revitalization of watercourses are of a great importance in terms of increasing the recreational potential of the landscape, which is nowadays in the Czech Republic yet underappreciated.
Evaluation methodologiesof the recreational potential are usedto define a part of the territory, which may increase their attractiveness mainly for visitors and locals. The status of the areais evaluated and assessed in terms of importance for the quality of the landscape, which may be positive, neutral or negative. The negative effects disturb the landscape, landscape elements seem to be heterogeneous and give inaesthetic impression. In addition, they canlimit the recreational use of the landscape area. It has a very low or zero recreational potential. The positive effect of landscape features isan increase in the recreational potential of the territory creating an attractive impression and it attracts the attention of visitors. Neutral recreational potential is such a condition that neither affects nor in any way contributes to the possibilities of its use.
For the purposes of the landscape evaluation in terms of recreation potential, attractiveness and its use,the following methodologies are most often applied: Evaluarion of the recreational potential by TERPLAN method (natural recreational potential of the landscape), Evaluation of the tourism potential (Vepřek, 2002), Methodological construction of evaluation of the tourism potential (Bína, 2002). Methods according to Vepřek and Bína evaluate the potential of tourism, which is based on the recreational potential of the landscape, but it also includes the currently preferred recreational activities. Furthermore "Methodology of possibilities of using landscapes" is used. It is a complementary method to quickly and tentatively compare two landscape areas. The disadvantage of this method is the subjectivity of the evaluation.
As illustrated by Bergen et al. (1995) Arriaza et al. (2004) or Acar and Sakici (2008) the presence of a water element in the landscape scene makes a positive perception of it. Bulut and Yilmaz (2009) have examined the nature of the most preferred water elements and found that the most preferred element is a natural pond, which is a part of urban environment (e.g. a pond in the park). The least preferred element is the scene of a branched river bed in the open countryside. The authors see the reason for these preferences in a higher number of people living in cities, where the direct experience with urban type of water feature dominates, which reflects their preferences.
Although there are different approaches to landscape assessment, a number of authors generally define two basic approaches: objective and subjective. The objective view is based on the assumption that the aesthetic value of the landscape lies in their characteristics or features (eg Martin, 1993; Nicholls and Sclater, 1993), while the subjective approach sees the aesthetic value of the landscape solely as a product of human mind (eg, Daniel and Vining, 1983 Kaplan and Kaplan, 1989).
A part of the recreational potential of an area is the character of the landscape. Water features are an inseparable part of the landscape and contribute to its creation. Landscape character expresses natural, socio-economic and cultural-historical relations of the landscape characteristics. Taking care of the landscape must be applied even in urban areas, where the landscape is of an important value. It's not just protected areas and natural parks, but also waterwaycorridors, forest and agricultural land (Vorel et al., 2004).
In the Czech Republic there is no precisely defined way in which the landscape could be assessed, but there is a wide range of methodologies from many authors. These include the works of Vorel (2004), Loew (1999), and Bukačka Matejko (1997, 1999, 2006), Lacina (1990, 2005), Michael (1999), Jančura (1999), Vondrušková (1994).

Materials and methods

The goal and the expected outcome of this work is to propose an ongoing methodology for the assessment of the importance of revitalization measures in terms of recreation potential of the landscape, and therefore their influence on the development opportunities of the region. This provisional proposal will be created on the basis of the analysis of practical examples of revitalization in the Czech Republic and abroad, field research, comparison and synthesis of existing evaluation methodologies. For the proposal ofa methodological evaluation procedure of revitalization,evaluation indicators will be selected from methodologies for the evaluation revitalization actions, landscape and recreational potential of the area.

In terms of evaluation of revitalization measures on watercourses the following methodologies were chosen for the selection of evaluation indicators: Methodology (HEM) Hydroecological monitoring, (Langhammer, 2008), Evaluation methodology of implemented revitalization actions - Selected watercourses and small water tanks - (Vrána, Dostál, Vokurka, 2003), Method of assessing the state of the riparian areas- QBR index of river quality, Method of evaluation of the current state of riparian vegetation of the watercourse (Šlezingr, Úradníček, 2002). The overview of these methods was chosen on the basis of the the importance of the individual indicators (eg riparian vegetation, water quality, river bed morphology), as elements in urban areas and the surrounding landscape, which significantly enhance the recreational potential of the revitalized area. According to Kupec, Schneider, Šlezingr (2009) HEM methodology, by its full name Hydroecological monitoring, is nowadays applied as the official methodology of ME CR for evaluating the effectiveness of revitalization.

For the selection of evaluation indicators in terms of the landscape and the landscape character, Methodology assessing the impact of the proposed construction, activities or changes in land use on the landscape (Vorel et al., 2004)was chosen for this work. The author of this methodology perceives aesthetic value, as a key term in the evaluation of landscape quality, landscape composition and creation.The hallmark of the work of Vorel et al. (2004) is a greater emphasis on the evaluation of visual impact of the landscape. There is an effort to maximize the objectification of evaluation in order to create a maximum standardized procedure.

To evaluate the recreational potential of the landscape (tourism) the following methodology will be selected - the methodology TERPLAN, according to the methodology by Vepřek (2002), and the methodology by Bína (2002), where the following issues will be selected: e.g. evaluation criteria by geographic, landscape-natural, cultural and historical values of the area. Specific criteria will be set for the evaluation of the observed indicators - recreational and aesthetic (e.g .sports facilities and trails, natural attractions, service facilities and their equipment, architectural and construction attractiveness, etc.) indicators for the landscape formation (natural, cultural and historical characteristics) technical and biotechnical elements of revitalization measures (e.g. the resulting character of the dam, bank reinforcement, character of the alluvial zone, accompanying vegetation plantings, etc.) The weight of these indicators and their criteria will be assessed in terms of the total recreational potential of the landscape and of recreational use. Finally, a table of evaluation indicators and their criteria will be set up. Subsequently, a proposal to create summarizing tables (field notebook) will be described in order to determine the overall effect of revitalization of recreational activities in practice. It will be possible to apply the proposed evaluation procedure to revitalization measures in urban environment and its surroundings.

Results

The outcome of the work is to propose an ongoing systematic procedure for assessment of the relevance of revitalization actions in terms of the recreational potential of the landscape and their impact on the development opportunities of the region. The result is a complex evaluation table that contains indicators and their criteria. The selection of these indicators and criteria has been carried out on the basis of the analyses of practical examples of revitalization in the Czech Republic and abroad, field research, comparison and synthesis of existing evaluation methodologies. See Tab. 1.

This table is assessed by a combination of two methods. Indicators and their criteria, which are the content of the assessment of the stated methodologies, are identified by the character X. Numerically, e.g. (1.1) are marked indicators and criteria that have an impact on other indicators of the mentioned methodologies. As an example, an indicator of the HEM methodology is stated, Langhamer (2008) –The riverside and the inundation area. This indicator also occurs in

evaluation ofmethodologies by Vrána et al. (2008), QBR, Šlezingr, Úradníček, (2002) and is marked with X. Revitalizing measures leading to riversideregulations and flood plain amendments have a significant impact on recreation and the creation of social security and amenities of the area. Furthermore, they are an important natural and aesthetic component of the landscape. These influences of revitalization (bio / technical, biological parameters) on recreation (perception of the landscape), the landscape character (structure and landscaping) are in the table marked numerically (3.2). Revitalizing treatment of riversides and inundation areas allow to increase the recreational potential of the area. However, the actual figures for recreation and the landscape character are not the condition for the revitalization of the riverbanks and flood plains.
Summary table (field notebook) for the evaluation of specific revitalization actions and the subsequent determination of total recreational effect of these actions will be designed according to the selected indicators, their criteria and will be complemented by other specific elements. Individual revitalization measures will be evaluated separately.
This off-road notebook will be complemented by another clear table with a description of the selected indicators, criteria and elements in terms of direct and indirect impact on the recreational potential of the territory. We will take into account the recreational, aesthetic, hygienic, safety, environmental, and technical aspects of revitalization measures. The proposed evaluation procedure can be applied to revitalization measures in urban environment and its surroundings.

Discussion
The presented methodology proposal is a partial (ongoing) outcome, which is currently being verified in the field on a model example of the river Ostravice in Ostrava, but also in the revitalization adjustments in the Czech Republic and abroad. The final version is the structure of the criteria used to determine the recreational potential of the revitalization actions. Based on field verification, it is necessary to specify the weight and value of each indicator. It can be assumed that the importance of revitalization actions for recreational potential is largely bound to the spatial extent of the revitalization. Since methodologies for the assessment of recreational potential / tourism potential do not distinguish between leisure opportunities for local people (mostly short-term recreation - half a day or one day recreation) and recreational potential in terms of visitors (multidays recreation), it will be necessary to incorporate this aspect of the methodology separately in the form of measure of importance - local regional, national (supraregional).

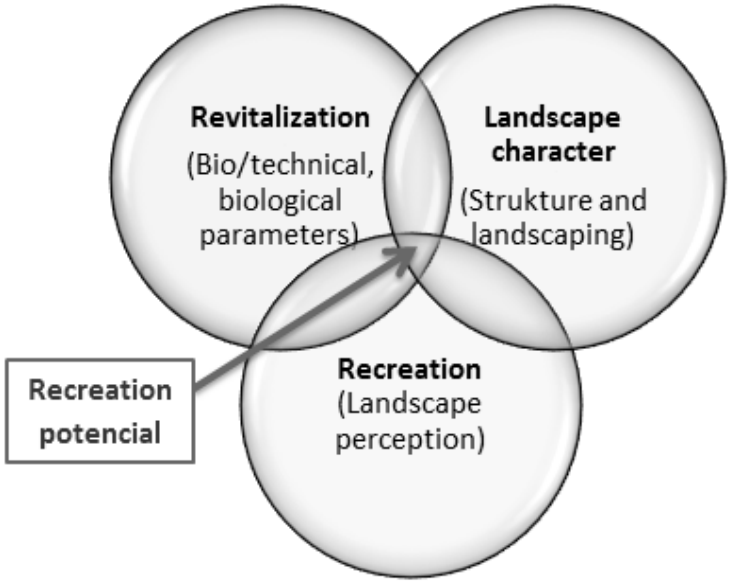

Fig. 1: Scheme of recreational potential

Tab. 1: Overview of current methodologies and evaluation indicators

	Evaluation methodologies							
	Revitalisation of water elements				Recreation			Landscape
Evaluation indicators and their criteria	HEM - Langhamer (2008)	Vrána et al.	QBR	Šlezingr, Úradníček (2002)	Dlna	Vepřek	TERPLAN	Vorel
1. River bed and flow path	X	X			5.,6.,7.,9.	5.,6.,7.		7.
1.1 trimness of flow path	X	X			5.,6.,7.,9.	5.1		7.
1.2 longitudinal river bed throughput	X	X			6.4,6.7,6.8,7.,9.	5.1		7.
1.3 river bed widths	X				6.7,6.8	5.1		7.
1.4 countersink in the longitudinal profile	X				6.4., 6.7	5.1		7.
1.5 countersink in the transverse profile	X				6.4., 6.7	5.1		7.
2. Bottom	X	X			6.,7.,9.	6.,7.		7.
2.1 bottom structure	X	X			6.4, 6.7,6.8,6.9			7.
2.2 bottom substrate	X				6.4,6.7,6.8			7.
2.3 bottom neatness	X				6.4,6.9,9.			7.,9.
2.4 dead wood in the river bed	X				7.,9.			7.,9.
3. Riverside and inundation area	X	X	X	X	5.,6.,7.,8.,9.	5.,6.,7.,8.	X	7.,9.
3.1 riverside neatness	X		X		5.,6.,9.	5.1	X	7.,9.
3.2 riverside vegetation	X	X	X	X	5.,6.,7.,9.	5.1	X	7.,9.
3.3 utilization of the riverside	X		X		5.,6.,7.,9.	5.1	X	7.,9.
3.4 utilization of floodplains	X		X		5.,6.,7.,8.,9.	5.1	X	7.,9.
4. Flow and hydrological regime	X				6.,7.,9.	6.,7.		7.
4.1 nature of the flow	X				6.4,6.7,6.8, 6.9			7.,9.
4.2 influencing the hydrological regime	X				6.4,6.7,6.9			7.
4.3 throughput of floodplains	X				5.,6.,8.,9.			7.,8.,9.
4.4 flow variability	X				6.4,6.7,6.11			7.
5. Presence of social amenities and security	1.,3.,4.	1.,3.	3.	3.	X	X		7.,8.,9.,
5.1 presence of service facilities	1.1,3.1-3.4, 4.3	1.1,3.2	3.1-3.4	3.II	X	X	3.1.-3.4	7.,8.,9.,
5.2 presence of information and educational elements	1.1,3.1-3.4.,4.3	1.1,3.2	3.1-3.4	3.II			3.1.-3.4	7.,8.,9.,
5.3 presence of rest mobiliary	1.1,3.1-3.4.,4.3	1.1,3.2	3.1-3.4	3.II			3.1.-3.4	7.,8.,9.,
5.4 presence of suitable transport infrastructure	1.1,3.1-3.4.,4.3	1.1,3.2	3.1-3.4	3.II			3.1.-3.4	7.,8.,9.,
5.5 suitability of the landscape for disabled people	1.1,3.1-3.4.,4.3	1.1.,3.2	3.1.-3.4	3.II			3.1.-3.4	7.,8.,9.,
6. Suitability of land for recreation	1.,2.,3.,4.	1.,2.,3.	3.	3.	X	X	3.	7.,8.,9.,
6.1 suitability of the landscape for walking and hiking	1.1,3.1-3.4.,4.3.	1.1.,2.,3.2	3.1-3.4	3.II	X		3.1.-3.4	7.,8.,9.,
6.2 suitability of the landscape for cycling	1.1,3.1-3.4.,4.3.	1.1.,2.,3.2	3.1-3.4	3.II	X		3.1.-3.4	7.,8.,9.,
6.3 suitability of the landscape for ski hiking	1.1,3.1-3.4.,4.3.	1.1., 2.,3.2	3.1-3.4	3.II	X		3.1.-3.4	7.,9.,
6.4 suitability of the landscape for recreation by the water	1.1,1.2,1.4, 1.5,2.1,2.2,2.3, 3.1-3.4, 4.1,4.2, 4.3,4.4	1.1.,1.2,2.1, 3.2	3.1-3.4	3.II	X		3.1.-3.4	7.,8.,9.,
6.5 suitability of the landscape for recreation-type forests	3.1-3.4	1.1.,2.,3.2	3.1.-3.4	3.II	X		3.1.-3.4	7.,9.,
6.6 suitability of the landscape for rural tourism	3.1-3.4.	1.1., 2.,3.2	3.1.-3.4	3.II	X		3.1.-3.4	7.,8.,9.,
6.7 suitability of the landscape for water tourism	1.1,1.2,1.3,1.4,1.5,2.1,2.2, 3.1-3.4.,4.1,4.2,4.3,4.4	1.1.,1.2,2.1, 3.2	3.1-3.4	3.II	X		3.1.-3.4	7.,8.,9.,
6.8 suitability of the landscape for sport fishing	1.1,1.2,1.3.,2.1,2.2, 3.1-3.4. 4.1,4.2,4.3,4.4	1.1.,1.2,2.1, 3.2	3.1-3.4	3.II	X		3.1.-3.4	7.,9.,
6.9 suitability of the landscape for watching water birds, a	1.1,2.1., 2.3,2.4, 3.1-3.4.,4.1,4.2,4.3,4.4	1.1., 2.1,3.2	3.1.-3.4	3.II	X		3.1.-3.4	7.,9.,
7. Signs of natural characteristics	1.1,1.2,2.2., 3.2-3.4,4.	1.1.,1.2.,3.	3.	3.2-3.4	X	X	3.	X
8. Signs of cultural and historical characteristics	3.4, 4.3.			3.IV	X	X		X
9. Signs of aesthetic value of the landscape	1.1,1.2,2.1,3.1-3.4,4.1,4.3	1.1.,1.2.,3.2	3.II	3.1-3.4			3.II	X

Conclusion

To determine the significance of revitalization measures in terms of recreation potential of the landscape, the following combination of methodologies has proved suitable:

A. Methodology for assessing the effectiveness (success) of revitalization
   - Methodology (HEM) Hydroecological monitoring (Langhammer, 2008),
   - The evaluation methodology of implemented revitalization actions - Selected waterways and small water tanks - (Vrána, Dostal, Vokurka, 2003)
   - The method of assessing the state of the riparian area - QBR index of river quality
   - The method of evaluation of the current state of riparian vegetation of the watercourse (Šlezingr, Úradníček, 2002)
B. Methodology for assessing the recreational potential (or potential tourism)
   - Assessment of recreational potential by the method of TERPLAN (natural recreational potential of the landscape)
   - Evaluation of the potential of tourism (Vepřek, 2002)
   - Methodical construction of evaluation of the tourism potential (Bína, 2002)
C. Methodology for assessing the landscape character
   - Methodology for assessing the impact of the proposed construction, activities or changes in land use on the landscape character (Vorel et al., 2004).

To create a system of criteria, groups of indicators from the (HEM) methodology were mainly used, e.g. theriver bed and the flow path, the bottom, the bank and the inundation area, flow and the hydrological regime. Furthermore, the methodology used by Bína e.g. suitability of land for recreation and the presence of social amenities and security. From the perspective of the landscape character according to Vorel et al. (2004) were selected indicators of natural, cultural, historical and aesthetic characteristics.

Within the project of the City of Ostrava "Revitalization of Ostravice River" our aim is to amend the river in a part of Ostrava in such a way so that it could serve the residents and visitors of the city as a pleasant area to spend their leisure time at, also for sport activities and environmental education. The revitalized river will contribute to improvement of the environment, at least in the city centre.

Based on the experience with application in practice, the methodology will be further specified (particularly in the potential coefficients and weights of criteria).

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Souhrn
Celkovým výstupem této prácebylonavrhnutí průběžného metodického postupu pro vyhodnocení významu revitalizačních opatření z hlediska rekreačního potenciálu krajiny. Výsledkem bylo vytvoření tabulky přehledu hodnotících ukazatelů a jejich kritérií. Následně navrhnutítvorby souhrnné tabulky (terénního zápisníku) pro stanovení celkového rekreačního efektu revitalizačních akcí v praxi. Tento průběžný návrh byl vytvořen na základě předchozích analýz praktických příkladů revitalizací v České republice a zahraničí, terénních průzkumů, komparace a syntézy stávajících metodik hodnocení.Pro návrh metodického postupu hodnocení revitalizací byly vybírány hodnotící ukazatele z metodik pro hodnocení revitalizačních akcí,krajinného rázu a rekreačního potenciálu území.Navrhovaný postup hodnocení bude možné aplikovat pro revitalizační opatření v urbanizovaném prostředí a jeho okolí.

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THE ECONOMIC VALUATION OF THE CHANGE IN FOREST QUALITY IN THE JIZERSKE HORY MOUNTAINS: A CONTINGENT BEHAVIOR MODEL

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Abstract
The paper presents a travel cost study which was conducted for the purpose of estimating a recreation value to the Jizerske hory Mountains in the Czech Republic. The value of forest recreation was derived using a single site travel cost model with count data models. The welfare change of recreation users associated with forest quality change was estimated using contingent behavior model, which relies on both observed behaviors and stated behaviors of visitors. Both actual trips and intended trips were pooled under the hypothetical scenario to estimate the value of forest quality change. Relevant information about visitors, their actual trip and recreation attitudes was gathered through an on-site survey in 2005. A total of 312 questionnaires were completed. The consumer surplus per trip to the site under the current conditions was about 713 CZK using Poisson model, 2 168 (negative binomial) and 2 248 CZK (generalized negative binomial). There was significant evidence of overdispersion that is why the negative binomial regression model was preferred to the Poisson model. The decrease in the welfare change in the access value associated with the impacts of air pollution on the quality of forest ecosystems was estimated at 462 CZK for one trip.

Key words: recreation demand, welfare change, poisson distribution, on-site sampling

Introduction

Non-timber functions of forest, such as recreational and aesthetical services, are not traded on ordinary markets; therefore their monetary values are not known directly. Stated and revealed preference techniques are some of the methods that can be used when placing a monetary value on non-traded goods. When using a revealed preference technique, e.g. travel cost method (TCM), we rely on observed behavior of individuals or households. Contrary to TCM, stated preference techniques rely on stated behavior of individuals in response to hypothetical situations.

There are two main approaches which combine stated and revealed preference data. The first approach is the random utility framework of trip choice modeling. This model has been used e.g. by Adamowicz et al. (1995).

The second approach is the contingent behavior model, which combines observation from contingent behavior with observations of actual behavior by the same individuals, using either pooled or panel data models. Englin and Cameron (1996) were the first to use a panel data approach in a study of the economic benefits of recreational fishing in Nevada. The pooled data model was followed by Eiswerth et al. (2000), who used a Poisson model to estimate the economic benefits of protecting water levels at Walker Lake, Nevada.

In this study, the single site model is applied to infer recreational values placed by visitors on the Jizerské hory Mountains (JH Mts.), one of the oldest landscape protected areas in the Czech Republic. Observed[2] and stated behaviors of recreation users are used to estimate the welfare change associated with the four hypothetical programs that improve or degrade the environmental quality[3] in the area. The contingent behavior model with the Poisson and negative binomial specification is used to estimate the welfare changes.

[2] Observed behaviors are measured by the actual number of trips to the recreation site and stated behaviors are expressed as the number of trips realized to the recreation site under hypothetical conditions.

[3] The hypothetical scenarios proposed (i) the decline of the forest quality of spruce wood in the near future because of continuing air pollution, (ii) the change of forestry composition in a favor of plant broad-leaved trees which are more resistant against air pollution than spruce wood, (iii) the designation of the bird area as a Natura 2000 network which will cover 40% of the area. The purpose of the bird area is to protect and increase population of two endangered bird species: black grouse and little owl, and (iv) charging an entrance fee into the bird area.

Economic foundation

Applying the single site travel cost model, we suppose that the individual's utility depends on a consumption of market goods, *x*, the number of trips to the recreation site, *v* and the environmental quality of site, *q* (Kolstad, 2000). Higher *q* is better. We also assume a weak complementarity of the trips and the environmental quality of the recreation site, *q*. The individual's utility is not influenced by environmental quality if the individual does not visit the site *(∂U/∂q = 0* when *v = 0*). Furthermore, *v* is increasing with *q* (Alberini and Longo, 2005). We also assume that the price of *x* is unity. The out-of-pocket expenses related to a single trip to the recreation site (fuel expenses, admission and parking charges) are denoted as p_0. The individual works for *L* hours at a wage rate *w*. Then, the individual's utility maximization problem can be recorded as follows:

$$\max_{x,v} U(x,v,q) \qquad (1a)$$

such that

$$wL = x + p_0 v \qquad (1b)$$

Out-of-pocket expenses are not the only cost of visiting the recreation site. The individual must take time to visit the recreation site. Thus, *T* denotes the total time expressed in hours that is available to the individual for leisure activities and work. The travel time associated with a single round trip is t_t and the on-site time associated with single trip is t_v. The individual then faces a time-budget constraint that we can be recorded as follows:

$$T = L + (t_t + t_v)v \qquad (1c)$$

Equation (1c) can be substituted into equation (1b) in order to eliminate *L* and thus reduce the maximization problem, so we get:

$$wT = x + [p_0 + w(t_t + t_v)]v \quad \text{or} \quad x + p_v v \qquad (2a)$$

where

$$p_v = p_0 + w(t_t + t_v) \qquad (2b)$$

The result of the maximization problem that is specified in equation (2) will be a demand function for trips to the recreation site:

$$v = f(p_v, q, y) \qquad (3)$$

where *y* is income (*wT*). We can assume that the demand function is log-linear and therefore we can write the demand equation as follows (Alberini and Longo, 2005):

$$v = \exp(\beta_0 + \beta_1 p_v + \beta_2 y + \beta_3 q) \qquad (4)$$

Using the demand function specified in equation (3) we can measure willingness to pay for a small change in environmental quality of the site, *q*. In fact, this is exactly the problem determined in the context of restricted demand.

Once the demand function is estimated, we can assess the consumer surplus (CS). If we follow the demand equation defined in (4) the consumer surplus is equal to (Haab and McConnell, 2002):

$$CS(p_{v0}, q_0) = \frac{1}{\beta_1} v_0 \qquad (5)$$

where v_0 is *v* estimated in equation (4) at the initial level of environmental quality (*q = 0*) and the price, p_v, is defined as in equation (2b).

According to Alberini and Longo (2005) the change in consumer surplus associated with the proposed change in environmental quality is defined as follows:

$$\Delta CS = CS(p_{v0}, q_1) \quad CS(p_{v0}, q_0) = \frac{1}{\beta_1}(v_1 \quad v_0) \qquad (6)$$

We can consider the consumer surplus (5) to be an approximation of the welfare that is associated with a visit to the recreation site, and the welfare change (6) to be the change of recreational value in response to variation in the environmental quality.

Sample characteristics

In order to apply the single site travel cost model, which relies on observed behavior of individuals, relevant information has to be obtained from visitors to the recreation site. Individual data are usually obtained by administering a survey. Therefore, a questionnaire that queried respondents about their current visit to the JH Mts., travel mode, attitudes, actual number of

trips to the recreation site and stated behaviors expressed as the number of trips realized to the site under hypothetical conditions was constructed. The survey on the JH Mts. was conducted from May to October 2005. Visitors doing summer recreational activities such as hiking and mountain biking in the central part of the JH Mts. were the target population of the on-site survey. The survey resulted in a total of 312 completed questionnaires.
6% of the respondent sample had come to the JH Mts. for the first time. The average number of trips in summer season (spring to autumn 2005) to the JH Mts. is 21.07 with a median value of 7. More than 11% of the sample made only one trip over the past 12 months. More than 31% of the sample made 1, 2, 3, or 4 trips to the JH Mts. A histogram of the numbers of trips is shown in Figure 1. Approximately 60% of the respondents were on a one-day trip to the JH Mts. when interviewed. More-day trips composed the rest of the sample.

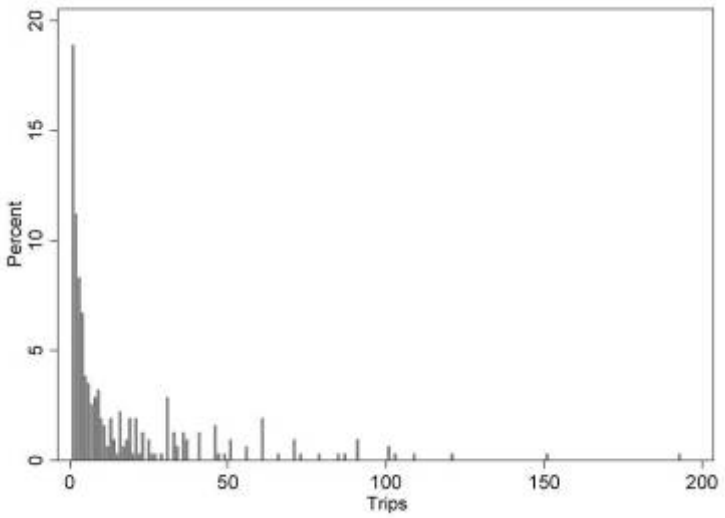

Fig. 1: Histogram of the number of trips realized to the JH Mts., N = 312

The total average cost spent on a trip per person was CZK 447. The costs included transport costs, accommodation costs and opportunity costs of time. The median value is CZK 108, and the maximum is CZK 5,820. The majority of the respondents (50%) were residents of the Liberecký Region, in which the JH Mts. are situated. Almost 26% of the sample came from Prague, the capital of the Czech Republic. The JH Mts. can be reached very easily from the capital by approximately a one hour's drive on a motorway.
More than 59% of the interviewed were male. The average age was 40 years, which is close to the medial value of 39 years. The average household size was 2.9 persons, the median value was 3 persons. The number of children per household was very low: the average was 0.5 child per family. The sample is highly educated as almost 52% of the respondents have secondary education, and 38% have a university degree. The majority of the respondents were married (51%), 37% of them were single. The economic status of the respondents is as follows. The majority, 59%, has full-time jobs, 18% are businesspeople, 8% are retired, and 6% are students. The average net individual income is 18.7 thousand CZK per month and the average net household income is 31.6 thousand CZK per month.
Table 1 presents the structure of the responses to the hypothetical situations in relation to enjoyment and number of trips. The majority of the respondents (83%) believed that in response to the implementation of the first program, i.e. 70% complete destruction of the spruce woods, their enjoyment from recreation in the JH Mts. would decrease. The rest of the respondents would have the same experience. 42% of the visitors stated that they would visit the site less often and 57% would not change the frequency of their visits.
If the second program was implemented, i.e. 80% of the area would be covered by broad-leaved trees, 34% of the respondents believed that their enjoyment would increase. 50% would have the same experience and 16% believed that their enjoyment would decrease. 11% of the visitors expressed that they would visit the JH Mts. more often, 5% would decrease their visitation rates.
In response to the designation of a bird area and an increase in the bird population, 45% of the respondents believed that their enjoyment would increase. The rest of the respondents would

have the same experience. 17% of the visitors stated that they would visit the site more often and the rest reported that they would not change the frequency.
If an entrance fee were implemented in the JH Mts., 24% of the respondents would visit the site less often. 74% of the visitors would not change the frequency of their trips.

Tab. 1: The structure of responses to hypothetical questions, in %, n = 312

	N (valid)	increase	equal	decrease
Change in enjoyment				
Spruce	309	0,32	17,15	82,52
Broad-leaved trees	308	34,09	49,68	16,23
Natura 2000	309	44,66	55,02	0,32
Change in number of trips				
Spruce	307	1,3	57	41,69
Broad-leaved trees	299	11,04	83,95	5,02
Natura 2000	304	17,11	82,89	-
Entrance fee	310	1,29	74,52	24,19

Specification of count data models
As one can see in Figure 1, the number of trips to the JH Mts. is proportionate to a model using a Poisson (P) distribution. The number of trips is a count data variable which can be denoted as *Y*. If we follow Haab and McConnell (2002), then the probability function for *Y* could be expressed as:

$$\Pr(Y = y) = \frac{e^{\lambda}\lambda^{y}}{y!} \qquad (7)$$

where the parameter λ is the expected number of trips and is a function of independent variables specified in the model. The expected value and the variance of *Y* are equal to λ. The number of trips is the non-negative integer variable and therefore λ usually takes a log linear form:

$$\lambda_{ij} = \exp(\mathbf{x}_{ij}\boldsymbol{\beta}_1 + p_{ij}\beta_2) \qquad (8)$$

where $\boldsymbol{x}$ is a vector of socio-economic variables and other variables determining the trip to the JH Mts. p_{ij} are the travel cost spent by the respondent ($i = 1, 2, \ldots, n$) on the trip. $\boldsymbol{\beta}_1$, and β_2 are unknown parameters.
The parameters in equation (8) are estimated using a maximum likelihood method. Using equation (7) and (8), the probability of observing the number of trips is estimated for each person in the sample.
When using the Poisson distribution, we assume that the expected value and the variance of *Y* are equal to λ. For recreational trip data, the variance is usually higher than the conditional mean, causing overdispertion in the data. The consequence of overdispersion is the fact that the standard errors in the case of the Poisson model are underestimated. The negative binominal (NB) regression model addresses the failure of the Poisson model by adding a parameter, α, that reflects unobserved heterogeneity among observation. The negative binominal distribution assumes the following form (Haab and McConnell, 2002):

$$\Pr(y \mid x) = \frac{\Gamma(y + \alpha^{-1})}{y!\Gamma(\alpha^{-1})} \left(\frac{\alpha^{-1}}{\alpha^{-1} + \lambda}\right)^{\alpha^{-1}} \left(\frac{\lambda}{\alpha^{-1} + \lambda}\right)^{y} \qquad (9)$$

Where $\Gamma()$ is the gamma function. The expected value of the negative binominal distribution is equal to λ. However, the variance of the dependent variable is $V = \lambda (1 + \alpha \lambda)$. The parameter is the overdispersion parameter. If $\alpha = 0$, no overdispersion exists. But if $\alpha > 0$, then overdispersion exists and the Poisson model is rejected in favor of the negative binominal distribution.
The application (9) restricts the overdispersion parameter α to a common value for all observation, so $\alpha_i = \alpha$. We use more flexible approach, generalized negative binomial model (GNB) that allows the overdispersion parameter to vary according to the characteristics of the visitors. Then, the parameterization of α *is* $\alpha_i = \alpha_0 / \lambda_i$ (Englin and Shonkwiler, 1995; Martínez-Espiñeira and Amoako-Tuffour, 2007).

Results

The specified count data models were estimated using a maximum likelihood method by means of STATA 11 software, and they are reported in Table 2. The coefficient of the travels cost variable is significant in these models and negative according to the economic theory. Its magnitude is from -0.0015 (P) to -0.0004 (NB). The numbers of trips increase with the respondents' age and decrease with the distance to the substitute recreation site. The visitation is higher for one-day trips compared to more-day trips. The numbers of trips tend to be greater among visitors with higher income and tend to be lower among people with university degree and if they area from the capital city, Prague. The length of the trip has a positive influence on the number of trips to the JH Mts. The number of people living in the household decreases the visitation rate to the JH Mts.

Tab. 2: Parameter estimates for on-site count data models

Variable	**P**	**NB**	**GNB**
travel costs	-0.0015***	-0.0004***	-0.0005***
distance to the substitute recreation site (in km)	-0.0002***	-0.0005***	-0.0005***
1=one-day trip; 0=more-day trip	0.3069***	0.5979***	0.5815***
number of people living in the household	-0.0930***	-0.0520**	-0,0656
respondents' age	0.0110***	0.0108***	0.0103***
university degree	-0.1538***	-0.2890***	-0.3020***
respondent living in Prague	-0.2903***	-0.3378***	-0.3176***
individual income (in thous. CZK)	0.0226***	0.0231***	0.0226***
length of current trip (in km)	0.0114***	0.0132***	0.0142***
mountain biker	0.1523***	0.2084***	0.1850**
1. scenario (forest quality decline)	-0.1437***	-0.1943**	-0.1981**
2. scenario (broad-leaved trees increase)	0,0094	0,0165	0,0148
3. scenario (designation of a bird area)	0.0409**	0,0541	0,0537
4. scenario (proposition of entrance fee)	-0.1553***	-0,1226	-0,1183
constant	2.0289***	1.5601***	1.6460***
alpha		1.0988***	1.1551***
number of children in the household			-0.1451***
university degree			-0.2410***
male			0.1529*
number of observations	1 475	1 475	1 475
Log-likelihood	-14 610	-5 149	-5 138
Pseudo R^2	0,313	0,057	0,059
$chi^2(14)$	13 331	627	645
AIC	29 250	10 330	10 313
BIC	29 329	10 415	10 414

Notes:

P - Poisson model, NB - Negative Binomial, GNB - generalized NB

* = p < 0,1; ** = p < 0,05; *** = p < 0,01

There is significant evidence of overdispersion, the NB model is preferred to the Poisson model. The GNB model allows the overdispersion parameter to vary according to variables that reflect visitor's characteristics: number of children, university degree and gender. The coefficients are highly significant, revealing that using the same overdispersion parameter for all observations would be overrestrictive.

The key variables for placing a monetary value on a change in environmental quality are the dummies corresponding to the hypothetical scenarios. As shown in Table 2, the only scenario

with a significant influence on the number of trips in the best fitted GNB model is the program affecting the quality of the spruce wood. As expected, its coefficient is negative.
We use the travel cost coefficients reported in Table 2 to calculate welfare measures in terms of the CS users derive from having access to the park. The average CS per season (in CZK of 2005) associated with an access to the JH Mts. ranges from 6 885 CZK for Poisson model to 24 274 CZK (GNB). The consumer surplus per visit is from 713 CZK to 2 248 CZK, respectively. If the spruce wood scenario were implemented, the welfare change based on the GNB estimates would decrease by about 4 988 CZK on average over the sample. If we express the welfare change per trip and person we come to the value of 462 CZK.

Discussion and conclusions
We have used on-site survey data from Jizerské hory Mountains to estimate and compare a set of count data models of recreation demand. Our results confirm, in line with earlier works based on recreational sites in the US and Europe that a model that corrects for overdispersion dominates more restrictive models in terms of goodness of fit.
The theoretical implications for the estimation of welfare estimates, i.e. consumer surplus, are as expected. The coefficient of the travels cost variable was significant in all specified count data models and negative according to the economic theory. Not correcting for overdispersion (by relying on Poisson estimates) substantially understates true consumer surplus.
The average consumer surplus per trip was about 713 CZK for the Poisson, 2 168 CZK for negative binomial and 2 248 CZK for generalized negative binominal.
Actual trips alone do not allow estimating the value of the forest quality change and other public programs that would influence the visitors' experience. Therefore, the actual trips were pooled with the hypothetical trips. This yielded estimates of the value of the change in the surplus associated with the new conditions.
Only the scenario under which the quality of the spruce wood would decrease had a significant influence in the best fitted model GNB on the visitation rate. As expected, its coefficient was negative. The welfare change of the access value associated with this program was estimated at 4 988 CZK. If we express the change of consumer surplus per trip we come to 462 CZK.

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Souhrn
Příspěvek představuje odhadnutý empirický model rekreační poptávky po Jizerských horách (JH), který byl vytvořen na základě tzv. single-site modelu cestovních nákladů. Tento model umožňuje určit, které významné determinanty působí na rekreační poptávku po Jizerských horách, a také umožňuje odhadnout rekreační přínosy plynoucí návštěvníkům této oblasti. Vliv environmentální a cenové změny na rekreační poptávku po Jizerských horách byl odhadován modelem podmíněného chování, který kombinuje projevené a vyjádřené preference návštěvníků Jizerských hor. Model podmíněného chování umožnil určit, jak silně působí environmentální a cenové změny na rekreační poptávku po Jizerských horách, a také umožnil odhadnout změny rekreačních užitků, které jsou vyvolané těmito změnami. Změna rekreačního užitku byla sledována v návaznosti na realizaci čtyř hypotetických scénářů: (i) zhoršení kvality smrkových porostů, (ii) změna druhové skladby lesního porostu, (iii) zvýšení populace ohrožených ptačích druhů a (iv) zavedení vstupního poplatku.
Pro odhad modelu cestovních nákladů byla využita data z dotazníkového šetření v Jizerských horách, které bylo realizováno od května do října 2005. Celkem bylo získáno 312 platných dotazníků. Cílová populace představovala soubor návštěvníků území (zejména cykloturisté a pěší turisté) centrální části Jizerských hor, kteří zde realizují letní rekreaci.
Z výsledků je patrná velká variabilita hodnot mezi použitými typy modelů. Dolní odhady poskytují modely vycházející z Poissonova rozdělení, kdy v případě Poissonova modelu byl odhadnut spotřebitelský přebytek na 713 Kč na výlet a osobu. Negativní binomické modely poskytují o poznání vyšší odhady rekreačních přínosů. Pohybují se v rozmezí hodnot od 2 168 Kč (negativní binomický model) až po 2 248Kč (generalizovaný binomický model).
V modelu podmíněného chování, který vychází z odhadu generalizovaného binomického modelu, byl prokázán významný negativní vliv snížení kvality smrkových porostů na rekreační poptávku po Jizerských horách. Významnost ostatních hypotetických změn se v tomto modelu neprojevila. Hodnota rekreačních přínosů plynoucí z 1 návštěvy JH poklesne v důsledku snížení kvality smrkových porostů v Jizerských horách o 462 Kč.

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THE EVALUATION OF RECREATIONAL POTENTIAL OF RAJECKA DOLINA WITH AN EMPHASIS ON LANDSCAPE STABILITY AND ECOLOGICAL SIGNIFICANCE

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Abstract
The aim of the contribution is to point out modern method for recreational potential evaluation of the example of Rajecka dolina. Presented approach is based on a combination of several well-known methodologies of recreational potential evaluation, landscape stability evaluation and the determination of the most important local ecological values. The main goal of the contribution is to enrich standard tourist attractions by highlighting local natural values while respecting their vulnerability to human activities. Integral parts of this proposed method are graphic delineations of basic analytical characteristics such as abiotic, biotic, socio-economic and cultural values of the territory and a map of current landscape structure. These data are processed into synthesis step where spatial relations are evaluated and coefficients of ecological stability are calculated. The list of the most important positive and negative features of Rajecka dolina gained by consecutive data evaluation and components with major ecological values are determined. The information needed for identifying of areas with the most significant recreational potential is based on this comprehensive evaluation. Finally, the recent state of recreational potential is discussed with a respect of landscape ecological values of model territory as well as the suggestion of potential development possibilities for local recreation.

Key words: recreational potential, landscape structure, stability, vulnerability, ecological values

Introduction

The realisation of recreational activities depends on natural, social, and technical conditions of particular locality. In general, relationships between the tourism and landscape where tourism enters in and which is therefore affected, are not fixed or consistent in time and space. For that reason it is important to specify factors that are particularly important in solving problems of territorial tourism development such as the evaluation of landscape potential for the recreation (Williams, 2009). The concept of recreational potential of particular landscape covers natural and anthropogenic. Natural potential with relatively stable nature has a primary importance for the determination of functional landscape use and it determinates its quality and suitability for recreational utilization (Kopšo, 1992).

In recent years, recreational potential has become increasingly significant from the perspective of both local and regional development opportunities. Therefore the evaluation of recreational or tourism potential has turned out to be an essential technique for considering background conditions of particular landscape and for selecting recreational activities that are most suitable. Until now, several methodologies for recreational potential evaluation have been developed (Mariot, 1983; Butler et al., 1997; Kliskey, 2000; Pralong, 2005; Anděl et al., 2008; Krnáčová et al., 2010; Moaramnejad et al., 2013). However, different methodological complications are still recognizable. The major are the absence of ideal (etalon) landscape to compare with, human subjectivism in perception of different environmental features, the optimum amount of indices for comprehensive landscape characterisation and the objectivity and simplicity of investigation (Lepeshkin, 2007). In suggested approach used in our contribution we try to minimize some of these mentioned barriers. For better understanding, proposed method was applied to a model area Rajecka dolina, which is the area with high natural potential, preserved cultural heritage and favourable conditions for tourism development.

Material and methods

The method proposal outlines an identification of major recreational activities with a respect to local natural conditions and main socio-economic factors. Presented approach goes through several stages:

1. Description of research area
2. Selection of recreational activities and their weights
3. Evaluation of specific indicators
4. Evaluation of modification factors
5. Synthesis of all data.

In the first step, research area should be described in detail in terms of basic natural characteristics such as local abiotic and biotic conditions. This step also includes socio-economic description of the landscape as well, mainly the identification of protected areas and culture and social phenomena. This examination of the landscape is based on LANDEP method (Ružička, Miklós, 1982). The step is followed by landscape structure investigation, i.e. current landscape structure mapping with the identification of basic structural elements and their spatial organization.
In the second step, specific recreational activities are selected and their weights are evaluated. The list of activities is based on the research conducted by Department of tourism ME SR (2005). Individual activities are picked out in a view of their homogeneity regard to major forms of the tourism in model region. Since all of them have different importance in tourism development, their significance in terms of their ratio of every tourism outputs is expressed by a weight. Each activity is assigned with weighting value from 1 to 10 corresponding to its importance for tourism as a whole.
The third part includes the evaluation of specific indicators, each of which affects individual recreational activities. Indicators of natural potential and cultural and historical potential are selected according to Anděl et al. (2008) and modified according to the character of research area. Together, 12 basic indicators are selected (Table 1). Each indicator is assigned with a value from 1 to 4. This is based on specific criteria that refer to the portion of elements of landscape total area, their quantity or particular range of grades or altitudes. All necessary indications can be obtained from basic analysis of research area where different data sources are used such as available maps, atlases, information systems, local researches, statistic surveys, etc. Finally, initial synthesis is done where the values of indicators are processed with the weights of each specific recreational activity.

Tab. 1: Set of evaluation indicators and their valuation.

Code	Indicator	Value 1	Value 2	Value 3	Value 4
I_1	Climate region	valley	hilly	mild uplands	uplands
I_2	Elevation	< 500m	500 – 900m	900 – 1200m	> 1200m
I_3	Slope	0 – 4°	4 – 8°	8 – 18°	> 19°
I_4	Water areas	0 – 2	3.V	6.VII	> 8
I_5	Forests	0 - 5%	5 - 30 %	30 - 60%	> 60%
I_6	Non-forest vegetation	0 - 5%	5 – 10%	10 – 20%	> 20%
I_7	Grasslands	0 – 5%	5 – 30%	30 – 60%	> 60%
I_8	Gardens and orchards	0 – 2%	3 – 5%	6 – 8%	> 9%
I_9	City parks	0 - 1	2	3	> 3
I_{10}	Protected areas	1	2	3	> 4
I_{11}	Cultural heritage	0 – 2	2.IV	4.VI	> 6
I_{12}	Spa areas	0	1	2	> 2

In the fourth step, modification factors are identified (Table 2). These factors have the capability to affect natural and cultural potentials indicators. In this set of factors are include landscape elements that are not related directly to the tourism and recreation but they influence them in a positive or a negative way. The list of selected factors is based on the set of factors used by Dpt. of tourism ME SR (2005) and it is modified to encompass oof ur requirements for identifying all major impacts on recreational potential.

Each factor is assigned with a value from range +2 to -2 which refer to the impact intensity on particular recreational activities in research area. The majority of essential data needed for this assignment are obtained from the map of current landscape structure (step 1). Landscape ecological stability is determined according to coefficient of ecological stability. In order to ensure the most reliable outcome, different coefficients should be used (Miklós, 1986; Löw, 1984 and Míchal, 1982) and the final result is detected by their mutual comparison. Environmental significance of the area is determined according to actual conditions of landscape elements and their ecological quality which is identified by field mapping. Five-point

scale is created for this factor where 1 refers to the least environmentally significant element and otherwise 5 means that the component is the most environmentally valuable.
The fifth step covers the overall synthesis of all obtained information. Qualitative data (numerical values) are converted into quantitative ones (verbal expression of these values and their importance for conducted research). Finally, the statement of the most suitable recreational activities according to local natural and cultural potentials is expressed.

Tab. 2: List of modification factors.

Code	Modification factor
F_1	Ecological stability
F_2	Environmental significance
F_3	Agricultural areas
F_4	Industrial areas
F_5	Mining
F_6	Environmental loads
F_7	Proximity to settlements
F_8	Transport accessibility

Results of Case Study
The model area Rajecka dolina is located in western part of Žilina region (Picture 1). Rajecka dolina covers 2 463 319.794 km^2 and has mostly upland character.

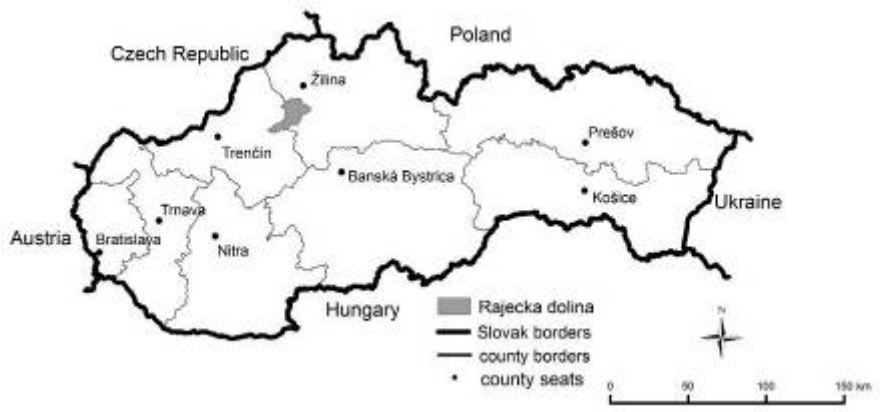

Fig. 1: Rajecka dolina location within Slovakia

From the first methodological step, some basic characteristics are experessed. The valley belongs to the inner Carphatian and falls into Fatra-Tatra region. Rajecka dolina is formed by Stražovska vrchovina from western part and is bordered by the massif of southern section of Mala Fatra, Lučanska Mala Fatra from eastern part (Mazúr and Lukniš, 2002). The valley is completely deforested with the predominance of arable land and grasslands. Within the area there is a first class road I/64, which connects Horne Považie region with Prievidza city and it continues towards Horna Nitra region through Fačkovske sedlo. From climatic point of view, the locality extends into two climatic zones, slightly warm and cold climatic zone. The average annual temperature is 8 ºC, in the higher altitudes about 4ºC (Lapin et al., 2002). Rajecka dolina is hydrologically integrated into river basin of river Rajčianka, which flows mainly by north and northeast direction, whereas it is getting more minor and major tributaries. Local soils are predominantly fluvial and gley on the floodplain of Rajčianka (Granec and Šurina, 1999). The area is characterized by lots of habitats, where living communities still have original character with many endemic species, glacial relicts and mountain and alpine species. There is also a quite perspective range area of hot water. The most important spot which provides healing resources, underhill climate and clean air is Rajecke Teplice spa.
As the part of this first methodological step, the map of current landscape structure was created (Picture 2). According to this map, we figured out that more than a half of Rajecka dolina

territory is formed by forests with the area of 1 542 512.655 km^2. The remaining landscape structure of Rajecka dolina is partly arable land and partly grasslands character, about 15% of each one. Built-up areas cover about 3% of whole territory.

In the second analytical step, seven major recreational activities for Rajecka dolina were selected (Table 3). Specific weight for each activity was assigned according to Regionalisation of tourism in Slovakia (Dpt. of tourism ME SR, 2005), these values are based on accurate statistical surveys about the quantity of tourists in Slovakia and on interviews with professionals.

Tab. 3: The list of recreational activities and their weight

Activity	Weight
Water recreation and fishing	5
Walking, hiking	8
Rural tourism	3
Cycling	6
Ski activities	7
Rock climbing	1
Sightseeing	10

As the third step, values of specific indicators of natural and cultural potentials were evaluated. According to first three indicators, the area was divided into four minor parts with different conditions (Picture 3). Values of the rest of them were not differentiated within the territory because they have the same values for the whole area (these are graphically delineated on the Picture 2).
Value 4 was given to forests according to the fact that they cover more than 62 % of Rajecka dolina. While grasslands cover 14.19 % of the territory, value 2 was assigned them. To gardens and orchards were given value 1 hence they cover only 0.45 %. To non-forest vegetation was given value 1 because it covers only 2.85 % of area. As in model locality are only two of water areas they were also assigned with the value 1. In Rajecka dolina there are only 2 city parks, therefore the value of this indicator is 2. In the territory can be found several small-scale and also large-scale protected areas and also NATURA 2000 sites, so to this indicator was given the value 4. Thirteen tangible cultural and historical monuments can be found here, so the value of this indicator is also 4. Finally, there is only one spa area in Rajecke Teplice, so value 2 was assigned for this last indicator.
As the result of this step initial synthesis was done where values of all used indicators were multiplied with the weight of each recreational activity (Table 4).

Tab. 4: Evaluation of indicators with activities weights for Rajecka dolina

Activities	Indicators											
	I_1	I_2	I_3	I_4	I_5	I_6	I_7	I_8	I_9	I_{10}	I_{11}	I_{12}
Water recreation and fishing	20	5	5	5	20	5	10	5	10	20	20	10
Walking, hiking	24	16	32	8	32	8	16	8	16	32	32	16
Rural tourism	12	3	6	3	12	3	9	3	9	12	12	6
Cycling	18	12	24	6	24	6	12	6	12	24	24	12
Ski activities	21	21	28	7	28	7	14	7	14	28	28	14
Rock climbing	3	3	4	1	4	1	2	1	2	4	4	2
Sightseeing	40	10	20	10	40	10	20	10	20	40	40	20

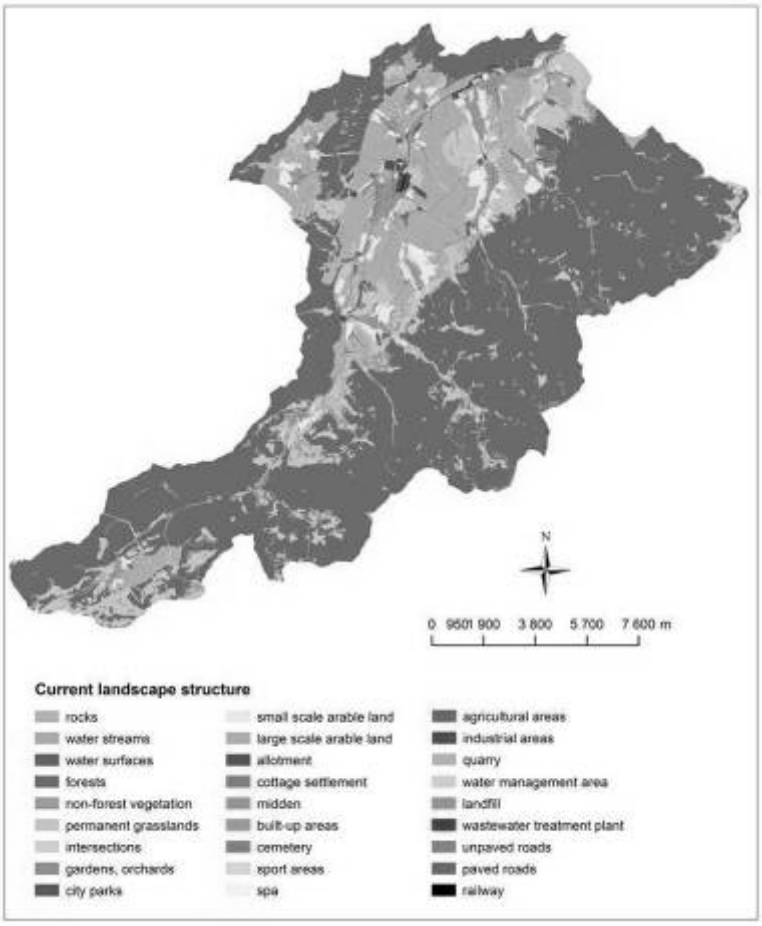

Fig. 2: Map of current landscape structure of Rajecka dolina

In the fourth step, other partial analysis was done by the evaluating of determined values of modificated factors to each recreational activity (Table 5). First factor includes information about the overall ecological stability of model area. Three different coefficients were calculated and their mutual comparison indicated high ecological stability of the area. Environmental significance was evaluated for each landscape structure element individually (Picture 3). Other factors are recognizable from the map on Picture 2.

Tab. 5: Evaluation of modification factors for Rajecka dolina.

Activities	Modification factors							
	F_1	F_2	F_3	F_4	F_5	F_6	F_7	F_8
Water recreation and fishing	2	2	-2	-1	-2	-1	0	2
Walking, hiking	2	2	0	0	-2	0	1	2
Rural tourism	2	1	2	0	-1	0	2	2
Cycling	2	1	-1	0	-1	0	1	2
Ski activities	2	1	0	0	0	0	1	2
Rock climbing	2	1	0	0	0	0	1	1
Sightseeing	0	0	0	0	-1	0	2	2

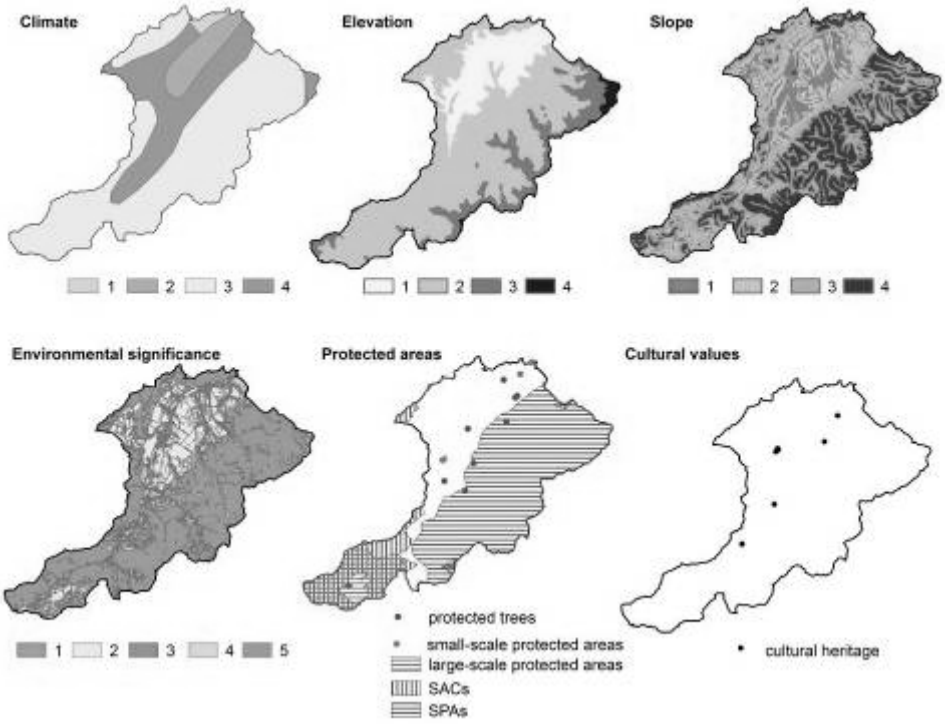

Fig. 3: Graphical delineation of some indicators and modification factors.

The fifth step of this method represents a synthesis of all obtained data. All the quantitative numerical values were calculated together and according to their outcomes, the most suitable recreational activities were selected (Table 6). According our outcomes, the sightseeing, cycling, walking (hiking) and ski activities were selected as the most suitable for the territory of Rajecka dolina. This area has good conditions also for water recreation and fishing. Rural tourism and rock climbing were evaluated as the recreational activities with less potential.

Tab. 6: Evaluation of modification factors and final results

Activities	Final values
Water recreation and fishing	135
Walking, hiking	245
Rural tourism	98
Cycling	274
Ski activities	223
Rock climbing	36
Sightseeing	283

Discussion

The presented method was selected according to more well-known techniques created by Ružička and Miklós (1982), Anděl and Balej (2008), Blankenship (2009), Zvara (2011), Moharamnejad (2013) and research recommendations summarized by Veal (2011). We consider this method as simple one, it works with available techniques and is also less expensive. This procedure allows to change the lists of activities, indicators and factors according to local conditions of territories that are evaluated. The weights of activities also depend on assessed area and statistical surveys of tourists number. Within this method, actual conditions of landscape elements and their ecological stability and environmental significance are discussed. Suggested method tries to react to actual methodological requirements for recreational potential assessment and tries to eliminate current local problems in research area.

Basically, there are two basic approaches how to evaluate recreational potential (Zvara, 2011). Local natural and anthropogenic characteristics can be assessed to find out either the most proper areas for the recreation and tourism or to find the most suitable activities specific for the area, alternatively their combination. Our methodology is based on the second approach; the evaluation of recreational potential covers the selection of specific recreational.

Conclusions

In the contribution a proposal of new method for the recreational potential assessment is presented. The technique is based on various well-known methodologies. It consists detail analysis of local environment, the selection of activities with high potential for development within assessed area, the weighting on the base of tourists number, the selection of natural and cultural potential indicators and the identification of modified factors and their evaluation. Collectively, this methodology takes into account the real situation, needs and requirements of the territory and needs and requirements of tourists as well.

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Souhrn
Cílem příspěvku je prezentace moderní metody hodnocení rekreačního potenciálu na příkladu Rájecké doliny. Uvedený přístup je založen na kombinaci několika dobře známých metodologií hodnocení rekreačního potenciálu, hodnocení stability krajiny a stanovení nejdůležitějších místních ekologických hodnot. Hlavním cílem příspěvku je obohacení běžných turistických zajímavostí pomocí zdůraznění místních přírodních hodnot za současného respektování jejich zranitelnosti vzhledem k antropickým aktivitám. Nedílnou součástí navržené metody je grafické znázornění základních analytických charakteristik, jako jsou abiotické, biotické socioekonomické a kulturní hodnoty území a mapa aktuální krajinné struktury. Tato data jsou zpracována v syntetické fázi, během níž jsou vyhodnoceny prostorové vztahy a spočítány koeficienty ekologické stability. Seznam nejdůležitějších pozitivních a negativních jevů v Rájecké dolině je stanoven na základě následného hodnocení dat a prvků s hlavní ekologickou hodnotou. Informace potřebné pro vytipování oblastí s nejvýznamnějším rekreačním potenciálem je založena na tomto komplexním hodnocení. Konečně, stávající stav rekreačního potenciálu je řešen s ohledem na krajinně ekologické hodnoty modelového území tak, jako doporučení potenciálních možností rozvoje místní rekreace.

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THE FINANCIAL ANALYSIS OF THE NATIONAL PARK PODYJÍ

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Abstract
This paper deals with the financial analysis of Podyjí National Park Administration (Podyjí NP Administration) in the years 2010 - 2012. NP Administration is a state-funded organization created by the Ministry of the Environment of the Czech Republic. Its purpose is to administer the Podyjí area which has a special status of a protected area. The financial analysis procedure focuses on aggregation of the financial statement-related (balance sheet, profit and loss account) indicators. The chosen financial analysis methods included the differential indicators analysis (net working capital) and analysis of selected ratio indicators (economic activity, liquidity, and debt indicators). The author also employed fundamental characteristics of time series (simple arithmetic mean, average absolute increase, growth rate, and the average growth rate). In order to perform a complete overview of economic behaviour of the examined entity, the paper includes charts with overviews of the significant items of income and expense and the National Park´s profit development during the analysed period. The aim of the paper is to evaluate and compare the obtained indicators with financial indicators from previous years.

Key words: financial ratios, characteristicsof the time series, costs, revenues, profit

Introduction

Attitudes towards protected areas are seen as key determinants for creation and a successful operation of protected areas (MANFREDO,1992; MOSE, WEIXLBAUMER, 2007; SCHAAL, 2009). Protected areas, such as national parks, represent the cornerstones of environmental policies both at national and international levels (EAGLES, McCOOl, 2002; IUCN, 1994).
Podyjí National Park (Podyjí NP) was established on 1 July 1991 by Government Regulation No. 164/1991 Sb. In order to ensure protection of nature in the National Park Podyjí and its protection zone, the Ministry of the Environment created the Podyjí NP Administration, which is based in Znojmo, on 1 July 1991.
Podyjí NP is located on the border with Austria, between Znojmo and Vranov nad Dyjí. Podyjí NP is the smallest national park in the Czech Republic - it has 63 km², its protection zone covers an area of 29 km², 84% of the area are forests, 9% is the agricultural land, and 7% are other types of landscape.
Podyjí NP Administration performs three principal types of activities:

- State administration in the field of environmental protection and protection of agricultural land and fisheries,
- The environmental protection-related activities, especially coordination of research and monitoring, creation of conservation management plans, information service and surveillance, environmental education and promotion,
- Economic activities including forest and selected non-forest areas management and game management (BŘEZINA, 2011).

Material and methods

Theoretical Background
Management of state-funded organizations is defined in Act No. 218/2000 Sb. on Budgetary rules and in Act No. 219/2000 Sb. on Property of the Czech Republic. The accounting is regulated by Regulation No. 410/2009 Sb., Implementing Act No. 563/1991 Sb. on Accounting (BŘEZINA, 2011).
A financial analysis usually includes two analytical techniques - percentage analysis and ratio analysis. The basis of both techniques are the absolute indicators, i. e. state and flow variables that form the contents of financial statements.
The most important differential indicator is the working capital. The basis for its calculation is the balance sheet. (KISLINGEROVÁ et al., 2010).
The fundamental tool of financial analysis is the analysis of ratios whose values are given by the financial accounting statements. They include profitability ratios, activity ratios, liquidity ratios, debt ratios, and capital market indicators (NÝVLTOVÁ, MARINIČ, 2010).
Activitity ratios are used primarily in asset management. Assets from the balance sheet and sales from the profit and loss account are interrelated. Liquidity ratios (or debt ratios) reflect the

fact that companies use external sources to finance their assets. Liquidity means the ability to pay due liabilities, it is a necessary condition for each company´s viability (KISLINGEROVÁ et al., 2010).
One of the most important tasks of statistical analyses of economic phenomena is the identification of dynamics of these phenomena. Simple rates of time series dynamics enable identification of fundamental features of "behaviour" of the time series, they also enable formulation of criteria for the time series´ modelling. The average value of an interval time series is calculated as a simple arithmetic average. A very important measure of time series dynamics is the growth rate. The average growth rate is calculated as the geometric mean of individual growth coefficients. The mean absolute increase is the change in value in time t compared to time t - 1(ARTL, ARTLOVÁ, RUBLÍKOVÁ, 2002).
Materials
Financial statements for the years 2010 - 2012 (balance sheets, profit and loss statements).

Methodology

1 Activity ratios

$$Total\ Inventory\ Turnover = \frac{\sum \text{total sales}}{\text{average stocks}}$$

$$Total\ Assets\ Turnover\ Ratio = \frac{total\ sales}{\sum total\ assets}$$

2 Liquidity ratios

$$Current\ Ratio = \frac{current\ assets}{\text{short} - \text{term liabilities}}$$

$$Quick\ Asset\ Ratio, Acid\ test = \frac{current\ assets - stocks}{\text{short} - \text{term liabilities}}$$

$$Cash\ Position\ Ratio = \frac{financial\ assets}{\text{short} - \text{term liabilities}}$$

3 Debt ratios

$$Debt\ Ratio = \frac{total\ debt}{total\ assets} \text{ x 100 [\%]}$$

$$Undercapitalized = \frac{own\ capital + \text{long} - \text{termallen capital}}{fixed\ assets}$$

$$\frac{\sum assets}{own\ capital} - Financial\ leverage$$

(NÝVLTOVÁ, MARINIČ, 2010).
Net Working Capital
NWC = current assets – short-termliabilities(KISLINGEROVÁ a kol., 2010)

The growth rate

$$k_t = \frac{y_t}{y_{t-1}}$$

The average growth rate

$$\overline{k} = \sqrt[n-1]{k_2\, k_3\, \ldots\ldots . k_n}$$

The averageabsolute increase

$$\overline{\Delta} = \frac{yt - y1}{T - 1}$$

The arithmeticaverage

$$\overline{y} = \sum_{t=1}^{T} yt \frac{\square}{T}$$

(ARTL, ARTLOVÁ, RUBLÍKOVÁ, 2002)

Results

This part of the paper contains the results of ratios´ evaluations. The activity ratios´ values are shown in Table 1, Table 2 contains values of debt ratios, and Table 3 shows values of liquidity ratios.

The total assets´ turnover value is very low and its development has been stable. The total inventory turnover ratio has been declining. The average growth rate of the monitored ratios has not exceeded 1 (see. tab. 1).

The value of total debt is low with a slightly upward tendency. The low debt is due to a high proportion of equity capital. The capitalised value is slightly above 1, which also indicates a high share of equity capital (the entity is slightly undercapitalised - short-term liabilities cover a part of fixed assets). The value of financial leverage is low and has a stable tendency. This is given by the fact that the NP Administration does not use external sources due to the entity´s legal form. The average growth rate of the monitored ratios has been around 1 (see. tab. 2).

The liquidity of the Podyjí NP Administration reaches high values and a has a slightly rising tendency. This is due to the prevalence of current assets over current liabilities. On average, in all three liquidities the current assets´ value predominates more than 7.95 times over current liabilities. The average growth rate of the monitored ratios has been around 1. The differential ratio´s value (working capital) is also high (due to the low value of current liabilities and a high proportion of current assets) and has a rising tendency. The working capital´s average growth is 1.20 (see. tab. 3).

In the years 2010 - 2012, the largest cost items were other services, labour costs, material consumption, and depreciation. The individual cost items have had a slightly downward tendency. In 2012, they decreased on average by 12% compared to 2010, excluding depreciation which slightly increased by 8% (see. fig. 1).

The biggest part of revenues during the reporting period came from transfers. Their average share in total revenues was 77%. Revenues from own products´ sales are generated by sales of timber, game, and seeds. On average, the income from timber sales represent 97% of all revenues from own products (see. fig. 2).

We can see an increase in the net profit in 2012 compared to other years of the analysed period. It has been caused by reduction of cost of other services, repairs and maintenance, and material consumption, and, on the other hand, by higher revenues from sales of products (timber). The organization´s profit has had an upward trend during the analysed period (see. fig. 3).

Discussion

The total assets´ turnover value is very low and its development has been stable. The total inventory turnover ratio has been declining (see. tab. 1). Hlaváčková and Kalousek (2010) reported the same findings when analysing the Podyjí NP´s economic activities during the period 2005-2009. The liquidity of the Podyjí NP Administration reaches high values and a has a slightly rising tendency. This is due to the prevalence of current assets over current liabilities. The current liquidity´s three-year average value is 8.90, the available liquidity´s 8.16, and the immediate (cash) liquidity´s 6.79 (see. tab. III). Hlaváčková and Kalousek (2010) calculated the following average values of the Podyjí NP´s liquidities in the period 2005-2009: current (total) liquidity 7.26, available liquidity 6.64, immediate (cash) liquidity 4.89. We can see that the liquidity ratios have an increasing tendency. Kislingerová et al. (2010) recommends these average values of liquidity: normal (total) liquidity 1,6 – 2,5, 2,5 when employing a conservative strategy, less than 1,6 for an aggressive strategy, never less than 1,0. Available liquidity 0,7 – 1,0, 1,1 – 1,5 for a conservative strategy, 0,4 – 0,7 for an aggressive strategy. The recommended value for cash liquidity is 0,2. The differential ratio´s value (working capital) is also high (due to the low value of current liabilities and a high proportion of current assets) and has a rising tendency (see. tab. 3). Hlaváčková and Kalousek (2010) also identified an upward trend in working capital during 2005 – 2009. The largest cost item in the years 2010 – 2012 were other services (costs associated with forest management and production) and labour costs (see. fig. 1). The same findings about the period 2005 – 2009 present Hlaváčková and Kalousek (2010). The biggest part of revenues during the analysed period came from transfers. Their average share in total revenues has been 77%. Revenues from own products´ sales are generated by sales of timber, game, and seeds. On average, the income from timber sales represent 97% of all revenues from own products (see. fig. 2). The same findings about the period 2005 - 2009 bring Hlaváčková and Kalousek (2010). These authors even report a 38% increase in the founder´s contributions in 2008 compared to 2007. Kupčáková (2010) identified

a balanced trend in contributions the founder has been providing to support the organization´s activities during the period 2003 - 2006. In the period 2010 - 2012 the profit has had an upward trend (see. fig. III). Hlaváčkova and Kalousek (2010) came with the same results, except for 2009 where there was a significant drop in profit.

Tab. 1: Activity ratios of the National Park Podyjí in years 2010 – 2012

Item name	2010	2011	2012	$\bar{y}$	$\bar{\Delta}$	$\bar{k}$
Total sales	11275,00	10872,39	12652,88	**11600,09**	**688,94**	**1,06**
Total sales (witho ut fixed assets)	11236,00	10872,39	12612,00	**11573,46**	**688,00**	**1,06**
Total assets	352881,00	362145,90	368312,95	**361113,28**	**7715,98**	**1,02**
Stocks	1559,00	2189,84	3663,86	**2470,90**	**1052,43**	**1,53**
Total costs	51414,00	54747,33	48232,50	**51464,61**	**-1590,75**	**0,97**
Total Inventory Turnover	**6,77**	**5,80**	**4,31**	**4,68**	**-1,23**	**0,80**
Total Assets Turnover Ratio	**0,03**	**0,03**	**0,03**	**0,03**	**0,00**	**1,00**

Tab. 2: Debt ratios of the National Park Podyjí in years 2010 – 2012

Item name	2010	2011	2012	$\bar{y}$	$\bar{\Delta}$	$\bar{k}$
Personal capital	349961,00	358825,57	364754,22	**357846,93**	**7396,61**	**1,02**
Total assets	352881,00	362145,90	368312,95	**361113,28**	**7715,98**	**1,02**
Fixed assets	327986,00	334801,01	332954,11	**331913,71**	**2484,05**	**1,01**
Debt rations	2920,00	3320,33	3558,73	**3266,35**	**319,37**	**1,10**
Debt rations	**0,83**	**0,92**	**0,97**	**0,91**	**0,07**	**1,08**
Undercapitalized	**1,07**	**1,07**	**1,10**	**1,08**	**0,02**	**1,01**
Financial leverage	**1,01**	**1,01**	**1,01**	**1,01**	**0,00**	**1,00**

Tab. 3: Liquidity ratios of the National Park Podyjí in years 2010 – 2012

Item name	2010	2011	2012	$\bar{y}$	$\bar{\Delta}$	$\bar{k}$
Current assets	24895,00	27344,89	35358,84	**29199,58**	**5231,92**	**1,19**
Stocks	1559,00	2189,84	3663,86	**2470,90**	**1052,43**	**1,53**
Financial assets	19404,00	20117,74	27279,60	**22267,11**	**3937,80**	**1,19**
Short-term liabilities	2920,00	3320,33	3558,73	**3266,35**	**319,37**	**1,10**
Funds accounting	21580,00	22348,02	28350,06	**24092,69**	**3385,03**	**1,15**
Current Ratio	**8,53**	**8,24**	**9,94**	**8,90**	**0,71**	**1,08**
Quick Asset Ratio	**7,99**	**7,58**	**8,91**	**8,16**	**0,46**	**1,06**
Cash Position Ratio	**6,65**	**6,06**	**7,67**	**6,79**	**0,51**	**1,07**
Net working capital	**21975,00**	**24024,56**	**31800,11**	**25933,22**	**4912,56**	**1,20**

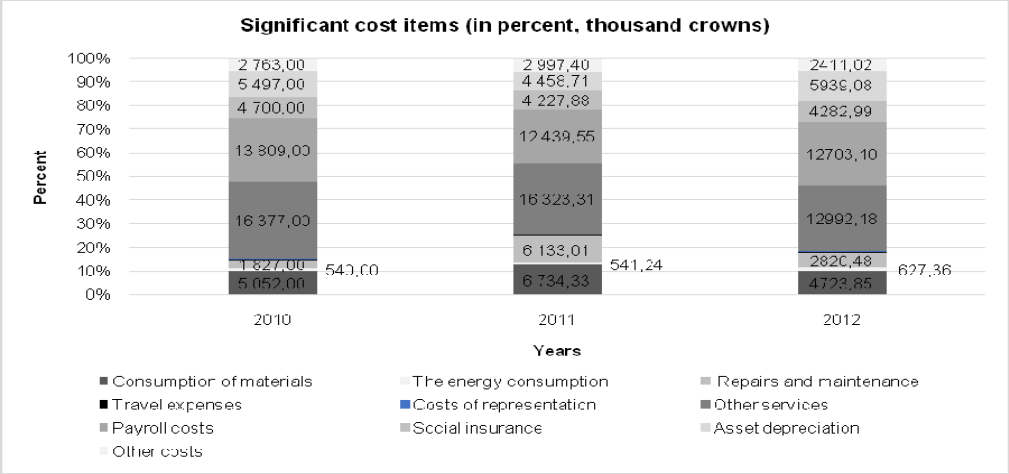

Fig. 1: Significant costs items of the National Park Podyjí in years 2010 – 2012 (in percent, thousand crowns)

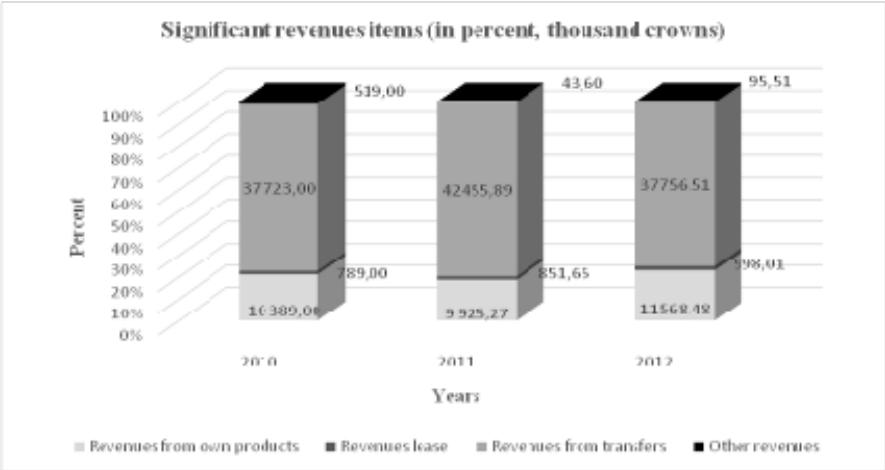

Fig. 2: Significant revenues items of the National Park Podyjí in years 2010 – 2012 (in percent, thousand crowns)

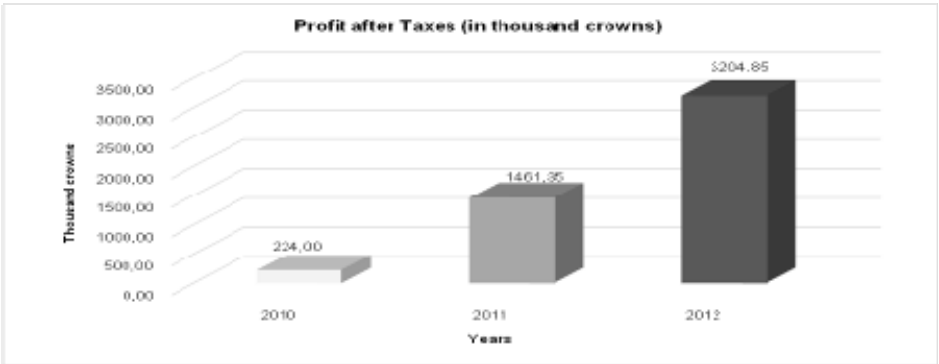

Fig. 3: Profit after Taxes of the National Park Podyjí in years 2010 – 2012 (in thousand crowns)

Conclusion

Administrations of national parks and protected areas are organizations that directly promote employment of social functions of forests and landscape. They provide people both the possibilities to spend time relaxing and to expand knowledge. The primary goal of these organizations is not profit, it is the protection of landscape and nature and, as an implication, fulfilment of the social order of improvement of quality of life. The financial analysis of differential indicators and ratios in state non-profit organizations provides usually only limited information, although some particular capital information may be crucial. However, the financial analysis itself is often insufficient in terms of providing fundamental information. It is therefore important, when performing financial analysis of state non-profit organizations, to cooperate with their founders (in this case the Ministry of the Environment) who have plenty of information and experience in this area. The forthcoming scientific activities of the Department of Forest and Wood Products Economics and Policy include consultations of selected financial analysis indicators with the Ministry of the Environment of the Czech Republic.

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Souhrn
Příspěvek se zabývá finanční analýzou Správy Národního parku Podyjí (NP Podyjí) jako státní příspěvkové organizace zřízené Ministerstvem životního prostředíČeské republiky(MŽP) pro správu území se zvláštním statutem ochrany v letech 2010 - 2012. Postup finanční analýzy je zaměřen na agregaci ukazatelů z účetních výkazů (rozvahy, výkaz zisku a ztrát). Z metod finanční analýzy byly využity analýza rozdílových ukazatelů (čistý pracovní kapitál) a analýza vybraných poměrových ukazatelů (ekonomické aktivity, likvidity a zadluženosti). Zároveň byly aplikovány jednoduché elementární charakteristiky časových řad (aritmetický průměr, průměrný absolutní přírůstek, tempo růstu a průměrné tempo růstu). Z důvodu úplnosti přehledu ekonomického chování zkoumaného subjektu studie obsahuje v grafech přehled významných položek výnosů, nákladů a vývoj výsledku hospodaření Správy Národního parku Podyjí za sledované období (viz. obr. 1, 2, 3). Cílem článku je vyhodnotit a porovnat zjištěné ukazatele s dosud známými ukazateli finanční analýzy národních parků z předchozích let.
Hodnota obratu celkových aktiv je velmi nízká se stabilním vývojem. Ukazatel obratu celkových zásob má klesající tendenci (viz. tab. I). Hodnota průměrného tempa růstu sledovaných ukazatelů se pohybuje do hodnoty 1. Hodnota celkové zadluženosti je nízká s mírně stoupajícím trendem. Nízká zadluženost je dána vysokým podílem vlastního kapitálu. Hodnota podkapitalizování je mírně nad 1, což značí opět převahu vlastního kapitálu (subjekt je mírně podkapitalizovaný - krátkodobé cizí zdroje kryjí i část dlouhodobého majetku). Hodnota finanční páky je nízká se stabilním trendem. Je to dáno tím, že správa nevyužívá cizí zdroje z důvodu typu právní formy organizace. Průměrné tempo růstu sledovaných ukazatelů je kolem hodnoty 1 (viz. tab. II). Hodnoty likvidity Správy NP Podyjí dosahují vysokých hodnot a mají mírně stoupající trend. Je to dáno převahou oběžných aktiv nad krátkodobými závazky. V průměru u všech tří likvidit převažuje hodnota oběžných aktiv 7,95 krát nad krátkodobými závazky. Hodnota průměrného tempa růstu sledovaných ukazatelů je kolem hodnoty 1. Hodnota rozdílového ukazatele (pracovního kapitálu) je rovněž vysoká (dáno nízkou hodnotou krátkodobých závazků a vysokým podílem oběžných aktiv) a má stoupající trend. Průměrné tempo růstu pracovního kapitálu je 1,20 (viz. tab. III).
Finanční analýza rozdílových a poměrových ukazatelů poskytuje u státních neziskových organizací zpravidla jen omezenější informaci, i když některé zejména kapitálové informace mohou být zásadní. Samotná finanční analýza je ale k zásadní výpovědičasto nedostatečná. Proto je důležité při aplikaci finanční analýzy na státní neziskové organizace spolupracovat s jejich zřizovatelem (v tomto případě s MŽP), který má dostatek informací i zkušeností v této oblasti.
V rámci vědecké činnosti Ústavu lesnické a dřevařské ekonomiky a politiky se plánuje v blízké budoucnosti konzultace zjištěných vybraných ukazatelů finanční analýzy s Ministerstvem životního prostředí.

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THE GREEN SPACES IN WARSAW FOR PEOPLE WITH DISABILITIES

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Abstract
Walking is one of the most popular type of physical activity undertaken by people with disabilities and the elderly. For these social groups walking is very important for keeping or even improving physical fitness. It is a component of rehabilitation allowing an active use of leisure time. Walks are the most preferably performed in natural areas such as forests, parks, gardens , etc. However, it is important that these areas be fully accessible, especially for people with motor dysfunction.
In Warsaw there are 76 urban parks with a total area of about 715 hectares and 27 forests covering an area of about 7 258 ha. These areas are a very important place for recreation for residents of the capital, including the elderly and the disabled. Among other important places are also Botanic Gardens of the University of Warsaw and the Polish Academy of Sciences.
The study analyzed localization of green spaces in Warsaw and also specified, on selected examples, their external availability, internal availability and recreation infrastructure adaptation to the needs of people with disabilities. For this purpose, distances between public transport stops and the main entrances of the selected objects were measured. The adaptation of the roads was specified on the basis of the technical condition of their surface and the width of passageways. The adaptation of the major walking paths and the infrastructure (i.e. information boards, benches, toilets) was also specified.

Key words: urban parks, urban forests, accessible for disabilities

Introduction

According to the Bill dated 16th April 2004 concerning environmental protection (art.5 Dz.U. z 2004r. nr 92, poz. 88) the green areas are terrains connected funcionally with technical and building infrastructure, covered with plants and surrounded by the borders of villages or towns. They are the integral part of towns/cities, districts and have an aesthetic, recreational and health functions.The basic form of the recreational green areas in a town are parks. In a small city or a district of a town the area, having a municipal function, according to Nowakowski (1987), should not be smaller than 5ha. Parks devoted to a passive recreation and walking are described as Walking Parks. Whereas, parks which have a passive and an active recreation function, built in a large terrain and equipped with sports gear, entertainment facilities as well as spectator spaces, are named Parks of Culture and Recreation. A perfect example can be the Śląski Park in Chorzów taking up 640ha. In connection with the development of urban and industrial agglomerations, some forests were also included in the cities' parks. Being in the borders of a city, the forests stopped having the production function, and were left alone with the protection and recreational aims (Bartosiewicz 1986) and became a permanent element of the towns' green. The flora of these parks, also called communal, is not being diversified. These are areas which are valuable because of the lay-out of the plants having great landscape features. However, introducing some technical units is limited to indicating and arranging the walking and recreational areas. Exploitation and use of the recreational areas, including forests and parks, depends on the lands' accessibility which, excluding the lawful regulations, results from the functioning of the inside and outside transport systems. By the outside accessibility - we mean a network of public transport with its diversity, number of stops (buses and trams) and the distance between the object of interests which all condition the size of recreational traffic and dictates the main entrances and directions for people. In fact, the inside accessibility – a network of routes and paths in the recreation area due to proper preparation enables a preferable form of rest and allows to canalize the recreational traffic inside the premises. Both parks and forests constitute a significant place of rest for the city-dwellers including the disabled. For these places play a great role for the disabled in the framework of their leisure time. A free use of various forms of activities contributes to satisfying many psycho-physical and social needs. It also has numerous health, recreational, entertaining, compensating and correction functions. Physical activity taken up by the disabled in their free time has generally an individual character, not formally arranged, and the main activities are walking and cycling (Kubasińska, Bergier 2005).

Parks and forests of Warsaw

In Warsaw the parks and green areas constitute 8% of the capital's space, and parks alone (76 in number) are situated on the land of 715ha. The terrains are very diversified, for example, as far as the space is concerned, ie. The largest one takes up 70ha – The Royal Park (Baths) – the small ones such as the Dreszer Park in Mokotów is about 2ha. The oldest ones are the Saski Garden, the Krasińscy Garden, the Royal Park and the Park in Wilanów. The premises come from different historical epochs. Starting with the Baroque – The Saski Park, sentimental ones like The Upper and Lower Gardens of Arkadia, the 19th century landscape parks – the Sielecki Park, the Praski Park, the 20th century municipal parks – Skaryszewski , Morskie Oko, and modern parks – Wielkopolski and the Dreszer Park. Their historical value and their cultural and national significance were confirmed by being put on various monument registers: the Ujazdowski Park, the Skaryszewski Park, and some are taken under conservation protection. The Warsaw parks have various owners. The Palace and Parks Groups: The Royal Park and Wilanów as well as the gardens of the Royal Castle belong to the National Museum. 9 parks have a general municipal status : the Saski Garden, the Ujazdowski Park, the Royal Park, the Krasińscy Park, the Paderewski Park, the Praski Park, Mokotowskie Fields, the Centrak Culture Park, the Fosa Park and the Citadel Descend. The rest are managed by the districts' town halls (http://zielona.um.warszawa.pl/parki). The admittance to most park is free except for Wilanów. Whereas 15% of Warsaw is covered by forests (~8000ha). They are situated mostly in Warsaw's surroundings, but a part of them are in the city – the Na Kole Forest and My Mother's Forest. To sum up, there are 27 forests in Warsaw. More than 45% bolongs to private people with their own security systems. The rest belong to the National Treasure, and its 68% (2716ha) is of perpetual land use of the city of Warsaw. 15 forest complexes are under the management of the city of Warsaw, but 32% (1271ha) belong to the Ministry of Health and the Ministry of National Defense, etc. (managed by the National Forests) (Studium uwarunkowań i kierunków zagospodarowania przestrzennego m. ST. Warszawy, March 2006) The forests constitute the basic element of Warsaw's Natural System. The bigger complexes have a climatic and biocoenosis functions. Moreover, they contribute a recreational, educational and scientific function constituting an important element of recreation in the city.

Disabled people in Warsaw

In 2011 according to the Statistics Office and its National Census there are 4697,5 thousand disabled people (12,2% of Poland's population) (in 2002 it was 14,35%). In this group – the legally disabled - some declared a slight disability. Among biologically disabled, there were men and women with a moderate degree of disability. Among the above mentioned research the largest number of disabled people live in Silesia, The Mazowieckie District and the Wielkopolska District. The smallest number in Oploskie and Podlaskie. The frequency of this phenomenon is 122 out of 1000, and this indicator was larger for women (127) than men (116). In almost all districts, apart from Lubelskie, Poskarpackie and Świetokrzyskie, more disabled people lived in cities than villages. The Census (2011) showed that in Mazowieckie we have 515,697 which is 11% of Poland's population. There were more women than men, 53,95% to 46,1% respectively. Most lived in cities and constituted 67,8% of all disabled people in Mazowiecie. The frequency was 98 out of 1000, where the indicator for women was 101 out of 1000 and for men 94 out of 1000. In cities the frequency was 103/1000, whereas in villages 88/1000. According to the Annual Book by the Statistics Office, based on data from 2002, there were 182,120 disabled people living in Warsaw, out of whom 74% were legally disabled (it meant they had a disability sentence). Around 40% were adults in productive age but this indicator is different in every district. Districts with a large number of elderly people have a smaller percentage of disabled people. In Żoliborz, Ochota, Śródmieście and Wola there are more than 40% disabled people in productive age. The biggest number (55%) in Ursynów, Bemowo, Targówek and Białołęka. We shouldn't forget about district where there are many young disabled people, which indicates a need for a long-term social politics in these places. In general Białołęka and Ursynów have the biggest number of disabled people in productive age. As it goes for the reasons of disability, we can come to some conclusions on the grounds of general Warsaw data, public surveys, needs and possibilities of the disabled, which were all realized in 2009 by PFRON and SWPS on a representative number of households. In this survey people were asked mainly about the reason of their health problem. The first group (18%) were people with neurological diseases and diseases connected with a bone, connective tissue and muscle structure (18%). Further we have

people with psychological and behavioral disorders (15%), handicap (9%) and cardiovascular system problems (9%). A different look at these data is based on ICD–10 classification and it brings about a different structure of basic reasons for health problems: behavioral and psychological disorders (28%), cardiovascular system problems (23%), neurological diseases (15%), bone, connective tissue and muscle structure (15%) and also eye structure diseases (13%).

The research methodology

The analysis of the accessibility of the green areas for the disabled people especially including people on wheelchairs was carried out on the examples of the : the Kombatanci Park, the Obwodu Praga AK Park, also the Linde Forest and Na Kole Forest. The Kombatanci Park - 5,06ha in size - is situated in a district called Włochy. It dates back to 18th century. It was created next to the earl's Tadeusz Mostowski mansion, and it was designed by A. Szubert. Following a special wish, in 1842, the park was visited by an English gardener – F. James thanks to whom the park has its contemporary looks – typical to English gardens. Contemporary attractions are: the palace, the entrance gate from 18th century, walking paths, playgrounds, natural monuments and the Capricorn's Pond. The Obwodu Praga AK (OPAK) Park is located in the Southern Praga. It's fenced and protected, has two playgrounds, sport equipment with ropes used for climbing, a fountain and a multifunctional pitch. This terrain up to 1920s was used a place for selling and grazing cattle. Later it became a square. It was designed by an architect Zygmunt Hellwig after the II World War and got a name after Hanka Sawicka. In 2005, following the decision of the Warsaw's Council, the park was named Obowu Praga AK to commemorate the Warsaw Uprising's soldiers from Praga. The Linde Forest is a small forest complex which takes up 20,34 ha and is located in Bielany, it serves as a buffer zone for a nature's reservoir "Park Bielanski". There are many walking paths with a lot of benches, three playgrounds. The forest is cut by the Bielański Stream which enhances the attractiveness of this place. The types of trees are mixed – in mixed forests and woodlands – where most common trees are pines, Robinia Pseudacacia, birch, oak, and Asplenifolia under partial protection. The Na Kole Forest is 48,33ha in size in Wola. This forest complex was created thanks to the forestation of public spaces in the mid-war times. The land is bordered by a railway and from the east by a huge artery "Trasa AK". The land is dominated by small forest habitats with Robinia Pseudacacia, birch, oak with its developed undergrowth, and a dominant bird cherry. In the sought of the forest there's a place commemorating an extermination camp from the II World War. There are walking paths, three playgrounds and a fitness path. On the basis of the research carried out by M. Woźnicka (2006) and the results of the literature analysis some characteristics got distinguished concerning the inside and outside accessibility for the disabled people. The results were evaluated in a three-step scale dealing with the adjustment of the needs and possibilities of this social group:

I class – good adjustment – lack of or insignificant obstacles to resting in a forest,

II class – little adjustment – this factor causes a some difficulty in resting,

III class – no adjustment – this factor on a large scale makes it difficult or impossible for the disabled people to rest or use their wheelchairs in such areas.

The transport accessibility in conditioned by the frequency and types of public transport by which you can get to a certain park, as well as the state of pavements from a bus stop to the park or forest. In the report car parks were also taken into consideration (opened neighbourhoods and forest car parks) in a close distance from these areas. The places with the I class are parks and forests with at least one car park and a bus stop (with a shelter and a timetable installed on the maximum height of 140cm) situated not further than 100m from the destination. The way from the car park or a bus stop must be in good condition, and at least two forms of transport with specific facilities for disabled people running twice an hour. II class of accessibility has a car park and a bus stop (not necessarily with a shelter but with an accessible timetable) within a distance of 100-500 m or with the road to the park or forest being uneven. Means of transport adjusted to disabled people but running once an hour. III class – car park and a bus stop further than 500m, a pavement leading to the green places in a bad technical state, and the forms of transport (with facilities for disabled people) running more rarely than once an hour. However, these are linear elements that decide about the inside accessibility. In the framework of the main places' adjustment (presented on the information boards at the front gates of parks and forests) as far as moving around in wheelchairs is concerned, we will take into account: the technical state of the surface and width of some roads and paths. The classes of adjustment for the state of the surfaces referred to the technical states formulated in the

analysis of literature and survey results, whereas the width of the roads took into consideration the parameters of wheelchairs and anthropometric data:
I class of adjustment – no ruts or bumps in the width of the roads, some unevenness of the road and little bits missing, the width itself is no smaller than 1,40m, a possibility of two wheelchairs taking over each other,
II class of adjustment – shallow ruts and some unevenness of the surface (the road surface with a partly distorted cross section), the width itself 0,90 – 1,39m (which equals the width of a wheelchair together with a person standing next to it),
III class of adjustment - deep ruts and holes in the road, the width smaller than 0,90m.
Moreover, some other obstacles were taken into account: big flower pots on walking paths, some narrowings of the roads, steep fall-downs, stairs, public toilets, etc.

Results

Two of the researched places were characterized by a good outside accessibility: these were The Kombatanci Park and The Linde Forest. Truly, there was no car park strictly next to the places, they were, however, located 100m away from them – in the residential areas or areas with services. Public transport stops were situated 100m far from these parks, but they were stops with shelters and timetables on a proper height. The outside accessibility in Na Kole Forest was complicated due to lack parking places, cars were parked on the pavements or along the street. Some discomfort was caused by lack of shelters and too high timetables (on the height of 1,70m) or no timetables at all. One pavement was covered with uneven pavement tiles. Whereas the access to the Obwodu Praga AK Park was only made difficult because of to high timetables. All paths in Kombatantów Park were characterized by a good state of surface and a proper width of the paths. The benches or rubbish bins were not causing problems for the movement on the roads. There was only one significant narrowing in one road caused by a tree. In the area of the park there are three playgrounds, one adjusted to disabled people and it has an artificial surface. On the remaining two playgrounds there is a sand surface. The obstacles are: lack of information boards with a map at the entrance, no toilets, no access to places of commemoration due to a high step. In the Obwodu Praga AK Park, as much as 98% of width of the available paths are well adjusted to the needs of the disabled people, especially to those on wheelchairs. The benches and rubbish bins have no major impact on the comfort of moving around the parks' paths. On 2% remaining a mediocre state of paths was observed due to unevenness of the Baum's pavement cube stones. Also the places like playgrounds, football pitches, picnic meadows indicate a good state of adjustment for disabled people. At the entrance gates we can see the information boards with the plan of the park, which is an additional advantage. Only extra equipment such as chess tables, tables for picnics, garden shelters and toilets are not taken into accounts as far as disabled people are concerned. In the Linde Forest as much as 20% of the analyzed paths' width are in a bad technical state, although 30% have got a good state and a proper width of the paths. The rest show a weaker state due to a mediocre technical state of the paths' surface. One of the two playgrounds was characterized by a sandy surface, so it is inaccessible to wheelchairs. The factors making it difficult for the disabled people to use the forest are: a stair at one of the main entrance gates, at two of them there are no information boards, there are two footbridges unadjusted to disabled people both for the construction and technical reasons. To add, the shelters are also adapted to people using wheelchairs. In this forest complex there are no toilets. In the south-east part of the forest there's a hillock where two walking paths are created and because of steep drops the paths are inaccessible to disabled people on wheelchairs. In the Na Kole Forest merely 4% of the roads length there's a bad technical state of the surface and are not adapted to disabled people, however, 22% of the road length presents an average adjustment to a particular social group. At the main entrances there are information boards with the map of the park. In one playground there is a sandy surface (inaccessible to people on wheelchairs), the remaining two playgrounds and two meadows are available to the analyzed social group. Such facilities as tables with benches to a minor extent meet the needs of the disabled people. In the forest area there are no toilets. The Na Kole Forest which is cut by a railway lane located on a hillock is a barrier against getting to another side of the park in the south.

Conclusions

1. The green areas in Warsaw are characterized by a satisfactory transport accessibility. The difficulties result from the lack of parking places, car parks or not fully adapted bus

stops and tram stops to the disabled people (mostly it results from two highly positioned timetables).
2. The technical state of the paths' surfaces in parks was better than in forests. Whereas the width of precincts in either of the places did not disqualify the areas as being inaccessible.
3. In all the places there occurred some barriers, which can influence the comfort of disabled people recreation.
4. Recreation equipment both in parks and forests did not take into consideration the needs of the disabled people.

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Souhrn

U většiny osob se zdravotním postižením jsou nejčastější venkovní aktivitou procházky. Chůze má významnou hodnotu v udržování a zvyšování jejich fyzické kondice. To může být také součástí rehabilitace lidí a umožňuje jim vyplnit jejich volný čas aktivně. Samozřejmě, tato skupina lidí, kteří jdou na procházku, využívá nejvíce ochotně přírodní zelené plochy, jako jsou lesy, parky a zahrady. Nicméně je velmi důležité, aby se mohli pohybovat v těchto místech co nejvíce pohodlně. Ve Varšavě je 76 parků, které zabírají 715 ha celkem a 27 lesní komplexů, které zabírají 8000 ha. Tyto oblasti jsou velmi důležité pro rekreaci občanů Varšavy včetně zdravotně postižených. V této práci byla analyzováno přizpůsobení osobám se zdravotním postižením na příkladu konkrétních oblastí , tzn. městských parků a lesů. V analýze dostupnosti byl podmíněn přístup na autobusové a tramvajové zastávky z vybraných míst, a to Kombatanci Park, Obwodu Praga AK Park, Na Kole parku a Linde parku, a také jejich vzdálenosti od hlavní brány k zelené ploše, a to i podle technického stavu povrchů silnic vedoucí do míst, a také podle počtu parkovacích míst. Vnitřní dostupnost byla také popsána a vyhodnocena podle technického stavu vnitřních komunikací a jejich šířky. Rekreační infrastruktura byla také brána v úvahu, například informační tabule, lavičky a toalety. Místa ve Varšavě se vyznačují dobrou dopravní dostupností, i když tam není mnoho parkovišť. Technický stav byl dobrý nebo střední ve 100 % z cest, ale 80 % z cest v lesích mělo dobrý nebo střední stav. Rekreační zařízení jak v parcích a lesích nebyla upravena pro potřeby zdravotně postižených osob. Ani jedno z analyzovaných míst nebylo plně přizpůsobeno potřebám osob se zdravotním postižením.

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THE CHARACTER OF POST-MINING LANDSCAPE AND ITS POTENTIAL FOR RECREATION IN CONDITIONS OF THE CZECH REPUBLIC

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Abstract
The recent pressure on landscape related to utilization of natural resources is becoming more and more significant. With human population growing and the utilization more intense, there is an increasing demand for multifunctional landscapes, where all activities from primal sector such as agriculture or mining to leisure activities and recreation can be carried out. Post – mining landscapes were characterized in four basic categories according to extracted raw material (sand and gravel, black coal, brown coal, stone) and the effects on the area, and their recreational potential was described. The article summarizes different approaches and assessment methods dealing with landscape character, its protection and evaluation used in the Czech Republic. Attempts were made to find a method suitable for disturbed landscapes after surface exploitation with regards to future comparison. Among the others, Assessment of Landscape Character Attractiveness (Lacina, 2005) has been chosen and applied to compare various sites in different states of degradation and restoration. Based on the results the relation between recreation potential and type and phase of restoration was examined.

Key words: assessment, attractiveness, landscape character, restoration

Introduction

The recent pressure on landscape related to utilization of natural resources is becoming more and more significant. There is an increasing demand for multifunctional landscapes, where all activities from primal sector such as agriculture or mining to leisure activities and recreation can be carried out. Lots of phenomena are connected with recreation potential and one of them is with no doubt character of landscape. Landscape, its layout and character, is not subject to the rules and templates. It is not possible to determine clearly how the right landscape should look like. It means that there is quite strong factor of subjectivity.

The term „landscape character“ is almost an incantation of present times. For its rather broad definition in Czech legislation and the absence of a specification of whether the assessment or protection, this topic is often discussed. The landscape character is defined by Act No. 114/1992 Gazette on the nature and landscape protection, as natural, cultural and historical character of a place or area, and it must be protected from activities that reduce its aesthetic and natural values. Interference in the character of a landscape, particularly the approval and placing of buildings, may be carried out only with regard for the preservation of significant landscape components, particularly protected areas and cultural landscape high points and for harmonious standards and relations within the landscape. For the purpose of protecting the character of a landscape with a significant concentration of aesthetic and natural values, and which is not particularly protected, the nature conservation authorities may establish a natural park. The Act does not regulate the assessment proceedings but the first article defines the subjects of protection. Landscape character protection is defined as general protection; as such it is valid in the whole territory of the Czech Republic.

The character of post-mining landscape and its potential for recreation in conditions of the Czech Republic depends on the way of affected area restoration. Traditional restoration methods are agricultural, forestry, hydric and the group of others (for recreational use, sports grounds or natural) according to a target state. Every method is generally based on two subsequent steps – technical measures and biological measures. In last decades natural regeneration became in importance equal to a traditional technical view of reclamation possibilities. The method of restoration is chosen according to a form of excavation impact and the level of degradation. These factors are dependent on the extracted material.

Extraction of sand and gravel influences an area mostly in a positive way, especially if pits are small or of middle size. Most of these pits are in lowland where a human impact is massive and the land-use is intense. Therefore every new nature-close habitat is valuable. Pits are often flooded (hydric reclamation) and have positive effect on recreation potential, the water is usually clear and these sites are popular for swimming or used as water reservoir.

Stone quarries can increase attractiveness of the landscape as well, depends on the size and structure. Rare species often occur in these nutrient-poor environment and former stone quarries often becomes nature protected areas.
Black coal mining has got several effects on surrounding landscape, although the process itself is under way mainly underground. Spoil heaps from waste material are created in whole area, terrain depressions arise and of course many technical buildings, derricks, railways and other mining facilities can be found in the area. Technical facilities basically do not attract common tourists and they are considered rather a blot on the landscape, however certain groups find them interesting and for example in Ostrava, a city with long industrial history and previous centre of black coal mining in the Czech Republic, The Lower Area of Vitkovice was inscribed on the the European Cultural Heritage list in 2008. Terrain depressions are flooded by groundwater and after that, if left, they can create a valuable habitat in the intensively used landscape.
Brown coal is mined by surface extraction, all soil and ground levels are removed as far as the brown coal layer and it is extracted afterwards in extensive surface pit. This mining means total destruction of original landscape. Inner and outer spoil heaps arise. During the excavation, no recreation is possible, only professional excursions. Afterwards, large area is reclaimed which gives to the area high recreational potential and reclamation process means a crucial factor for future development. Mostly technical hydric reclamation is applied when the extraction is terminated. Large and deep lakes are created. Most of the heap area is reclaimed technically and lead to agricultural or forestry use. New sport grounds can be established, in the Most Area, for example, hippodrome for horse competitions and in-line skating has been built.
Besides, in the Czech Republic, there is an effort by scientists, non-governmental organizations and occasionally even mining companies themselves to increase the proportion of near-natural restoration measures in post-mining sites, but it is often limited by legislative barriers (Řehounková, Řehounek, Prach, 2011). It is said that it is the visual quality and character rather than its productive function that attracts people to live or relax in the countryside (Brabec and Smith, 2002).

Materials and methods
Currently, a number of methods and approaches dealing with landscape character, its protection and evaluation is used in the Czech Republic. Although assessment principles are common, despite all the efforts of the experts, the uniform method usable in practice has not been approved yet. Following summarization was made to find a method suitable for disturbed landscapes after surface exploitation with regards to future comparison.
Landscape character assessment could be divided into two forms, namely preventive and causal. Preventive assessment presents comprehensive description and evaluation of the current state of landscape character and it includes recommendations of principles and methods for protection. Causal assessment builds on preventive and comes out of it. Its aim is to assess the concrete plan effect on landscape character (e.g. wind turbines, quarry, cutting down some trees etc.). So far, according to Salašová (2006) most comprehensively compiled methods could be divided in simplified form in two directions. Access “architectural” puts greater emphasis on the evaluation of visual effects of landscape physiognomy. “Biogeographic” approach works less with abstract concepts (such as aesthetics) and it is focused more on landscape structure.
One of the first methods of landscape character assessment is presented by Míchal´s methodical recommendation from 1999, specifying the text of § 12 of Act No. 114/1992 Gazette on the nature and landscape protection. It should serve as a basis for the preparation of generally obligatory implementing legislation about landscape character protection, but it has not been issued yet. The mining activity is here seen as a negative phenomenon in landscape belonging to the cultural characteristics of the place or region. Another methodology (Bukáček and Matějka, 1999, 2006) was initiated by the management of protected landscape areas of the Czech Republic. An important step in this methodology is to identify features of landscape character and determine the weight of their expression, significance and valuables. Mining in general is mentioned as a negative element in the landscape. Quarries are included especially in natural characteristics (relief and scattered vegetation – stands of artificial civilization elements) and also into characteristic of cultural and historical components (characteristics of surfaces and shapes). In other methodologies, mining and its effects are not directly noted. As a key concept in the assessment, Vorel (1999) identifies the aesthetic value of landscape. Methodical approach introduces procedures used in architectural and landscape composition,

uses standardized evaluation steps and objectivised, generally accepted judgments. Löw (1999, 2003) connects the issues of landscape character with landscape typology. Typical features of landscape are created by natural conditions and land use and they are reflected in the image of the landscape. Different combinations of typical features create various types of landscape. The preserve state of typical features determines the preserve degree of landscape character in diverse parts of landscape. Last but not least methodological approach comes from the Department of Landscape Architecture at the Faculty of Horticulture, Mendel University in Brno, under the guidance of associate professor Salašová.

Lacina (2005) states that it is better to talk about attractiveness of the landscape than about its aesthetic value. Attractiveness is evaluated by "scoring" method, which appreciates representation and distribution of major landscaping components such as relief, water bodies and vegetation cover. The method favours varied dynamic hilly landscape and a mosaic of vegetation formations, which corresponds to the conventional perception of central Europeans.

For purposes of this research it is not suitable to use methods assessing the impact of the concrete project on the landscape character, because the study deals with the problematic of already existing mining. Most of the above mentioned methods are in large part based on the descriptive verbal assessment and the results are extensive documents or studies. Some of them, moreover, do not refer the issue of mining. From the viewpoint of comparing how different types of mining and their subsequent reclamation are reflected in landscape, scoring approach of landscape attractiveness assessment invented by Lacina (2005) was chosen as the most suitable, relatively quick and simple method. Under this procedure, the mining activity is included into the anthropogenic disturbance of relief, but its effects may be reflected also in other indicators.

Four areas from different parts of the Czech Republic were chosen to test the methodology from Lacina. These areas are: Karvinsko, which is affected by black coal mining, Mostecko, where brown coal is mined, Tovačov with lakes created after sand and gravel excavation and the area nearby Beroun where many limestone quarries is situated. These areas have not been divided into square grid, but evaluated in complex as types of current landscapes, delimited as a projection of certain landscape structures with an emphasis on vegetation cover. According Lacina (2005), this approach is considered more appropriate for this method.

Tab.1: Evaluated areas

Locality	**Area**	**Main cadastrals**
Mostecko	25 km^2	Braňany, Starý Most, Želenice, Obrnice
Karvinsko	25 km^2	Horní Suchá, Stonava, Doly
Tovačov	25 km^2	Tovačov, Troubky, Lobodice
Berounsko	25 km^2	Bubovice, Mořina, Kuchař

Results

The method of Landscape Attractiveness Assessment (Lacina, 2005) has been applied on four types of landscape influenced by mining. In the evaluation, three different states of the area were considered. Historical state before excavation, the area during the mining process and as the last, the same landscape, but after restoration. For mentioned examples, the most common restoration types were considered. It is forest restoration for spoil heaps, hydric restoration for sand and gravel pits and brown coal mines and natural restoration for stone quarries.

The main factors were relief, water bodies and vegetation cover and the total landscape attractiveness was calculated as their summation. According to total AK, types of landscape are divided into 5 categories with an attractiveness: I. very low (less then 10), II. low (11-20), III. average (21-30), IV. high (31-50) and very high (more then 50).

During excavation of black and mainly brown coal, attractiveness of landscape drops significantly, however after restoration it can be even higher then original state owing to different restoration practices. Especially flooding of mined pits and depressions brings more water bodies to the area and makes it more attractive for tourist. In case of sand, gravel and stone mining, the attractiveness rises even in the period of active excavation. Sand and gravel is usually mined in intensive agriculturally used landscape and excavation rises diversity and creates new water bodies.

Tab. 2.: Landscape Attractiveness Assessment according to Lacina (2005)

Landscape Attractivness Assessment according to Lacina (2005)																
(post)-mining landscape character	relief (AR)				AR	water bodies (A_{vo})					A_{vo}	vegetation (AV)			AV	AK
	TR	PFR	AFR	ANR		ZV	TB	PFT	AFT	$K_{(CV)}$		$H_{(SV)}$	$H_{(PV)}$	$K_{(RV)}$		
black coal landscape - before mining	1	2	2	1	**4**	1	2	1	1	1	**5**	2	2	1,5	**6**	**15**
black coal landscape - mining	1	1	2	2	**2**	1	2	1	1	1	**5**	1	2	1,5	**4,5**	**11,5**
black coal landscape - after restoration	1	2	2	1	**4**	3	2	1	2	1	**8**	1	2	1,5	**4,5**	**16,5**
brown coal landscape - before mining	1	2	2	1	**4**	1	2	1	1	1	**5**	2	2	2	**8**	**17**
brown coal landscape - mining	1	1	1	3	**0**	1	2	1	1	0,5	**2,5**	1	1	1	**2**	**4,5**
brown coal landscape - after restoration	1	2	2	1	**4**	5	2	1	2	1	**10**	1	2	1,5	**4,5**	**18,5**
sand and gravel pits landscape - before excavation	1	1	1	1	**2**	1	1	1	1	1	**4**	2	2	1	**4**	**10**
sand and gravel pits landscape - excavation	1	1	2	2	**2**	3	1	1	2	1	**7**	2	2	1,5	**6**	**15**
sand and gravel pits landscape - after restoration	1	1	1	2	**1**	5	1	1	2	1,5	**13,5**	2	3	1,5	**7,5**	**22**
stone quarries landscape - before excavation	3	2	2	1	**6**	1	3	2	1	1	**7**	2	2	1	**4**	**17**
stone quarries landscape - excavation	3	2	2	3	**4**	1	3	2	2	1	**8**	2	2	2	**8**	**20**
stone quarries landscape - after restoration	3	2	2	3	**4**	1	3	2	2	1,5	**12**	2	3	2	**10**	**26**

landscape attractivness **AK = AR + AVo + AV**

relief **AR = TR + PFR+ AFR - ANR**

TR complex relief type (1- extensive depressions, 2 - narrow depressions, 3 - flat rolling lands and uplands, 4 - indented rolling lands and uplands, 5 - mountains)

PFR specific forms of natural relief (1 - 3 according to frequency)

AFR specific forms of anthropogenic relief (1 - 3 according to frequency)

ANR anthropogenic relief disturbance (e.g. active mines) (from -1 to -3)

water bodies **Avo = (ZV + TB + PFT + AFT) * K(cv)**

ZV total water bodies occurence (5 - prominent, 3 - average, 1 - marginal)

TB watercourse and bank characteristic (5 - swift current with natural banks, 4 - calm current with natural banks, 4 - changing of swift and calm current stretches with natural and near-natural banks, 3 - straightened watercourse with near-natural banks, 2 - swift current with artificial (reinforced) banks, 1 - calm current with artificial (reinforced) banks)

PFT specific natural forms of watercourse (meanders, waterfalls) (1 - 3 according to attractivity)

AFT specific (attractive) anthropogenic forms of watercourse (weirs) (1 - 3 according to attractivity)

$K_{(CV)}$ water cleanness (1,5 clean water, 1 - moderate pollution, 0,5 heavy pollution, 0,3 very serious pollution)

vegetation **AV = (HSV + HPV) * KRV**

$H_{(SV)}$ vegetation structure (sum: 1 - one layer vegetation, 2 - two and more layers vegetation)

$H_{(PV)}$ vegetation variability (1 - insignificantly variable, 2 - variable, 3 - significantly variable, 5 - very significantly variable)

$K_{(RV)}$ distribution in landscape (1 - dominance of unbroken vegetation formations, 1,5 - large-scale mosaic, 2 - small-scale mosaic)

From similar reasons an attractiveness of stone quarries area rises, rock faces are exposed and area attractiveness is even slightly higher then in original state. After restoration, in this assessment was considered natural restoration when the quarry is left for natural processes and the bottom is partially flooded, the total attractiveness is the highest from all types of (post)-mining landscapes (26 points). The lowest is brown coal mined landscape in active phase (4,5 points). These results agree with common subjective expectations.

Fig. 1 : How attractive is mining landscape? Its future depends on the restoration. Jezeří Chateau, possible tourist goal and black-coal pit ČSA

Discussion

Lacina´s methodology does not include evaluation of cultural and historic landscape features, which influence, mostly increase, its attractiveness. Absence of a scale specification adds even more subjectivity to this method of assessment and results are afterwards hardly comparable. Nevertheless if the goal is to compare attractiveness of different landscapes or states, relative evaluation numbers are sufficient, even if some factors can not be evaluated precisely. In this case, water bodies characteristics evaluation, especially *specific natural forms of watercourse* and specific *(attractive) anthropogenic forms of watercourse*, is relevant. In factor *vegetation*, points for unbroken formations were given to area where all original vegetation was destroyed, just to give the lowest points as possible. In *relief* assessment, positive points were given in category *anthropogenic relief disturbance* (1- low, 2- medium, 3- serious disturbance) and these were subtracted afterwards. It does not comply with Lacina´s original formula but it was considered mathematically more correct.

In every case, personal experience with evaluated area is important.

Conclusion

It is said that excavation disturbs landscape characteristic. However this statement is seldom supported by any assessment and the evaluation use to be subjective. What kind of disturbances and how serious effects can be expected? Is the disturbance permanent? Can subsequent restoration compensate these disturbances?

The goal of the article was to evaluate different methodologies used in the Czech Republic from the view of (post)-mining landscapes, to find the most suitable one and to test possibilities to notice and describe changes in landscape during the process of mining and restoration and its relation to recreational potential.

Despite numerous imprecisions of tested methodology mentioned in discussion, Lacina´s Landscape Attractiveness Assessment was rated as suitable for evaluation of landscapes affected by excavation. Direct relation between landscape attractiveness a recreational potential is regarded.

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Souhrn
V dnešní době je v souvislosti s využíváním přírodních zdrojů kladen na krajinu stále větší a větší tlak. S rostoucí populací a jejími potřebami se zvyšuje poptávka po multifunkční krajině, která bude schopna zajistit a uspokojit všechny činnosti od primárního sektoru jako je zemědělství přes těžbu až po rekreaci a volnočasové aktivity.
V příspěvku jsou charakterizovány potěžební krajiny, které byly rozděleny do čtyř kategorií na základě těžené suroviny (štěrk a písek, černé uhlí, hnědé uhlí, kámen). V České republice existuje několik metod a přístupů hodnocení krajinného rázu. Jednotlivé metodiky jsou shrnuty a popsány s ohledem na možnosti využití hodnocení krajin ovlivněných těžbou. Pro účely výzkumu a zejména možnosti porovnání výsledků byl vybrán jako nejvhodnější poměrně rychlý a jednoduchý bodovací přístup, který využívá Lacina při hodnocení atraktivity krajinného rázu.
Metodikou dle Laciny byla hodnocena čtyři území představující krajiny typické pro těžbu určitého druhu suroviny, a s tím souvisejících narušení. Hodnoceny byly tři různé fáze, ve kterých tyto krajiny jsou či mohou být. Jedná se o stav před začátkem těžební činnosti, v jejím průběhu a po ukončení a následné rekultivaci. V daných případech byly brány v úvahu nejčastější způsoby rekultivace - lesnická pro výsypky, hydrická pro těžebny písku a štěrku a rovněž při zatápění zbytkových jam po těžbě hnědého uhlí a ponechání lokality pro přirozenou obnovu u kamenolomů.
U všech příkladů krajin a jejich stavů byla bodově hodnocena různá kritéria ve třech skupinách: reliéf, vodní útvary a vegetační složka krajiny. V rámci tohoto postupu je těžební činnost zahrnuta do antropogenního narušení reliéfu, její vliv se však může projevit i v dalších ukazatelích. Celková atraktivita krajiny pak vzešla z jejich součtu, v konkrétních příkladech jako hodnota v rozmezí 4,5 u krajiny postižené aktivní těžbou hnědého uhlí (nízká atraktivita), po 26 u krajiny s četnými kamenolomy s ukončenou těžbou (průměrná atraktivita). Rozložení bodového výsledku odpovídá subjektivním předpokladům. I přes občasné nejasnosti při použití metodiky hodnocení atraktivity krajiny a s ní přímo souvisejícího rekreačního potenciálu byla tedy tato metoda vyhodnocena jako vhodná pro použití při evaluaci krajin ovlivněných těžbou.

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THE INTEGRATION OF PUBLIC RECREATIONAL TOURISM INTO THE REGIONAL FOREST MANAGEMENT PLANS: A CASE FROM THE CZECH REPUBLIC

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Abstract
The aim of this paper is to inform about the system of forest management in the Czech Republic and the forests management support, assess current status of the public recreational tourism forests. The Czech's regional forest management plans are processed by natural forest areas (according to the natural conditions), which is the whole country a total of 41 plans. The plans adapt forest management system for 20 years period. These plans contain the classification of natural conditions, declarations of forests functions and transport accessibility. The recreational functions are possible nearly in all public forests. In some cases, forest management must be adapted to the requirements of recreation and purposefully create the conditions for recreational use of the forests. In these forests are the primary recreational functions of forests (forests are classified as special purpose forests). Everything is regulated by management through the strategic actions – the framework directive for forests management (by forest management units). According to the meaning and application of the recreational function of forests under these plans forests are divided into 5 groups, e.g. by natural conditions, position in the landscape, the importance of including in terms of land use plans, etc. Everything is digitally mapped and divided.

Key words: Czech Republic; regional forests management plan, recreational tourism

Introduction

Forestry includes multiple targets, multiple stakeholders and monitor complex socio - ecological and political interaction. Public involvement in decision-making processes in forest management is a challenging task (Jayanath & Gamini 2003).
Willingness to pay for public recreation in forests is often discussed at various national levels, as in Finland, it was confirmed that both protected forests and forests commercial (economic) confirmed possibility of willingness to pay for public recreation in forests (Tyrväinen et al. 2014).
Current approaches to modelling recreational value of forests are described based on regression models that relate to forest inventory data with the preferences of different forest stands (Edwards et al. 2011).
Natural and physical environment as a result of recreation burdened with stress factor. The places where these impacts on forest ecosystems visible include mountainous areas, coastline, islands, lakes and areas close to human settlements. Intensity of use with high impact on the state of forest ecosystems is a major factor in designing forest management (Farrell & Runyan 1991).
Urban forests provide opportunities for recreation for many people. You need knowledge of the motives for visiting the forest for the planning and management of these forests. These forests are used for a diverse set of recreational activities. To characterize these forests in relation to recreational activities are diverse (Eriksson & Nordlund 2013).
The demand for recreational opportunities continues to grow, and many forest organizations must base their management of forests include forms of recreation and demands her to the forest management plans. Deciding how to manage these forest functions can be challenging effort given to other important objectives in forestry (Grebner 2013).
In the Czech Republic the function of forests declared according to the Forest Act (Act No. 289/1995 Coll.), where the functions are basically divided into productive and non-productive. For forest functions under this Act mind benefits conditional upon the existence of the forest. Also, according to the Forest Act forests are divided by prevailing functions into three categories, namely the protective forests, special-purpose forests and production forests. Recreational forests belong to the category of special purpose forests, where they are distinguished by additional subcategories spa; suburban and other forests with increased recreational functions of forests or sub-category, in which another important public interest requires a different way of farming. The inclusion of forests in the categories of special purpose decided by the state administration of forests on a proposal by the owner of the forests or on its own initiative.

The aim of this paper is to inform about the system of forest management in the Czech Republic and the forests management support, assess current status of the public recreational tourism forests.

Materials and methods

In order to effectively take into account the state of the forest ecosystem (in terms of differentiation of natural conditions) is defined terminology such as functional potential, production potential by natural conditions), non-production functions (which includes features such as soil conservation, biodiversity, functions to promote water regime and recreational functions). Recreational function is defined as the synthetic effect of hygiene, health, medical, aesthetic and psycho effects on forest regeneration of physical and mental powers of human (Fialová & Vyskot 2010).

Some forest functions are declared public interest and the existing categories of forests. Categorization of forests, i. e. their division into categories and subcategories, is an expression of their term mission, the predominant method of forest exploitation on the territory. Sub forests increased recreational functions of forests have the most intensive recreational buildings, forests in areas with intense athletic activity, forests in the area of national cultural and historical monuments, etc. It is assumed in these high-traffic management therefore aims to support health effects of recreational forest. Forest area around the spa facilities are destined to the therapeutic use of spa guests is paramount here physically therapeutic effect of forests.

The principles of forestry management in these categories include the cultivation of mixed forest stands, as required by the application of aesthetic, ornamental and introduced species, or vice versa promoting natural composition and character of natural vegetation, it is suitable substitution of all economic means. Logging should be moved out of the holiday season, should be excluded heavy machinery, the busiest locations should be disposed of mining residues.

The Czech's regional forest management plans are processed by natural forest areas (according to the natural conditions), which is the whole country a total of 41 plans. The plans adapt forest management system for 20 years period. These plans contain the classification of natural conditions, declarations of forests functions and transport accessibility. The recreational functions are possible nearly in all public forests.

Results

The majority of the forest area in the Czech Republic takes place in a forest recreation in nature as a free benefit from forests. In the suburban recreation in areas with intensive building recreational facilities, and intense sports activities, where they must adapt to the requirements forestry recreation and purposefully create the conditions for recreational use of the forest is paramount and recreational functions of forests can be classified into special-purpose forests according to the forest Act No. 289/1995 Coll.

In terms of recreational functions of forests is the goal of forestry healthy forest, resistant to the different elements and pests, aesthetically formed, with huge old trees, a mosaic composed, spiced non-forests areas, with increased access to air and sunlight as the prospects of the landscape. Forestry management should allow recreational activity and not be disturbed by the noise, motor vehicles, and garbage and polluted by chemical substances, and should have time and customized logging.

According to the prevailing recreational activities, tastes and demands of forest visitors are changing the nature of recreational services provided by forestry areas with no signs of civilization to the sports facilities and landscaping with intensive attendance and nearness of restaurant facilities (Holuša senior, 2001).

According to the meaning and application of the recreational function of forests in regional forest management plans are divided into five following classes:

1. Non-utilizable recreational forests - this class includes forest areas, where recreation is excluded in any form and where the public is prohibited or greatly restricted entry.
2. Forests with conditionally usable recreational features - include forest area, which is dominated by other non-productive functions of forest and where the input is within the time otherwise regulated, or are just some of the possible forms of recreation such as forests and game reserves pheasant, which is not allowed after a certain period and the streamlined movement of visitors.
3. Forests with prevailing production function - in forests with prevailing economic production function is focused on sustained maximum production quality of wood, and can also carry out

health and recreational function. They are used mainly for tourists, the collection of forest fruits and mushrooms, sport, etc.
4. Forests with supported recreational functions - this class include forest parts that are farmed in the category of economic forest, but at the same time have a significant recreational function. Management at these locations is influenced by recreational activities and is therefore to be here, to some extent, to guide his way. Most of these are part of the vegetation in the vicinity of recreational or medical devices that are either on the forest floor or in the immediate outskirts of the forests near ski areas, etc.
5. Forests with the highlighted health and recreational functions - in this class according to the recreational value of the forest is classified declared or designated as special purpose forests under Act No. 289/1995 Coll. on forests. They forests spa and suburban forests and other forests with increased recreational functions. Areas with the largest recreational use in various forest areas in the regional forestry plans are always in the map functional potential (Holuša senior 2001).
Exemplified on the two natural forest areas. e. g. Moravskoslezské Beskydy, which has an area of 82,432 hectares and forest cover 75.2% - the forests declared as special-purpose forests under Act No. 289/95 are not here. This is due to the fact that the major part of the forest area is realized in the form of free recreation benefits of the forest. But in areas with intensive building recreational facilities, where they must adapt to the requirements forestry recreation and purposefully create the conditions for recreational use of the forest's recreational functions paramount. Also forests in areas with intense sports activities in which they are applied and the requirements specific to deforestation and farming in the adjacent forest areas generally have the character of suburban forests with similar forestry management methods.
The second example is a forest area No. 35 Jihomoravské úvaly with an area of 294,552 hectares and forest cover around 14%. In this area, recreation areas cover about 32% of forests (Macků et al. 1999).

Discussion
In the forest natural area No. 40 would be worth considering whether the forests surrounding the most used ski areas and large cottage settlements should be included in the category of special purpose, to reflect increased demands on forest management under their holiday load.
The Czech's regional forest management plans are written for the first twenty years period. First plan was published in 1999. How will be the character of these plans in the new period is currently a question. There is an expectation in a change of legislation, professional content of forestry institute, which ensures the processing of these plans. Over-pressing recreational functions may not be the same as the process remains. We expect owners but the pressure to reduce the area of forests with recreational functions. The ownership structure is more diverse and thus increases the possibility of deciding on public access to the forest.

Conclusion
The Czech's regional forest management plans are processed by natural forest areas and adapt forest management system for 20 years period. According to the meaning and application of the recreational function of forests under these plans forests are divided into 5 groups, e.g. by natural conditions, position in the landscape, the importance of including in terms of land use plans, etc. Total area of different type of recreational forest function are different by the distance between cities, spas, but is also dependent on the activity of the administration and ownership structure. In the future, we expect that this approach will change with regard to the distribution of forests owners and level for processing of plans.

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Souhrn
Na převážné části rozlohy lesů v České republice se uskutečňuje rekreace v lesní přírodě ve formě volného užitku lesa. V oblasti příměstské rekreace, v místech s intenzivní zástavbou rekreačních zařízení či intenzivní sportovní činnosti, kde se musí lesní hospodářství přizpůsobit požadavkům rekreace a 1cílevědomě vytvářet podmínky pro rekreační využití lesa, je rekreační funkce prvořadá a porosty se mohou zařadit do lesů zvláštního určení podle zákona č. 289/1995 Sb., o lesích.
Podle převládajících rekreačních aktivit, vkusu a nároků návštěvníků lesa se mění i charakter rekreačních služeb poskytovaných lesním hospodářstvím od oblastí bez známek civilizace až po sportovní areály a parkové úpravy s intenzivní návštěvností a s restauračním zařízením (Holuša st. 2001).
Podle významu a uplatnění rekreační funkce jsou lesy v oblastních plánech rozvoje lesů rozděleny do 5 tříd:
1. Lesy rekreačně nevyužitelné - do této třídy se řadí lesní části, v nichž je rekreace vyloučena v jakékoliv formě a kam je pro veřejnost zakázán, nebo značně omezen vstup.
2. Lesy s podmíněně využitelnou rekreační funkcí - patří sem lesní části, kde převládají ostatní funkce lesa a kde je vstup návštěvníkům časově i jinak regulován, nebo jsou zde možné jen některé formy rekreace např. lesy v oborách a bažantnicích, kde je vstup zakázán po určité období a je usměrněn pohyb návštěvníků.
3. Lesy s převažující produkční funkcí - v lesích s převažující produkční funkcí je hospodaření zaměřeno na trvalé zajištění maximální produkce jakostního dříví, přičemž mohou plnit i zdravotně rekreační funkci. Využívány jsou převážně turisticky, při sběru lesních plodin, sportovně, apod.
4. Lesy s podporovanou rekreační funkcí - do této třídy se řadí lesní části, které jsou obhospodařovány v kategorii lesa hospodářského, ale mají současně výraznou rekreační funkci. Hospodaření na těchto lokalitách je ovlivněno rekreační činností a je proto nutno zde do jisté míry usměrnit jeho způsob. Většinou se jedná o části porostů v blízkosti rekreačního nebo zdravotnického zařízení, které jsou buď na lesní půdě, nebo při jejím bezprostředním okraji, lesy v blízkosti lyžařských areálů apod.
5. Lesy se zvýrazněnou zdravotně rekreační funkcí - do této třídy dle rekreačního významu se zařazují lesní části vyhlášené nebo navržené jako lesy zvláštního určení podle zákona o lesích. Jsou to lesy lázeňské a lesy příměstské a další lesy se zvýšenou rekreační funkcí. Oblasti s největším rekreačním využitím v jednotlivých lesních oblastech v regionálních lesnických plánech jsou vždy v mapě funkčního potenciálu.
Celková výměra rekreačních lesů se mění podle jednotlivých přírodních oblastí. To je dáno výskytem měst, polohou v krajině, ale i samotnou aktivitou orgánů státní správy lesů. V budoucnu očekáváme, že se výměra rekreačních veřejnosti přístupných lesů bude měnit v závislosti na vlastnické struktuře lesů. Otázkou také zůstává forma druhé vlny zpracování oblastních plánů rozvoje lesů.

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THE LANDSCAPE STRUCTURE OF THE SETTLEMENTS AROUND THE KRUPINA TOWN

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Abstract
The research of the secondary landscape structure offers many possibilities of its interpretation in the relation to the vertical or topical, as well as to horizontal attributes of the landscape. The aim is the evaluation of the development and the transformation of the secondary landscape structure of the despersed settlements in the cadastral area of Krupina town oriented to the changes processed in the certain period of 1987 and 2013. The further stage of the thesis deals with and evaluates the despersed settlements. We have created mosaics of the landscape structure on the basis of which the typology of despersed settlement in 1987 and 2013 has been formed. They have been arranged into four types (A, B, C, D) by the combination of basic landscape elements of landscape structure. The regionalisation has been developed in two time periods as well. Two regions (agricultural and forest) and seven sub-regions have been defined. The result of the above mentioned is the evaluation of the development and the transformation of the area being observed, proposals for the maintenance of the despersed settlements, recommendations for the despersed maintenance and trends of the despersed development.

Key words: landscape elements, typology, regionalisation, mosaics

Introduction

In the landscape ecology the vegetation of the agricultural landscape is considered to be the important part of the primary and the secondary landscape structure with ecological and environmental functions. Research of the secondary landscape structure has quite a long tradition in Slovakia as well as abroad, with a few approaches and methodological procedures arising from. The starting point of the contribution is to understand the landscape as the integrated, substantial, time-spatial entity, not just the set of components or elements but their mutual interaction as well. To know the country, it is important to know its present as well as current conditions. The landscape development is determined by the processes and phenomenon arising from the attributes of landscape components in concrete climatic and morphostructural conditions. Ružičková, Ružička (1973) define landscape components expressing landscape content, and landscape elements expressing spatial relations of the secondary structure. The interest area represents cadastral area of Krupina town, one of the oldest Slovak towns (with Trnava as well) from the historical perspective. Medieval Krupina played important defensive role against the Turkish invasion leading to the mining towns of Central Slovakia. Krupina town has the specific position at the edge of the highlands and sub horizontal volcanic plain. Mountain area represents the edge of Štiavnické vrchy separated from Krupinská planina (plain) by the Krupinica river valley. Geographical position designated Krupina town to have the commercial function as well as the defensive function with strategic interests. Characteristic features of the town and its close surroundings represent scattered settlements offering the country specific nature with varied representation of landscape elements and well preserved historical structures connected with the landscape utilization. The despersed settlements were built in the 18th century and they are the part of the area up till now. They play important role in the country and they represent the part of the historical and the present landscape structure. Some of the despersed settlements are not being farmed and their function has been waning that causes reduction of the landscape utilization potential and they gradually disappear. The interest area of Krupina despersed settlements belongs to the circumference of the area being endangered by the potential drought. The present vegetation of the agricultural landscape is the important factor in the process of the drought problem solving that is the accompaniment of the climatic changes in the conditions of the Central European mid climate. The aim was to evaluate development and changes of the secondary landscape structure of the despersed settlements in the cadastral area of Krupina town with regard to the processes of changes within the certain period (1987 – 2013). The sub-procedures leading to the aims being determined are: development of the landscape ecological characteristic of the area, evaluation of the despersed settlements on the basis of the selected criteria, and evaluation of the mosaic of the despersed settlement and its landscape structure. Supuka, Hreško, Končeková (2003) mention the landscape structure elements forming the landscape mosaic with its hierarchical arrangement.

Materials and methods

The process of methodology has been realized in the several stages. The introductory stage analyses structural attributes of the landscape. We have been oriented to the analysis of the primary, the secondary, and the tertiary landscape structure. There are 34 despersed settlements in the town. The despersed settlements have been evaluated on the basis of the selected criteria. Mosaic of the landscape structures in the despersed settlements has been evaluated as well. The aim of the evaluation was to determine the relation among the spatial position of the despersed settlements, the size indicators of the settlements, and the selected attributes of the position in the georelief as well as the differences depending on the distance between the despersed settlement and the town centre. The evaluation of the despersed settlements in the observed area has been realized on the basis of three indicators: number of houses, position in the relief, and direct distance from the town centre. We have proceeded to one-stage classification of despersed settlements on the basis of the data being determined according to: number of all of the objects (4-class classification from 1 to 161 objects), coefficient of economic importance (4 categories to 0,5 – 2 and more – rate between number of economic and residential buildings), number of inhabitants (4 categories to 20 and over 100 inhabitants), direct distance from the centre of the town (4 categories to 2 km and 6 and more kilometres), position in the georelief (8 categories – despersed settlements situated on the plateaux, slopes). The despersed settlements have been also subdivided according to their position and relation with the town centre. We have formed four groups of despersed settlements: despersed settlements in the mountain area of Štiavnické vrchy, despersed settlements at the edge of Štiavnické vrchy and Krupinská planina (plain), despersed settlements of Krupinská planina (plain) in the direct neighbourhood of the settlement, with the huge gravitational effect being signified. Mosaics of the landscape structure have been developed in two time levels. The base for 1987 was the topographic map, scale: 1:25 000. Letters M-34-123-C-c Krupina, M-34-123-C-a Dobrá Niva, M-34-122-D-b Banská Štiavnica, M-34-122-D-d Prenčov and M-34-135-A-a Bzovík, the present period has been developed on the basis of the orthophoto maps from 2002 and 2003 and it has been updated by the terrain research in March 2013. The mosaics are being formed around 34 despersed settlements at the distance of 1, 5 km. Typisation of despersed settlements has been realized on the basis of the input data (1987, 2013). Combinations of real elements of landscape structure have been arranged into 4 mosaic types in 1987: A. house, meadow, forest with individual other elements (without orchard), B. house, garden, field with individual other elements (without orchard, vineyard, and meadow), C. house, orchard with individual other elements (without meadow), D. house, meadow, orchard with individual other elements (without field), and 4 types of mosaic in 2013: A. house, meadow, field, forest with individual other elements (without orchards), B. house, garden, field with individual other elements (without orchard, vineyard, and meadow), C. house, orchard with individual other elements (without garden and meadow), D. house, orchard, meadow with individual other elements. Regionalisation of despersed settlements has been developed in both time levels. Two regions have been formed according to the landscape utilization: forest region, and agricultural region, depending on the relief segmentation. We took into consideration watercourses as the boards of the regions. We have determined seven sub-regions within the region. 3 sub-regions have been allocated within the agricultural region and 4 sub-regions have been allocated within the forest region. The process of region and sub-region allocation arose from the landscape elements being represented in the individual despersed settlements in 1987 – 2013. The aim of the final phase was to observe dynamics of the transformations of the despersed settlements on the basis of their evaluation according to the selected criteria, and to develop recommendations arising from the potential of the area being observed, and to preserve the landscape character of the area as well as traditional landscape utilization in such a way.

Results and discussion

We have classified 4 classes of despersed settlements in the interval from 2 to 161 according to the number of all buildings. Selected categories are being evaluated in the following way: with the small number (2-10), with the mean number (10-30), with the large number (30-50), with the very large number (50 and more). The despersed settlements have been devided into 4 categories according to the coefficient of economic importance (the ratio between the number of economic and residential buildings): the low economic importance (to 0,5), the secondary economic importance (0,6 – 1,0), the great economic importance (1 – 2), the huge economic importance (2 and more). We have formed 4 categories according to the number of inhabitants

at the individual despersed settlements: the small number (to 20), the mean number (20-50), the large number (50-100), and the very large number (over 100 inhabitants). The direct distance of despersed settlements from the Krupina town centre was the criteria of their division into following categories: the very short distance (up to 2 km), the short distance (2 – 4 km), the mean distance (4 – 6 km), and the long distance (6 km and more). We have sectionalised 8 categories according to the position in the georelief: plateaux position (the despersed settlement placed in the plateaux only), slope position (the despersed settlements placed on the slope only), slope-plateaux position (2/3 of the despersed settlements placed on the slope and 1/3 on the plateaux), slope-vale position (2/3 of the despersed settlements placed on the slope and 1/3 in the valley), slope-saddle position (2/3 of despersed settlements placed on the slope and 1/3 in the saddle), ridge position (the despersed settlements placed on the ridge only), ridge-plateaux position (2/3 of despersed settlements placed on the ridge and 1/3 on the plateaux), ridge-slope position (2/3 of the despersed settlements placed on the ridge and 1/3 on the slopes). Following elements prevail in A landscape structure: house, meadow, forest, and very rarely other elements as are for example garden and vineyard. Type A contains the despersed settlements: Červená hora, Čierne blato, Dráhy, Ficberg, Gubáň, Havran, Holý vrch, Môlkňa, Odrobinovo pole, Okrúhla hora and Široké lúky. Type B contains elements with the hugest representation of house, garden, and field. Following despersed settlements belong to this type: Bebrava, Biely kameň, Briač, Kopanice and Na Petre. Type C is typical by the dominant representation of the elements house, and orchard. It contains the despersed settlements: Hozník, Husársky most, Kňazova dolina, Kukučka, Pijavice, Pod Vodojemom, Šváb, Tanistravár, Tepličky, Tvoľ, Vajsov, Vĺčok and Žobrák. Type D is formed by the elements – house, meadow, and orchard. This type contains following despersed settlements: Líška, Nová hora, Stará hora and Starý háj. Two regions have been defined on the basis of the regionalisation in the area: region of the agricultural landscape and the forest landscape. Sub-regions 3, 4 and 5 belong to the region of the agricultural landscape. Sub-region 3 contains despersed settlements: Kopanice, Kňazova dolina, Tepličky, Pod Vodojemom, Hozník, Briač, Tanistravár, Biely kameň, Husársky most and Okrúhla hora. Sub-region 4 is formed by the despersed settlements: Pijavice, Žobrák, Môlňa, Červená hora, Líška, Čierne blato and Havran. Sub-region 5 contains despersed settlement: Tvoľ, Ficberg, Stará hora, Na Petre and Bebrava. Region of agricultural landscape is represented by 22 despersed settlements forming the most of the area, being placed on the south slopes and in the immediate vicinity of the intra-region of Krupina town. The area is largely represented by fields. The forest landscape contains sub-regions 1, 2, 6 and 7. The sub-region 1 contains the despersed settlement Poloma, situated on the north part of the cadastral area. Following despersed settlements belong to the certain region: Brezová, Dorkovička and Lánička. Sub-region 2 is represented by the despersed settlements Vĺčok, Škvarkov kopec, Vichorec, Šipošky, Šnierky and Kňazova Hora. Sub-region 6 is represented by the despersed settlements Široké lúky, Nová hora, Kukučka, Dráhy, Starý háj and Vajsov, Niklberg and Kamenný kríž. Sub-region 7 contains the hamlet settlements Šváb, Gubáň, Odrobinovo pole and Holý vrch.

Conclusion

The preservation of the despersed settlements in the landscape has the huge importance. The hamlet settlements are irregularly diffused, but regularly separated from the intra-region. The area being observed contains 34 hamlet settlements we dealt with in the contribution. The aim was to evaluate development and changes of the secondary landscape structure with the emphasis on the hamlet settlements. We have evaluated hamlet settlements on the basis of the selected criteria according to the number of all of the objects in the area, according to the coefficient of the economic importance, and number of inhabitants, according to the direct distance from the town centre, and their position. According to the number of objects, the most of which is at Kopanice hamlet settlement (128), and the least of them Pod vodojemom hamlet settlement (1). Economically the most important is the despersed settlement Bebrava and economically the least important is the despersed settlement Biely kameň. The most of the inhabitants live in Červená hora despersed settlement (228), the least of them live in Čierne blato (1). The outmost despersed settlement (the longest distance from the town centre) is Holý vrch (8, 79 km far from the town centre). The shortest distance from the town centre represents the hamlet settlement Pod Vodojemom (0, 92 km far from the town centre). The most of the hamlet settlements (13) are placed in the slope-plateaux relief, and the least of them in the plain and the slope-saddle relief position. We have also evaluated mosaics of landscape structure of hamlet settlements. Type C is the one that has been changed the most from the complex

evaluation of region typology. It has been changed into type A and D. Meadows, fields, and forests have completed the original landscape elements. Tendency of changes of the landscape utilization in regions and sub-regions is very similar. The forest way of landscape utilization, urbanization and surface water increase in the certain area. The agricultural way of landscape utilization decreases. New houses are built in the hamlet settlements but they do not have the function of the despersed settlements as it used to be before. Preservation of traditional ways of landscape management and recovery of agriculture are the proposals of the area being observed. We also propose the maintenance of the old orchards. We do not support their transformation into the building sites. They are important for the landscape from the ecological perspective. They do not occur in the present landscape very often. The Slovak hamlet settlements deserve the increased attention. The importance of orchards as the important biotopes of fauna and flora has been already appreciated abroad but there is no interest oriented to the orchards in Slovakia. The hamlet settlements are important from the perspective of the preservation of historical landscape structures being created by many landscape elements. The hamlet settlements can be developed in two different ways. They can be transformed into the residential sections without any agricultural function in the certain area, or they can be changed into the recreation areas. While they are being transformed into the recreation areas, the way of landscape utilization will be realized. Omasta (2011) mentions the population leave from the hamlet settlements. We did not detected abandonment of the hamlet settlements but the transformation of the management and its functions.

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Souhrn

Cílem příspěvku bylo zhodnocení vývoje a změn druhotné krajinné struktury Láznička osídlení s ohledem na procesy změn za určité časové období 1987 a 2013. Zaměřili jsme se na hodnocení rozptýleného osídlení na základě environmentálních kritérií, analýz mozaik krajinné struktury, regionalizaci a typizaci, hodnocení trendů a vývoje krajinné struktury. Metodiku jsme vypracovali v několika etapách. V prvním kroku jsme analyzovali prvotní, druhotnou a terciární krajinnou strukturu. Ve druhém kroku jsme definovali typy v krajině podle zastoupení krajinných prvků. Kombinace reálně se vyskytujících prvků krajinné struktury jsme uspořádali do čtyř typů mozaiky: A, B, C, a D. Dále jsme vypracovali typizaci a regionalizaci území. V území je možné rozlišit sedm subregionů na podkladě původní struktury z roku 1987 a podkladu vytvoření krajinných typů v území. Region zemědělské krajiny má nejvyšší zastoupení v typu C (8) lazů, v typu A (6), v typu B (6) a typu D (2) lazy. Region má největší rozmanitost typů rozptýleného osídlení. Rozčlenění regionů jsme vytvořili ze dvou hledisek, a to z hlediska členitosti reliéfu a z hlediska vyskytujících se vodních toků v území. Pro hranice jsme brali v úvahu vodní toky a jako první úroveň jsme rozlišili lesní půdní fond od zemědělského. Území jsme hodnotili z environmentálního hlediska a na základě mozaik krajinné struktury. V obou časových úrovních jsme vypracovali regionalizaci rozptýleného osídlení. Vytvořili jsme dva regiony (zemědělský a polní). Regiony jsme vzájemně srovnávány a hledali způsoby jejich racionálního využití. V závěrečné etapě jsme se zaměřili na hodnocení a racionální využívání rozptýleného osídlení. V souladu s evropskou úmluvou o krajině je důležité v zemi vymezit typy. Podstatným je zachovat rozptýlené osídlení v území a snažit se vrátit k původním hodnotám v krajině.

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THE NATURE CONSERVATION IN PARKS AND MONUMENTS IN THE USA - THE EXPERIENCE OF THE KNOWLEDGEABLE TOURIST

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Abstract
The system of the large-area's nature conservation in the USA is represented of the network of National Parks, National Monuments and State Parks. The Tribal Parks have the special part in this system. The large areas are without human utilization and the tourism is concentrated to chosen destinations with special traffic infrastructures, accommodations, etc. for visitors. Hiking, trekking, climbing and other outdoor activities. The meeting wildlife – the problem with motto: „Keep wildlife wild".

Key words: tourism, outdoor, hiking, wildlife, visitor

This article is not a complete summary of the nature conservation system in the USA. It is an attempt to pass on the experiences of a knowledgeable tourist. It means a man who is influenced by his profession and is not amazed at the nature's beauty but he pays attention to details and is trying to make a comparison.
The system of large protected areas is varied and multi-leveled in the USA. One of possible classifications can be by the founder – federal or state government (National or State Parks). Another classification possible is by the area. Then can we distinguish between Parks and Monuments (probably only at the national level). Tribal Parks have specific status for a foreigner. They are areas with the administration and management of the natives (but at the national level). National forests and specific places within them (for example Red Canyon in the Dixie National Forest) are other types of protected areas.
The park system has several common attributes:

- paid entrance;
- unified visitor centers, information systems or printed materials;
- minimal or no settlement;
- large areas without people management.

National Parks (hereinafter referred to as NP) have a unified system of rangers and in most cases free public transport by "shuttle bus". A tourist can see the unification best in visitor centers – there is a unified layout (cinema, information service, food or souvenir stores, restaurant, toilets, exhibitions, sometimes showers, etc.) The cinema shows a loop with movies about the NP. The movie time was the same in every visited NP.

Transport

Tourists usually go to the protected areas by car. We can see other means of transport too, primarily variously modified bicycles. There are blacktops or other roads for cars inside the protected areas. Visitors often take shuttle buses in larger NPs. These small buses have opening side-windows or sunroofs sometimes, or the bus driver troubles poor tourists by wrongly adjusted air-conditioning (usually very cold). The NP Grand Canyon also has a railway. Another specific way of transport is a joy flight by helicopter, a ride on a horse or mule, rafting, paddling and others. And naturally walking, running, hiking, climbing.

Accommodation

Visitors can choose accommodation of their choice. The lodge means better comfort in any building – bungalows, hotels, boarding-houses. The camps are for owners of tents or caravans (trailers). There are some distinctions among the camps. On the one hand, there are very simple conditions for sleeping and washing, on the other hand, there are camps with fireplaces, grills, facilities, rain or wind shelters on every place for a trailer or a tent (Fig. 1). A special possibility for sleeping was in the State park Goblin's Valley – a night in the Mongolian yurt. There are no showers or baths in a vast majority of the camps in NP. That is the problem for visitors with tents because washing your body in a small sink in restrooms is practically impossible. There are parks with paid showers near the visitor center. For example, in Bryce Canyon NP you can have warm water for a long time (8 minutes) and it costs 2 dollars only. The time is enough for washing 2–3 persons.

In all NPs there are the strict rules for storage of food. The reason is animals. For example, there are bears in Yosemite NP. There are the big iron containers in the camps. Visitors have to put all food into the container for the night. The food cannot even be in the car. In Capitol Reef NP there was a problem with raccoons and so it was forbidden to put the garbage near tents but we had to take it out in the garbage tin or hid it in the car. The ranger called attention to the rules emphatically but very courteously. Generally speaking, one of the things that are different between the Czech Republic and the USA is the way of communication. I do not mean the American style "don´t worry, be happy". I will give example from my own experience. We committed two minor offences against camp rules. The ranger always came in a short time and called our attention to the bad behavior. And always in a very friendly form. We did not have any uncomfortable feeling of fear in face of the authority of the ranger. There was one important thing – he gave an explanation why our behavior was bad. It was in stark contrast to similar situations in the Czech Republic.

Fig. 1: State Park Goblin's Valley and very well equipped camp

Visitor Center

The unification of the visitor centers in NPs has already been mentioned. The State Parks try to copy this. There are differences among the states of the Union depending on how they cope with local particularities or how much money they have for the operation of the entrance halls/gates. They are more modest commonly but it does not mean worse. A big problem was to buy stamps. The picture cards are prepared for visitors, but the stamps are sold at the post office only.

Walking/hiking/trekking

The basis for this activity is short well-kept trails, which enable two hour's walks. More attractive trails are longer and show the nature's beauty, scenery and points of view and provide more physical activities for hikers. It is possible to set out for more days' treks in all NPs, but we met very few adventurers. The case apart is NP Grand Canyon, where it is possible to come down to the Colorado River and then go back up. This attractive trail can take one day but the advice is to stay overnight on the bottom of the canyon. Sometimes longer treks were not recommended for extremely climatic conditions - primarily hot and dry weather (for example NP Death Valley). There was another attraction in Zion NP - you can walk through the bottom of the river (Fig. 2). The time of this hike can be various – the visitors can turn at any moment and go back. It is their decision if they turn back after 15 minutes or 4 hours. They can go for a longer trip for a few days to the other part of NP too. Another attraction is the easy "ferrata" (a secured way on the rock) on top of rock Angels Landing in Zion NP. There are different types of road surfaces. Longer trails have natural surface with some local adjustments only but for example in Yosemite NP we could see the remains of very old blacktop on the way from the Glacier Point. In Zion NP some parts of road were concrete. We could also see the stone blocks. Sometimes the way is broken through the rock. We went on a pathway only 1–1.5 m wide without railing in the rock wall in Zion NP. This will not be probably very pleasant for persons who get dizzy (Fig. 3). This approach to tourists' safety could be often seen (the absence of indications and prevention of danger). It is inconceivable in Europe! Also the way of marking is different from us. There are signs with figures about distances on the crossways only. This is no problem because the paths are very well visible and clear in terrain and there are no unmarked crossings. Only in the paths made of stones (on the rocks) there are lines or little pyramids made from small stones, which are bordering the way. Sometimes, we could see man-made signs (wood or plastic plate on a pole) (Fig. 4). There are signboards with maps, information, warnings, orders,

bans and rules near the roads, crossings or in Visitor centers. The number of boards with orders and bans is minimal. They are formulated as notices or appeals and visitors are usually only asked not to do something.
Every park has a unique style of marking, but the details are similar. In the entrance of parks there are the ranger checkpoints. The rangers usually collect the visit charge (Fig. 5).
The most important means of transport in the USA is a car. Cars need parking places. The area and equipment of them depend of the attractiveness of each place (Arches NP has a very large parking place in an area called “The Windows”).

Fig. 2: The walking through the bottom of the river in The Narrows (NP Zion)

Fig. 3: The pathway only 1–1.5 m wide without railing in the rock wall (NP Zion)

Fig. 4: The man-made sign on the rock (NP Zion)

Fig. 5: The ranger checkpoint and gateway into the Zion NP

Wildlife

We read many times the slogan "Keep Wildlife Wild". Every enthusiast is sure to agree with this idea. But the way of the putting this slogan in place is strange. The park wildlife may do everything. The nature is their home and the people are only visitors here. The people must not kill or hurt the animals. The animals are free. There are signboards with warnings not to feed animals everywhere. There are attached pictures of bitten and scratched arms by squirrels. Everything would be great if the wildlife did not lose the fear of people. The sentence "Don't feed the squirrels" cannot be true because the squirrels take the food themselves. They get into your open rucksack beside your leg or they begin to climb up a frightened tourist who made the mistake to sit down on the stone and took their snack. The animals are so cheeky in popular places that they do not run away although there is danger that you trample on them – as if they believed you will not do it (Fig. 6). We could see some species of animals face to face but are they still wild animals? There is a rule to keep the minimum distance of 30 m from wapiti. It becomes funny at the moment when the deer goes through the camp 1 m from your tent or the deer's group grazes around the camp's toilet.

Fig. 6: Very cheeky squirrel in Yosemite NP

Tribal areas

Some protected areas are in districts with the administration of the natives. The Antelope Canyon is the world-famous natural place, but it is very small. Never mind that the entrance fee for usual visitors includes the sum which is fixed for natives only. It is pleasant if the guide belongs to the local Amerind tribe. We felt awkward by our visit of the Monument Valley Navajo Tribal Park. It is the most important place of nature's beauty in the USA, thus it has a big tourist potential. But the problems were: stands, counters or tables with supposedly original Native American jewels everywhere (Fig. 7); the litter alongside the roads; the snobbish visitor center with hotels and stores (with "Native American" goods); the uncanny "shopping village" with "Native American goods" near the Park's boundary; no alcohol in the camp's store (not even beer). The very strong "*genius loci*" of this landscape with rocks and sand is vanishing and is being replaced with something else. And that is very sad.

Fig. 7: Counters with original Native American jewels (Monument Valley Navajo Tribal Park)

Other findings

The specific rock structures in Mono Lake will not be noticeable in next few tens of years, because there is a plan to get the original lake surface back to the level before the moment when the water began to be used for drinking, irrigations and other utilizations.

"Small tube" telescopes without glasses show various places of interest from vantage points. The telescope is made from a little iron tube on the iron bar and it is firmly fixed in one direction only. The tube guides our attention to the specific place in the scenery.

The Delicate Arch in the rays of sunset is a well-known picture. There are lots of people here at that moment, but they all respect the unwritten rule and do not come near the Arch. Only in this way it is possible to make the fascinating photos of unpeopled landscape (Fig. 8).

It is possible to see small places surrounded by a fence. The entrance is prohibited on the grounds of restoration and regeneration of the natural succession, the ecological susceptibility or the biodiversity (Fig. 9).

It is possible to make a trip in the group with the ranger's commentary.

Fig. 8: The Delicate Arch without people, but they were there (Arches NP)

Fig. 9: Special small protected area (Grand Canyon NP)

Souhrn

Systém velkoplošné ochrany přírody v USA je tvořen soustavou Národních parků, Národních monumentů a Státních parků. Zvláštní postavení mají tzv. Tribal parky, které jsou řízeny původními obyvateli. Dalším typem jsou Národní lesy. Rozsáhlé plochy jsou ponechány bez lidského zásahu a turismus je směřován do vybraných míst s vlastní infrastrukturou (doprava, ubytování). V chráněných územích je možno při dodržení určitých pravidel provozovat různé

aktivity od krátkých procházek, k delším pěším výletům, ale také třeba horolezectví, rafting, cyklo- a hipoturistiku aj. Ubytování je možné v tzv. „lodžích“ nebo v kempech s různým komfortem vybavení (často úplně chybí možnost vysprchovat se). Národní parky mají jednotný styl prezentace, uspořádání návštěvnických center atd. Informace o pravidlech chování v parcích nejsou většinou psána formou zákazů či příkazů ale spíše jako doporučení nebo žádosti se stručným, ale jasným vysvětlením důvodu požadovaného omezení. Všude se apeluje na návštěvníky, aby dodržovali určitá pravidla chování ve vztahu k divokým zvířatům. Jednak je to kvůli vlastní bezpečnosti, ale také s cílem ponechat zvířata „divokými“. A to je problém, protože zvláště některá zvířata postrádají strach z člověka – veverky sice krmit nebudete, ale samy vám vlezou do batohu, jeleni wapiti si nic nedělají z toho, že byste od nich měli udržovat vzdálenost alespoň 30 m a klidně chodí mezi stany nebo se popásají přímo u toalet. Značně rozpačité pocity vzbudila návštěva parku Monument Valley, který je spravován kmenem Navajo. Na straně jedné silná komercionalizace až podpora snobismu u návštěvníků, na straně druhé je cítit některé sociální problémy. Vším trpí *genius loci* tohoto pro Američany významného místa. Inspirující je ohleduplnost mezi návštěvníky, což se projevilo např. při fotografování známého kamenného oblouku Delicate Arch při západu slunce. I když bylo okolo až několik set lidí, nikdo se nepřibližoval v kritické momenty k oblouku, a tak bylo možno vytvořit obrázky krásně nasvíceného oblouku zcela bez lidí. Místy je možno narazit na menší oplocené plochy se zákazem vstupu, kde je chráněna přirozená sukcese, ekologická citlivost území nebo biodiverzita.

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THE PROPOSAL OF RECREATIONAL AND EDUCATIONAL TRAIL FOR DISABLED PEOPLE IN WHEELCHAIR AROUND THE HISTORICAL WATER RESERVOIR POČÚVADLO

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Abstract
The paper presents the proposal of recreational and educational trail for disabled visitors on wheelchair around the historical water reservoir Počúvadlo in the Protected Landscape Area Štiavnické vrchy (Central Slovakia). The water reservoir Počúvadlo was constructed in the 18th century in connection with mining actvities near the town Banská Štiavnica. Water reservoir Počúvadlo is a part of unique historical water-management system which was built in this region from 16th to 19th century. In the year 1993 was town Banska Štiavnica along with the technical monuments in the surrounding inscribed to the UNESCO World Heritage List. Currently this water reservoir is intended first of all for recreational purposes. Near the water reservoir Počúvadlo, there are various opportunities for recreational and educational actvities for visitors with disabilities in wheelchair with a very good acces.

Key words: recreation, Banská Štiavnica, UNESCO

Introduction

One of the main objectives "The world health organization" is a fact, that all nations should be bearers of research in the questions of generally health,including support for disabled people in wheelchair . Creativity and skills of researchers should be used to strengthen of health not only in academic centres but also in the other programmes for its promotion at all levels. Margaret Chan (2013) reported: „As we approach the 2015 deadline for meeting the United Nations Millennium Development Goals (MDGs), it is time to take stock of the progress that has been made since 2000. It is also time to reflect on how we made progress, and on how we could do better. One idea is to make greater use of community-based interventions. Understanding how to make progress towards achieving the MDGs is the essential question. As the 2015 deadline draws closer, we are looking for ways to improve all aspects of health, within and beyond the MDGs framework“.One way of improving the conditions for disabled people in wheelchair at national and supranational level and their inclusion is the development of tourism. Building recreational and educational trails without barriers is one of ways discovering of local traditions, history and natural beauty.The usefulness of such activities is essential,because the stay in an authentic historic and natural environment has affects on development of not only physical activities but also the mental health of these people.Education and enrichment of knowledge based on the new experiences in the new region brings opportunities for further personal development and individual growth (Lukáčik 2008). Removing of barriers and connecting of people together regardless of borders and limitations is the motive of all those who understand the basic human thought of mutual assistance and philosophy of the progress "with man hand in hand."

Materials and methods

The artificial water reservoir Počúvadlo(called tajch) is near of historical town Banská Štiavnica, which is 15km away from the central city. It is the most famous and most visited recreational resort of Štiavnickévrchy.Počúvadlo is situated on the area of 12 hectares and is a favorite summer but also winter resort. This water reservoir is a popular place for tourists, children's summer camps and local cultural events. It is also the starting point for the highest hill of Štiavnickévrchy– Sitno (1009 m a. s. l.).Besides bathing, boating, fishing and water bikes Počúvadlo seasonally offers food services, refreshments, evening live music and other attractions for its visitors.

The methodology of evaluation and proposals for accessing of the recreational and educational trail for people with disabilities in wheelchairs around the historic water reservoir Počúvadlo is divided on the:

- current state and options:

Informations about the water reservoir Počúvadlo and surroudings Banská Štiavnica in the Protected Landscape Area(PLA) Štiavnické vrchy.
Natural conditions of water reservoir Počúvadlo in PLAŠtiavnické vrchy.

The basic information about the availability of locality Počúvadlo, characteristic of hotel Topky and accessibility for wheelchairs .

- proposals for accessing:

Suggestions for accessing of route, recreational and educational activities.
Evaluation and proposal of geometrical characteristics route.

Current state and options

Informations about the water reservoir Počúvadlo and surroudings Banská Štiavnica in Protected Landscape Area(PLA) Štiavnické vrchy

Počúvadlo and its surrounding is located near the historical town Banská Štiavnica in the PLAŠtiavnické vrchy.It has a unique position in Europe in frame the mining water management system which was built in the surroundings of Banská Štiavnica from 16th to 19th century.The town and its surroundings of Banská Štiavnica are rich with technical development history which bore the signs of world priority in the past. Due to history was Banská Štiavnica the third most significant town in Hungary in the 18th century. Thanks to the establishment of the Mining Academy in 1762, later expanded to the Mining and Forestry Academy, Banská Štiavnica was inscribed forever in history as the seat of the world's first forestry high school. The development of mining was included to the development of technical water management disciplines. This is proven by 54 original reservoirs forming a unique water management system which laid the foundations of purposeful dam building in Slovakia (Baco in Lichner et al.2005). Many of them are functional even today and in spite of their respectable age they serve both to supply water and also for recreational purposes. With regard to dam height, the water reservoir Počúvadlo with dam height of 22.5 m was in the 19th century the third highest dams of mining reservoirs constructed in Europe.According to historical documents (Figure 1) the construction of water reservoir Počúvadlo was started on April 24, 1775. Počúvadlo reservoir is made up of five earthen dams. The wall of the main dam is 195.3 m long, 19m wide at top and 29.6 m high. In 1855 the volume was 745,300 m^3 with the maximum depth 10.8m, as mentioned in historical documents. The proposal to build of new water reservoir far from the village Počúvadlo was submitted by engineer master Jozef Karol Hell (15 May 1713, Banská Štiavnica – 11 March 1789, Banská Štiavnica). His first machine was able to pump water up from the depth of 212 meters.He was a student of Samuel Mikovíny which was the famous architect, surveyor, mathematician, cartographer, astronomer, water engineer, builder and teacher - the first Slovak engineer with a degree. With the construction of dam Počúvadlo were associated many things and paradoxes, for example, that among workers in the construction worked women (for example, in June 1776, out of 478 workers it were 360 women, in July 1777 out of 190 people it were 80 women and in august of the following year, out of 308 women worked along on site only 111 men). This was due to cost cutting and for reasons of cheap labor. According to archived documents, construction was finally finished on May 26, 1779. In the course of the construction which lasted for 4 years, were invested 102 322 florins and 56 ¼ farthings. The planned budget for construction of the water reservoir was exceeded by more than 30 thousand florins, for reasons of accidents during construction, which had to be removed, as mentioned in historical documents (Lichner et al. 2005).Traditions and mining heritage are still in focus, as demonstrated by the various events all over the world (Figure 2).These primacies and other interesting information about the history of Počúvadlo and its surroundings can be a good reason for people in weelchair to visit this region and to have information about local culture.

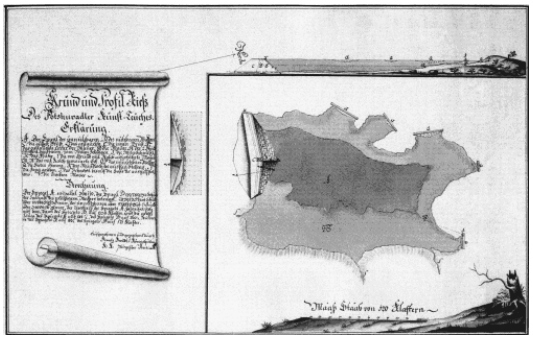

Fig. 1: Počúvadlo – The ground-plan: Ján Schultz (the end of the 18th century)

Natural conditions of water reservoir Počúvadlo in PLAŠtiavnické vrchy

PLAŠtiavnické vrchy was declared by Decree No. MK SSR. 124/1979 Coll. of 22 September 1979 as amended by Act no. 287/1994 Coll. Its acreage is 77,630 ha. The motive of declaration protected area was the protection of nature and natural values, following the valuable monuments of the history, also to protection of the wider surroudings of the historical town of Banská Štiavnica, having regard to all-round cultural, scientific (water retention in the country) and medical-recreational importance. Compared to other large protected territories, thus of significantly different motive.Štiavnické vrchy with its area is the biggest protected landscape area of Slovakia.In direction of longitude has PLA of 40 km in direction of latitude 37 km. The highest peak is Sitno (1,009.2 m a.s.l.), the lowest point is located in the valley of Hron in the village Kozárovce (180 m a.s.l.).This is mountain, which was the biggest stratovolcano in Tertiary Period on the territory of Slovakia.This area has a varied geological structure, which is reflected in the variety of its forms of terrain.From the geological point of view, there are andesites, rhyolites, tuffs and breccias, sometimes sandstones, slate, quartzites and limestones.Biogeographic location area at the interface of two different climate types causes blending elements of Pannonian flora and fauna with the Carpathian mountain elements.Štiavnické vrchy is a country which has been formed and transformed of the activities of miners over the centuries.Abundant mining history, documented unique technical monuments gives the country a special character.

Fig. 2: World Mining Heritage, Mine Tours, Mining Museums Worldwide (Source:

http://www.flickr.com/groups/world_mining_heritage)

The basic information about the availability of locality Počúvadlo, characteristicof hotel Topky and accessibility for wheelchairs

Basic data of availability of locality Počúvadlo and proposal polygon are summarized in Tables 1, 4.Location of water reservoir Počúvadlo is plotted on the map Štiavnicke vrchy (Figure 3).Identification of hotel Topky is shown in Figure 4. Topky is a hotel with wheelchair access, directly on the bank of Počúvadlo. It provides a nice common areas and accommodation in rooms with private shower and toilet. Directly in areal is the conservatory, fireplace room and cafe. During the summer season is open terrace overlooking the Počúvadlo.The hotel is situated in a forest-park with possibilitiesto spend leisure activities. The hotel has self parking without payment and has own bus for guests and visitors.Before entering to the recreation area is a public car park with paying for services.In the immediate vicinity of the water reservoir are information boards about the locality and direction signs of hiking trails (Figure 5).There's a basic technical equipment for recreation (beach with grass surface, grocery store, refreshment stands, boat rental and water bikes, etc.).

Proposals for accessing

Suggestions for accessing of route, recreational and educational activities

The unique Štiavnickévrchy is predestined for recreation and tourism.Given on the mining water management system built in the surroundings Banská Štiavnica it has a unique position in Europe. Počúvadlo is most-visited water reservoir with regard on tourism in the territory of Štiavnické vrchy. There are options of accessibility for people in wheelchairs and the possibility of recreational and physical activities around the reservoir Počúvadlo.Basic data of availability of locality Počúvadloare in the Table 1. In the vicinity of the hotel and reservoir of Počúvadlo may be carried out various activities which are processed in the Table 2. It is the nearest hotel with wheelchair access in the area of Počúvadlo. This are provides comfortable services with interesting events in the area. Services are verified by many visitors with disabilities in a wheelchair.The proposed educational activities in the area of Počúvadlo within 30 km are

handled transparently in the Table 3.Characteristics of the polygon for wheelchair users and of the reservoir Počúvadlo are in the Table 4 and longitudinal profile is in the Figure 6.
The educational process we plan to implementon 4 proposed stops through of the visual panels with the themes T1-T4 (description in Table 4). The final proposal will solved in the context with the needs of "people in wheelchairs" including technical parameters. The authors (Jakubis, Rusko 2003, Jakubis, Jakubisová 2010, 2012, Jakubis 2011, 2013, 2014, Fialová et.al2014) dealed with similar problems in proposals of touristic polygons in nature on the other localities.Educational topics (T) for leisure time have been designed in accordance with special focus and goals:
T1: Informations about trail for disabled people in wheelchair and the natural conditions in the PLA Štiavnické vrchy, flora, fauna, protected areas and monuments;T2: The history of water management system and technical monuments of the surroundings water reservoir Počúvadloas a part of the UNESCO World Cultural Heritage; T3: Historical informations about of water reservoir Počúvadlo, technical monuments and curiosities; T4: The history of forestry education. Function of forest ecosystems, focusing on the water protection and on the water management in the landscape.

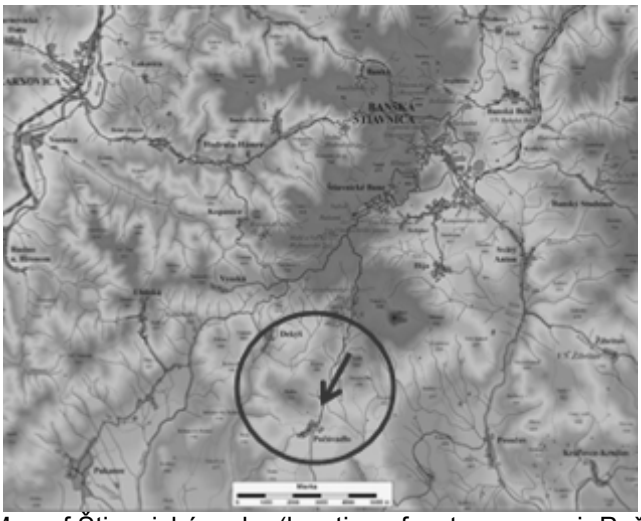

Fig. 3: Map of Štiavnické vrchy (location of water reservoir Počúvadlo)

Source: http://www.tajchy.sk/pic/picture.php?obr=mapa_velka

Fig. 4: View from Sitno to Počúvadlo, identified hotel Topky (Jakubisová, 2014)

Evaluation and proposal of geometrical characteristics route
Disabled access for wheelchair users is limiting condition for entry into the area of the proposed educational-tourist polygon. The other important criterias of planning routes in the outdoor environment include: surface of routes, length of route, longitudinal and cross gradients of route, duration of activity, technical data of wheelchair and other technical standards.The criteria of touristic activities for people in wheelchair in natural of polygons are summarized on the based

empirical experiences of wheelchair users: surface of the route should be in principle hard or reinforced; obstacles on the route (depth / height) should be < 8 cm (for electric wheelchairs is acceptable limit up to 10 cm); the maximum increase or decrease should not exceed 10% (for electric wheelchairs - max. 15%); the maximum length of the section with longitudinal gradient road 10% - 15% should be < 150 m; ideal length of route should not exceed 4 km of the planned half-day activity; the maximum cross slope should be < 3% (for electric wheelchairs < 5%); maximum gradient at rest places for potential rotation of wheelchair users should be < 0,1%; minimum width for safe passage for wheelchairs should be > 90 cm; the minimum space for safe passage of two wheelchairs should be > 180 cm; space needed to rotation of the wheelchairs should be limited to a minimum diameter of circle = 1,500.00 mm (data were derived of size of massive electric wheelchair - Orthopaedics - Tourning - 928).
Characteristics of planimetric and distance of altitude the routes are processed in the Table 4 with other technical details of the route.Longitudinal profile of the route is on the Figure 6.

Tab. 1: Basic data ofavailabilityoflocalityPočúvadlo

Country:	Slovakia
Geographic region:	Banská Bystrica
Governing body:	Štiavnické vrchy Protected Landscape Area administration in Banská Štiavnica
Location:	CentralSlovakia
Coordinates:	48°32′N 18°58′E
Established:	22 September 1979
Area:	77,630 ha

Tab. 2: Options of tourism and activities in the vicinityPočúvadlo

No.	Summersports	Trans.	Winter sports	Trans.	Otheroptions in vicinity	Trans.
1.	hiking in wheelchair	ind., in wheel chair	winter hiking	in wheel chair	thermal pools (Sklené Teplice, Vyhne)	car, bus
2.	watersports, fishing, visit theforest park	ind., in wheel chair	curling (on the frozen water surface of Počúvadlo	in wheelchair	educational tourism (Antol, Banská Štiavnica, Štiavnické Bane	car, bus

Explanatory notes: Trans. - transport;

Fig: 5: Direction signs of hiking trails in surroundings locality Počúvadlo

Tab. 3: Theproposededucationaland recreationalactivities in the area ofproposed polygon Počúvadlowithin 30 km

Distance from–to [km / h]	The title of activity	Brief description and time requirements of activity in hours
Počúvadlo – Štiavnické Bane [10,5 km/0,25 h]	Open-Air Mining Museum Banská Štiavnica	The oldest and most extensive mining exhibition in Slovakia shows the evolution of oremining in Central Europe from the Middle Ages to the end of 21 century. Underground exhibition with a visit to the mine fromthe 17th century. Time requirements of activity – 4 h
Počúvadlo- Banská Štiavnica [15,3 km/0,29 h]	St. Catherine'sChurch	Late Gothicchurch. Catherine wasbuiltbetween 1488-1491.Underneath the church there is a crypt in to which was buried reeve and prominent towns people.
Počúvadlo- Svätý Anton [19,5 km/0,33 h]	Museum ofSvätý Anton	Baroque – Classical mansion. The first mention 15th century. The building has in it self hidden elements of calendar symbolism – the mansion had 4 entrances, 7 arcades, 12 chimneys, 52 rooms and 365 windows.
Počúvadlo- Sklené Teplice [28,4 km/0,61 h]	Spa Sklené Teplice	Rarity of Sklene Teplice is the occurrence of thermal mineral water springs with a temperature of 37-52 ° C. Unique product of nature called Parenica – thermal bath, which offers visitors the opportunity to bathe directly in the cave where are available the hot water springs.

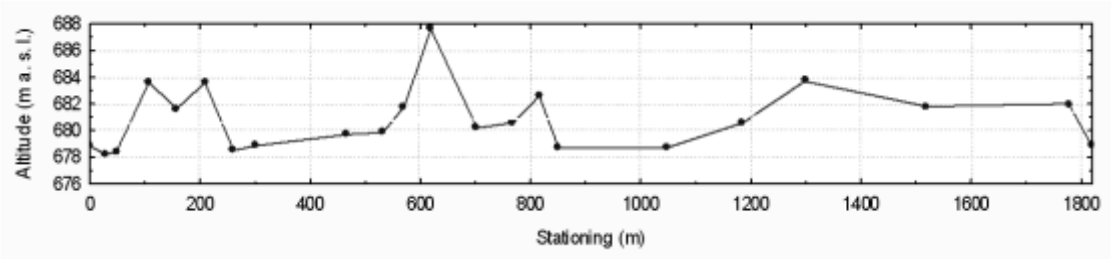

Fig. 6: Longitudinal profil of route Počúvadlo

Results

A summary of the basic characteristics access of people on the wheelchairs in natural conditions and the limits on the route are presented in Table 4. Total length of the proposed polygon is 1.82 km, which represents time on the passed route approximately 1.09 hours (speed of the movement of wheelchair users 1 km/0.6 h). Planimetric data and data on height differences on the route of proposed polygon for disabled people in wheelchair are in Table 4. Longitudinal profile of the route is on the Figure 6.The lowest point is of 678.20 m a.s.l. and the highest point is of 683.70 m a.s.l. on the route.Maximum longitudinal slope is 12.08% between stations S11-S12on the length of the route 48 m. The maximumcrossslope is 2.00 % on theroad. Max. height/depth of barriersis 0,05 m on theroad. Estimatedtimeof the routewithoutstoppingis 1.09 h. Estimated time of the route with stops is 2.09 h.Estimated speed of wheelchair users is 1 km/0.6 h. Thematic focus activities (on education and recreation) in the area of proposed polygon Počúvadloare shown in Table 3.

Conclusion

The uniqueness of the water reservoir Počúvadlo and its water management system in the surroundingsBanská Štiavnica is contribution to the progress of world civilization and was recognized by UNESCO in 1993 when the historic town and technical monuments was inscribed in the World Cultural and Natural Heritage List.This area is a precondition for recreational options people who are interested about unique attractions and informations in the natural environment, which should be accessible to all without barriers.

Tab. 4: Characteristics of the polygon Počúvadlo

Summary of the characteristics of the route for wheelchairs:	Data
Total length of the route:	1.82 km
Maximum longitudinal slope between stationsS11-S12:	12.08 %
The maximum cross slope on the road:	2.00 %
Max. height/depth of barriers on the road:	0,05 m
Estimated time of the presentation on individual stands:	¼ h
Estimated speed of wheelchair users:	1 km / 0.6 h
Estimated time of the route without stopping:	1.09 h
Estimated time of the route with stops:	2.09 h

Explanatory notes to Table 4: For overcoming obstacles for wheelchair users is important: maximal fall does not exceed of 150 m; cross slope of the routeis max. 2 %; obstacles on the route not exceed the height/depth of 8 cm

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Souhrn
V článku se zabýváme návrhem edukačního a rekreačního polygonu v okolí historické vodní nádrže Počúvadlo, která se nachází v Chráněné krajinné oblasti Štiavnické vrchy, pro osoby se zdravotním postižením na vozíku. Oblast je významná svou historií a je zapsána ve světovém přírodním a kulturním dědictví UNESCO (United Nations Educational, Scientific and Cultural Organization). V příspěvku popisuji, navrhujia hodnotím údaje potřebné pro aktivní rekreaci a vzdělávací aktivity tělesně postižených osob na vozíku, čímž jim vytváříme podmínky pro překonávání bariér, poznávání nových zajímavých místních lokalit a historických památek v tomto regionu. Záměrem byla podpora bezbariérového přístupu a ochrany lidských práv na zvyšování příležitostí a inkluze těchto lidí do společnosti, podpora poznávání světového kulturního a přírodního dědictví UNESCO prostřednictvím edukačních - rekreačních aktivit na trase navrhovaného polygonu v okolí vodní nádrže Počúvadlo a v jeho blízkém okolí. Adaptace osob se zdravotním postižením na invalidním vozíku v prostoru a jejich pohyb je klíčovou podmínkou pro jejich bezbariérový přístup realizaci zájmů. Navrhovaný polygon má délku 1,82 km, povrch trasy je kombinací zpevněné zemní, dlážděné a bitumenové cesty, maximální sklon na trase je 12,08%, maximální příčný sklon na trase je 2 %, doba projetí trasy bez edukačních zastavení je 1,09 h, se 4 plánovanými zastaveními po 15 minut je to 2,09 h, pro rychlost pohybu na vozíku 1 km / 0,6 h. Navrhli jsme 4 vzdělávací aktivity na trase a 4 v okolí s dostupností dopravním prostředkem do vzdálenosti 30 km. Vzdělávání je navržené formou vzdělávacích panelů s vybranými tématy, umístěných na trase. Dále předkládáme důležité údaje o technické vybavenosti území, rekreačních, přístupových a parkovacích možnostech a další zajímavé informace o navrhované lokalitě. Začleněním zdravotně postižených lidí na vozíčku realizujeme myšlenku rozmanitosti a humánnosti v rámci jejich začlenění do běžného života v kulturní společnosti.

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THE REVITALIZATION OF A LOCALLY IMPORTANT WETLAND

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Abstract
Wetlands are the part of the foundation of our nation's water resources and are vital to the health of waterways and communities that are downstream. Wetlands feed downstream waters, trap floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. The degradation of the wetlands is the result of various factors including droughts and unsustainable water irrigation.
The aim of paper is to point the attention to the existence of wetlands as ecosystems of degraded habitats, their importance and function as an environmental factor. Paper deals with wetlands and methods of revitalization which are the foundation for choosing the most suitable methodology for its application at the selected area. Three alternatives were prepared for revitalisation of Cicky - locally important wetland in Kosice. The result is a plan for the restoration of the wetland area with respect to preservation of ecological stability.

Key words: ecological stability, recultivation, wetland Cicky

Introduction

Wetlands occupy only a small area on most watershed landscape but their hydrologic roles in terms of storage as well as their influence on sediment and water quality are often substantial. It belongs to the territories with special protection. It is necessary to find the ideal balance between landscape and nature protection and the possible utilization for leisure activities so that none of these sides is damaged essentially and irreversibly (Fialova, 2013). Wetlands are areas inundated or saturated by surface of groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted to saturated soil conditions. The hydrologic functions of wetlands include (Brooks, 2013):
- intercepting and reducing the transport of sediment and other pollutants to downstream water bodies;
- attenuating storm flow peaks;
- supporting hydric plants not found elsewhere on a watershed, thereby providing enriched biodiversity; and
- providing habitats for many organisms from microbes to migrating waterflow - which has led to wetland preservation programs.
Two hydrologic conditions are necessary for wetlands to form (Verry): (1) there is a persistent excess of water at the earth’s surfaces, and (2) the topography and climatic regime result in slow-moving water.
Paper deals with wetlands and methods of revitalization which are the foundation for choosing the most suitable methodology for its application at the selected area. Three alternatives were proposed for revitalisation of Cicky - locally important wetland in Kosice.

Materials and methods

Whether proposals for a site relate to improved management of creation, it is often useful if the background and reasons for any work are put in writing. This can be a as short project proposal of where there are longer term management implications as a management plan. Ideally, either should contain the following sections (Hawke, 1996):
- site description
- site evaluation,
- rationale behind site proposals and objectives,
- prescriptions to achieve objectives and work plans.
This framework will help with the long-term planning of resources and labour. The process enables constrains to be identified and clear goals to be set (Hawke, 1996). Wetlands can develop in dryland regions, where water collects in depression and maintains and persistent, saturated soil condition. Wetlands most often are low-lying areas that are connected with groundwater. In some cases, wetlands are maintained by their own water table, which in essence is a perched groundwater system. Perched refers to limited downward water percolation and, therefore, limited connections to regional groundwater. In any case, the water table of wetlands is normally above, at, or near the ground surface throughout the year

(Valkova, 2006). Examples of the various surface-groundwater relationships for wetlands formation are illustrated in Figure 1 (Mitsch, 1993).

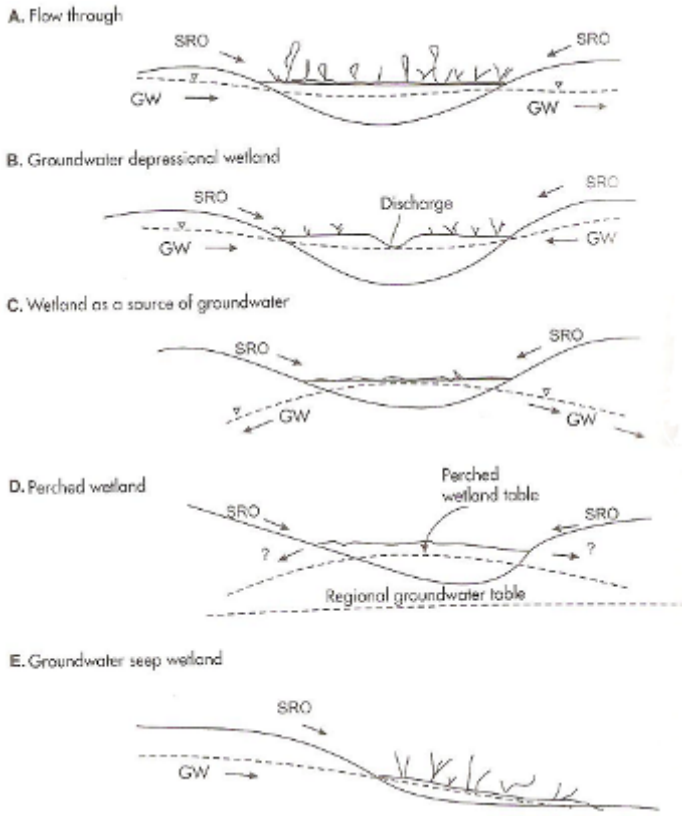

Fig. 1: Surface and groundwater relationship that form wetlands (modified from [6])

The flow-through type wetland (Fig. 1 A) maintains a fairy stable water table in the wetland throughout the year because of the direct connection with regional groundwater source. Example of depressional wetland formation are situation where surface runoff and groundwater flow into the depression, and where the water table in the wetland is sufficiently raised, the wetlands discharges water from channel outlet (Fig. 1B). In drier environments, a depressional wetland can form from seasonal precipitation excess and surface runoff and either discharge to groundwater (from the edges of the wetland) during periods, of high water tables, as in Fig. 1C, or can maintain a perched water table above regional groundwater (Fig. 1D). Wetlands can also form in areas where springs and seeps occur (Fig. 1E).

Study area

Geological structure of the surrounding area of wetland is not very complicated and predetermined its morphological character, which is reflected in the current form of relief. In terms of regional geological division of the Western Carpathians (Vass, 1988), our area of interest is incorporated into the Eastern Basin. It is a geologically heterogeneous region that builds younger paleozoic rocks, tertiary deposits of neogene and quaternary age diluvial deposits (Kalinciak, 1996a).

Southeastern slopes of elevation 513 m asl. (see georelief) are formed by age the oldest rocks. It is a rock complex, which under the structural-tectonic scheme (Kalinciak, 1996b)[9] can be devided in gemerikum tectonic units, which form the bedrock of neogene basin. On the surface of the slopes mentioned above appears mainly the so-called rock of Dobsinska and Cermelska groups of carbon age (according to Kalinciak, 1996a): younger paleozic and carbon.

It is fed by two springs whose water is running northerneast of Cicky at an elevation of 318 m asl.. Cicky stream is left tributary of Myslava creek that flows directly to Hornad river from the west side. The height difference between the wetland Cicky (291 m asl.) and springs of Cicky stream is 82 m (western locus); 107 m (eastern locus) respectively. From the confluence to wetland it flows southeast. Water sources are impervious clays and silt stones with gravel positions. Cicky stream is not regulated, has a balanced slope, but very unbalanced flow due to

anthropogenic interventions - deforestation and management of the surrounding slopes (these days-intensively) (Valkova, 2006):
From landscape point of view following types of habitat in the vertical direction can define:
- water logged and inundated areas,
- stands of trees in the alluvium,
- man-made habitats extensively farmed land (gardens and orchards),
- grassland habitats on the slopes flat backs Friesian or without,
- man-made habitats intensively farmed fields on the slopes of flat ridges,
- shrub habitats tires potholes.
The aim of our work was to propose suitable solution of sustainable revitalization of natural wetland Cicky.

Results and Discussion
To maintain ecological stability of a given zone wetland Cicky, we propose the following three alternatives:
1) Alternative focused on the preservation status of wetlands with the proposition of necessary measurements. Design a solution for alternative 1 requires:
a) removal of invasive plants,
b) purifying stream Cicky.
2) Alternative focused on the design of technical measurements to ensure the necessary amount of water in wetlands. Design a solution for alternative 2 requires:
a) Cicky stream regulation,
b) design of the weir,
c) design of the dike.
3) Third alternative aimed on complex reconstruction of the wetland. Design of this alternative includes more steps and operating procedures. This option is one of the biggest changes in the wetland environment, but it wills gradually, stage by stage brings the return and settlement of fauna and flora. Reconstruction process can be classified into these following steps:
a) removal of wetland vegetation,
b) cleanup of wetland bottom,
c) stream regulation in wetland,
d) construction of dike,
e) shaping the terrain,
f) construction of collecting channels,
g) cane plantations.
First step of the wetland reconstruction was to remove the vegetation of wetland. Plants that are found in the area (reed, cattail, alder, willow, shrubs, etc) are necessary to remove and then burn or take to the dump. Shrubs and tree branches can be used to build tracks for excavator or in shaping the field of wetlands in the system D/F (dike/furrow).
Next step is cleanup of wetland bottom. Accumulated layer of the wetlands which has created over the time, it is necessary to completely eliminated (by hand of by using the excavator). For flooding and still waterlogged soil is the use of such a mechanism necessary to ensure a more solid basis under the digger in the form of tracks, for better movement and to prevent of drop into the soil as well as prevent water pollution. A stronger base may consist of tailings and also from local materials (preferably clayey soil well reinforced), which is then subsequently removed. Thickness of removed mass will reach 50 to 60 cm. Line of processes should be from south to north, upstream of wetlands creek. In places with difficult access of excavator manually removal of earthed layer can be used. Thus excavated layer can be placed to the areas along the edges to build the dike.
Stream regulation in wetland is the third step in reconstruction process. To facilitate further procedures of reconstruction it is necessary to redirect the stream to concentrated flow. Therefore, I suggest building a temporary river bed in a place where the water flows into the wetlands that will be conducted along the eastern part of the area. Channel length should be about 80 m, bottom width will be 0.5 m, depth 0.6 m of trapezoidal shape. Due to the flow, river bed is sufficient for its temporary redirection and functioning.
In the next step in the construction of dike is following. This alternative plans a magnification of the original wetland area in the southeastern, southern and north-western part (total approx. 400 m^2, using dikes). We design the length of dike about 207.5 m, with kilometrage starting in the eastern wetlands (garden areas), ending at 208.5 m kilometrage in the northwestern part. In the kilometrage of 70 m weir with length of 1 m will be built. Excavated earthed layer and local

materials (banked earth) can be used for the construction of dike. We propose crest of width 0.4 m, height of dike should be 0.8 m, upstream shoulder 1:4, downstream shoulder 1:7 that will connected smoothly into the original ground. The crest and the slopes will be grassed and dike will be thus integrated into the landscape.
Shaping the terrain is also very necessary in case of reconstruction of wetland. We design the creation of D/F system (Fig. 2) (Hawke, 1996).

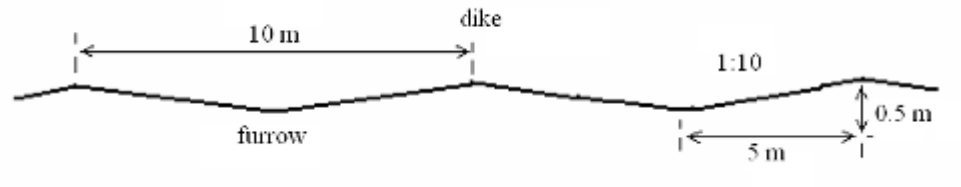

Fig. 2: System D/F of surface creation

Excavator and ploughing techniques will be used to create surface for future wetland. Such steps of forming furrows can effectively ensure the sufficient distribution of water to improve conditions for plants and animals existing in wetland.
We propose that the configuration of the system in the direction from north to south with a length of each dike from 7 m to 55 m, (5 dikes in the widest and 4 dikes in the narrowest section).
To ensure the supply of water to the furrow of wetlands we design to build the conveyance channel with four outlets, which will supply the furrows with necessary quantity of water. Its length will be 35 m, with a bottom slope from 0.25 to 1 ‰, width and height of the stream channel 30 × 30 cm and bank slope 1:1 (Fig. 3). Velocity in the conveyance channel will be 0.3 - 0.5 $m.s^{-1}$.

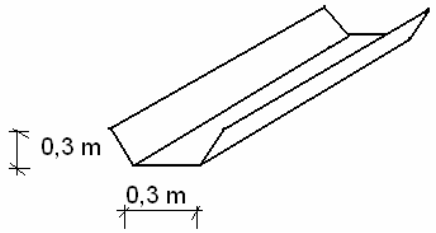

Fig. 3: Section of the conveyance channel [4]

For planting of cane two main factors must be taken into account:
- source of plants for planting,
- location of planting.
There are few options for obtaining the cane. Most appropriate way of its acquisition of localities with similar natural conditions. Another option is to remove the original use of reeds that their roots are cut off and planted foot of the stem to a depth of 4 cm below the surface, so that the section was located above the surface. Another solution could be a small planting seedlings or sowing. All possibilities are illustrated in Fig. 4 (Hawke, 1996).

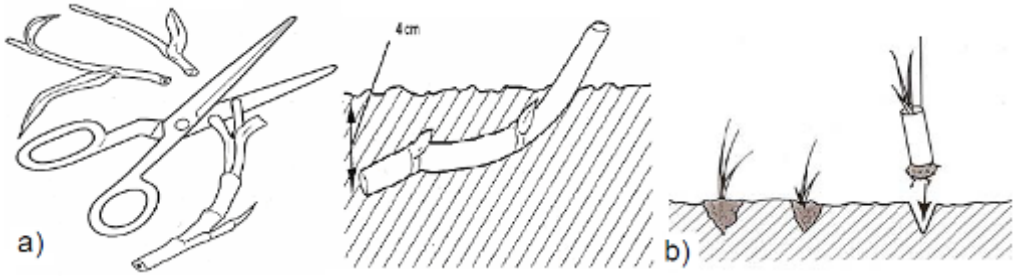

Fig. 4: Sources of cane and way of its planting a) cutting and planting; b) planting of seedlings'

The recommended depth of water during planting of cane is only 2-5 cm, because young plants are sensitive to the amount of water. Good places for dikes are built the system D/F. The reed has the ability to reproduce and grow up quite rapidly to other localities. That is how the reeds spread from dikes to deeper places of furrows and progressively fill all areas of wetland.

Conclusion

Wetlands are important biological and hydrologic features of watersheds. In addition to supporting unique plant and animal communities, wetlands can reduce stream flow volumes and peak discharges to receiving stream channels through their storage function. They can also reduce the sediment delivery to receiving waters and improve the quality of water that is discharged to streams and rivers.

Design and performance of the most suitable methods of revitalization of locally important wetlands and its application was presented in the paper. Solution of design was drawn up in three alternatives. First alternative is aimed on removal of invasive plants because their roots soaking up large amounts of water from the wetlands.

Second alternative requires technical adjustments, such as stream regulation, design of weir which is to provide an increased water level and slow down its runoff from the wetland and design of dike. Both alternatives represent the minimum interference with the natural environment wetlands, but it set only a temporary solution to the situation. In the third alternative, complex reconstruction of wetland is proposed, but it is the largest intervention in the environment. Wetland after the final planting and will be able to provide the conditions for reeds and animals, which over time can inhabit a given area.

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Souhrn

Příspěvek poukazuje na existenci mokřadů, jako ekosystému dnes již degradovaných stanovišť, na jejich význam a funkci v složce životního prostředí. Zabývá se také způsoby revitalizace mokřadů, které mají sloužit jako podklad pro vypracování metodiky v návrhu revitalizace lokálně významného mokřadu Cicky v Košicích (Slovensko). Tato problematika je v příspěvku popsána ve třech alternativách, kde každá z nich má podrobně zpracovaný návrh řešení. S ohledem na rozsáhlý soubor informací a výsledků, detailní postup návrhu, je v tomto příspěvku věnován třetí alternativě, která znamená největší zásah do prostředí. Po konečné výsadbě bude schopna poskytnout podmínky pro život mokřadní rostlin a živočichů, které časem dokážou osídlit danou plochu.

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THE REVITALIZATION OF RIVERS - BANKSIDE TREES AND SHRUBS

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Abstract
The revitalization of rivers is one of the editing options watercourses. Well-known examples - ecological disaster, poor treatment in the past, poor water quality in the river, the use of prefabricated elements etc. In these cases it is necessary to propose revitalization.
But i revitalized river needs some stabilization. Especially in the vicinity of buildings in urban areas, etc.

Key words: river, stone, wood, revitalization, stabilization,

Introduction

One of the basic elements of the revitalization of rivers modification of vegetation on the banks.
Bankside trees and shrubs are an important element in landscape enhancement. Within stream regulation, we should try to propose necessary interventions to the river profile and its closest surroundings with maximum respect for existing vegetation. Having carried out technical adjustments, it is necessary to propose, in liaison with competent specialists, and to provide for the implementation of new planting, or reconstruction of riparian and accompanying stands.
The planting of and the consequential care for bankside trees and shrubs should not be underestimated as unplanted areas within natural succession become overgrown with self-seeding species whose unsuitable location and species structure may impair the stability of slopes, flow ratios in the riverbed and, even in aesthetical terms, they do not have to necessarily make a good impression.
Fully-grown, maintained bankside trees and shrubs are a dominant element in flatlands and their impact on the overall character of the area is appreciable.

Revitalization and stabilization of banks of river

Trees and shrubs that grow along the banks of the rivers are a good part of the stabilization. They also have many other functions.
Bankside trees and shrubs are an important element in landscape enhancement. Within stream regulation, we should try to propose necessary interventions to the river profile and its closest surroundings with maximum respect for existing vegetation. Having carried out technical adjustments, it is necessary to propose, in liaison with competent specialists, and to provide for the implementation of new planting, or reconstruction of riparian and accompanying stands.
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Fully-grown, maintained bankside trees and shrubs are a dominant element in flatlands and their impact on the overall character of the area is appreciable.
iparian and accompanying stands play an important sanitary function, too. A fully-grown stand is able to intercept dust particles, to act as a partial noise barrier and it creates an overall positive impression by means of which green vegetation influences the human mind etc.
Vital bankside trees and shrubs also considerably contribute to:

- the retardation of runoff from stream banks,
- increased soil infiltrability on stream bank slopes,
- a reduction in extreme discharges,
- an increase in minimum discharges (in the areas of wetlands, cut -off stream branches, …),
- stream protection against water contamination by risk elements,
- optimal development of zoocoenosis and biocoenosis.

The next part deals in particular with the quality of streamside trees and shrubs; aspects of the technical solution of a particular stream regulation are thus not described in detail. Further, attention will be paid to tree species creating streamside vegetation, although we have to take into consideration that riparian stands are also created by a herb layer.

To design suitable riparian and accompanying stands, it is important to understand the division of riparian zones according to the best prospering types of vegetation:

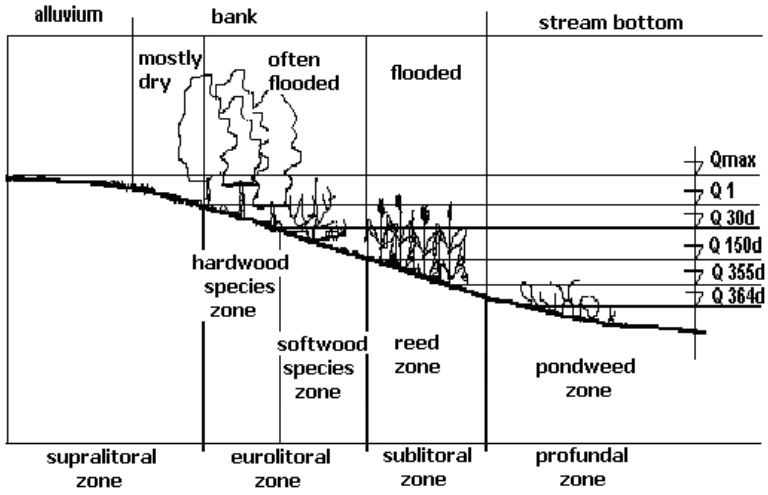

Fig. 1: Riparian vegetation arrangement

- **profundal zone:** a continuously flooded part of banks, colonised by freely floating, immersed, rooted or not - duckweed, pondweed etc.
- **sublitoral zone**: it is often called the reed zone – reed, calamus, flowering rush and others.
- **eulitoral zone**: a wide range, in lower parts knotweed, reed, cattail flag, near the surface soft tree species - willow, alder, poplar
- **supralitoral zone**: above the level of the design surface, rare flooding, area of accompanying stands of English oak, ash, maple, lime tree…

Conclusion – Discusion

To avoid errors resulting from the misunderstanding of the essence of the function of streamside trees and shrubs in the future, it is necessary to realise that streamside trees and shrubs, requirements for their spatial arrangement and quality of the biological function are among the basic aspects of the stream regulation draft conception. This means the issues related to the vegetation design will be of equal importance for a designer as the issues of capacity and stability of the designed riverbed.

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Souhrn
V rámci revitalizace vodních toků plní nezastupitelnou funkci vegetační doprovod, tedy břehové a doprovodné porosty. Pro zdařilý návrh vegetačního doprovodu je nutná znalost zonálního dělení břehového území a především pak schopnost aplikace této znalosti v rámci výběru vhodných dřevin.
Kvalitně navržený, prosperující vegetační doprovod výrazně přispívá ke stabilizaci břehových území i v rámci revitalizačních zásahů.

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THE VISUAL BEAUTY OF LINEAR GREEN-STRUCTURES IN THE RURAL LANDSCAPE, PRINCIPLES OF AESTHETIC EVALUATION AND ITS APPLICATION IN LANDSCAPE MANAGEMENT

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Abstract
The visual beauty is one of the characteristics of the landscape that is very difficult to objectively evaluate. Two different approaches are generally used to assess the aesthetic quality of the landscape. One is the expert approach evaluating the inherent physical characteristics of the landscape and the other one is the perception-based approach regarding aesthetic quality of the landscape as a product of the mind of the viewer. Up to this day, the subjectivist view of aesthetics has been widely adopted. The linear green-structures like hedgerows or alleys within the rural landscape, if properly vegetated and managed provide a series of important effects (decreased erosion, water treatment, species communication, wood for burning, food and shelter for animals, sinks for atmospheric CO_2, etc.) and thus contribute to the overall ecological stability of the landscape and also to its beauty. In the Czech Republic, several methods are used for assessing the non-production functions of woody vegetation. However, none of them widely incorporates its effect on aesthetic quality of the landscape. This paper shows the principles in recent aesthetic evaluation of the landscape and tries to draw conclusions for landscape management practice regarding the creation and management of linear green-structures within rural landscape.

Key words: eye of the beholder, philosophy of aesthetics, memory of the landscape

Introduction

The ability to observe, see and feel visual beauty of landscape seems to be something completely natural and inherent to every man. But, the truth is it is far from that. The aforementioned ability to acknowledge beauty within landscape is an evolving cultural process from deep history with surprisingly dynamic changes and paradigm shifts. In Europe, the very wild nature that we are nowadays trying to conserve and protect was traditionally seen as something meaningless, scary and ugly up to the 18th century (Stibral, 2005). However this is only true for wild untamed nature, individual natural objects (trees, blossoms, birds) or human affected nature like gardens and parks are observed as beautiful worldwide. Interestingly, fields and rural landscape suffered the completely opposite paradigm shift in Europe. In the Czech Republic, up to the 20th century rural communities found plain fields clean and aesthetically pleasing, while forests and mountains were seen as ugly and messy. References can be found in that times literature and speech of witnesses (Stibral, 2005). The fascination with wild natural sceneries is also closely connected to the era of romanticism, a birth-date of tourism, where the thinking on aesthetics was advanced, not by philosophy, but by poetry. However, this view was first adopted by individual poets, intellectuals and artists and later by the members of high society not reaching the rural communities for a long time (Lothian, 1999).
In the Czech Republic, during the communist regime the face of the landscape has been widely altered. The objects of small landscape architecture both artificial and natural (wayside shrines, hedgerows) were intentionally destroyed to shatter the bonds of the people to their landscape (Trnka, 2006). According to historical maps and aerial images the former rural landscape was a small-scale mosaic of close fields, meadows and pastures complemented by isles of forests and residence following the roads and rivers. Such a landscape could be found up to the socialistic collectivisation in the early 50s of the 20th century. The use of mechanisation and the intensification of agronomy led to the creation of huge arable fields, the cattle were moved to mass stables. Ecologically interesting and aesthetically pleasing habitats like ponds, hedgerows, orchards lost their importance and were abandoned or destroyed. The rural landscape of the Czech Republic had been unified, which causes environmental issues up to this day.

Materials and methods

In this unified landscape inherited by today's generations in the early 21th century the uniformity and fragmentation are the main challenges. The importance of linear green-structures increases. The linear green structures are defined as vegetated strips where its width is lower

than 30% of its length with significant ecotone effect (Supuka et al., 1999). The linear green-structures in rural landscape are vegetated zones interposed between fields, usually following streams, roads or terrain breaks. They are able to fulfil many environmental functions, for example by reducing and filtering surface and groundwater runoff, reducing water and wind erosion (Dosskey, 2001), allowing migration and survival of species, affecting microclimate, producing wood, improving orientation, acting as sinks for atmospheric CO^2 and enhancing the beauty of the landscape (Borin et al, 2010). Hence, they are typical multi-functional elements in the rural landscape which is both a curse and a blessing. In the Czech Republic such green-structures are usually recognised as outstanding landscape elements incorporated within the territorial system of ecological stability as ecological corridors (The Nature Law, 1992).

When evaluating landscape aesthetic quality, there are two competing paradigms (Lothian, 1999, Daniel, 2001), *objective* and *subjective*. By the objective account the aesthetic quality of the landscape is to be found within the properties of the landscape itself as an inherent attribute. By the subjective account the beauty of the landscape is to be found in the eye of the beholder a. k. a. within the mind of the human observer. After several centuries of debate the subjective account seems to have largely won out in modern philosophy (Daniel, 2001). What this means in practice is that landscape aesthetic quality is considered a joint product of visible features of the landscape interacting with relevant psychological perceptual processes in the human observer (Brown and Daniel, 1991). The question remains, what are the perceptions most pleasing to the human eye. The most important in this matter is the fact that, as shown above, the feelings that are reported as being high aesthetic quality are changing over time. As such they can also be widely influenced by media and public opinion. A sophisticated approach and *marketing* to landscape beauty remains the biggest challenges to researchers, artists and ecological activist worldwide. Even though the human mind is susceptible to paradigm shifts there are some common basis for the evaluation of beauty in things provided by aesthetics as a science (Mezera, 1977). According to Mezera (1977) the best and mostly used way to objectivise our subjective feelings and perceptions of beauty are words used to describe said things. Because words do not only let us describe features but also allow for a limited understanding of feelings like pleasant or disturbing whose significance are somewhat similar for every man. Mezera (1977) describes the following five criterions as defining aspects of visual beauty of features in the landscape:

1. Mightiness
2. Prominence and individuality
3. Harmony and unity
4. Correctness of composition
5. Gracefulness and conciliatory serenity

The above mentioned criterions are highly relative. Therefore they are best used when evaluating landscape as a whole as they allow for comparison of observed features among themselves and also allows for judgment over their respective prominence and mightiness and also an evaluation of the perceived feelings of the whole area. Because visual beauty is mostly observed by our sense of sight (Fér in Mezera, 1977) different criterions of spatiality and inner quality of the features in the landscape can be described:

1. Size and proportionality
2. Shape and texture
3. Illumination
4. Colour

Different authors come up with different indicators of visual aesthetics (Tveit et al., 2006). A summarized number of indicators together with the analysis of the relevance are offered for example by Rosley et al. (2013):

1. Mystery
2. Legibility
3. Coherence
4. Stewardship
5. Naturalness
6. Openness
7. Complexity

They come to a conclusion that of the above mentioned indicators of beauty, complexity (defined as follows - complexity encompasses the diversity and richness of landscape features and refers to content and possibilities of an exploration) is the most suitable and valid indicator to assess the rural landscape environment.

Results

Linear green-structures thanks to their limited land requirements are the most easily integrated natural elements within the rural landscape where the demand on land is usually very high. At the same time their multi-functionality makes their projection and creation a very complex matter. When building upon the above described criterions of visual aesthetics it is possible to estimate the direct effect of linear green-structures in the rural landscape both at the landscape scale and at the element scale.

On the landscape scale:

1. They positively affect the naturalness, harmony and gracefulness of the landscape
2. They contribute to the legibility and complexity of the landscape
3. They contribute to the feeling of mystery
4. They affect openness and composition of the landscape
5. They affect the relative perception of other elements by their mightiness, individuality and proportionality

On the element scale:

1. They affect the colour of the landscape
2. They affect the illumination of the landscape
3. They affect the feeling of stewardship from the landscape

When projecting, creating, planning and managing linear green-structures it is imperative not only to understand their various functions, but also to being able to evaluate which particular functions are the most needed within the actual locality. Applied on the visual beauty of a projected, created, planned or managed linear green-structure, it is important to look at the surrounding landscape as a whole for scope. The mostly suitable scope or framework for visual aesthetics evaluation of rural landscapes is created by the area of sight of the observer. On this scale it is possible to evaluate the actual needs, weaknesses and strengths of the landscape according to aforementioned criterions and adjust the parameters of the linear green structure accordingly.

Another important role in the evaluation of visual beauty of the landscape is played by the people who spend the most time within the landscape because these are the people who contribute the most to the public opinion on landscape beauty of local communities. As shown above, the perception of beauty is changing and evolving and is mostly present within the eye of the beholder. That being said the observer's opinion on aesthetics can widely change according to his experience and memory of the landscape. Because the rural landscape is not often the destination for recreation nor sports nor any other leisure activities the people that are spending the most time there are farmers and game keepers because to them the rural landscape is the main source of livelihood. Their view on aesthetics of rural landscapes may or may not be widely altered by only seeing it as a workplace or only seeing the purpose in the features of the landscape and not their beauty. At the same time their opinion and view on aesthetics are very important, as they contribute mostly to the public opinion thus evolving the paradigm and possibly bringing a new paradigm shift. A constant dialogue with these users of the landscape should be very welcomed, appreciated and needed by the landscape management practice.

Discussion

The evaluation of aesthetics of natural phenomena is a complex matter. The public opinion as well as the expert view on it has been the subject of hundreds of years' long dialogue and philosophical interpretations and paradigm shifts. In the particular case of rural landscapes it is more than apparent. If it is still possible to draw some basic principles from individual studies, the most restricting is actually the time when they were elaborated. One the other way to obtain the best results is to link the evaluation of aesthetics with other functions of the evaluated features. Like the results of a study by Borin et al. (2010) on the aesthetic value of hedgerows that show that in general all natural elements like hedgerows, meadows, scattered trees, etc. increase the aesthetic beauty. On the other hand, man-made elements like modern buildings, pylons, asphalted roads usually decrease it. The study highlights the importance of hedgerows composed of trees taller than 6m. They main perceptions pleasing to the human eye are that they improve the naturalness of the territory and can screen the man-made elements.

Mezera (1977) defines the character and charm of individual tree species which can be used to affect specific aesthetic criterions. For example a birch is laughing, aspen chatty, beech pensive, oak defiantly shouldered, ash noble, maple sturdy, lime hearty like fruit trees. The personalisation of individual tree species is connected closely to the memory of the landscapes and in the Czech Republic dates to the pre-socialistic times before collectivisation. But in some

extent this memory and the bond to the rural landscape is still present within the minds of the people. It is important to contribute to and build upon these historical bonds in the landscape management practice.

Conclusion

To evaluate visual beauty of rural landscapes and their inner features, the future lies within the use of the subjectivist paradigm mainly because the method is able to reflect the preferences of the community. Linear green-structures are able to enhance the visual beauty of landscapes by increasing the perceived naturalness and other criterions of visual aesthetics of the area which are contemporary perceived as aesthetically pleasing. It is possible to define some of these basic criterions and use them when projecting, creating, planning or managing the linear green-structures. Due to the temporal character of public opinion it is important to remain in close contact and dialogue with the current users of the landscape, mostly farmers and game keepers.

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Souhrn

Hodnocení estetiky a krásy krajiny je dlouhodobý proces starý jako lidstvo samo. Současné nahlížení na estetiku přírodních jevů je výsledkem několik set let trvající diskuze filosofů, umělců, vzdělanců v kombinaci s veřejným míněním. Budoucností hodnocení estetické kvality a krásy venkovské krajiny a jejích složek se zdá být subjektivní paradigma hodnocení (krása je v oku toho, kdo se dívá), a to hlavně proto, že tento přístup je schopen vyjádřit veřejné mínění komunity. Při vlastním popisu pak existuje možnost vyjádřit a popsat estetickou hodnotu a krásu složek krajiny pomocí základních estetických kritérií, která se jeví jako relativně stabilní a přirozená víceméně každému člověku. Existenci a znalost těchto kritérií je možno využít v krajinářské praxi při navrhování, realizaci, plánování a péči o liniové vegetační prvky. Tyto prvky, které jsou schopny plnit i rozličné spektrum environmentálních a produkčních funkcí, jsou zároveň díky svému velmi nízkému nároku na půdu snadno a často implementovanými prvky v naší venkovské krajině. Z toho také pramenní jejich zásadní význam pro ovlivnění stability našeho venkova. Vzhledem k přechodnému charakteru toho, co je společností chápáno a vnímáno jako krásné, je nutné setrvat v úzkém dialogu se skupinami lidí, které se aktivně ve venkovské krajině pohybují, případně v ní pracují. V ČR jsou to převážně zemědělci a myslivci. Právě tyto skupiny významnou měrou přispívají k vytváření veřejného mínění na estetiku venkovské krajiny. V krajinářské praxi je proto zásadní názory těchto skupin znát a respektovat.

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TOURISM AND RECREATION IN PROTECTION PLANS OF POLISH NATIONAL PARKS BASED ON THE EXAMPLE OF THE WOLIŃSKI NATIONAL PARK

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Abstract
In the paper, the scope of analysis expected by Polish law for drawing up a plan of tourism and recreation management in the national parks was discussed. In Poland, the national park protection plan is the main medium-term planning document, defining the rules to the recreational availability and tourism management. Thus, the article focuses specifically on the laws and regulations, which are a set of guidelines to the project of the protection plan. In addition, some methodological assumptions and the results of the inventory of tourism and recreation infrastructure resources and also the results of the inventory of the risks to nature, related to recreation and tourism utilization, were presented. Park area was divided into functional and special zones, determined on the basis of analysis of the land use structure, relief and touristic resources. Within each zone the inventory of tourism and recreation facilities was made, including identification of threats to the nature. Finally for each of the zones the tourism and recreation possibilities and limitations of the development were defined.

Key words: protected areas, Wolin island, tourism and recreation development, tourism planning

Introduction

The tourism in national parks develops really dynamically. The number of visitors frequenting Polish national parks sums up to 11 million annually. The parks have, most of all, a protection function, however, among others, the parks also constitute a social function connected with making the terrains accessible for touristic purposes. Not only do the parks contribute to satisfying natural human need for contact with nature, but also they constitute a form of gaining sightseeing and touristic knowledge. The areas are of unique features. At the same time, there are a lot of regulations and limitations set under lawful acts (Dz.U.2004 nr 92, poz.880.) which are naturally linked with the parks' touristic and recreational functions. The regulations include a ban on wild fungi and other plants picking, apart from places named by the park's boss. There is also a ban on hunting and fishing in some restricted areas, as well as a ban on walking, skiing, cycling and horse riding excluding some special routes. In national parks you can't go climbing, caves exploring, swimming. You can't use motor boats or do other water sports, you can't sail and again, excluding waters and routes indicated by the park ranger. Different forms of human activity, especially the economical ones to which a touristic activity must be added, create or may create particular dangers to the natural and cultural environment in the future. Therefore, environmental protection and cultural issues require numerous regulations, pointing out some methods of potential dangers' elimination or limitations. In case of national parks, similarly to touristic parks and reserves, the basic document formulating detailed rules of environmental protection, including some findings dealing with methods and range of touristic and recreations allowance, is the protection plan.
The aim of this work is the indication of possible directions of development of tourism and recreation in the Woliński National Park on the grounds of the inventory of infrastructure resources and the recognition of environmental dangers to the Park resulting from using the area in touristic and recreational context.

The Woliński National Park compared to other national parks in Poland

According to the bill concerning the environmental protection (Dz.U. z 2004 nr 92, poz.880.),a national park takes up an area of specific natural, scientific, social, cultural and educational qualities. It is of minimum 1000ha in size where all nature and its values are under lawful protection. The parks are created in order to sustain biological diversity, recourses, compositions and many elements of inanimate nature. Also the parks sustain the sightseeing value of the places, it works on restoring the proper state of recourses and elements of nature, recreating deformed natural settlements, settlements of plants, animals and fungi. Until now, 23 parks were created in Poland which take up 316,748ha in total. This constitutes approximately 1% of Polish territory. The Białowieski and The Karkonowski Park are about to get enlarged. The Ministry of Environment is considering the possibility of creating 3 new parks, ie. Turnicki,

Jurajski and Mazurski. The first park in Poland created in 1947 was the Białowieski National Park. In the 1950s The Świętokrzyski Park was opened (1950), Babiogórski (1954), Pieniński (1954), Tatrzański (1954), Ojcowski (1956), Wielkopolski PN (1957), Kampinowski (1959), Karkonoski (1959). The 1960s gave us the Woliński (1960), Słowiński (1967). The next one was Bieszczadzki (1973), Roztoczański (1974), and in the 80s – Gorczański (1981) and Wigierski (1989). The other parks: Drawieński, Poleski, Biebrzański, Gór Stołowych, Magurski, Bory Tucholskie i Narwiański were created in the 90s. Among the above mention parks the Ojcowski Park takes up 2,146ha, where the largest is Biebrzański (59,223ha). In the group of the largest parks with the area of more than 20,000 ha there are Tatrzański (21,164ha), Kampinowski (34,588ha) and Bieszczadzki (29,202ha). There are only two parks situated in the coastal zone, ie. Słowiński and Woliński.
The Woliński National Park was founded due to the regulation of The Council of Ministers on the 3rd March 1960. (Dz.U..1960, nr 14, poz.29) in order to protect the wealth of the indigenous flora and fauna, and also the unique landscape of the Polish coast. It is the first land-sea park in Poland. The park together with the buffer zone is located in the west-Pomeranian district. In 1996 one mile of The Baltic Sea waters was included to the park, also the archipelago of the islands in the backwaters delta of Świna, including the waters of the Szczecin Bay. Currently the area takes up 10,937ha, with forest ecosystems (beech, mixed forests, beech and oak, pine woods) occupying 4,648.53ha (ie. 42,5% of the parks land), water ecosystems – 4,681.41ha (42,8%) and non-forest lands 1,607.46ha (14,7%). 498.72ha (4,565) – all this is under strict protection. Most significant features of the park are: the most picturesque cliff coast line, well-kept beech forests, unique and insular Świna delta and the coastal waters of the Baltic sea.

The plan of the park's protection as a means of touristic and recreation development
The plan of protection is a document with a perspective, it's long-term and formulates the rules of using the area in the next 20 years. According to the Environmental Protection Act (Dz.U.2004, nr 92, poz.880), the plan takes into account the evaluation of the state of nature, social and economical conditions, spatial management, identification and evaluation of existing and potential inside and outside dangers, as well as the analysis of the previous plans' effectiveness so far. In these plans we indicate ways of the area access and places devoted to realising the goals such as education, tourism, recreation and sport.
Recently a detailed plan of parks' protection has been described by the Regulation of the Ministry of Environmental Protection dated 12th May 2005 (Dz.U.2005, nr 94, poz.794). According to the regulation (&12) the scope of arrangements of these documents on the levels of municipality and district deals with specifying particular conditions of the terrain management and also limiting its use, that means that depending on the needs, there can be limitations to infrastructure for tourism and education. In the framework of the project there are some topical maps created, such as "technical, touristic and educational" maps as well as maps of "places allowing scientific, educational, touristic, recreational and sport research". The analysis of the indications aimed at creating the plan of national park protection included in the above mentioned Regulation allows us to claim that currently in the context of tourism and recreation development a special care is laid on the tourist routes, forgetting other elements of tourism (eg. tourist accommodation, car parks, viewpoints, camp sites). In this Regulation there's nothing about the necessity of doing a stocktaking of the resources. In the maps which concern tourism there are no indications showing the amount of accommodation, seasonal sleeping possibilities nor any gastronomy whatsoever. Neither are the authors of the protection plan obliged to set the frames of touristic-recreational development, nor do they take the amount of touristic resources around the park into consideration. This is a result of a shortage of arguments in favour of tourism development, which in fact means status quo or further limitation in the subject of the current use of the National Parks.

The touristic and recreational development of WPN – current state
The present land of WNP and the buffer zone has been always considered as extremely attractive, considering the fauna and flora which here is very characteristic for the coastal zone (Guide Book 2012...). The current state was formed in the 1990s and at the beginning of the 20th century some touristic routes were created and they function until now. Accommodation provided by the area is humble. There is a summer resort "Grodno II" with its 120 sleeping places. There is also "Grodno" and "Biała Góra". There is no town nearby, and all the accommodation is placed in the boarders of the Wolin Island. The primacy in tourism belongs to Międzyzdroje, Wisełka and Świetość (Map..... 2011). In the municipality of Międzyzdroje there

are 69 hostels, including 28 yearly ones. The whole number of sleeping places sums up to 6497, but 2960 are available all year long in hotels, guest houses, educational centres and resorts (http:/www.stat.gov.pl/bdl/). The other places are mainly camp houses and camp sites, which is just seasonal. The service standards are getting better each year but they are still on a low level. The tourist season lasts 2-3 months, although the period is slowly being prolonged to 5-6 months (Kowalczyk 2010). The total number of tourists in 2012 was 119,026 people. The big attraction is a golf course in Kołczewo (Hotel Amber-Baltic in Międzyzdroje). In the park and in its surrounding there are about 50km of walking paths and bike routes (Map.....2007). Here there is also an international bike route of 4km along the Baltic Sea R-10 (The Hanzeatic Coastal Route) – which belongs to Euro Velo. The net of walking paths and bike routes is supplemented by education routes of general natural subjects. The park is cut by a touristic road for car use with two car parks : "Kwasowo" and at the Gosań Hill.
The main premises in WNP is a Display Bison Pen and a Museum and Education Centre in the Park's headquarters in Międzyzdroje. The pen, 28ha in size, was opened 1976 following a programme of conservation breeding of bison. Apart from the paddock, there are also observation terraces and a playground. The Museum Centre is a used for conferences and educational meetings, and serves as a museum of natural science. Next to the museum there are aviaries with white-tailed eagles and eagle owls, additionally, a Gallery "Old Museum", in which exhibitions take place. These two most frequented places attracted 70,000 tourists in the last few years (Dusza 2012). The data of the Ministry show that in 2009 the park was visited by 1,500 visitors.
The aquatic part of the park is open to visitors thanks to kayak routes of 19km. The park also has viewpoints (Tourist map... 2008/2009). The most popular ones are Kwacza Góra and the Gosań Hill. Also, the viewpoints at the Czajcze Lake, Turkusowy Lake and the Zielonka Hill. The view from Zielonka covering the Delta of Świna was named the landscape of the year by the International Society of Nature Friends in 1993/1994 (Jakuczyn 2004). Among the above mentioned places only the one at the Turkusowy Lake is adjusted to disabled people, the others have no facilities, especially for people on wheelchairs.

Existing and potential dangers in realising the aims of the park's protection resulting from the touristic and recreational activity being carried out.
Among different dangers connected with human activity the most significant is touristic movement. In WNP this movement takes place in three most common places: along the beach, with the biggest number of beach-goers in Międzyzdroje and Wisełka, The Bison Pen, and The Turkusowe Lake. Apart from obvious negative aspects such as: scaring animals, dropping litter, damaging plants, in the Park and in its buffer zone there are other dangers to the protection plan. A danger to the landscape physiognomic features is a lack of uniformed small architecture, cohesive information system, the lack of recreational utilities maintenance and renovation of historical roads, especially the cobblestone roads. In the buffer zone the main danger is a lack of cohesive standards of resort towns also no respect for the patterns of regional architecture when new buildings are erected. The other danger is a lack of the roads' passability in some places, which results in treading the terrain along the indicated tracks and, in consequence, in widening of the routes. In the routes a great erosion can be observed. The other dangers to functioning of the park, connected with the development of tourism and recreation are making fires in prohibited places, there also appear unnatural beach entrances. A significant problem seems to be a lack of sanitary facilities (toilets + rubbish bins), which leads to pollution with sewage and rubbish in the most attractive parts of beaches and the surroundings of the Wisełka Lake.

The concept of tourist and recreation development in the plan Of WPN protection
Work on the project was carried out in 2012-2013. In the project a ban on permanent and seasonal building on the edge of the cliff and a ban on creating new paths near the cliff, also a ban on creating new entrances to the beaches and permanent beach buildings, damaging new plantings. Following the postulates of the project the size of the tourist base should be kept in the same size. The concept of the development was based on the following assumptions:

1. The superiority of the protection of the natural values over any human activity
2. The limitation of transit through the park, and a change in the organisation of transport services in the park's towns
3. Zoning of the development of the touristic function – adjusting different types of development forms to the nature conditions

4. Apart from the beach zones, the only acceptable form of rest in WNP should be tourism limited to indicated routes
5. Setting urbanisation standards for holiday towns enabling a proper environment protection and cultural features

According to the postulates included in the concept there are two distinct categories of terrain in the park having changeable possibilities: areas with strict protection – which prohibit any tourist activity, and area of limited penetration which are again divided into 3 functional- spatial parts:
Zone 1 – *forest areas* between 102 road from the north up to the bay with the coastal waters. In this area we have the strictest protection rigours including a ban on placing any forms of stay. It should be possible to build few protection roofings used by tourists to observe nature or to rest.
Zone 2 – *The Karsibór Islands and the backwaters of Świna* the highest protection rigour, a ban of any forms of stay, a possibility of admittance for only a specific and qualified activity in restricted areas. Footbridges, roofings, viewpoints, viewing towers and birdwatching spots are acceptable.
Zone 3 – *The terrains located in the direct neighbourhood of a water areas*
A. *Coastal waters with the beach, forests limited by 102 road from the south.*
The highest protection rigour. A ban on any form of stay apart from the existing ones. A permanent building of barracks in Biała Góra and a summer resort - Grodno II and an Educational Centre - Grodno, kept for museum, educational and exhibition purposes. The remains of fortification from II World War should be included in the didactic purposes and should be protected by uncontrolled penetration. There is a possibility of making the place accessible only in restricted routes.
B. *The Woliński Lakeland in the boarders of WNP.*
The area includes lakes: Czajcze, Domysłowskie, Rabiąż i Warnowo with a part of forests of WNP limited by a line of the road between Wisełka – Warnowo. The dominating function – environmental protection, supplementary function – recreational and educational. The plans of the area development and the concepts of designing should take into consideration a ban on introducing new plans for residential tourism at the above mentioned lakes. The possible forms of rest at the lakes should only include walking in the tourist routes and nature and landscape observation.

Conclusion

In Polish legislation dealing with the plans of parks' protection there is a lack of clear defining of the scope of resources inventory for the tourist and recreation base, but also there is a shortage of methods allowing to define final and acceptable indications of the tourist and recreation in the national park and its buffer zone. It's essential to regulate the questions of the effectiveness of the environmental protection in the context of both nature and culture.

Tourism and recreation in WNP will be developing in terms of unique landscape features and access to attractive beaches. Such a high frequency of visitors requires a zoning of the intensity of touristic and recreational development in the Park. Planning a further development we must sustain the current size of the accommodation base with the bike and walking routes. In the park and its surrounding a birdwatching and observation infrastructure should develop, ie. viewing and observation towers accompanied by educational paths. The area of WNP has to be protected from anthropic pressure by not only limiting the access, but most importantly, by creating services for tourist movement outside the park and the neighbouring towns. It's essential to create uniformed urbanisation standards for the nearby towns in the protected and the neighbouring area as far as the landscape and cultural features are concerned.

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Rozporządzenie Ministra Środowiska z dnia 12 maja 2005 roku (Dz.U. nr 94/2005 poz. 794) w sprawie szczegółowych zasad sporządzania planu ochrony dla parku narodowego, rezerwatu przyrody i parku krajobrazowego, dokonywania zmian w tym planie oraz ochrony zasobów, tworów i składników przyrody.
Rozporządzenie Rady Ministrów z dnia 03.03.1960r. (Dz.U z 1960 r. Nr 14, poz.29) w sprawie utworzenia Wolińskiego Parku Narodowego
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Souhrn
Tento článek pojednává o rozsahu analýz nezbytných pro stanovení předpisů pro cestovní ruch a rozvoj rekreace v národních parcích v právním rámci polské legislativy . Cílem této práce je také ukázat možné směry rozvoje cestovního ruchu a rekreace ve Wolińskem národním parku týkající se úpravy obsažené v plánu péče. Pro realizaci tohoto cíle bylo nutné analýzovat nízké regulace, jako je zákon o ochraně životního prostředí a vyhlášky Ministerstva ochrany životního prostředí na jedné straně a na další straně – stav cestovního ruchu a rekreační infrastruktury a identifikace různých nebezpečí pro přírodní a kulturní prostředí vztahující se k cestovnímu ruchu. Studie ukázala, že polský zákon nestanoví jasně rozsah turistiky a rekreace. Také tam je nedostatek metod pro definování konečné a přijatelné indikátorů turisty a rekreace v národním parku a jeho ochranných pásmech. Analýza cestovního ruchu a rekreačních zdrojů ukazuje stále velké příležitosti pro rozvoj cestovního ruchu. Článek prezentuje koncept rozdělení parku do tří zón určených na základě analýzy využívání území, reliéfu a turistických zdrojů . Pro každou zónu jsou určeny možnosti a omezení.

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TOURISM IN KARSTIC LANDSCAPE OF THE SLOVAK WORLD HERITAGE SITES

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Abstract
The Slovak Karst and Aggtelek Karst are part of the largest karst region in Central Europe with a well-developed karst relief and an almost complete range of the karst phenomena of temperate climate. It si known also for its diversity of flora and fauna. Since 1995 the Caves of Slovak Karst and Aggtelek Karst have been included to the UNESCO´s World Herigate List. For ecological and environmental tourism are used mostly the caves, but the karstic landscape is also very siutable for ecotourism development. The landscape of the Slovak Karst National Park is interesting not only by its remarkable natural formations, but also by the abundance of its material evidence of man´s activity, such as monuments of architecture, popular building and fine art. Tourism development and visitor activities associated with World Heritage Properties should always contribute to the protection, conservation, presentation and transmission of their heritage values and should contribute to local community empowerment and socio-economic development in an effective and equal manner. Effective tourism planning and management, including cooperative partnerships, should be an integral aspect of the site management system.

Key words: ecotourism, Slovak Karst,caves, National Park, World heritage

Introduction

Definition of recreation: something people do to relax or have fun **:** activities done for enjoyment; refreshment of strength and spirits after work; refreshment or diversion (https://www.google.sk/#q=recreation+definition). Recreation is an essential part of human life and finds many different forms which are shaped naturally by individual interests but also by the surrounding social construction. Recreational activities can be communal or solitary, active or passive, outdoors or indoors, healthy or harmful, and useful for society or detrimental. A list of typical activities could be almost endless including most human activities, a few examples being reading, playing or listening to music, watching movies or TV, gardening, hunting, hobbies, sports, studies, and travel. Not all recreational activities can be considered wise, healthy, or socially acceptable or useful.

Definition of tourism: the activity or practice of touring, especially for pleasure; a traveling around from place to place; a long journey including the visiting of a number of places in sequence, especially with an organized group led by a guide; a brief trip through a place, as a building or a site, in order to view or inspect it. The term „tourist“, meaning „an individual who travels for the pleasure of traveling, out of curiosity“ (Ceballos-Lascuráin, 1996).Tourismin themodern senseis an Englishinvention. Unlike“traveler” who himself organizes activities, tourist ispassive, expects interesting things happen to him that everything will be provided for him. Purchasing tourists residence (stay) tourist can undertake someone else to provide thatwill have apleasant experience (Chorvát, 2007).

Nature-based tourism denotes all tourism directly dependent on the use of natural resources in a retalively undeveloped state, including scenery, topography, water features, vegetation and wildlife (Ceballos-Lascuráin, 1996).

Sustainable tourism is tourism that is developed and managed in such a way that all tourism activity – which in some way focuses on a heritage resource (be in natural or cultural) – can continue indefinitely.

Ecological tourism, or ecotourism, as specific category of nature-based tourism, is environmentally responsible travel and visitation to relatively undisturbed natural areas, in order to enjoy and appreciate nature (and any accompanying cultural features – both past and present) that promotes conservation, has low visitor impact, and provides for beneficially active socio-economic involvement of local populations (Ceballos-Lascuráin, 1996). Ecotourism is currently increasing from 20% by 10 – 12% of arrivals each year (Barré, 2010).

According to Millennium Ecosystem Assessment the cultural ecosystem services provide recreational, aesthetic, and spiritual benefits (Millennium Ecosystem Assessment, 2005).

Slovak Karst (Slovenský kras) is situated in the southeast Slovakia. The protected territory (National Park) has an area of 361.7 km^2 and is surrounded by a prevention zone of 383.3 km^2. Its 43-km long southern boundary coincides with the Slovak border with Hungary. It is a series

of plateaux whose maximum altitude ranges between 400 - 900 m. The summits of the Plešivec Plateau reach 851 m, and those of the Silica Plateau reach 679 m. The highest elevation is reached by Pipítka (1 225 m) on the northern boundary of the transition area. The lowest point of 190 m a.s.l. is the Turňa Valley in the transition area on the southern margin of the territory (Rozložník, Karasová, 1994).
A physico-geographical division separated the karst territory into a montane and an intermontane landscape. Within the montane landscape was distinguished here a karst, a semi-karst and a non-karst landscape. The intermontane landscape is made up of hallows and hills, terraced and conical high plains, fluvial meadows and low cones (Drdoš, 1967, Mello, 1994).At the second stage of division, where settlement, communications and economic land use were taken as the differentiating criteria, was recognized an unsettled landscape of secondary forests, a landscape of cultural steppes and an industrialized landscape with an urban structure.
The area of Slovak Karst was officially declared as the Protected Landscape Area (PLA) in 1973. Its official objectives are the protection and recovery of natural resources, and the coordination of human management, environmental protection and natural beauty, with regard to their multiple scientific, economic, and health functions. These legal principles are the basis of the protection of rare ecosystems, fauna, flora, and abiotic phenomena. The territory of Slovak Karst was declared a National Park, March 1, 2002 and classified in Category II of the IUCN Protected Area Category System.
In 1977, the Bureau of the International Coordinating Council of the UNESCO´s Man and the Biosphere Programme designated the former Slovak Karst Landscape Protected Area (LPA) and its prevention zone within the UNESCO´s international system of Biosphere Reserves (BR). For functional purposes, the BR has been divided into a Core Area (24% of the BR area) and a Buffer Zone (65%). The rest of the PLA, and its entire prevention zone, form the BR´s Transition Area (11 % of the whole). In order to ensure a differentiated protection and land use, the territory of the protected landscape region and its protective belt should be divided in terms of functionality and space (Rozložník, Karasová, 1994, Vološčuk, 2009).
The variety of caves formations in Slovak Karst and Aggtelek Karst World Heritage and the fact that they are concentrated in a restricted area means that the 712 caves currently identified make up a typical temperate-zone karstic system. Because they display an extremely rare combination of tropical and glacial climatic effects, they make it possible to study geological history over tens of millions of years. These caves are remarkable for having the world´s highest stalagmite and an ice-filled abyss, which considering the territory´s height above sea level, is a unique phenomenon for central Europe (UNESCO, 2010).
The Slovak karst is known for its abundance of karst forms and inorganic nature as a whole. The protection motiv played a decisive role in the setting up of such outstanding protected natural formations as are the caves Ardov, Brázda, Gombasecká, Domica, Milada, Jasovská, the Ochtinská Aragonite cave, the chasm Diviačia priepasť, the Silica ice-dome, etc. In 2000, the World Heritage was affiliated the Dobšinská Ice cave. Several geological localities are to be found here, of special significance from the paleontological and stratigraphic aspect (Mello, 1994). The most known Cave in Hungarian Aggtelek Karst National Park is Baradla cave system (Jakál, 2005,). Slovak Domicacave withthe Hungarian Baradla cavecreates a uniquecave complex, whichannuallyvisited bythousands of tourists (Bodolai, Varga, 1994).
The caves situated in Slovak Karst National Park and the adjacent Aggtelek National park in Hungary the World Heritage Commettee has inscribed on the World Heritage List on9 December, 1995, as Caves of Slovak Karst and Aggtelek Karst. Inscription on this List confirms the exceptional and universal value of a cultural or natural site which requires protection for the benefit of all humanity (Klinda, 2000).
The caves of the Slovak Karst are important not only for their geomorphological value (Drdoš, 1967) but also for the numerous finds of past settlement (Bánesz, 1994). These include the only evidence of *Homo sapiens fossilis* in Slovakia, a solitary example of Buková Hora Culture, and discoveries of ritual masks and ritual sacrificial cannibalism. All of these discoveries are of European importance (Bánesz, 1994, Ložek, Horáček, 1988, Minárik, 1988).

Material and methods
In the years2008-2010was performedresearchon the environmentalpotential ofSlovak Karst National Park. The environmentalpotentialwas performedby the methodof SWOT (Strenghts, Weaknesses, Opportunities, Threats) analysis. There were identifiedstrengthsand weaknesses, as well as opportunitiesandthreats. SWOTmethodwere evaluatedthenature trailsin the

regionposed aseducationaland promotional informationresource"*in situ*". Results of the SWOT analysiswereproposals for measures toincreaseenvironmental awarenessand streamlinemanagementofthe eco-awareness. They were evaluatednature trails:Zádielskátiesňava (gorge), Horné lúky (Uppermeadows), Jasovská skala (Jasov rock), Domicaand vicinity, UNESCOCave-CaveKrásnohorská.The research resultswere publishedin a monograph(Vološčuk, Tomaškinová, 2011).

Results

Strenghts - Very valuable territory: RAMSAR sites, World Heritage, UNESCO-MAB Biosphere Reserve, Natura 2000, environmental valuable possessions - a national park, national nature reserves, nature reserves, protected areas, high biodiversity and high accumulation of karst forms, the most typical karst area in Central Europe, 1,050 caves and pits; incidence of endemic fauna and flora; ethnographic value, wine cellars and wineries in Hrhov; typical folk architecture; high cultural and historical potential area; very good opportunities for hiking tourism; multicultural region (Slovak-Hungarian population); mining Museum in Rožňave; management plan for the national park and biosphere reserve and wetlands.

Weaknesses - insufficient technical infrastructure of most municipalities; poor connectivity of public transport from centers ton villages; bad condition of local roads; lack of investment in community development; low marketing of the region; insufficient possibility for sports and cultural activities for visitors (lack of facilities for swimming and water sports, sports halls, theaters); indifference of the population of rural tourism; the low level of foreign languages; management lack of cultural and historical monuments; high unemployment (26-29%); mining near the national park; the fragmentation of competencies of critical stakeholders.

Opportunities -increasing interest of the natural and cultural values; growing interest in family holidays in nature; growing interest in ecotourism, agrotourism and etnotourism; diversification of products and forms of tourism and recreation (establishment of a network of information centers, sightseeing places, nature trails); high potential of area to obtain social and economic benefits (new jobs in tourism, a return to traditional forms of management in karst landscape); suitability of area for modest tourism –landscape type of karstic plateaux allows to engage in active forms of relaxation families, pensioners and people with poor health my energy; create new greenways to Plešivská plateau and attractive surroundings of the village Krásnohorská Dlhá Lúka; production of regional and local gastronomic typical for Gemer region; revive traditional handicraft production and presentation of local folklore traditions; increase promotion of the region at home and foreign countries.

Threats - loss of existing markets and customers; negative demographic trends; population migration; high representation inadaptable citizens of Roma origin; failure to close the nature management practices in karst landscape - bad choice of agricultural crops, non-directed forest logging, increasing soil erosion, because the principle of storage chemicals and livestock manure in the karst landscape, karst water pollution, excessive use of fertilizers and chemicals, old environmental burdens - uncontrolled landfills, abandoned and unrevitalised stone quarries, abandoned grasslands overgrown trees, threat cave systems backfilling depressed relief forms, burning dry grassland and biodiversity loss.

Discussion

Tourism at protected areas

International Union for Conservation of Nature and Natural Resources – IUCN has agreed upon a single definition of a protected areas as follows: „*An area of land/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means"* (IUCN, 1994, EUROPARK, IUCN, 2000). Within this broad IUCN definition, protected areas are in fact managed for many different purposes.

IUCN has developed a six category system of protected areas: Ia = Strict Nature Reserve: managed mainly for science; Ib = Wilderness Area: managed mainly for wilderness protection; II = National Park: managed mainly for ecosystem protection and recreation; III = Natural Monument: managed mainly for conservation of specific natural features; IV = Habitat/Species management Area: managed mainly for conservation through management intervention; V = Protected Landscape/Seascape: managed mainly for landscape/seascape conservation and recreation; VI = Managed Resource Protected Area: managed mainly for the sustainable use of natural ecosystems (IUCN, 1994)

The management objectives in protected area categories(IUCN, 1994) is shown in Table 1.

Tab.1: Matrix of management objectives and IUCN protected area management categories

Management objective	Ia	Ib	II	III	IV	V	VI
Scientific research	1	3	2	2	2	2	3
Wilderness protection	2	1	2	3	3	_	2
Preservation of species and biodiversity	1	2	1	1	1	2	1
Maintenance of environmental services	2	1	1	_	1	2	1
Protection of specific natural/cultural features	_	_	2	1	3	1	3
Tourism and recreation	_	3	3	_	2	2	1
Education	_	_	2	2	2	2	3
Sustainable use of resources from natural ecosystems	_	3	3	_	2	2	1
Maintenance of cultural/traditional attributes	_	_	_	_	_	1	2

Key: 1 = Primary objective; 2 = Secondary objective; 3 = Potentially applicable objective; - = not applicable

The link between protected areas and tourism is as old as the history of protected areas. Protected areas need tourism, and tourism needs protected areas (Eagles et al., 2002). Though the relationship is complex and sometimes adversal, tourism is always a critical component to consider in the establishment and management of protected areas. Inall categories ofprotected areascanonly be performed bythe principles ofecotourism (Ceballos-Lascuráin, 1996).

For the application ofecotourism in protected areascanapplythe principlesof the Global Code of Ethics for Tourism, which was adopted by resolution A/RES/406(XIII) atthe thirteenth World Tourism Organization General Assembly (Santiago, Chile, 27 September - 1 October 1999).

According to Global Code tourism activities should be conducted in harmony with the attributes and traditions of the host regions and countries and in respect for their laws, practices and customs. Tourism infrastructure should be designed and tourism activitiesprogrammed in such a way as to protect the natural heritage composed of ecosystems and biodiversityand to preserve endangered species of wildlife; the stakeholders in tourism development, and especiallyprofessionals, should agree to the imposition of limitations or constraints on their activities when these are exercised in particularly sensitive areas - nature reserves or protected areas. Nature tourism and ecotourism are recognized as being particularly conducive to enriching and enhancing the standing of tourism, provided they respect the natural heritage and local populations and are in keeping with the carrying capacity of the sites(UNWTO, 1999).

It is imperative then that the multiple functions of many protected areas are systematically considered when drawing up management plans (Ceballos-Lascuráin, 1996, Tomaškinová, Tomaškin, 2013). Carrying capacities must be determined carefully for each management zone.

Tourism atWorld Heritage Sites

The World Heritage Sites in Europe are predominantly used for visitor attraction that is coherent with the Convention that cleary states the need for State Parties to consider both conservation and presentation equivalent aims of the properties and may consider that these two elements are an integral part of addressing tourism management. Sustainable tourism at World Heritage properties define a cooperative stakeholder relationship among relevant government agencies, public and private tourism sectors, and civil society including NGOs, visitors, site management, museums and community members (Barré, 2010).

It should beemphasized thatWorld Heritageis not acategoryof protected area. World Heritagesitesmake upalreadydeclaredprotected areasunder the nationallegislation.

Tourism development and visitor activities associated with World Heritage Sites should always contribute to the protection, conservation, presentation and transmission of their heritage values. Tourism should mobilize local and international awareness, understanding and support for their protection, conservation and sustainable use (Barré, 2010). Tourism planning and management, including cooperative partnerships, should be an integral aspect of the World Heritage Sites management plan (EUROPARK, IUCN, 2000, Eagles et al., 2002, UNESCO, 2010, Pichler et al., 2007).

Tourism infrastructure development and visitor activity associated with World Heritage Sites should contribute to local community empowerment and socio-economic development in an effective and equal manner. Tourism planning defines a vision for tourism and other public use development and management. Planning is based on the system of limits of acceptable change.

It includes zoning systems with the appropriate visitor experiences aligned with the zone, interpretation message, and business planning. Interpretation and education help managers communicate the World Heritage Outstanding Universal Value to visitors and help address impact issues.
Tourism generate demand for a wide range of services, providing opportunities for community development. These services are linked to the World Heritage Property, providing an alternative to high-impact land uses such as logging or mining, tourism helping foster community support for conservation and site management.

Tourism at caves
Tourism in World Heritage Sites (Caves of the Slovak Karst and Aggtelek Karst) is concentrated mostly on the caves opening for visitors with guide. The caves of the Slovak Karst represent national nature monuments as strictly protected category of protected areas in Slovakia. At the same time they are instructive places where attendance is possible only with guides. Entry points of caves are equipped with information panels, on which visitors before entering the cave have the opportunity to become familiar with the specifics of the cave.
The management of caves ensures the Slovak caves administration in Liptovský Mikuláš, which is part of the organizational structure of the State Nature Conservancy in Banská Bystrica directed by Ministry for Environment of the Slovak Republik. Care and services of the cave provides Slovak caves administration with Speleological service. Research and monitoring of caves provided by the staff of the Slovak caves administration and various scientific research institutions. The exhibitions present the World Heritage are situated in the entry section of Domica cave, Gombasecká cave, Ochtinská Aragonite cave, Jasovská cave and Dobšinská Ice cave. One of the best exhibition (UNESCO – caves) is near the Krásnohorská cave, which is open for tourism only in restricted numbers of visitors.
The caves of the World Heritage are threated by agricultural and forestry activities in buffer zones above ground caves, and visitors (tourists) - stalactites breaking.
The number of touristsin the cavesof world heritagein 2013: Dobšinská ice cave 57 764, Domica cave 24 384, Gombasecká cave 7 116, Jasovská cave 14 982, Ochtinská aragonit cave 20 375. Ticketfor adultsis: Dobšinská Ice cave 7,00€ Domica cave 6,00 € (sailingboat 9,00 €), Gombasecká cave 5,00 €, Jasovská cave 5,00 €, Ochtinská aragonit cave 6,00 €.

Tourism at landscape of the Slovak Karst National Park
The territory of the Slovak Karst National park and Aggtelek Karst National Park, by its natural features is attractive for tourism, however, no suitable conditions have thus far been created for its adequate development in harmony with nature protection. The territory offers the most favourable conditions for organized short-term tourism for hikers (Vološčuk, Tomaškinová, 2011, Tomaškinová, Tomaškin, 2013).
The protected landscape region is interesting not only by its remarkable natural formations, but also by the abundance of its material evidence of man´s activity, such as monuments of architecture, popular building and fine art. The best known national cultural monuments are the chateau Krásna Hôrka and the church at Štítnik, then the picturesque ruins of the Turňa castle, the preserved ruins of the mediaeval church Lúčka, the cloister complex with a French-style garden at Jasov, mansion and museum at Betliar, mausoleum of Andrássy family at Krásnohorské Podhradie village, several places of pilgrimage and futher monuments (Rozložník, Karasová, 1994).
The natural conditions of the landscape determine its use. The density of setlement is very uneven, but generally low: there are only three villages on the Silica Plateau, on sites where soils are suitable for agricultural crops. Woodlands are the predominant biome of the plateaux: of the total area of the National Park, forests cover 76%, grasslands and pastures 16%, arable land 4%, the others 4% (Rozložník, Karasová, 1994). Most of the woodlands are coppice stands derived from repeatedly cut broad-leaved trees, and forest plantations cultivated by foresters (Lasák, Szöllös, 1994).
Tourism on the plateaux landscape is weakly developed, although thewalkin the springof the highplainsalongthegrassyarea planted with shrubs and karst pits provides extraordinary aesthetic experiences.Walking ecotourism is the most developed in the canyon Zádielska gorge, which is a unique karst area. At the entrance of the gorge to the Zádielska gorge is situated educational panel and in the gorge aresome educational stops. Relatively abundantly is frequented apicturesque ruins of the Turňa castle on hill from which is the extraordinary views of the surroundings(Vološčuk, Tomaškinová, 2011, Tomaškinová, Tomaškin, 2013).

On the plateaux, forestry is predominant, with some agriculture. Settlements and related economic activities are concentrated in the basins and river valleys. The wide-ranging region has an industrial-rural character, and more people are employed in agriculture than industry. The most important industrial activity out of National Park is the exploitation of raw materials and accompanying processing, machinery, and metal-working industries (Rozložník, Karasová, 1994).
The present situation and forestry activities are the following: the state owns around 40% of the forest area, approximately 48% of the forest area is supervised by the companies and private owners. Forests owned by the church and the local municipalities represent 9% of the forest area. The remaining 3% of the forestland is under the management of other subjects. Currently, massive restitutions of the forest lands to the original owners take place, and so the organizational diversification is quickly changing.
The Slovak Karst National Park has its own Administration (in Brzotin village) which coordinates activities and the use of natural resources in harmony with their preservation (Rozložník, Karasová, 1994). This administration is not responsible for caves manažment.
There are no institutional mechanisms for coordinating of transboundary Slovak Karst National Park and Aggtelek Karst National Park as a World Heritage Sites.
Relatively goodtransboundary cooperation is betweennational parksin the border areaDomica CaveandCaveBaradla.Transboundary visitor management includes the management of recreation, tourist and service activities. Cooperative management strategies consider the direct and indirect effects of visitor use, facility development and tourism promotion (Hamilton et al., 1996, Vološčuk, Tomaškinová, 2011, Tomaškinová, Tomaškin, 2013).

Conclusion and summary

Platform solutions for sustainable tourism in karstic Slovak-Hungarian World Heritage Sites has become ecotourism and recreation. The ecotourism formed in symbiosis at first glance irreconcilable inconsistency in the implementation of tourism in practice, such as the preservation and presentation. Ecotourism provides managers of protected areas a complex solution to keep visiting tourists under control so that the benefits derived from its development to organizations thrive on nature and landscape protection, but also local communities and citizens themselves.
Based on the research results of the environmental potential of the area of the National Park Slovak Karst, which caves were listed in 1995 on the List of World Heritage, the following recommendations were proposed: to revive tourism in the region; increase the environmental awareness of the domestic population; improve environmental education; improve the promotion of natural and cultural heritage; develop cross-border cooperation with Hungarian Aggtelek National Park; improve the network of nature trails and update of marked hiking trails and expand their network; broaden awareness among inadaptable Roma citizens (in some municipalities is 70-90% of Roma); draft a new greenways and bike routes supplemented by educational information panels; to use not only natural but also cultural potential of the region;build a network and guided sight-seeing places educational sites; survey also propose attractive "animating" programs and workshops, for example ”How to make goat cheese”, “How is lived on farm”, “How they lived Neolithic people”; draw attention to the involvement of local communities and small and medium enterprises;provide information services and attractive promotional material in foreign languages;promote the region attractive website, it is important foreign mutation websites, which is currently in the region completely absent;establish regional environmental quality mark “Slovak Karst National Park” while it effectively to promote.

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Souhrn
Slovenský kras a jeskyně Aggteleckého krasu jsou součástí největšího krasového regionu ve střední Evropě s rozvinutým reliéfem a téměř s celou škálou krasových jevů mírného pásma. Jsou známi díky své bohaté diverzitě jak rostlin, tak živočichů. Od roku 1995 jsou jeskyně Slovenského krasu a Aggteleckého krasu zařazeny na seznam světového dědictví UNESCO. Z hlediska ekoturistiky jsou nejčastěji využívány převážně jeskyně, ale samotná krasová krajina je taktéž velmi atraktivní právě z hlediska rozvoje ekoturistiky. Krajina Národního parku Slovenský kras není zajímavá jen díky svým pozoruhodným přírodním útvarům, ale také se zde vyskytuje mnoho výtvorů lidské činnosti v podobě různých architektonických památek, moderních staveb a výtvarného umění. Rozvoj turistiky a aktivit návštěvníků spojené s vlastnostmi světového dědictví by měli vždy přispívat k ochraně, zachování, prezentování a předávání právě hodnot tohoto dědictví a též by měli přispívat k posílení místní komunity se socio-ekonomickým rozvojem efektivním a spravedlivým způsobem. Efektivní plánování a řízení cestovního ruchu zahrnující širokou spolupráci by mělo být základním prvkem systému managementu.

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TOURIST FOOT TRAIL OF COCOA IN HUAYHUANTILLO, PERU

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Abstract
Huayhuantillo is a small village with a population of 200 inhabitants, located in the foothills of the Peruvian Andes. 20 years ago, the main incomes used to come from growing coca plants, but nowadays the majority of the villagers grow and sell cocoa and decorative flowers. However, with the transition to cocoa plantations the amount of earnings decreased.
One of the possibilities how to improve the effectiveness of production and living standards of local people is to enhance the attractiveness of the area for tourists. In Huayhuantillo, 10 interesting places showing different systems of cocoa plantation were localized. In addition, information boards with comments are to be installed at the places. The stops are connected with two foot trails and in the centre of the village an information kiosk will be constructed. Also a leaflet about Huayhuantillo has been designed. Social work with the local people is very important too. Inhabitants of the village should comprehend the importance of tourism for their economy and also start to benefit from it. Presently, courses for villagers about tourism take place in Huayhuantillo.
This work can be used as a pilot project for other localities in the Amazon zone where many problems with illegal coca plantations might be eliminated.

Key words: Amazon, cocoa plantations, coca, social work

Introduction

Negrusa et al. (2007) defines rural tourism as that form of tourism offered by people from rural areas, with accommodation on a small scale and with the implication of important components of their rural activities and customs of life. Due to the great relative importance given to agriculture in Latin America we can expect a greater emphasis for the development of specific policies to rural tourism in this region in the future (Barrera, 2002). For example in Peru rural tourism has become more popular in the last years (Ministerio de Comercio Exterior y Turismo, 2008).
In Peru the number of tourists traveling to the country increased from 1,064,000 in 2002 to 3,164,000 in 2013 but the main part of them go to Macchu Picchu and a few other popular localities (Ministerio de Comercio Exterior y Turismo, 2013). If we look at the number of visitors going to Cueva de Lechusas, one part of theTingo Maria National Park (Huanuco region), there were just 1,025 foreign tourists but 71,530 Peruvian visitors (Chirinos.H. et al., 2012). These data indicate that Tingo Maria zone has the touristic potential for develop and it should be promote more to foreign tourists. One of the reasons why international visitors don't go to Tingo Maria is the undeveloped tourist infrastructure.
If we study possibilities of rural tourism in Peru it is important to look at the situation of coca production. The extension of Coca field in Peru exceeded Colombia's extension in 2011 and is still growing (UNODC report, 2013). There are many development projects focused on motivating local people to change the cultivated crops from coca to others (cocoa or coffee) (AGRONoticias América Latina y el Caribe, 2012). If growers change their plantations from coca to other crops, their work is not illegal anymore and they could also start tourist exploitation. This fact can increase the motivation of the local people to stop coca production.
Small scale rural tourism projects are a very important start. They can show the way, and at the same time, discover the problems which can appear during the implementation. This paper is about the presentation of a small scale development project in Huyhuantillo village, Huanuco region, Peru, where a tourist trail in the cocoa plantations has been created. The idea was that in the future Peruvian smallholders and communities will start their tourist exploitation without help from the outside.

Materials and methods

LOCATION AND NATURAL CONDITIONS
The presented small scale development project was realized in the area of Huayhuantillo village, where villagers focus on cocoa production

The village Huayhuantillo is located 37 km from the city of Tingo Maria. This area is situated in the central part of Peru in the Huanuco region, Rupa Rupa district and Leoncito Prado province. The coordinates of Huayhuantillo are: 9°16'18.80'' S and 75°52'38.90'' W. The average elevation of the whole area ranges between 500 - 600 m a. s. l. There is a tropical climate with annual rainfall of 3,400 mm, average temperature 24.5 °C and relative humidity of 84 % which is suitable for growing cocoa, coffee, corn, yucca, papaya and rice (Ministerio de Agricultura, 2014, [online pdf document]). The surroundings of Tingo Maria are also one of the biggest producers of coca leaves in Peru.
In general, after first colonization of this region cocoa was the prime crop cultivated in the culture. Thereafter came the coca growing boom and the economic importance of cocoa decreased significantly (Ministerio de Agricultura, 2014, [online pdf document]). From the 70´s to the 80´s coca created the majority of Huayhantillo's production.
Cocoa is the most economically important crop these days in Leoncio Prado province. There exist more than 3,800 ha of cocoa plantations with different ages and varieties (Ministerio de Agricultura, 2014, [online pdf document]).

METHODS
Field work started in January 2014 and local people, students from Mendel University in Brno and students from Universidad Nacional de la Selva, Tingo Maria cooperate on it.
In the surroundings of Huayhuantillo 10 interesting places were defined. They demonstrate different systems of cocoa plantations, a plant nursery, a cloning area and viewpoints (Image 1). During the fieldwork students measured GPS coordinates, they took photos and collected information from growers. The measured points were subsequently processed in the ArcGIS programme and a tourist map with three foot trails was created. The collected data were used as an informational base for the creation of tourist signs with short information and photographs describing the surrounding place and selected topic. The final form of the information signs, as well as additional promotion at leaflets were created in the Photoshop program.
The information kiosk is to be constructed in the centre of the village by local people. A simple house for tourist accommodation is to be built near the river and it will be partly financed by the local community.
Courses about tourism will take place in Huayhuantillo during and also after the initiation of the construction of the foot trails. One part of the courses will be about tourism in general and the other will be focused on rural tourism. Very important will be the course on how to administer the web site where information about Huayhuantillo will appear.

Results
We divide the results of the project into two main parts. The first part is technical improvement and the other social improvement.
technical improvement is represented by the information tables (Image 2), three foot trails, information kiosk, accommodation house, the leaflets (Image 3) and the creation and administration of the web site. All this work will be financed by the Czech development agency and will be done in 2014. All information tables and leaflets will be in Spanish and English.
Social improvements are represented by income diversification, the improvement of knowledge about tourism and possibilities to start with new types of business. The local people could open new shops, restaurants and also promote accommodation in their houses to Huayhuantillo visitors. A few years ago local growers started making products from cocoa such as brandy, wine, jam and chocolate and they sell it occasionally on local markets in Tingo Maria. The new tourist foot trail should increase the number of visitors and it could be an opportunity for growers to sell products from cocoa.

Discussion
The principal result and, at the same time, the initial reason for submitting the project is the popularization of the area of interest, which can streamline agronomical production and hence economic growth and the living standards of the local people. Improving living standards has many aspects and also several risks.
The effectiveness of the foot trail and other popularizing instruments can be assured in the case of the active attitude of the provider towards the maintenance of all the project materials. Especially keeping the website as a principal instrument of popularization of the foot trail, active interaction with tourists and tourist centres and maintenance of the tourist kiosk might well propagate the village compared with other areas of cocoa plantation.

However, for the local people, historically this is not so comprehensive a way of working. The popularization and advertisement is rather typical for European, Northern-American communities. On the other hand, the visitors, mainly tourists from abroad, are habituated to accept all the instruments of advertisement and any information about local natural, as well as social conditions could be highly effective.
A subsequent gain for the project is the cooperation of people across the world. Cooperation of local authorities, students from Universidad Nacional de la Selva in Tingo María and students from Mendel University in the project is very important. Students of the Mendel University in Brno had the opportunity to work in the real project and cooperate with people from a tropical country; on the other hand the local inhabitants could share their ideas and see what they can do to improve tourism in Huayhuantillo.
From the mentioned points of view, the project affords great potential for the villagers, as well as for the social edification of both local people and visitors.


Fig. 1: View from the viewpoint in the top of the plantations

Fig. 2: Example of the information table which will be installed in the foot trail


Fig. 3: The back side of the touristic booklet made by students. In the image you can see also the map with three foot trails

Conclusion

The paper was written to inform people about the developing project in Huayhuantillo village, Peru. The presented project is focused on improving the attractiveness of local production. The main instrument of popularization is a foot trail, supported by creating a website, tourist kiosk and leaflets.

Huayhantillo could become an educational centre about cocoa growing and tourist potential in the whole region in the future and encourage other villagers to develop and diversify incomes, not only rely on the purchase prices of their crops. It is important to monitor the results of the project in the future. Knowledge of the development after the end of the project will give us very important information.

The project serves as the pilot project for other communities and shows a way to improve the living conditions and to diversify the incomes of the community. The results of the project could be inspiring for other communities of producers and hence it could contribute to the development of the region.

The model of popularization of cocoa production in Huayhuantillo can be, with modifications, implemented in any area or type of agronomical production.

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Souhrn

Huayhuantillo je menší vesnice nacházející se na úpatí Peruánských And, jejíž populace čítá přibližně 200 obyvatel. Před dvaceti lety se místní lidé živili pěstováním koky. Postupně však díky rozvojovým projektům začaly od pěstování koky opouštět a v okolí Huayhuantilla nalezneme v současné době kakaové a květinové plantáže. Faktem zůstává, že díky změně pěstované plodiny z koky na kakao, příjmy místních obyvatel poklesly.

Podpora turistického ruchu je jednou z možností jak diverzifikovat příjmy místního obyvatelstva a začít s rozvojem sektoru služeb. Z tohoto důvodu byl navržen projekt s názvem “Ruta de cacao en Huayhuantillo” (turistické stezka ve Hayhuantillu), který má podpořit turistické využití lokality a zároveň motivovat místní obyvatele k dalšímu rozšíření služeb. V rámci projektu bylo vytipováno 10 turisticky atraktivních míst, které mají spojitost s pěstováním kakaa a kde budou instalovány informační cedule. Jednotlivá místa budou spojena třemi turistickými stezkami a uprostřed vesnice bude postaven také informační kiosek. Další důležitou částí projektu je propagace a proto byla vytvořena informační brožurka a webové stránky o Huahauntillu a zajímavostech v jeho okolí. Neméně důležitá je práce s místními obyvateli. Je plánováno několik školení, ve kterých se lidé dozvědí, o nových možnostech, které jim turismus přináší a také o tom, jak se aktivně zapojit. Místní budou motivování k založení jednoduchých stravovacích zařízení (většinou formou podávání jídla přímo u nich doma), možnosti začít poskytovat ubytování ve svých domech, případně nabízet průvodcovské služby. Na popud obyvatel Huayhuantilla se také vybuduje jednoduchý dřevěný domek, který bude sloužit turistům k přespání a zároveň jej budou využívat skupiny profesionálů, které přijíždí do vesnice na školení. Na této stavbě se bude finančně podílet i místní samospráva.
Přesah prezentovaného projektu je v jeho jednoduchosti a využitelnosti i na jiných místech Peru. Ve smyslu „příklady táhnou“ by mohl motivovat i ostatní vesnice k vybudování jednoduché turistické vybavenosti, která pomůže zlepšit místní ekonomiku. Výsledky projektu se navíc dostanou i do podvědomí profesionálů pracujících s kakaem, díky vzniku školícího centra přímo ve vesnici Huayhuantillo.

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TOURIST TRACKS IN THE TRAINING FOREST ENTERPRISE KŘTINY NATURE RESERVES

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Abstract
The study shows the results of extensive research into the actual state and management of the forest reserves in the Forest Training Enterprise (FTE) of Mendel University not far from Brno, which were established on the proposal of Professor Zlatník from the 1950s. Currently the forest reserve network occupies about 8% of the enterprise area. The classification method separately assesses the present state and management of the protected area, each in terms of eight criteria. Criteria are scored on a 6-point scale. In 2005/6 and in 2013 the methodology was applied to all protected areas of FTE, and the negative role of tourism and tourist trails was compared to other criteria assessed, over the 10-year period.

Key words: protected areas, assessment, evaluation, management effectiveness, tourism

Introduction

An assessment of the current state and management of 20 forest reserves in the Forest Training Enterprise (FTE) of Mendel University was undertaken. Table 6 shows the length of all tourist trails inside and outside the nature reserves. The forest reserve network occupies about 8% of the enterprise area. Out of 10 000 ha of TFE, an area of more than 2 900 ha is part of the Moravian Karst Landscape Protected Area (LPA). As the southern part of TFE touches Brno, the second largest city in the Czech Republic, the places assessed are frequently visited by Brno's inhabitants, but also by other tourists from the Czech Republic and abroad. The caves of the Moravian karst alone are visited by 350 000 tourists each year, while other tourists use the dense network of trails and cycle-ways traversing this area (Štefka, 2013). Several studies (Manning, 2002; Pickenring and Hill, 2007) show the severe impact of tourism on protected areas, what is also the case of the most visited parts of the LPA Moravian Karst (Štefka et al., 2006), where guided tours have had to be limited.

Fig. 1: Endangered species Dictamus albus

Materials and Methods

The Methodology for Assessing the State and Management of Small-Area Specially Protected Areas (Svátek, Buček, 2005) has been tested in the Czech Republic (Svátek, Buček 2007). The assessment was carried out twice, in the period 2005-2006 and in 2013. Each protected area was assessed during one day, except for the nature reserve Křtinský lom, which was established in 2011 (Šmiták, 2010) as the 20th nature reserve and assessed only in 2013. Management plans (Bučková, 2001a; Bučková, 2001b; Štefka, 2001a; Štefka, 2001b; Štefka, 2001c; Štefka, 2002; Tichý L., 2002).
The method is based on an assessment of the state of the territory and its management, and each is evaluated by eight criteria, presented in Table 1.

Tab. 1: Criteria for the state and management of a protected area

criteria to assess the current state	**criteria to assess the management state**
subject of protection	documentation
structure	boundary marking
significant species	roads
reproduction	buffer zone
damage to reproduction	elimination of external impacts
invasive and expansive species	reproduction management
dumps and litter	management measures
other negative impacts	fulfilment of conservation objectives

The contemporary state and management of the protected area is evaluated based on the scale listed in Table 2:

Tab. 2: Scale for the assessment of individual criteria of state and management

degree	**meaning**
0	extremely low
1	very bad
2	bad
3	average
4	good
5	outstanding

To distinguish the importance of individual criteria, each of them was assigned a multiple coefficient (presented in Tables 3 and 4). A multiple coefficient is fixed - the evaluator cannot change it. The final evaluation of the contemporary state of the protected area is then calculated as a percentage of the total number of points obtained from the maximum possible number (100) of points for the assessed state criteria.

Tab. 3: The procedure for the assessment of the contemporary state of the protected area

number of criterion	**criterion**	**degree**	**multiple coefficient**	**score**
i		S_i	k_i	$S_i \times k_i$
1	subject of protection	0–5	3	...
2	structure	0–5	2,5	...
3	significant species	0–5	2	...
4	reproduction	0–5	1,5	...
5	damage to reproduction	0–5	1,5	...
6	invasive and expansive species	0–5	1	...
7	dumps and litter	0–5	1	...
8	other negative impacts	0–5	1,5	...

Each of the 16 criteria listed in Tabs. 1 and 2 is evaluated by a grade based on the following verbal numeric scale in Tab. 5. For each criterion, grade 0 indicates the worst (lowest) evaluation, while grade 5 indicates the best (highest) evaluation. For all criteria, therefore, this applies: the higher the grade, the better the rating. The contemporary state and management in the area is therefore evaluated as follows.
All marked trails were measured through an internet application (mapy.cz). If more than one trail followed the same route, that was not calculated. Information about forest roads (FR) and public traffic roads (TR) were mentioned as well as the occurrence of non-marked trails through the nature reserve. Roads on the edge of a nature reserve were marked eFR, eTR respectively.

Tab. 4: The procedure for the assessment of the management of the protected area

number of criterion	criterion	degree	multiple coefficient	score
I		S_i	k_i	$S_i \times k_i$
1	documentation	0–5	1	...
2	boundary marking	0–5	1	...
3	roads	0–5	1,5	...
4	buffer zone	0–5	1,5	...
5	elimination of external impacts	0–5	1,5	...
6	reproduction management	0–5	2	...
7	management measures	0–5	2,5	...
8	fulfilment of conservation objectives	0–5	3	...

Tab. 5: Scale for the resulting assessment of a specially protected area

A_{stav}	The resulting assessment of the current state	Abbreviation
0 – 30,9	very bad	V
31 – 50,9	bad	B
51 – 70,9	average	A
71 – 90,9	good	G
91 – 100	outstanding	O

Results

The extensive network of tourist trails in the protected areas of TFE Křtiny is shown in table 6. More than 9 km of marked trails go through protected areas and another 8.2 km around them. Other unmarked trails used by visitors from villages as well as tourists are mentioned in table 6 as well. Only 7 protected areas are completely without trails.

An assessment of the individual criteria of nature reserves of the TFE Křtiny is presented in tables 7 and 8.

The worst results for current state and management were assessed for two ponds (nature reserve Babí doly and Soběšické rybníčky) where most rare amphibians are now extinct or missing. Illegally released and fed exotic fish species are responsible for the decline in amphibian diversity in both mentioned nature reserves. 42 points for the current state evaluation give the lowest score obtained out of all the nature reserves assessed.

The most problematic criterion for the current state (evaluated in 2013) is **damage to reproduction**, which is low for most nature reserves (see the sum in table 7). **Invasive and expansive species** criterion were also rated with a low number of points due to mouflon grazing in many forest reserves and alien fish species in ponds. The third lowest rated criterion was structure, as the forest of nature reserves evaluated was managed 30 or 40 years ago and the **structure** of the forest is still even aged.

Reproduction management due to high numbers of grazing animals (roe deer and muflon) was the worst rated criterion in management assessment, especially in the Březinka, Býčí skála, Jelení skok and Maluzín nature reserves. Some rare species of plants are unable to reproduce (f.e. *Taxus baccata)* or the reproduction is very limited *(Sorbus torminalis, Sorbus aria, Ulmus sp., Abies alba*). The student thesis of Horský (2013) shows that almost all seedlings of *Taxus baccata* are damaged by grazing. Similar information is found in Jelínek (2007) in the study of endangered woody species of TFE Křtiny nature reserves or in Štefka (2006). On the other hand only small areas were under tourist pressure due to climbing (PA Býčí skála) or tourist traffic (PA Hádecká planinka, Dřínová) which can be seen in the table 8 under the criterion **roads** (it is broader – also permanent road traffic is assessed here).

Table 6: Trails in the protected areas of TFE Křtiny

protected area	category	area of PA (ha)	number of trails	through the PA (m)	edge trails (m)	more unmarked trails	road	
Babí doly	PR	0,16	2	0	192	yes	eFR, FR	
Bayerova	PR	17,13	0	0	0	no		0
Březinka	PR	6,45	0	0	0	no	eFR	
Býčí skála	NPR	179,6	6	4905	2140	yes	TR,FR,eFR,eTR	
Coufavá	PR	23,24	1	0	246	yes	eFR, FR	
Čihadlo	PR	55,28	3	155	760	yes	TR	
Dřínová	PR	28,85	1	0	1048	yes	eFR	
Habrůvecká bučina	NPR	90,69	0	0	0	no	eFR, eTR	
Hádecká planinka	NPR	85,02	2	846	1012	yes		0
Jelení skok	PR	108,4	1	769	617	yes	eFR	
Kněžnice	PP	7,23	0	0	0	no	eTR	
Křtinský lom	PP	2,96	0	0	0	yes		0
Malužín	PR	53,33	0	0	0	yes	eTR, FR	
Rakovec	PR	37,32	1	0	364	no	FR	
Rudické propadání	NPP	3,72	0	154	171	yes		0
Soběšické rybníčky	PP	1,09	0	0	0	yes	eFR	
U Brněnky	NR	15,06	2	351	25	yes	eTR	
U Nového hradu	PR	43,34	2	1364	244	yes	eTR, FR, eFR	
U Výpustku	PR	63,73	1	627	664	yes	TR, eFR	
Zadní Hády	PR	43,34	1	0	723	no		0
SUM		**865,94**		**9171**	**8206**			

According to the methodological assessment of small-area protected areas, most nature reserves of TFE Křtiny obtained average to good results both in current state and management. Out of 100 points, which a protected area can reach at a maximum, 42 to 82 in the current state were reached, and 52 to 86 in management, respectively. The assessment in the period of 2005/6 was lower due to the improvement of management in most evaluated places except PA Babí doly and Soběšické rybníčky (see above).

With the assessment according to the methodology mentioned, endangered plant (partly also animal) species monitoring was also carried out between 2005 and 2013 in all nature reserves (except the steppe part of PA Hádecká planinka). Rare plants were mapped by GPS. Only three endangered plant species showed a decreasing trend, *Anemone sylvestris* in a micropopulation in the semisteppe edge of the PA Hádecká planinka and *Pulsatila grandis* on the former pastures of PA Čihadlo. Both places are changing due to forest expansion. The population of the critically endangered orchid *Epipactis greuterii* was damaged by clear cutting in the buffer zone of PA Habrůvecká bučina. On the contrary, *Galanthus nivalis* expanded in PA Býčí skála. During the period assessed PA Habrůvecká bučina lost nests of the black stork (*Ciconia nigra*) during a wind storm. The loss of none of the species or populations was most likely caused by tourism.

Tab. 7: Assessment of the contemporary state of the nature reserves of the TFE Křtiny

code	category	name	subject of protection	subject of protection	structure	structure	significant species	significant species	reproduction	reproduction	damage to reproduction	damage to reproduction	invasive and expansive species	invasive and expansive species	dumps and litter	dumps and litter	other negative impacts	other negative impacts	summary			
Field work year			**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**
1898	PR	Babí doly	2	3	3	n	2	n	2	n	1	n	1	n	4	4	2	3	42,85714	64	**B**	A
612	PR	Bayerova	4	3	3	2	3	1	4	4	3	1	3	3	4	4	4	4	70	52	**A**	A
585	PR	Březinka	4	3	2	1	3	2	4	5	2	1	4	4	4	5	3	3	63,57143	54	**A**	A
151	NPR	Býčí skála	4	4	3	2	4	5	4	5	2	1	3	1	4	4	3	3	68,57143	65	**A**	A
632	PR	Coufavá	4	4	3	3	3	1	4	4	3	2	3	2	5	5	3	2	69,28571	58	**A**	A
380	PR	Čihadlo	4	4	3	2	4	5	4	5	3	2	4	4	4	4	4	4	74,28571	74	**G**	G
591	PR	Dřínová	3	3	3	3	4	5	4	3	3	3	4	3	4	3	4	4	70	68	**A**	A
617	NPR	Habrůvecká bučina	4	4	3	2	4	5	4	5	3	3	4	3	4	5	3	4	72,14286	76	**G**	G
103	NPR	Hádecká planinka	4	4	3	4	4	5	4	5	3	4	4	4	4	4	4	3	74,28571	83	**G**	G
629	PR	Jelení skok	4	4	4	4	4	3	4	5	2	2	2	2	5	4	4	4	74,28571	72	**G**	G
593	PP	Kněžnice	3	3	4	4	3	4	4	5	3	3	4	4	4	4	4	4	70,71429	76	**G**	G
5613	PP	Křtinský lom	5		4		4		4		4		4		3		4		82,85714		**G**	
630	PR	Malužín	4	3	3	2	4	5	4	4	2	2	3	2	4	4	4	4	70,71429	64	**G**	A
592	PR	Rakovec	3	1	3	1	3	3	3	3	4	4	3	2	5	5	4	4	67,14286	50	**A**	B
1185	NPP	Rudické propadání	4	4	4	4	4	5	4	4	4	4	4	4	4	3	3	3	77,85714	79	**G**	G
1043	PP	Soběšické rybníčky	2	3	3	2	2	2	2	2	1	1	1	1	4	3	2	3	42,85714	44	**B**	B
584	PR	U Brněnky	4	4	3	3	3	5	4	5	3	4	4	4	4	4	3	3	69,28571	79	**A**	G
615	PR	U Nového hradu	4	4	4	3	4	4	4	5	3	2	3	3	4	4	3	3	74,28571	71	**G**	G
647	PR	U Výpustku	4	3	3	2	5	5	4	4	3	1	3	1	4	4	3	3	73,57143	59	**G**	A
594	PR	Zadní Hády	4	3	3	3	4	5	5	5	3	3	4	4	5	5	5	4	80	76	**G**	G

Tab. 8: Assessment of the management of nature reserves of the TFE Křtiny

code	category	name	documentation	documentation	boundary marking	boundary marking	roads	roads	buffer zone	buffer zone	elimination of external impacts	elimination of external impacts	reproduction management	reproduction management	management measures	management measures	fulfilment of conservation objectives	fulfilment of conservation objectives	summary		
Field work year			**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**	**2013**	**2005-6**
1898	PR	Babí doly	5	4	4	3	4	3	4	4	2	3	2	3	1	n	2	3	52,1428571	64	**A**	A
612	PR	Bayerova	5	4	4	4	4	4	3	1	4	4	3	2	4	3	3	3	72,1428571	60	**G**	A
585	PR	Březinka	5	5	4	4	3	3	3	2	3	3	2	1	3	3	3	3	61,4285714	56	**A**	A
151	NPR	Býčí skála	5	5	4	4	3	3	4	3	4	4	2	1	2	2	3	3	62,1428571	57	**A**	A
632	PR	Coufavá	5	4	3	2	2	2	3	3	4	4	3	2	4	3	3	3	66,4285714	57	**A**	A
380	PR	Čihadlo	5	4	4	4	4	4	4	4	4	4	3	3	3	3	3	4	70,7142857	74	**A**	G
591	PR	Dřínová	5	5	3	2	3	3	3	2	3	3	3	2	3	3	3	3	62,8571429	56	**A**	A
617	NPR	Habrůvecká bučina	5	4	4	4	4	4	4	2	4	4	3	2	4	3	4	3	78,5714286	62	**G**	A
103	NPR	Hádecká planinka	5	4	3	3	3	2	4	4	4	3	4	4	3	3	4	3	74,2857143	64	**G**	A
629	PR	Jelení skok	5	5	5	5	4	4	4	4	4	3	2	2	3	3	3	3	69,2857143	67	**A**	A
593	PP	Kněžnice	5	4	4	4	3	3	3	3	4	4	3	3	4	4	3	4	70	73	**A**	G
5613	PP	Křtinský lom	5		5		4		4		4		4		5		4		86,4285714		**G**	
630	PR	Malužín	5	5	5	5	4	4	3	3	4	4	2	1	3	2	3	3	67,1428571	61	**A**	A
592	PR	Rakovec	5	3	4	4	4	4	2	1	4	4	3	3	4	2	3	2	70	54	**A**	A
1185	NPP	Rudické propadání	5	4	4	3	3	3	3	4	3	3	4	4	4	3	4	4	75	71	**G**	G
1043	PP	Soběšické rybníčky	5	5	5	5	4	4	3	4	2	2	2	1	2	1	2	2	55	51	**A**	A
584	PR	U Brněnky	5	4	4	3	3	3	4	4	4	4	4	4	4	4	4	4	79,2857143	76	**G**	G
615	PR	U Nového hradu	5	3	4	4	3	3	3	2	4	3	3	3	4	4	3	3	70	63	**A**	A
647	PR	U Výpustku	5	5	4	4	3	3	3	2	3	3	3	1	3	2	3	2	64,2857143	49	**A**	B
594	PR	Zadní Hády	5	4	5	5	4	2	3	2	4	4	3	3	3	3	3	3	70	62	**A**	A

Fig. 2: Tourists at the Hádecká planinka Nature reserve

Discussion

Tourism may threaten the diversity of plants or animals, but other land uses seem to be more critical for the diversity of the TFE Křtiny nature reserves. All the nature reserves mentioned (except the smallest ones, see table 6) have some area with no tourist trails, and seven of them are located outside the tourist trail network altogether. This does not mean that no tourists or local people enter the area, but those locations are relatively quiet and safe for the endangered species populations.

As mentioned above, this does not apply to other land uses, which are legal in the Czech Republic's protected areas (hunting and keeping game animals overpopulated) or illegal (illegal fishing in the property of others). Loss of biodiversity due to natural forest succession could be fixed by management plans - in some cases forest is the target ecosystem and open areas are gradually decreasing (other protected areas specialize in this land use and its endangered species). Forest biodiversity is the main conservation target in TFE Křtiny nature reserves.

Transformation of the forest outside nature reserves to close to nature management may help the endangered species population in nature reserves. According to research into commercial forest biodiversity at the Training Forest Enterprise Křtiny (Damborská, 2011; Kučerová, 2009; Pavlů, 2011; Procházka, 2010; Procházka, 2010; Škrabanová, 2010; Thonnová – Krmelová, P., 2010) in the past 10 years, endangered species have not grown under coniferous monocultures, and rarely in mixtures where coniferous species (*Picea abies, Larix decidua, Pseudotsuga menziesii*) prevail. As found in the research plots of the Silviculture department of Forestry Faculty, Mendel University (Jelínek, Kantor, 2006), the species composition of woody undergrowth under spruce and pine monoculture is very rich and it is quite easy to change it into broadleaf forest where rare species prosper.

Conclusion

The study is based on the Czech Methodology for Assessing the State and Management of Small-Area Specially Protected Areas, which occupy 865 ha, or around 8% of the Training Forest Enterprise Křtiny, Mendel University property. The vicinity of Brno, the second biggest city of the Czech Republic, could make the network of nature reserves highly vulnerable through tourism. The network of tourist trails in the nature reserves extends 9.1 km and another 8.2 km of tourist trails touch the nature reserves. Only 7 protected areas are without the direct impact of tourist trails.

The assessment of protected areas shows that it is not tourist trails (criterion road or other negative impacts), but game management in many forest reserves (especially PA Býčí skála, Jelení skok, Maluzín, Březinka) and fish management in protected ponds (PA Babí doly and Soběšické rybníčky) that are the cause of the poor results for the state and management of particular protected areas (see the damage to reproduction and invasive species criteria). Even through monitoring of the populations of endangered plant species (partly also endangered animal species) in the nature reserve network, it is not tourism but game grazing damage (partly by the non-autochthonous mouflon) and fisheries in nature reserves which are responsible for the particular endangered species population decline.

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Souhrn
Studie hodnotí současný stav a management 20 maloplošných zvláště chráněných území Školního podniku Křtiny (ŠLP) podle metodiky, která je založena na posuzování 8 kritériích pro stav území a 8 kritériích pro management území. Rezervace ŠLP Křtiny zaujímají 865 ha, tj. cca 8 % z rozlohy Školního lesního podniku Křtiny. Kvůli bezprostřední blízkosti krajského města Brna je území často navštěvováno obyvateli, k čemu slouží i síť turistických tras. Přes maloplošná chráněná území vede 9,1 km značených stezek a dalších 8,2 km turistických stezek vede okrajem těchto území. Pouze sedm chráněných území je bez přímého vlivu turistických tras. Hodnocení přírodních rezervací ukazuje, že to není turistický ruch, ale myslivost v mnoha lesních rezervacích (zejména NPR Býčí skála, PR Jelení skok, PR Malužín a PR Březinka) a nelegální chov ryb v chráněných nelesních územích (PR Babi doly a PP Soběšické Rybníčky), které jsou příčinou špatného hodnocení některých rezervací nebo úpadku přírodní hodnoty dvou nejhůře hodnocených zvláště chráněných území ŠLP Křtiny.

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TOWARDS AN INCLUSIVE APPROACH TO RECREATION AND LANDSCAPE PROTECTION

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Abstract
Recreation and landscape protection are conventionally perceived as two opposing land uses taking place within urban areas and in their surrounding outdoors. Landscapes, especially those adjacent or well connected to urban areas, are often utilised as resources for recreation, leisure or tourism. These uses represent stress factors towards the landscape, leading thereby to conflict situations between protection and recreation. In this paper, we define the most common negative impacts of recreational use on the landscape and come up with contemporary landscape design and planning strategies integrating recreation and protection into one inclusive approach. This might lower the negative impact of recreation and support a new, multifunctional and inclusive approach to land use planning, instead of the conventional bipolar understanding. A well designed recreational infrastructure, considering the multifunctionality of the landscape, has the potential to convert recreation from a stressing factor to a supporting factor of nature and landscape preservation through environmental education and raising the public awareness of landscape.

Key words: recreational infrastructure, environmental education, design of recreational places, legislation, Slovakia

Introduction

The word ***recreation*** refers to all kinds of activities that refresh and renew the human body and soul. Leisure is the time available after all duties, and can be spent according to diverse preferences (BROADHURST, 2001). The main reasons for recreation are: 1) to have fun, 2) to relax, 3) to learn something, 4) to stay in the nature, 5) to do physical activity.
Landscapes surrounding urban areas serve often as a resource for recreational use. The recreational potential and a further sustainable development of peri-urban landscapes have been extensively assessed by BIHUŇOVÁ (2006).
In relation to landscape protection, the most relevant form of recreation is the ***outdoor recreation*** which includes activities ranging from the very passive ones *(e.g. sitting, relaxing and enjoying views)* to those more active ones *(e.g. summer and winter sports, hiking, cycling and horse riding)*. There are activities carried out by persons themselves, or activities done in groups or with families (BELL and others, 2009). Besides active recreation, there is also a rising interest for education in the forest areas, forest pedagogy, guided scientific tours also as a soft form of tourism – ecotourism and new types of motivation and activities like geocatching, using smart phones and QR codes (PICHLEROVÁ and BENČAŤ, 2009).
Active recreation and education in forest areas are closely related to the field of ***forest pedagogy*** which represents a form of education contributing to a sustainable development of our society. It is an environmental education through a sensual perceiving of the nature and supply of information on the environment, its protection and a sustainable development. The tools of forest pedagogy include games, direct experience and experiential learning which develop all aspects of the human personality (BIHUŇOVÁ, LANČARIČ and KONC, 2010; NATIONAL FOREST CENTRE, 2009; KARIKOVÁ, 1997). Besides the recreational and educational utilization of forests, their role as specific components of protected landscape areas has to be considered. VOLOŠČUK, PICHLER and PICHLEROVÁ (2013) focus on the UNESCO world heritage site - the Primeval Beech Forests of the Carpathians and Ancient Beech Forests of Germany and emphasise the outstanding universal value of the ecological processes and the present integrated management plan. According to them, the ultimate goal is to achieve a harmonic co-action of the management and development on the one hand and the primary objectives of the world heritage site, i.e. protection, biodiversity conservation, ecosystem and landscape stability, rational use of natural resources and ecotourism development on the other, all aiming at the largest possible extent of the landscape potential utilization.
A sustainable development of recreation considering the aspect of nature and landscape protection is strongly related to raising the ***environmental awareness*** of the public. Many people want to engage in nature or ecotourism; they wish to take part in activities that may have a benefit for their local environment. There is also a rise in communal consciousness and

participation in community activities (BELL and others, 2009; PRÖBSTL and others, 2009; PRÖBSTL and others, 2010).
Since recreation can be considered as one of the ***economic activities*** using landscape as a resource, landscape planning practitioners have to consider and assess the impact of recreation on the environment. ZVIJÁKOVÁ, ZELEŇÁKOVÁ and PURCZ (2014) evaluate the effectiveness of the environmental impact assessment and come up with useful recommendations for an improvement of this assessment tool in order to support landscape protection. Besides recreation also other economic functions and interests might get into interaction or conflict situation with the landscape protection and nature conservation. FIALOVÁ, VYSKOT and SCHNEIDER (2009) analyse the aspects of nature conservation which are in conjunction with the high functional effectiveness of forests. The ecological stabilization function of the forest has to be considered when planning the recreational infrastructure in protected landscape areas. The ecological stabilization function has to be integrated into the forest management plan, including the recreational utilization (FIALOVÁ and VYSKOT, 2010).

Material and methods
The method used to elaborate this paper consisted mainly of literature review on recreation and landscape protection and their functional interactions and intersections. We have reviewed the effective legislation on landscape protection which might affect the recreational use of the landscape - the *Act No. 543/2002 on Nature and Landscape Protection* with a focus on those articles which discuss prohibited recreational activities. We have elaborated summarising figures aiming at an extraction and presentation of efficient information on the legislation to be used in landscape and recreational infrastructure planning.
In order to verify the results of our literature and legislation review, we have selected the *Protected Landscape Area Ponitrie* which is according to the Act No. 543/2002 protected in the 2nd degree of protection, *see figure 1* for prohibited activities in areas protected in this degree. We have analysed this protected landscape area in order to define the main conflict situations and negative impacts of recreational use on the landscape and come up with contemporary landscape design and planning strategies aiming at integration of recreation and protection into an inclusive landscape planning approach.

Results
As a result of the legislation review, we have created a diagram depicting the relation between recreation and landscape protection. This might simplify the understanding of the *Act No. 543/2002 on Nature and Landscape Protection* and provides us with an overview improving our understanding of differences between the diverse degrees of protection. The figure focuses on recreational activities which are according to the legislation prohibited in the certain protected area, *see following figure*.

Fig. 1: Recreation vs. landscape protection: Prohibited activities related to recreation according to the degree of protection - the own graphic interpretation is based on the review of the Act No. 543/2002 on Nature and Landscape Protection (part 3, chapter 1, § 11-16).

For landscape planners and architects, the knowledge of territorial landscape protection and protected areas is crucial. In order to provide an overview of the relation between different protection categories ranging from large- to small-scale protected areas and their degree of protection, we have elaborated a figure which - along with the previous figure - provides information about recreational infrastructure planning potentials and possibilities.

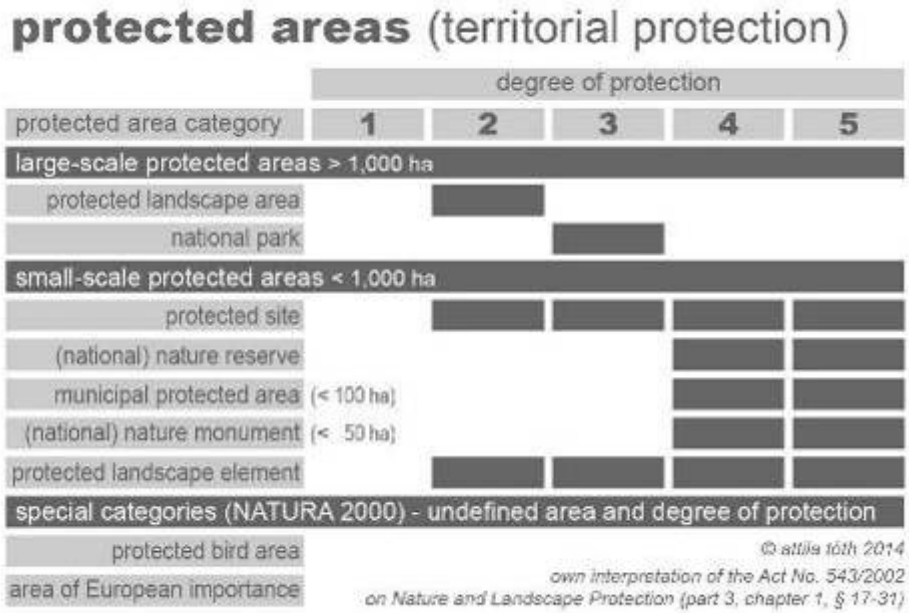

Fig. 2: Categories of protected areas in terms of territorial landscape protection - the own graphic interpretation is based on the review of the Act No. 543/2002 on Nature and Landscape Protection (part 3, chapter 1, § 17-31).

Based on the analysis of the *Protected Landscape Area Ponitrie* (a large-scale protected area in the 2nd degree of protection - *see previous figures*) (STATE LANDSCAPE PROTECTION OF THE SLOVAK REPUBLIC, 2014). There are negative phenomena considering landscape planning in the selected protected landscape area, that are: 1) the absence of territorial and landscape planning documentation in the small submontane areas; 2) a lack of conceptuality and a high rate of spontaneity in development; 3) disrespecting for the landscape character of the area and architectural features; 4) introducing non-native plant species (in many cases invasive species); 5) polluting the environment of the protected area; 6) vandalism impacting mainly the elements of the recreational infrastructure.

According to the *figure 1*, cycling is prohibited outside designated cycle routes and trails. This prohibition is often disrespected by users, causing thereby problems and a common conflict between recreational utilization and protection of the landscape. Many cyclists do not respect the designated cycle routes. Besides this conflict, also hikers do not respect the marked nature trails. This causes in many cases trampling down the green surfaces. Significant damages are caused also by campfires which are not prohibited in this degree of protection. Vandalism and use of motor vehicles act as further stress factors. Waste is an issue which must be also considered, although waste is an issue of overall effectiveness in all degrees of protection (even in the 1st degree) at the overall territory of the country.

According to the conducted reviews and analysis, we can propose actions aiming at the solution of the described problems as well as recommend design, planning and educational strategies aiming at a further sustainable development of the protected landscape area. These recommendations are: 1) rising the conceptuality in landscape and territorial development; 2) respecting the environment in development processes; 3) improving the educational and information infrastructure in order to give efficient directions to users of nature trails; 3) controlling the observance of the designated prohibitions and limitations; 4) awareness raising and environmental education in schools; 5) application of information elements which are more resistant to vandalism.

The sustainable development and planning of the recreational landscape infrastructure can be improved by application of contemporary trends in recreational landscape planning, such as: 1) sustainable tourism; 2) ecological tourism; 3) green tourism or ecotourism; 4) soft tourism; 5)

rural tourism; 6) greenways. These approaches and their measures have a potential to improve the current situation in the protected landscape area. In the long-term, we have to consider a more sustainable and efficient solution which consists in the environmental education in educational facilities.

Discussion

The proposed protection measures are in accordance with the tourism management tools elaborated by ŠVAJDA and SABO (2013) who state that the ecological carrying capacity stands not only for the maximum amount of visitors without cardinal destruction of the natural environment, but it also relates to the users' behaviour, condition of the infrastructure and the ability of the soil and vegetation to resist the stress and destruction. Therefore, we have proposed environmental education as a long-term tool and solution of the aspect of the users' behaviour. Unlike the assessment of protected areas from the tourism management perspective (ŠVAJDA and SABO, 2013), we focus on landscape protection from the recreational landscape infrastructure planning perspective. Our recommendations agree with the findings of ŠTĚPÁNKOVÁ, BIHUŇOVÁ and KABAI (2012) who arrived at the conclusion that education and awareness rising are the most efficient tools for long-term improvement of the recreational landscape infrastructure. While SUPUKA, FERIANCOVÁ and others (2008) deal with recreational potential of rather urban and peri-urban landscapes, we approach it from the perspective of landscape protection.

Conclusion

Based on the provided review on recreation in the context of landscape protection, we define the main articles of the Act No. *543/2002 on Nature and Landscape Protection* of the National Council of the Slovak Republic which particularly affect the recreational utilization of the landscape, especially of protected landscape areas which are under a certain degree of territorial protection according to the mentioned act. The definition of the main problems and conflict situation that appear in protected landscape areas - explained by the example of the *Protected Landscape Area Ponitrie* - followed by concrete measures which aim at a qualitative improvement of the current situation. These measures have a potential to contribute to a sustainable development of protected landscape areas or other forms and categories of territorial protection and conservation. The main point within the recommendations is the environmental education as a long-term measure. Our aim is to provide a useful document for management bodies and planning subjects dealing with recreational landscape infrastructure planning.

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Souhrn
Článek se zabývá rešerší rekreace, rekreačního využití krajiny a chráněných krajinných oblastí, se zaměřením na venkovní rekreaci. Zabýváme se lesnickou pedagogikou a naukou o životním prostředí jako důležitými součástmi sociálního rozměru ochrany krajiny a rekreace. Kromě rekreace také uvažujeme o dalších ekonomických aktivitách, které mohou ovlivňovat krajinu, a tudíž se mohou dostat do rozporu s ochranou krajiny. Na základě rešerše národního zákona č. 543/2002 Sb. o ochraně přírody a krajiny, definujeme hlavní průniky mezi ochranou přírody a krajiny a rekreačního využití krajiny. Na příkladu Chráněné krajinné oblasti Ponitrie stanovujeme hlavní negativní dopady rekreačního využití chráněné krajinné oblasti a přicházíme s doporučeními, řešeními a strategiemi s potenciálem pro zlepšení stávající situace modelové chráněné krajinné oblasti a dalších krajinných oblastí s územní ochranou.

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VISITOR MONITORING OF SELECTED TRAILS IN ŠLP KŘTINY

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Abstract:
The popularity of spending free time actively in the forests is on the rise. This trend is mainly obvious in the forests that surround large towns and cities. The Training Forest Enterprise Masaryk Forest Křtiny (ŠLP ML Křtiny), surrounding especially the north-western part of Brno, is not an exception. As everywhere in the Czech Republic, the people who seek leisure in the forest environment represent a burden on the forest and create the necessity to build and maintain recreation infrastructure (parking places, gazebos, resting places, etc.). Besides the mentioned facilities, which generate recreation-related costs directly, the visitors use facilities typically used for the forest management, especially forest hauling roads. The excessive loading of these roads designed originally for forest management purposes represents higher costs for forest administrators in relation to their maintenance. These costs, however, can hardly be directly related to the recreation overburdening for the accounting purposes.

Key words: Eco-counter, forest roads, daily maximum, daily minimum

Introduction

The requirement of European multifunctional forestry model devised in the EU Common Agricultural Policy reform and the fact that, except complex methods for the assessment of forest social functions (Vyskot, I. et al., 2003) and the assessment of social and economic significance of forest functions (Šišák et al., 2003), there is no accepted direct method determining the monetary value of costs and benefits of forest ecosystem service for the forest enterprise economyled the team of the Faculty of Forestry and Wood Technology, Mendel University in Brno (LDF MENDELU in Brno), to research the issue of specification of the additional costs created in relation to the recreation burden on forest hauling roads by means of a direct method for the quantification of the recreation burden on forest hauling roads in combination with the identification of the related costs in the accounting of the forest enterprise.
This issue is solved within the framework of the development project of LDF MENDELU in Brno unspecific research called “Alternative approaches to the assessment of recreation potential in the area of ŠLP ML Křtiny” starting in June 2013. The aims of the project are to quantify and assess a selected socio-economic forest function (recreation function) using alternative assessment approaches and the example of three forest districts in ŠLP ML Křtiny - Vranov forest district, Habrůvka forest district and Bílovice and Svitavou forest district. These three differ in the natural conditions as well as the management ways. The data gained through the research are currently being processed. However, the first results (the results of the recreation burden on selected forest hauling roads) are highly interesting and provide some general conclusion, as far as the investigated area is concerned. This paper presents the first partial results gained at the first stage of research in the area of Bílovice nad Svitavou forest district.

Basic data on visitor monitoring of selected forest hauling roads in the area of ŠLP ML Křtiny, Bílovice nad Svitavou forest district

The cooperating company, Partnerství, o.p.s., has installed three automatic readers of hikers and bikers to the roads in the district for the purposes of visitor monitoring of selected forest hauling roads in ŠLP ML Křtiny. The monitoring devices were installed in July 2013 and the monitoring was conducted until November 2013. Students of MENDELU in Brno performed manual calibration counting in July 15-20, 2013, in the monitoring places.
The trail visitor monitoring used automatic readers Pyro Box Compact from Eco-counter. This device counts all users of trails (hikers, bikers, in-liners, etc.) without distinguishing among them. Counting is based on the temperature difference between a human body and the surroundings. The readers can distinguish the direction of the movement and are installed in the narrowest places of the trails in the way which prevents counting two persons walking side by side as one. The data are stored in one-hour intervals.
Three places in total were monitored in this way - two forest hauling roads: Resslova (Červená) and Šumbera, and one reference biking trail: Bílovice (a link between tram terminal in cadastral area Brno–Obřany and the entrance in the forest complex of ŠLP ML Křtiny, forest district

Bílovice in the cadastral area Bílovice nad Svitavou). The roads are characterized in Tab. 1 - their location, or the location of the monitoring device is shown in Fig. 1.

Tab.1: The locations of visitor monitoring of selected forest hauling roads in the area of ŠLP ML Křtiny, Bílovice nad Svitavou forest district

Monitoring location	**Name**	**Surface**	**Width**	**User type distinction**	**Movement distinction (IN/OUT)**
Hiking and biking trail Brno - Bílovice nad Svitavou	Bílovice	bituminous	3.0 m	no	yes
Forest road Kopaniny - Reslova hájenka (Resl's lodge)	Resslova	(Type 1) unbound mixtures	4.0 m	no	yes
Forest road Šumbera (Kopaniny - Hády)	Šumbera	(Type 1) unbound mixtures	4.0 m	no	yes

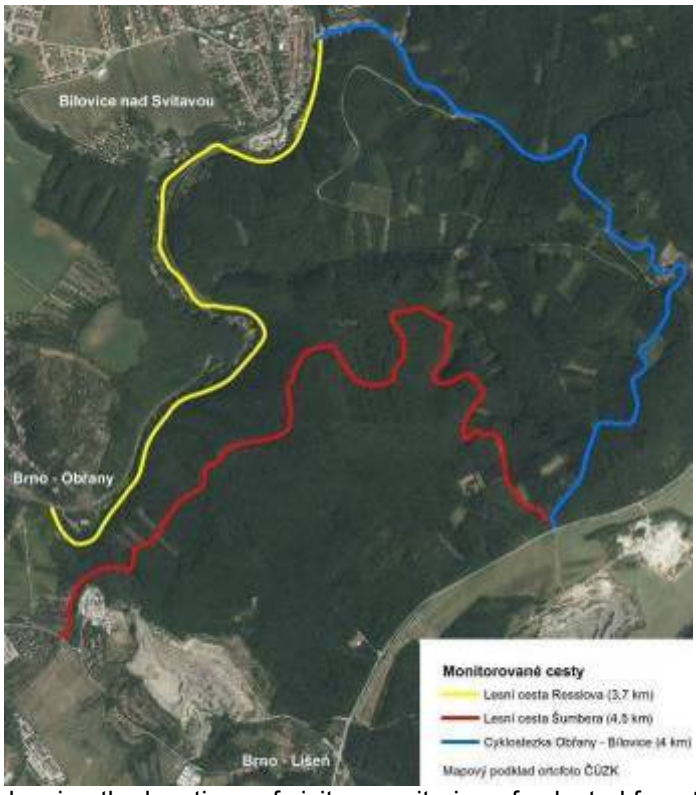

Fig. 1: The map showing the locations of visitor monitoring of selected forest hauling roads in the area of ŠLP ML Křtiny, Bílovice nad Svitavou forest district

The results of visitor monitoring of selected forest hauling roads in the area of ŠLP ML Křtiny, Bílovice nad Svitavou forest district

As has been mentioned, visitor monitoring of selected forest hauling roads in the area of ŠLP ML Křtiny was conducted in and has been assessed for three research locations. Below see (Tab. 2, Fig. 2) the presentation of the counting results divided into the locations and months.

The data presented in Table 2 and Figure 2 show that the most users in total (over 136 thousand) and in particular months were recorded by the reader on the reference biking trail Bílovice in the monitored period. The second trail from the perspective of the entire monitored period as well as particular months is Resslova (Červená) with about 80% lower number of users; Šumbera had the fewest users - 57% compared to Resslova (Červaná). The effect of summer holidays is the most obvious in the biking trail Bílovice, i.e. there is a high number of users in July and August. By contrast, forest roads Resslova and Šumbera manifest relatively low differences of visitor counts in particular months.

Tab. 2: Comparison of visitors of selected forest hauling roads in the area of ŠLP ML Křtiny, Bílovice nad Svitavou forest district in July 6–November 30, 2013 (selected indicators)

Selected indicators for user counts	Bílovice	Resslova	Šumbera
Total	136,243	29,216	12,487
Daily maximum	Sunday July 14, 2013 (2,735)	Sunday July 14, 2013 (610)	Saturday September 7, 2013 (344)
Daily minimum	Thursday November 28, 2013 (51)	Thursday November 21, 2013 (42)	Monday July 29, 2013 (12)
The day with highest counts	Sunday	Sunday	Sunday
Hourly mean	38	8	4
Daily mean	921	197	84
Monthly mean	27,249	5,843	2,497

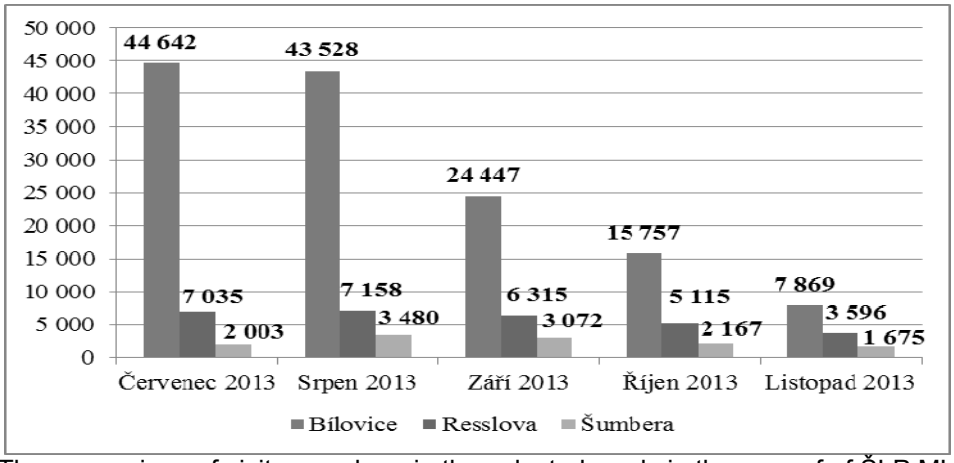

Fig. 2: The comparison of visitor numbers in the selected roads in the area of of ŠLP ML Křtiny, Bílovice nad Svitavou forest district in July 6–November 30, 2013 (in months)

The highest number of visitors (about 44.6 thousand) was recorded by the counting device on the Bílovice trail in July; in contrast, the lowest number of visitors (about 2.1 thousand) was recorded in the Šumbera forest road. The only increase in visitor numbers in forest hauling roads Resslova and Šumbera was recorded in August when compared to July. However, we need to note here that the monitoring started in July 6 - so we do not have the data for the entire July. In September, the visitor numbers on these two roads decreased by about 12% when compared to August. The biking trail Bílovice showed a slight decrease of 2.5% in August when compared to July; between September and November the number of visitors dropped rapidly by 35–50% a month.

The greatest absolute drop in visitor numbers was recorded at the end of summer holidays and the onset of a colder weather in the Bílovice trail in September. The greatest relative drop in visitor numbers was recorded in the Bílovice trail as well and it was in November. It is worth noting that the greatest relative increase in visitor numbers of all the monitored locations was recorded in forest road Šumbera in August (compared to July).

Conclusion

With respect to the above presented results of visitor monitoring (recreation load of forest hauling roads) we can draw several general conclusions concerning the suburban forests of Brno (where ŠLP ML Křtiny, Bílovice nad Svitavou forest district undoubtedly belongs).

Besides the obvious correlation with the weather and the period of summer holidays, the loading of forest hauling roads is affected by their surface, morphology and possible "target". The reference biking trail Bílovice dominates regarding all the mentioned parameters (high quality bituminous macadam, minimum elevation difference, it leads from the tram terminal to a restaurant). In this respect, the other two forest hauling roads are rather "passage ways", although Resslova (Červená) can also be used to get to a restaurant. The surface of the forest roads is mineral reinforced stone (Type 1 unbound mixtures) or partially bituminous macadam of lower quality (Resslova - Červená); the elevation difference of both is considerable (215 m).

Another significant factor of forest road loading is the accessibility by other means of transport (tram, train, car - a parking place). Transport accessibility forms the difference in the recreation burden between Resslova (Červená) and Šumbera. Resslova is close to train station Bílovice nad Svitavou and there is a parking place.
There is also a complex of factors that can be summarized as “recreation traditions” - habits of local visitors, long-term provision of facilities in the forest hauling roads by the forest management personnel, organizing leisure events, etc. In this respect, Resslova (Červená) again dominates over Šumbera.
In conclusion, the condition of the forest environment (mainly forest stands) in the investigated area and the monitored period does not seem to be the dominant criterion of recreation burden, except for the elements of recreation infrastructure (resting places, benches, etc.) The most significant criteria with a direct effect on the recreation burden laid on forest hauling roads are: road surface, road morphology, a possible target, road accessibility by other means of transport.

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Souhrn

Stále větší počet lidí tráví svůj aktivní odpočinek v lesním prostředí. Tento trend znamenávají nejen lesníci na území celé České republiky. Jako všude v republice, i na Školním lesním podniku Masarykův les Křtiny, dochází k velkému tlaku rekreantů na lesní prostředí a na nutnost výstavby rekreační infrastruktury, což sebou nese nemalé finanční náklady. Požadavek modelu evropského multifunkčního lesnictví koncipovaného v reformě Společné zemědělské politiky EU a fakt, že v současné době neexistuje metoda zjišťující peněžní hodnotu přínosů a nákladů služeb lesních ekosystémů pro lokální ekonomiku, vedla tým odborníků složených z Ústavu lesnické a dřevařské ekonomiky a politiky, Ústavu inženýrských staveb, tvorby a ochrany krajiny a Ústavu geoinformačních technologií k podání návrhu na projekt Alternativní přístupy k hodnocení rekreačního potenciálu v zájmovém území ŠLP ML Křtiny, který byl řešen od června 2013. Cílem projektu je kvantifikovat a vyhodnotit vybranou socio-ekonomickou funkci lesa (funkci rekreační) s využitím alternativních hodnotících přístupů na příkladu tří polesí ŠLP ML Křtiny – Polesí Vranov, Polesí Habrůvka a Polesí Bílovice nad Svitavou, které jsou odlišné přírodními podmínkami i způsobem managementu. V rámci tohoto článku bychom Vás chtěli seznámit s dílčími výsledky šetření a to s monitoringem návštěvnosti na vybraných lokalitách.

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VISITORS IMPACT ON AIR TEMPERATURE IN CAVE CLOSED FOR PUBLIC

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Abstract
Moravský Kras is the largest karst area in the Czech Republic and is important place for recreation activities. There are more then 1100 caves registered in Moravský Kras. The following five caves are opened to public: Punkevní, Kateřinská, Balcarka and Sloupsko-šošůvské. About 400,000 people visit them every year. The other caves are closed for public. The people visit closed caves because of the research and protection. Cave Piková dáma is closed for visitors. During the winter season 2011/12 19 accessions into this cave were registered, including only three accessions in working days. Mean increase of air temperature caused by visitors in 18 cases was 0.13°C. The smallest measured temperature increase was 0.05°C and the largest one 0.31°C. The observable temperature alteration lasted on average 1.2 hours. Due to the fact, that most of temperature increases determined in this way corresponded to the records in excursion day book, these small temperature increases can be related to influence of the visitors. No influence of visitors on air humidity in this cave was realized.

Key words: microclimate changes, man in the underground

Introduction

Research of caves is today amateur issue. People do it at their free time as recreation activities. Moravský Kras is the largest karst area in the Czech Republic and is important place for recreation activities. There are more then 1100 caves registered in Moravský Kras. The following five caves are opened to public: Punkevní, Kateřinská, Balcarka and Sloupsko-šošůvské. About 400,000 people visit them every year. The other caves are closed for public. The people visit closed caves because of the research and protection. Their visits change microclimate of caves and it is important to observe these changes.

Microclimate of caves is an important element of their formation and existence and it influences many karst processes. Air circulation, temperature and humidity influence the creation and corrosion of speleothems. Yet greater is the importance of microclimate in caves with ice decoration, where the temperature smaller than 0 °C is the condition for decoration's existence. In the Czech Republic, there are no caves with permanent ice, however parts of some caves are ice-covered seasonally. Just in these caves, the length of period with temperature smaller than 0 °C is the decisive condition for ice formation. Climatic change can change this temperature in caves (Badino 2004).

Microclimate has been one of the criteria for classification of caves. Classification after cave temperatures and their development is today replaced by classification according to air circulation (Jančařík in Přibyl et al. 1992). This division is not unambiguous, and various authors understand it differently. Historically, caves were ideally divided into static with one entry and dynamic with more entries. Static caves with one entry or more entries in little different heights can be cold (ice caves), drawing external cold air and cooling in the winter season. Inversely work the warm static caves, lying above the entry level and warming up in the summer season. Jančařík (in Přibyl et al. 1992) characterizes static caves by air exchange only during one half of the year and stagnation during the second one.

Dynamic caves have two or more entries with different altitudes. There are contrasting directions of circulation in summer and in winter. In the summer season the rock is heated and humidity increases, in winter season cooling and drying proceeds.

Also combination of abovementioned cave types may exist, namely the statodynamic cave. It is virtually a dynamic cave, which has during a part of the year closed the connection between the upper and lower entry. Some authors use different division, and it depends on the concrete cave, which never represents ideal type.

Whether the cave is static or dynamic, the circulation has not one beginning and one end with constant flow. It may change in dependence on external conditions. The air circulation may oscillate in the range from several seconds (Faimon et al. 2012) to days. Suitably selected measurement methodic is a condition to obtain such oscillations.

Measurement of microclimate in cave is no easy issue. The cave climate is frequently regarded as constant, because its changes are small compared to the outer temperature. Thus

measurements inside the cave require adequate equipment with necessary precision and long time, because the changes may occur in an unexpected moment too.

Materials and methods

Temperature and air humidity were measured in the Ice Passage of the Piková dáma Cave ("The Queen of Spades"). This cave is very interesting for visitors. The Piková dáma Cave lies in northeastern part of the Moravian Karst, which belongs to the geomorphological unit Drahanská vrchovina Highland (Štogr and Kučera 1997; Vít 1998). The cave system was created in Devonian limestone of the Macocha Formation. The cave entry formed by a shaft with a centering lies near the village Holštejn in the Hradský valley in altitude 462 m a. s. l. The 70 m deep cave is interconnected with a nearby Spirálka Cave. These two caves form a large labyrinth of several levels, connected with the central Studna Abyss on a expressive joint, and with an old stream bed. The entry into the Ice Passage, where the measurement proceeded, is located above the bottom of the Studna. Beginning of the Ice passage has the form of a wide water channel with numerous facets. In the walls and roof are located openings of corridors and shafts leading from adjacent parts of the cave. The bottom is covered by little lakes, and an intermittent stream flows there. The Ice Passage ascends, at the beginning slightly, then in cascade stages. It is terminated by a labyrinth of small phreatic tunnels and a stack of blocks leading into the half-blind Holštejn Valley near the ponor of the Bílá voda River. The Holštejn Valley near Stará Rasovna Cave belongs to the coldest sites of the Moravian Karst, which is determined by forest stand in the surroundings and by the valley orientation. Into this valley flows the cold air and snow accumulates here, which lies here significantly longer time than in the surroundings. The Ice Passage of the Stará Rasovna Cave, as the entry for the cold air, directly links up the Ice Passage of the Piková dáma Cave. Cold air flows through the Ice Passage, firstly of the Stará Rasovna Cave and then of Piková dáma Cave, to the central abyss, through which the already warmed air flows up and is blown out by an entry situated by 20 m higher and by the nearby blower Křížový kluk. This arrangement in connection with form of the cave enables cooling of the Ice passage and formation of ice decoration in the spring, when water begins to flow into the cave as a consequence of spring thawing. The greatest ice decoration is here usually during the end of April and beginning of May. This cave is solitary in the Czech Republic, where it is probably the only karst ice cave. Faimon et al. (2012) and Litschman (2012) studied microclimate in nearby caves.

Air temperature and relative humidity were measured due to character of the cave during winter season from November 13, 2011 to May 9, 2012. Measurement interval was set on 15 minutes. In the Ice Passage was located HOBO U23 Pro v2 Data Logger (Onset Computer Corporation, Inc., Massachusetts; Range: Temperature: -20 to 70 °C, RH: 25 % to 95 % RH, Accuracy: Temp: ± 0.53 °C from 0 to 50 °C, RH: ± 3.5 % from 25 % to 85 % over the range of 15 to 45 °C, ± 5 % from 25 % to 95 % over the range of 5 to 55 °C). The HOBO U10 Data Logger of the same producer, placed near the cave entry, was used for measurement of external air temperature and relative humidity. For specification of the measurement methods, the Methodic of monitoring of microclimatic conditions in cave systems (Hebelka et al. 2011) was used.

Cave visits are recorded into the Excursion book. All records were compared with temperature changes.

Data processing was performed by softwares: HOBOware lite, Microsoft Excel and STATISTICA.

Results

During the measurement, 19 accesses into the Ice Passage were registered, only three accesses happened in working days. Figure 1 describes peak of temperature increase. The greatest temperature increase of 1.09 °C, occurred on November 20, 2011 and lasted for 1.5 hour. This measurement, however, was intentionally influenced by visitors, who increased temperature of the sensor by their breath. Mean increase of air temperature caused by visitors in other 18 cases was 0.13 °C. The smallest measured temperature increase was 0.05 °C and the largest one 0.31°C. The observable temperature alteration lasted on average 1.2 hour, the shortest one lasting 0.5 and the longest one 2.25 hours.

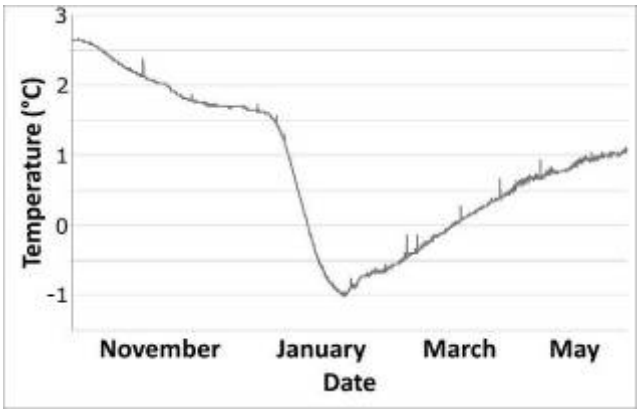

Fig. 1: Temperature in the cave

Discussion

The Piková dáma – Spirálka cave system is relatively frequently visited. Thus the question suggests itself, what influence do the visits in cave have on the temperature and air humidity. The study of the Excursion books and evidence of all visits in the cave represented the first step to evaluate the influence of visits in the Ice Passage. Sudden, short-term and uncommon temperature increases were identified in the temperature data. The interest was concentrated mainly on non-working days, when the most of visits happen. The influence on temperature and humidity changes in the cave can be assumed by the presence of persons in limited cave room as well as by opening the entrance, when the port is enlarged from the the size of 25 x 45 cm to the whole diameter (1 m) of the entrance and enables easier air flow.

Due to the fact, that most of temperature increases determined in this way corresponded to the records in excursion day book, these small temperature increases can be related to influence of the visitors. Mean increase of air temperature caused by visitors was 0.13 °C. If the opened cave entrance should have impact, the temperature should probably decrease. No influence of visitors on air humidity in the cave was realized.

Conclusion

Cave visitors change cave temperature. These changes are small and short-term. Temperature returns quickly to original value.

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Souhrn

Výzkum jeskyní je v dnešní době amatérskou záležitostí. Lidé je zkoumají ve volném čase jako rekreační aktivitu. Moravský Kras je největší krasovou oblastí v České republice a důležitým místem pro rekreační aktivity. V Moravském krasu je registrováno více než 1100 jeskyní. Většina z těchto jeskyní je veřejnosti nepřístupná. Lidé navštěvují uzavřené jeskyně z důvodu výzkumu a ochrany. Jejich návštevy mění klima jeskyně a je důležité sledovat tyto změny.

Mikroklima jeskyní je důležitým prvkem jejich vzniku a existence a ovlivňuje řadu krasových procesů. Ještě větší vliv má mikroklima v jeskyních s ledovou výzdobou, kde je podmínkou existence výzdoby teplota menší než 0 °C.
Teplota a vlhkost vzduchu byla měřena v Ledové chodbě jeskyně Piková dáma, která leží v severovýchodní části Moravského krasu. Vchod do jeskyně tvořený zaskružovanou šachtou leží poblíž obce Holštejn v tzv. Hradském (Holštejnském), její hloubka je 70 metrů. Jeskyně je propojena s blízko ležící jeskyní Spirálkou. Konec Ledové chodby je tvořen bludištěm malých chodeb a sborem balvanů ústících do poloslepého Holštejnského údolí, které patří k nejchladnějším místům Moravského krasu. Ledovou chodbou proudí studený vzduch do centrální propasti, kterou již ohřátý vzduch proudí vzhůru. Toto uspořádání v souvislosti s tvarem jeskyně umožňuje prochlazení Ledové chodby a vznik ledové výzdoby v jarním období. Nejmohutnější ledová výzdoba zde bývá koncem dubna a začátkem května.
Teplota a vlhkost vzduchu byly měřeny vzhledem k charakteru jeskyně v zimním období od 13.listopadu 2011 do 9. května 2012, interval měření byl zvolen 15 minut. V Ledové chodbě byl umístěn Data Logger HOBO U23 Pro v2 firmy Onset Computer Corporation, Inc., Massachusetts. Od stejné firmy byl použit i Data Logger HOBO U10 pro měření venkovní teploty a vlhkosti vzduchu, který byl umístěn v blízkosti vstupu do jeskyně. Pro stanovení metodiky měření byla použita Metodika monitoringu mikroklimatických poměrů v jeskynních systémech (Hebelka a kol., 2011).
V průběhu měření bylo zaregistrováno 19 vstupů do Ledové chodby, z toho pouze tři vstupy byly v pracovních dnech. Největší zvýšení teploty o 1,09 °C nastalo 20.11.2011 a trvalo 1,5 hodiny. Toto měření ovšem bylo ovlivněno úmyslně návštěvníky, kteří svým dechem zvýšili teplotu čidla. Průměrné zvýšení teploty vzduchu způsobené návštěvníky bylo v ostatních 18 případech 0,13 °C. Nejmenší naměřené zvýšení teploty bylo 0,05 °C a nejvyšší 0,31 °C. Pozorovatelná změna teploty trvala průměrně 1,2 hodiny, nejkratší trvala 0,5 a nejdelší 2,25 hodiny. Vzhledem k tomu, že většina takto určených zvýšení teploty souhlasila se záznamy v exkurzním deníku, lze tato malá zvýšení teploty přičíst vlivu návštěvníků. Pokud by měl mít vliv otevřený vchod do jeskyně, mělo by pravděpodobně dojít ke snížení teploty. Na vlhkost vzduchu v jeskyni nebyl zjištěn žádný vliv návštěvníků.

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VULNERABILITY OF HIGH-MOUNTAIN LANDSCAPE ENVIRONMENT AND IT´S EVALUATION FOR TOURIST ACTIVITIES ON EXAMPLE VELICKÁ DOLINA VALLEY IN THE VYSOKÉ TATRY MTS.

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Abstract
The paper presents results of the landscape-ecological research, which has been realizated in 2000-2014. The Velická valley situated in the southern part of Vysoké Tatry Mts was chosen for study area as it represents a suitable model area of alpine zone. The main aim of the research was the mapping and evaluation of the actual state of the landscape components and elements of the area with low impact on the landscape. Further on the basis of biotic and abiotic factors assess the level of the vulnerability resistance to a set of the destructive processes. Although there are current studies dealing with abiotic and biotic components of the high mountain landscape in the Vysoké Tatry Mts none of those presents the detailed and complex study at such a large scale as 1:10 000, as is presented in this paper.

Key words: vulnerability, tourist activities, high-mountan, lansscape, Vysoké Tatry Mts.

Introduction

Lanscape-ecological evaluation is becoming again very actual problem. It is linked mainly with its application in legislation and various methodological procedures.
Our study concentrates on evaluation of vulnerability of a high-mountain landscape in the Vysoké Tatry Mts, particularly the alpine zone of Velická dolina valley. It is a territory with high diversity of geomorphologic, pedologic, but above all, biotic conditions. This area is attractive for tourists and therefore it is highly visited.

Materials and methods

Vulnerability of landscape is a special landscape property, used for implicit reaction of the landscape to external factors. Mostly it is used for expressing the landscape sensitivity, or resistance to destructive (stress) natural and anthropic impacts.
The reaction of landscape elements on artificial impulses varies. Some elements are more vulnerable than others (Hrnčiarová, 1999).
Vulnerability of high-mountain landscape is given by the utilizable environmental properties making some territories more prone to the origin of erosion (destruction), than other. To design the activities optimalization, which will not support the mentioned destruction, but will have positive decelerating effect it is necessary to recognise the natural attributes of particular landscape.
Vulnerability of natural environment is retrieved by potential and real influence of destructive factors (processes and man) to the landscape. The influences could develop and to acquire destructive to catastrophic effect. Attributes of biotic and abiotic environment could be used for understanding of the high-mountain environment reaction to external impulses (Hrnčiarová, 1996).
Some of the most important studies estimating the vulnerability of the natural environment at the territory of the Tatry Mts. And other mountains are the papers of Drdoš (1989), Varšavová, Barančok (1999) and others. These studies were used as a part of the resources for presented paper.
We based our vulnerability evaluation of the study area on:
• vulnerability assessment of abiotic complexes (AK) of the natural environment based on the set of destructive processes
• vulnerability assessment of biotic complexes (BK) of the natural environment based on the set of destructive processes, continuity and/or discontinuity of vegetation cover
• total vulnerability assessment of landscape-ecological complexes (KEK).

Vulnerability evaluation of study area - the alpine zone of Velická dolina valley is to the certain extent a subjective method. It is based on assigning a value of vulnerability to studied attributes of the individual components and elements of the environment.
According to detailed scale of the map (1:10 000) a five-degree vulnerability scale of a given territory was used for vulnerability evaluation. We defined following areas:

• critically vulnerable areas (total environmental degradation by destruction processes, extensive areas without vegetation, unstable ecosystem, etc.)
• very vulnerable areas (consistently affected by environmental degradation, impaired vegetation cover, regeneration of the area is very slow, etc.)
• middle vulnerable areas (medium to moderate environmental degradation, vegetation cover is often discontinuous, regeneration of area takes longer, etc.)
• moderate vulnerable areas (moderate environmental degradation)
• slightly vulnerable areas (relatively low degradation).

Vulnerability of abiotic complexes
In evaluation of abiotic complexes were used numerous studies (Varšavová, Barančok, 1999; Drdoš, 1989; Lukniš, 1968, 1973; Linkeš, 1980; Nemčok et al. 1994; Hreško et al. 2009).
Abiotic environment is represented by the set of abiotic components: geological substrate - relief - soil - climate - hydrologic properties. Abiotic environment can be evaluated by the vulnerability of individual abiotic components based on their properties. Vulnerability of abiotic environment was evaluated on the base of the set of destructive processes in this territory. According to Midriak (1983) there are:
• water processes (processes induced by surface flowing water)
• gravitational processes (landslides, falling rock crumbs, climbing down of talus), water-gravitational processes (debris flows, debris shifts), nivation-gravitational processes (snow avalanches), cryo-gravitational processes (solifluction, frosty climbing down, frosty sliding)
• aeolian processes (aeolian corrasion, deflation)
• cryogenous processes (regelation processes)
• anthropogenic processes (treading and abrazing of the surface – surface destruction, destruction and erosion of soils, etc.)

Vulnerability of biotic complexes
In evaluation of vegetation vulnerability of the destructive processes we used studies by: Jurko (1990), Barančok (1996a, b), Varšavová, Barančok (1999), Boltižiar (2000b).
Biotic environment is a superstructure of abiotic environment; its limits are unstable, easily variable not only under the effect of human activities, but also under that of natural processes. The biotic complexes were characterized by vegetation. Evaluation of vegetation according to its vulnerability by external factors is complex because vegetation units are complexes and the interfering factors act also in a complex way.
The vegetation of the alpine zone of the Velická dolina valley is variegated and its structure diverse. The degree of vegetation vulnerability depends not only on the vegetation type, species present, intensity of negative threat, but also on various circumstances that can substantially influence the consequences.

Vulnerability of landscape-ecological complexes
Total vulnerability of landscape-ecological complexes were determined on the base of attributes and degree of vulnerability of abiotic and biotic complexes. Landscape-ecological complexes are characterised by the values of structural stability defined by nature of relation of landscape components and elements. According to its own structure every landscape-ecological complex has different stability and to it related vulnerability to a set of the natural destructive processes and anthropogenic influences.

Natural conditions of the study area
The geological structure of this area is relatively simple. The study area is build by the Palaeozoic metamorphic rocks (gneisses, migmatites, migmatized gneisses), igneous rocks (granodiorites), which represent a crystalline complex. The overlying layers contain Pleistocene and Holocene sediments (glaciofluvial, deluvial-proluvial, etc.).
The geomorphological value of this study area is relatively monotonous (Midriak, 1989). The geomorphological map (Lukniš, 1968) shows that the study area contains the following geomorphological units: forms of removing processes (cliffs and smooth relief on granodiorites, glaciated knobs), forms of accumulation (firn and würm moraines, talus cones, landslides, rock-aluvial fans, glacifluvial cones).
On silicate rocks lithosols, regosols, leptosols and podzols are developed. Lithosols occur scattered, most frequently among solid rocks and their stony wastes. Leptosols are spread on

base of the slopes. Podzolized leptosols are present mainly in 1600 - 1800 m above sea level (under dwarf pine stands). Humic podzols are distributed on the firn and würm moraines.
Climatologically the studied area can be classified as cold to very cold . The air temperature in the upper dwarf pine line area is 4 to 11.5 °C in July and -7 to 11 °C in January. The mean average annual precipitation totals are 1000 - 2130 mm. Wind conditions are complicated as their directions and speed is much influenced by the relief.
The spatial distribution of single vegetation units (nomenclature after Mucina, Maglocký, 1985) is often determined by the sea level altitude. Alpine zone is represented by alpine grassland communities mostly belonging to the alliances *Juncion trifidi, Loiseleurio-Vaccinion, Festucion versicoloris, Calamagrostion villosae, Adenostylion, Trisetion fusci, Cratoneuro filicini-Calthion laetae*. Plant communities in higher elevations spread on granodiorites are represented by the alliances of the A*ndrosacion alpinae, Festucion pictae, Salicion herbaceae* alliance and less by the communities belonging to Juncetea trifidi class. Dwarf pine stands (*Pinion mughi*) are typical for the lowest elevations in the southern part of study area.
Diverse geological substrate, relief and various mezo- or micro-climatic characteristics allowed the development of highly variegated natural mosaics of mentioned plant communities.

Results

Vulnerability of abiotic complexes based on the set of destructive processes

We have compiled partial abio-complexes from geological, relief (geomorphological forms and slopes gradient) and soil conditions of the studied area. After assessing the vulnerability of single indices we proceeded to the assessment of overall vulnerability of the abio-complexes (Fig. 1) and its vulnerability to individual destructive processes.

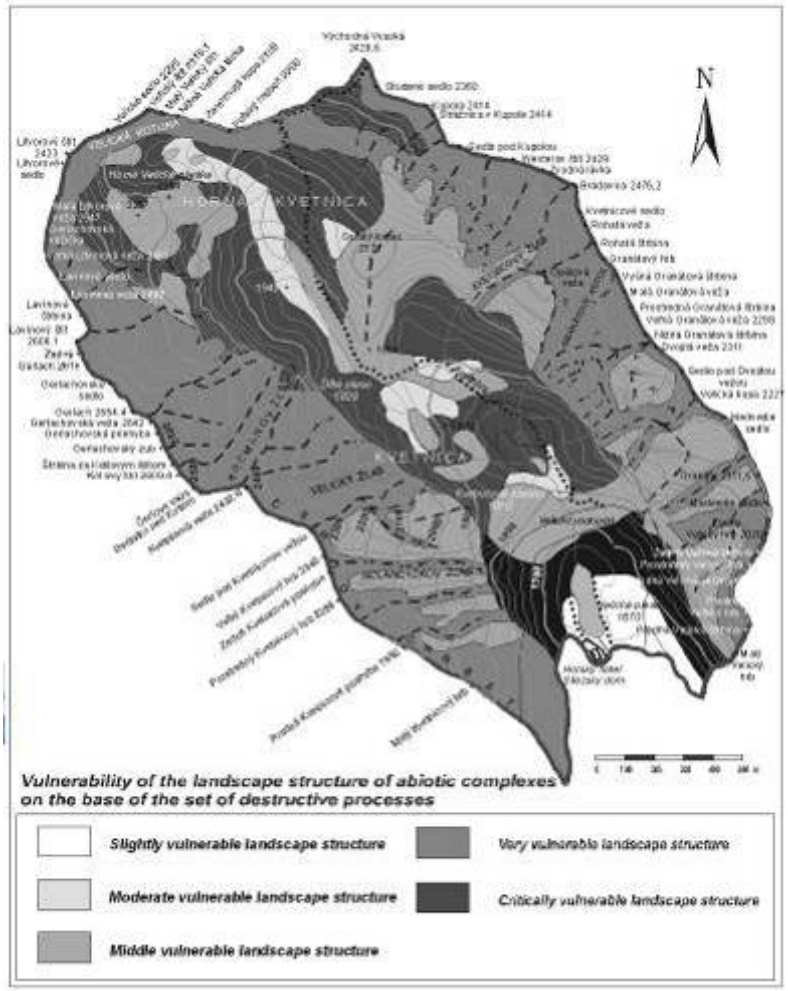

Fig. 1 Vulnerability of abiotic complexes based on the set of destructive processes

• *critically vulnerable areas*
Critically vulnerable areas are characterised by vulnerable relief accompanied by extreme climatic conditions and very permeable and moving substrate. Here belongs the stands with debris flows (Hreško et al. 2012), talus cones, landslides with very easily or moderately eroded soils (Midriak, 1989). Critically vulnerable is 35 % from the whole territory. These negative natural interferences are intensified by high concentration of tourists.

• *very vulnerable areas*
Territories consistently affected by environmental degradations. Here belongs cliff, troughs, debris erosional rills with slope gradient over 35°. Very vulnerable is 40 % of the whole territory.

• *middle vulnerable areas*
The middle vulnerable area is the territory with middle to moderate environmental degradation. Here are included stands, such as glaciated knobs, stands on wits silicate lithosols, with several kinds of destructive processes or a single kind of processes of high intensity. These areas territories occupy 15 % of the study area.

• *moderate vulnerable areas*
The territory with moderate to low environmental degradation occupies 15 % of the area. It is characterized by the occurrence of at least two kinds of destructive processes (gravitational and cryogeneous) of moderate to low intensity and higher slope gradient.

• *slightly vulnerable areas*
Slightly vulnerable area is the area with very slight degradation. Here one kind of low intensity destructive process on small area is either absent or only sporadically occurs. Slightly vulnerable territory (5 %) is linked with glacigenic gravelly-bouldary-blocky moraine sediments.

Vulnerability of vegetation based on the set of destructive processes
In the investigated area dwarf pine stands and alpine communities such as alpine grassland stands, snow beds, slope debris and springs are present. They vulnerability shows the Fig. 2.

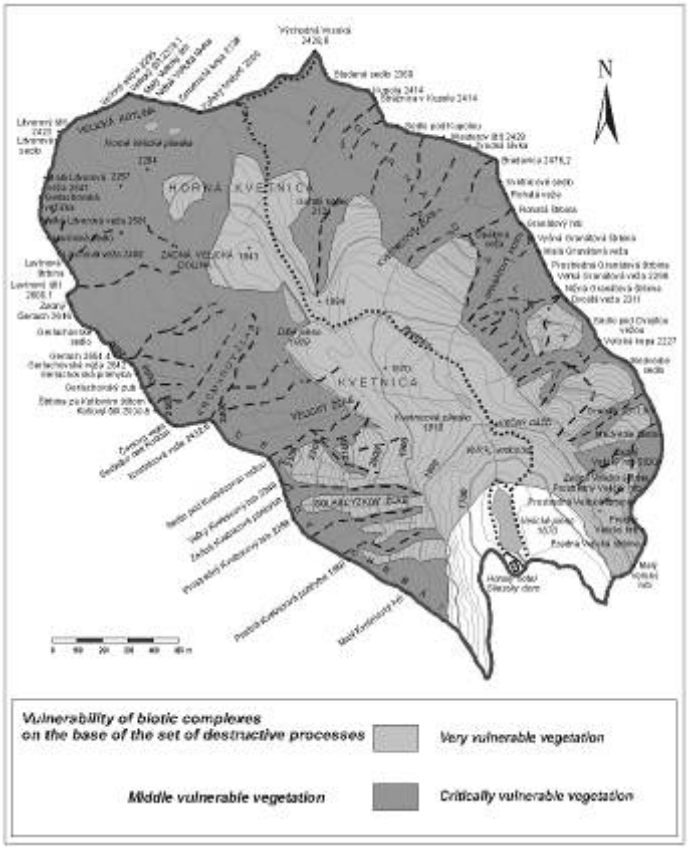

Fig. 2 Vulnerability of vegetation based on the set of destructive processes

• *critically vulnerable vegetation*
Here belong the communities of slope debris from the alliance *Androsacion alpinae* bound to cliff relief; communities of the snow beds and patches from the alliance Salicion herbaceae and *Festucion pictae*. They do not form coherent stands and seldom form larger groups of plants. The communities of critically vulnerable vegetation cover 50 % of the territory.

• *very vulnerable vegetation*
The communities of alpine grass-herb stands (alliances *Juncion trifidi, Loiseleurio-Vaccinion, Festucion versicoloris, Calamagrostion villosae, Adenostylion, Trisetion fusci*) and azonal communities of springs (*Cratoneuro-filicini-Calthion laetae*) are characterized as very vulnerable. Vulnerability of vegetation increases also by overall vulnerability of the abio-complex. They form coherent stands and cover 38 % of the territory.

• *middle vulnerable vegetation*
Here belong communities of coherent dwarf pine stands of alliance *Pinion mughi* covering 12 % of the territory. Vulnerability of these communities increases near avalanche grooves, long lasting snow is a limit factor.

Vulnerability of landscape-ecological complexes based on the set of destructive processes
On the base of attributes and degree of vulnerability of abiotic and biotic complexes total vulnerability of landscape-ecological complexes was defined and is presented on the Fig. 3.

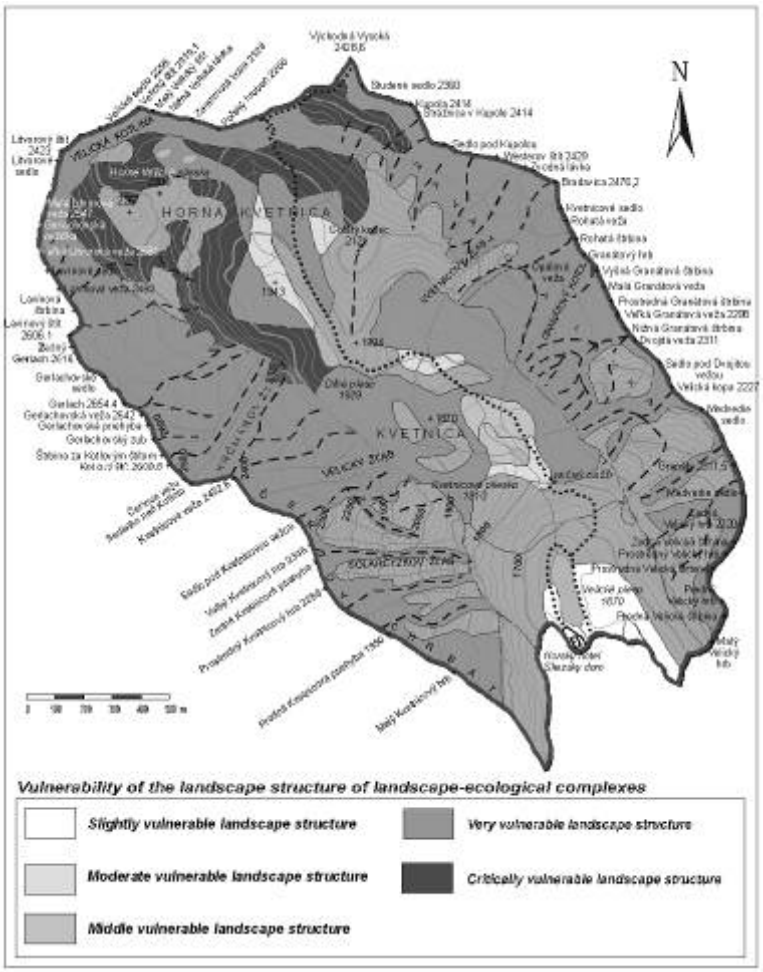

Fig. 3 Vulnerability of landscape-ecological complexes based on the set of destructive processes

Conclusion

The presented vulnerability evaluation of selected abiotic and biotic components and elements of natural environment of the alpine area in the Velická dolina valley is an example of a global solution for nature protection and its synchronization with the possibilities of land use for tourist activities.

In the study area five vulnerability groups were created. The main factors used for the grouping were the destructive processes such as water, gravitational, aeolian, cryogeneous and anthropogenic processes. Three maps of vulnerability for different components were constructed. This paper is a complex study containing important information that might be used in projects or plans for the optimalization of the tourist activities in the Velická dolina valley.

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Souhrn
V práci prezentujeme výsledky krajinnoekologického výzkumu, který jsme realizovali v letech 2000-2014. Za zájmové území jsme si vybrali Velickú dolinu, nacházející se v jižní části Vysokých Tater, která představuje vhodnou modelovou lokalitu. Cílem bylo komplexně zachytit a zhodnotit současný stav krajinných složek a prvků alpínskeho stupně, jako příklad málo narušené krajiny, charakterizovat jejich abiotické a biotické vlastnosti a na jejich základě stanoviť stupeň zranitelnosti vúči souboru destrukčních procesů, se zvláštním zřetelem na turistické aktivity. I když v současnosti existují práce, které se dotýkají hodnocení složek vysokohorského prostředí, neexistuje u nás ucelená a podrobná studie tohoto vysokohorského území ve velkém měřítku (1:10 000), kde by byly komplexněji zhodnoceny všechny parametry.

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ZONES OF PROTECTION IN THE PROPOSED NATIONAL PARK IN THE COLCA CANYON AND THE VALLEY OF THE VOLCANOES IN SOUTH PERU

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Abstract
The Valley of the Volcanoes and the Colca Canyon have been the object of research of Polish scientists since 2003 whose goal is to protect the area by designating the Colca Canyon and the Valley of Volcanoes National Park. The research area is located in the Western Cordillera of Central Andes in the Arequipa Department. This is an area of the highest scientific, educational and landscape values. The National Park Colca Canyon and the Valley of Volcanoes have been designated to protect geological formations, lithostratigraphic profiles, classical tectonic, erosional and volcanic forms, geomorphological-landscape formations, the spring zone of the longest tributary of the Amazon river, pioneer organisms, ecosystems, archaeological monuments and objects of material culture of the local societies. Within its boundaries the following zones applied national parks of Peru have been designated: strict and partial protection, special use and recreation. The aim of the paper is to present an principles of environment management in each zone, objects and protection goals and threats. The results will be applied to a plan of protection of the future national park.

Key words: protected area, strict protection, partial protection, special use, recreation

Introduction

Researchers from AGH University of Science and Technology and other Polish academic institutions (Pedagogical University of Cracow, Jagiellonian University in Krakow, University of Silesia in Katowice, Polish Academy of Sciences, Polish Geological Institute, University. J. Kochanowski in Kielce) have already been carrying on environmental studies of the Colca Canyon and the Valley of Volcanoes in Peru for 10 years. The spectrum of research includes such disciplines as geology, geology of deposits, volcanism, spatial, environmental protection, ecology and landscape evaluation. The origin of the interest in the Colca Canyon dates back to 1981, when the expedition of Cracow students called *Canoandes* explored the canyon, which became a feat that was considered one of the greatest geographical discoveries of the twentieth century. The canyon was entered into the Guinness Book of Records as the deepest canyon in the world, and since then it has aroused interest of researchers and tourists. Extremely natural values of the area in the form of various geological formations (lithostratigraphic profiles, classic tectonic, erosion and volcanic forms), geomorphological and landscape formations, pioneering organisms, ecosystems, archaeological sites and objects and sites of material culture of the local communities are the basis for scientific research and attractions for tourists from all over the world (Paulo & Gałaś 2006, Paulo & Gałaś A (eds) 2008, Gałaś 2008, 2011, Kalicki & Kukulak, 2009, Żaba et al. 2012, Ciesielczuk et al. 2013). During the last decade, the number of visitors has very grown and in the 2013 it reached an average of 702 people per day (257,000 per year). The situation and awareness of necessity to protect scientific, educational, scenic and cultural heritage values require a rational approach to their use. Members of the Polish Scientific Expedition to Peru have been conducting work on indexation of individual objects and forms in order to protect the area within the planned National Park of the Colca Canyon and the Valley of Volcanoes (Krzak 2005, Gałaś & Gałaś 2011, Paulo et al. 2014). As part of the work on creation of instruments for rational land use and spatial management of the study area, appropriate management zones have been designated, which are the basic elements for the sustainable management and planning of national parks. Principles of management of the environment have been established in each zone, the objects and purposes of protection have been determined and potential dangers have been identified. The results will be used in creating a plan for designating a future national park (NP).

The study area

The study area is situated in the province of Caylloma, Castilla located in the north-western part of the department of Arequipa, one of the largest among the 25 political-administrative regions of Peru. It covers the area of approximately 30 000 km^2 and the average population density there is about 5 inhabitants per km^2 (Fig. 1).

According to the physio-graphic approach, this part belongs the Western Cordillera range of the Andes and an edge of the Altiplano Plateau. The characteristic feature of the area is a great range of altitude and most of the area is elevated 3000-5000 m a.s.l. It is cut by deep valleys and canyons of the Colca and the Andamayo rivers, which join together forming the Rio Majes. The bottom of the Rio Majes descends from 800 to 600 m a.s.l. in the area of investigation while the bottom of the Rio Colca charging that river lowers from 3800 to 800 m a.s.l. Stratovolcanoe cones Coropuna (6425), Ampato (6288), Hualca Hualca (6025), Mismi (5597) and relicts of post-explosive calderas (Fig. 1) tower above the mountain peneplain (Paulo & Gałaś, 2008).

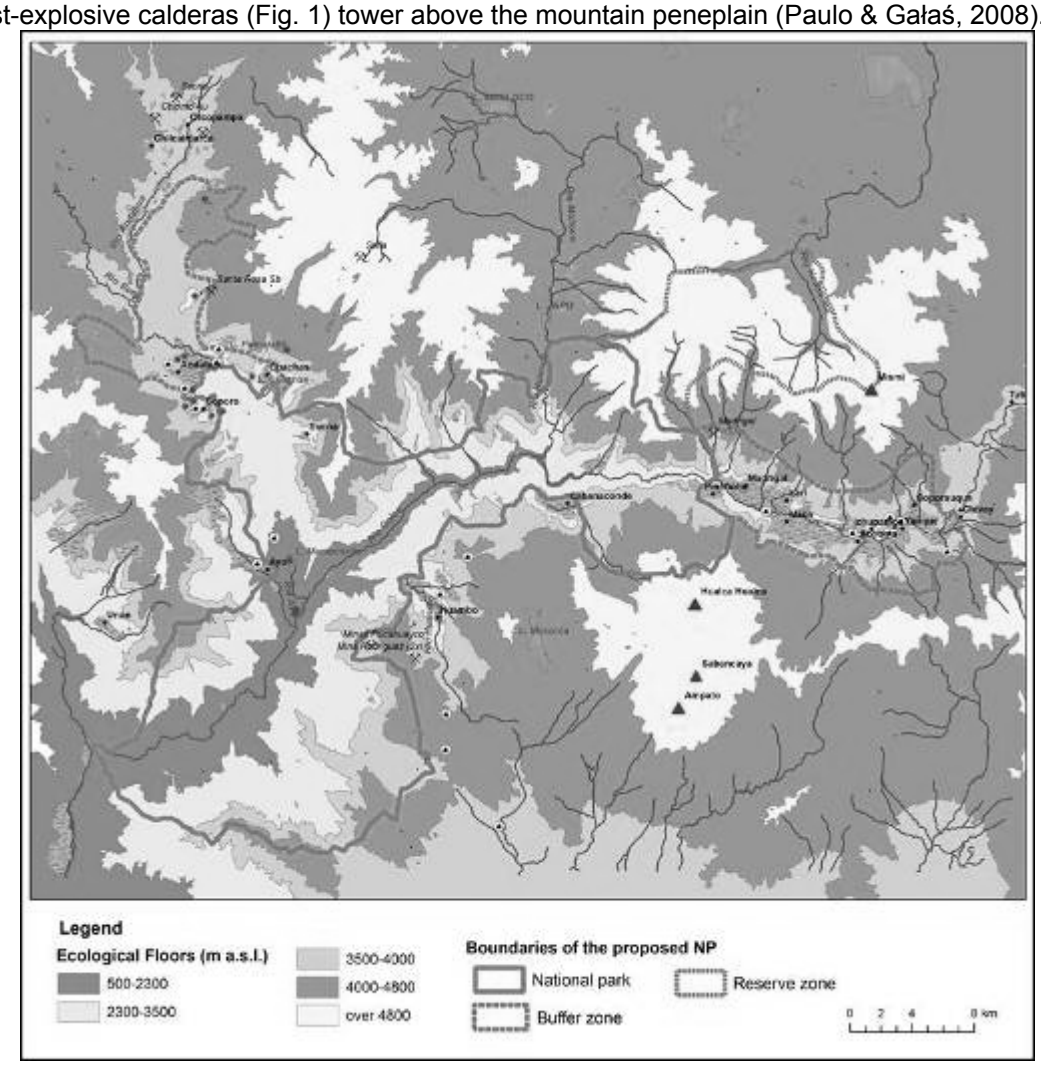

Fig. 1: The boundaries of the proposed national park together with a range of ecological floors.

Physiography of the study area directly shapes the ecological floors occurring there: 5 of 8 floors described in Peru (Fig. 1, Tab. 1).

There are three administrative categories of nature protected areas in Peru (Decreto Supremo 2009) domestic (national) el Sistema Nacional de Areas Naturales Protegidas – SINANPE, regional (local) and private. 191 790 km^2, e.i. 14,9% of the total area of Peru had been covered by nature protection till September 2009 (Paulo et al. 2014).

The following types of areas, considering the goal of protection and acceptable use, are distinguished in terms of the legal status, (Paulo et al. 2014, Decreto Supremo 2009) (Tab. 2):

- areas of indirect usage, where it is not allowed to exploit natural resources and to transform the environment, although non-invasive research and tourism, educational and cultural activities are permitted in properly designated and managed national parks, national and historical sanctuaries.
- and direct usage, which enables the use or exploitation of resources, mainly by the local communities, in those places and such resources which are defined in the area management plan: state reserves, scenic reserves, protective forests, wildlife communal reserves, hunting grounds and protected species habitats.

Tab. 1: Characteristics of the ecological floors occurring in the area of the proposed park along with the indicated possible socio – economic functions (according to Pulgar 1967)

Ecological Floors	Characteristic features	Economic predispose-tions
Yunga 500 – 2300 m a.s.l.	The region has varied vegetation due to occurrence of high levels of seasonal rainfall exceeding 400 mm per year. The temperature is about 15 to 22 °C, during the day, it can reach up to 30 °C. The area is very prone to avalanches (rockfalls) and landslides.	agriculture, tourism nature conservation
Quechua 2300 – 3500 m a.s.l.	The climate is temperate and dry, with rain occurring from December to March. A characteristic large thermal contrast between day and night and between the areas exposed to the sun and shade can be observed. The relief consists of valleys and gentle slopes. This effect has been modified over the centuries by the systems of terraces and embankments. The area belongs to the most populated ones, with very high agriculture and livestock potential.	agriculture, tourism, settlement, nature conservation
Suni 3500 – 4000 m a.s.l.	The dominating climate is moderately cold and dry, setting the limit of cultivation and cattle breeding, mining is a dominating activity. The relief is characterized by sharp peaks, steep and rocky slopes, narrow valleys in some areas slightly wavy, called *pampas.*	agriculture settlement, mining
Puna 4000 – 4800 m a.s.l.	The relief is varied, comprising mainly of Andean plateau, and numerous lakes and ponds. The climate is cold.	mining
Janca over 4800 m a.s.l.	The highest geographic region of Peru, regarded as a glacier area. The climate is very cold.	mining, qualified tourism

Tab. 2: General characteristics of the management zones in the proposed NP (Paulo et al. 2014, Gałaś & Gałaś 2011)

Zones	Characteristics	Natural, landscape, educational values (selected sites of protection)
Strict protection zone (*protección estricta*)	• little or no intervention in ecosystems, • the sites of unique species, rare or fragile ecosystems, • only operation related to the management and monitoring of the environment are permitted, quite exceptionally scientific research is allowed.	• wet environments, rich in water • outcrops of rocks and soil, • springs and geysers, • lithographic profiles, • tectonic forms, relief, landscape
Partial protection zone (*uso silvestre*)	• little human intervention • wildlife dominance, • only management and control activities, scientific research, education and recreation without fixed infrastructure and motor vehicles are permitted	• thermal pools of small touristic capacity in Sangalle and Llahuar • green oasis in the Canyon *0 suspension bridges (for pedestrians) crossing the Rio Colca
Tourism and recreation zone (*turístico y recreativo*)	• great landscape values, • education and research activities, • tourism and recreational use of the area • tourism infrastructure (accommodation and catering), • hiking trails, • communication infrastructure	*1 thermal swimming pools in Calera and Yanque used for recreation *2 Maca-Layo fault zone and the accompanying landslides and lacustrine sediments exposures *3 observation point Cruz del Condor,

Direct usage zone (*de Aprovechamiento Directo*)	• economy use, • direct usage of flora and fauna, including fishing, according to the conditions determined for each NP, • education, research and recreation measures	*4 Areas adjacent to the existing villages having sufficient potential to be used for agriculture without endangering valuable wildlife resources e.g. Tapay, Cosnirhua, Sucna, Choco
Special usage zone (*uso especial*)	• existing buildings, • agriculture, breeding and raising livestock or other activities related to usage of the existing potential	➢ settlements ➢ cultivated plots ➢ livestock raising They include the following villages: Tapay, Cosnirhua, Malata, Llanca, Soro, Sangalle, Canco, Choco, Sucna and single haciendas below Huambo.
Revitalisation zone (*recuperación*)	• The areas transformed by nature or human activity, • it requires special treatment to recover the quality and sustainability of the environment	There is a gold mine West of Soro (primitive mining methods are used), gold extraction by means of amalgamation – higher concentration of mercury in the Rio Colca
Cultural heritage zone (*histórico cultural*)	• areas of significant historic or archaeological values, • educational and recreational activities related to their cultural value	• The whole complex of terraced fields in the Colca Valley was deemed as a cultural heritage according to the government decree no. 262/INC (2010) • 17th-18th churches, • archaeological sites, • traditional buildings, markets, • regional clothes of local inhabitants and others. The complex also includes terraces in Cabanaconde and Tapay communes, reaching Tuti up the river. Cabanaconde has similar values.
Buffer zone (*amortiguamiento*)	• areas adjacent to the protected areas ensuring their protection. • place for infrastructure, tourist facilities, hotel base, • ensures cleanness standards, waste management and sewage discharge.	Two buffer zones: 1the Colca Valley with a small area of fields and buildings near Cabanaconde and Huambo 2the northern part of the Valley of Volcanoes. Both zones cover developed areas with relatively high population, both are crossed by the rivers charging the Rio Colca in the area of the planned park.
Reserve zone	• areas adjacent to the protected areas ensuring their protection.. • educational and research activities, • touristic and recreational usage of the area	Mismi massif, springs of the Amazon River

Regardless of the assigned category each area should be divided into the management zone with the specified requirements and the objectives of conservation and development.
Basing on the analysis of the resources and values of geodiversity, biodiversity, the existing use of the environment and the assessment of possibilities of further development management zone for the proposed NP have been designated in accordance with the Peruvian law in force (Tab. 2). Additionally, for each type of socio-economic functions occurring in the area of NP, potential environmental conflicts, divided according to 4-degree scale, have been determined (Tab. 3). It has been also pointed out that conflicts can be eliminated by creation of appropriate management zones within the area of NP.

Tab. 3: The scale of conflict: small, medium, large, very large

Socio-economic functions	Existing conflict	Potential conflict	Conflict eliminated by designating a national park
Mining	**small** currently there are no mining operation within the area of the proposed park	**very large** documented mineral resources may cause abandoning the project of NP and mining activity may seriously damage the environment	yes
Energetics	**very large** existing high-voltage lines have significant impact on the landscape values	**very large** the hig-voltage line and hydraulic structures have impact on the landscape and reduce local water resources	no possibility to reduce the impact
Agriculture	**small** existing agriculture has little negative impact on the environment providing its organic character	**small up to large** potential threat to the environment by growing usage of fertilizers and pesticides in the Colca Valley	yes
Settlement	**small up to medium** the current state of settlement shows small or at some places medium negative impact on the environment	**medium, large** introduction of building without proper planning means a very high urbanistic and suburbanistic pressure	yes
Water, waste management	**medium** improper, or even the lack of water and waste management	**large** unregulated water-sewage and waste management may in the future cause very significant environmental consequences.	yes
Tourism	**very large** pressure on development of tourist facilities without complex planning and disregarding the environment	**very large** unlimited growth of tourism pressure may result in significant consequences for the environment and its natural values	yes

Conclusion

Local governments in the area of the Colca Canyon are worried as they assume that designating the national park will hinder economic development of the region. However, unreasonably guided development of tourism, including unregulated construction of tourist centres without comprehensive plans which take into account nature protection and the environment capacity endangers the sustainable development of the area. Establishing management zones of socio-economic development adequate to the bio-and geo-diversity occurring in the area, may be an opportunity for the environment and the inhabitants. Management zones with determined rules of the environment protection and environment resources usage is one of the basic elements of the sustainable management and planning of national parks. They help to resolve conflicts between land users and natural-cultural factors. Hence, increase of the environmental awareness of the local community will be crucial for the future economy and the environmental status of the study area. Designation of the National Park Colca Canyon and the Valley of Volcanoes can only take place when approved by the local authorities representing the interests of the local inhabitants.

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Souhrn
Údolí vulkánů a Kaňon Colca jsou předmětem výzkumu polských vědců již od roku 2003. Cílem výzkumu je chránit tuto oblast prostřednictvím návrhu Národního parku Kaňon Colca a Údolí vulkánů. Analyzované území se nachází v oblasti Západní Kordillery v Centrálních Andách v regionu Arequipa v Peru. To je oblast nejvyšších vědeckých, vzdělávacích a krajinných hodnot. Území plánovaného Národního parku Kaňon Colca, a Údolí vulkánů zahrnuje především jedinečné geologické formace, litostratigrafické profily, klasické tektonické, erozní a sopečné formy, geomorfologické a krajinné útvary, pionýrské organismy, ekosystémy, archeologické památky a předměty kultury místních společností. V Peru jsou v rámci národních parků vydělené zóny ochrany, které jsou následné rozdělenu na: přísná a částečná ochrana území pro speciální využití a rekreaci. Cílem příspěvku je představit principy environmentálního managementu v navrhovaných zónách ochrany národního parku, objekty a cíle ochrany, jakož i možné konflikty a ohrožení. Dosažené výsledky budou použity při plánování území budoucího národního parku

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