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Refuge in the Heart of the city? Urban ecological changes on the south slope of Sas Hill (Budapest)

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Abstract: Sas Hill is situated in the heart of Budapest, about 3 km West of the Danube. Although the utilization and the flora of this area (in geological terms crag) have changed a lot during the last 150 years, a significant part of the hill has remained undeveloped. Its historic vineyards first had been turned into orchards and had been also used as a military camp, then the area was left to deforestation and spontaneous afforestation.
This "green island" of the ever-developing city, shelter for relict plants, is at the same time under attack from aggressive invasive species – and while it wins its battles against new development plans, it loses every day in small fringe battles.
On the southern areas outside the fence, no environmental protection is being implemented. The delay is only partially caused by lack of funds, lack of perspective regarding future use and vegetation plays a significant role, as well.
The research facilitated the development of differentiated patch-level treatment proposals and the allocation of model areas where the unique features of the ecological processes characterising 21st century settlements can be demonstrated.

Key words: urban ecological changes, landscape recreation, protection of relicts, spread of invasive species

Introduction

The Sas Hill Natural Reserve was created by Resolution No. 985/1957 of the National Environment Protection Council in 1957. Some 22.7 hectares of the 30 hectares of land covering the area were fenced in, and (on the southern slope of the hill) 5.5 hectares remained in the use of the military. In the close proximity of these zones 7.3 hectares of land was offered to private citizens for lease as hobby gardens. These three areas, all still undeveloped (Fig 1.), have met different fates. Within the enclosed area, the direction and intensity of management have changed congruent with the prevailing environmental protection approaches and available funds. The areas located outside this zone remained unattended. The hobby gardens were turned into orchards but cultivation has mostly been suspended.
Since the designation of the natural preserve, we can see the typical aggressive expansion of invasive species (Fig 2.). Thus the fate of the millennia-old refuge seems to be jeopardized, including the real assets of the hill that are embodied in the remnants of the original flora, the relicts, and the habitats of rock and Aeolian soil. Nowadays there are EU funds to help the reconstruction and development of natural habitats, which presents a new problem: as until a few years ago no actions were documented in these reserves, the chronology and causality of changes is unknown.

Materials and methods

In order to achieve a clear vision of the area, this short study intends to sum up the correlation factors regarding local vegetation and based on the experiences gained through personal on-site exploration, maps and photo

documentation draw some conclusions that might help the preservation of this natural reserve, as well as might contribute to stemming the spread of evasive species . In the course of the research the following procedure was applied:

1. Monitoring the utilization and the changes of the vegetation on the basis of available maps and relying on aerial photos and observations;
2. The exploration of interrelationships among changes;
3. Determination of the means and extent of intervention.

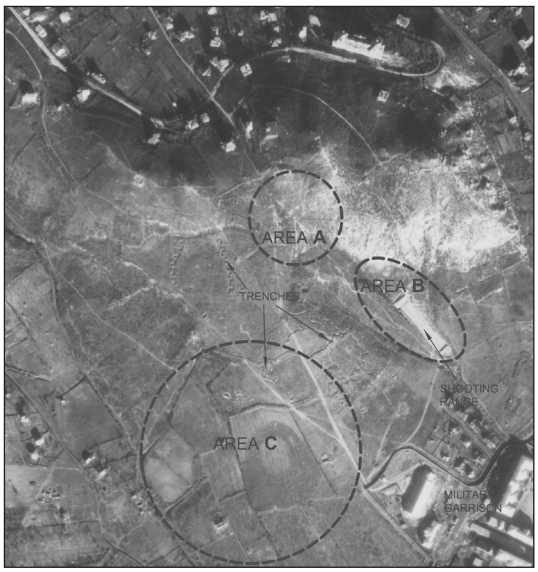

Fig. 1. Sas Hill and the three analysed areas (A, B, C) in 1951

Fig. 2. The Sas Hill Natural Reserve: the closed and the open areas as well as the hobby gardens and the three analysed areas in 2009

Description of the situation. Discussion

Area A: Afforestation on the southwestern side of the hill top

The area under observation is a steep dolomite slope just below the lower peak, with the angular offset of 20 degree. In this zone the thin soil cannot provide proper conditions for natural woodland or vineyards. When this area was declared protected, grassland was probably not highly valued and – as shown by aerial photos from 1963 – significant afforestation was carried out both on the steep slope and at the foot of the hill. Gradually the dolomite rubble has come to the surface, and from the photos it can be seen that through tampering with the mainly bare surface and the shaping of simultaneous benches this area was prepared for this afforestation and the benches were dotted with lines of trees.

During a field trip to analyze the present situation, the rows of Flowering Ash (*Fraxinus ornus*) could easily be seen. The age of these trees is different but all of them seem to be younger than 35 years old. Aerial photos showed that after a previous landscaping was implemented, further afforestation occurred. An important observation is that despite the earlier tampering and the conspicuously fresh erosion trenches, this zone of the hill is relatively free of invasive vegetation.

Due to the soil characteristics, endangerment of this area is less significant than that of its surroundings and thus – by thinning the Ash trees and facilitating the growth of natural shrub strips – it can be suitable to create a habitat that resembles the natural dolomite woodland.

Area B: Site utilized for military purposes and shooting range

Situated at the foot of the hill this area's Aeolian soil was used for grape production till the end of the 19th

Fig. 3. Alleys of Flowing Ash

century, then used as training by the military garrison located here. On the eastern slope of the hill, as shown on an aerial photo from 1951, there was an oblong landscaped area 130 meters long and 30 meters wide, where buildings were erected and a shooting range was carved into the hillside. On the photo shot in 1963 no buildings can be seen anymore. In the meantime this zone had been incorporated into the reserve.

An escarpment consisting of old Field maples (*Acer campestre*) can assist in the identification of the original land form that has been filled up and also eroded. Seen as a forest from the air, through direct examination, it can be clarified that this 'forest' is composed of mainly high-grown starry false spirea and Old man's beard (*Clemtis vitalba*), but sporadically Manna ash (*Fraxinus ornus*) also appears on the site. No ruins of the former buildings can be seen, but close to this "tiered" area a cut-off trunk, and along the erosion ditch a sprout colony of the oldest Tree of heaven (*Ailanthus altissima*) can be found.

Based on the facts above the conclusion can be drawn that the environmental degradation commenced with the construction of buildings and the utilization of the loess wall as part of the shooting range, and this process proceeded as the area was declared protected but became abandoned. The intervention that totally eliminated the original vegetation and the not unfavorable conditions made the growth of weeds possible, and with the continuous erosion through the next 40-50 years the local species were replaced by invasive stocks.

Due to the total transformation, the species of the original flora stock can only be found sporadically and it is questionable what the reconstruction can rely on without facilitating the advancement of the invasive stock. Because of its proximity to residential areas it is suggested that this territory – within the protected zone – be used for development, (such as demonstration and maintenance purposes) and that this subzone serve as a buffer-zone.

Fig. 4. The vegetation of the shooting-range

Area C: Gardens and trenches

At the southern foot of the Hill an area of close to 8 hectares is found, which for approximately 50 years was divided into gardens measuring about 0.1 – 0.2 hectares each. It is interrupted by an area of trenches created and left behind by the military. Until the phylloxera epidemics this area used to be a wine-growing region and the maps originating from the early 20th century show – probably as the remnants of the wine-growing plots – bigger grassland plot-blocks separated from one another by confines consisting of rocks. On the aerial photographs this old territorial structure can be easily recognized into the 1960s and it can be presumed that the proportioning occurred roughly at the same time that Sas Hill was declared natural preserve.

Looking for the old confines and the borders of the plot-blocks we notice that the oldest trees, namely the local species of Norway maple (*Acer platanoides*) constitute the border of this zone. In contrast to this, on the new fringes (after the appearance of the gardens) no trees can be observed and the vegetation here mainly consists of Common Hawthorn (*Crataegus monogyna*), Common Dogwood (Cornus sanquinea), Dog Rose (Rosa canina), Blackthorn (*Prunus spinosa*) and sometimes Common lilac (*Syringa vulgaris*). The inner world of the gardens varies in accordance with the conditions of the maintenance and the time of abandonment. Units covered by grassland or by Canada goldenrod (*Solidago canadensis*), and bushes (like on the fringe) can be differentiated. Despite the fact that this area is not cultivated Tree of Heaven (Ailanthus altissima) appears only in patches, and mainly where the area had been tampered with (e.g.close to the ruins of buildings, destroyed foundations, etc.).

In general, it can be stated that the infection by invasive species is not yet substantial. It is especially significant that the plot of land with trenches is covered by native bushes. Under the shrub forest having grown for some 50 years the deep ditch can still be found, and despite the fact that over the last 15 years the homeless people finding shelter here have filled it up with garbage, in this vegetation no invasive species have appeared yet.

Due to its specific conditions, this zone can be seen as a buffer-region of the preserve and in this respect it is essential that the relatively low level of threat constituted by the invasive plants can be fully eliminated by reaping and poisoning the Tree of heaven (*Ailanthus altissima*). In shaping the perspective it must be taken into consideration that the relatively good conditions prevailing in this area can be connected to the lasting non-interference and thus only interventions and developments causing small-scale trauma to the environment are recommended, and where the proper follow-up treatment/handling of the environment can be guaranteed.

Fig. 5. The vegetation of gardens

Conclusion

The research results of several scientists compelled us already to pay close attention to the increased danger originating from the interference that had occured during the last decades. It was ascertained that within the realization of environment protection quick action is demanded due to the proportion of damages caused by the

invasive plants and by the rapid space of their spread. It is not enough, however, to know the general principles of floral invasion as every race and every special living space attacked by these invasive species create special problems. (CRAWLEY, 1989)

Historical investigations can prove to be a useful aid in local examination aiming at the management of protected areas. Considering reconstruction it is not indifferent when the original vegetation – in this case the rocky grassland, loess grassland, dolomite bush-forest and Turkey oak Pedunculate oak woodlands – disappeared or how and how frequently it has been interfered with and when the last intervention occurred. The correlation between the changes observed at the three different zones led to the formulation of territorially differentiated, nevertheless realistic understanding of the past development. Our research clearly proved that intervention in this and similar areas must be planned with great care. It was also shown that the larger the scale of intervention is the larger the risk could be that valuable relicts of our past might fall pray to invasive plants. With proper attention and gradual and careful conversion our environmental values can be preserved..

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