A STUDY ON THE NECESSITY OF GREEN PARKING LOTS IN TIMISOARA

STUDIU PRIVIND NECESITATEA REALIZĂRII DE PARCĂRI ECOLOGICE ÎN MUNICIPIUL TIMIŞOARA

SILVICA ONCIA[*], FLORIAN BORLEA, LAURA ŞMULEAC***

[*]Universitatea de Ştiinţe Agricole şi Medicină Veterinară a Banatului , Timişoara
***Direcţia Silvică Timişoara*

Abstract: *Green parking lots are green islands in crowded urban areas. Larger green parking lots have become a necessity in Timisoara. In order to be technically appropriate, they must meet certain demands related to material permeability and natural drainage systems. The vehicle emission metabolization capacity of three species of trees has been studied.*

Rezumat: *Parcările ecologice se constituie ca insule verzi în zonele aglomerate urbane, de aceea este necesară extinderea lor în municipiul Timişoara. Pentru a corespunde din punct de vedere tehnic, acestea trebuie să îndeplinească anumite cerinţe privind permeabilitatea materialelor şi sistemele de drenare naturale. A fost studiată capacitatea de metabolizare a noxelor de către trei specii diferite de arbori.*

Key words: *green parking lots, pervious paving, runoff and vehicle emission reduction*
Cuvinte cheie: *parcări ecologice, pavaj permeabil, reducerea scurgerilor şi a noxelor*

INTRODUCTION

Parking lots are part of the townscapes. Town planners should try to create a balance between the need of parking spaces and other desires of the community as part of their goal: pedestrian-oriented town planning and environment durability [1].

Large surface parking lots accentuate difficulties like pollution and water runoff, increase the urban heat islands and are not a very pleasant sight.

On analysing these drawbacks, one will discover that the most effective way to improve landscape and water quality and reduce pollution is to build ecological or green parking lots [2, 4].

MATERIAL AND METHOD

Green parking lots involve a series of methods applied simultaneously to reduce the total pervious area of a parking lot and the surface temperature and to maintain a green island in crowded areas.

Pervious paving (figure 1) and natural drainage systems reduce stormwater runoff and improve the aesthetic side of the parking lot.

Natural drainage systems or natural drainage green areas include: bioswales, green areas for stormwater runoff collection and the biologically modified vegetal strips that improve water quality and reduce runoff.

Shading can lower surface temperature. The tree crowns cool the microclimate and indirectly reduce the stormwater runoff that permeates the drainage system.

The shading and cooling potential of parking lots (figure 2) is determined by a series of factors like tree species, size, growth, crown density, spatial arrangement and water use [3].

Research work had been don eon the tress in the Botanic Park and the Central Park in Timisoara. Three species were chosen for the study: lime tree, chestnut tree and sycamore tree.

Figure 1. Pervious paving

Figure 2. The shading and cooling potential of parking lots

RESULTS AND DISCUSSIONS

The building of a green parking lot must come as a result if testing numerous best management practices that filter and water, cause water infiltration and reduce air pollution.

In order to decide upon the best possible variant, the limits that soil, drainage layer, runoff evacuation and groundwater layer impose.

Pervious paving ensure a stable surface and allow eater to flow through the holes in the paving material.

The 15-cm thick drainage layer made of broken stone and geotextile material provides both stable surfaces and underground runoff collection.

Where grass has grown into the holes, a fertile soil layer is necessary (figure 3). In shading parking lots, root system of the planted trees must be considered (figure 4).

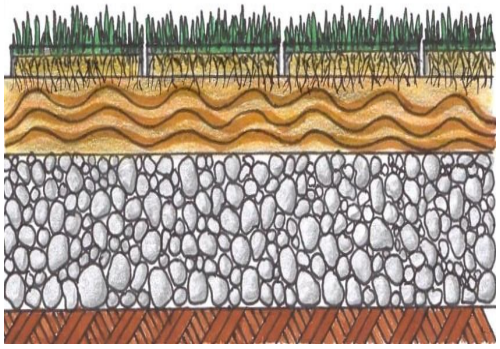

Figure 3. The fertile soil layer

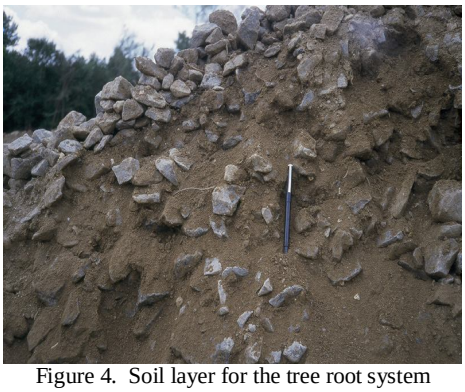

Figure 4. Soil layer for the tree root system development

Irrigation depends on rainfall and soil humidity and varies with the infiltration speed to avoid water stagnation.

The irrigation water must not increase the flow on the parking lot surface.

When properly designed and built, the following are considered pervious paving materials: porous concrete and road stone, when they meet the vehicle traffic standards.

The general constructive limits of pervious pavement are the following:

- 2% or lower slope inclination;
- maximum slope inclination for any type of pervious paving – 5 %;
- distance between pervious pavement and abrupt slopes – 100 m;
- the tree cover area in the basic calculation – 8 % ;
- the estimated final tree cover (increased shaded areas in the parking lot – 2-50%).

Traffic has caused differences in the pollution-related behaviour of the tree species (tables 1, 2).

Table 1

The forest species from Central Park

	Forest species	K ppm	Ca ppm	Cd ppm	Cu ppm	Fe ppm	Mg ppm	Mn ppm	Na ppm
1	**Chestnut tree** 1-1	923,3	3576	0,426	4,829	569,9	439,1	10,48	557,5
2	Chestnut tree 2-3	959,2	3682	0,398	7,39	589,8	569,7	9,72	314,1
3	Chestnut tree 3	1755	3710	0,465	6,285	786	605,4	13,79	663,7
4	Chestnut tree 4-3	912,3	1458	0,102	2,175	161,4	384,6	29,5	259,2
5	Chestnut tree 5-4	990	1654	0,348	8,601	514,4	323	15,98	1180
	Avarage	**1108**	**2816**	**0,348**	**5,9**	**524,3**	**464,4**	**15,9**	**594,9**
6	**Sycamore tree** 1	2299	5273	0,656	5,465	929,1	1014	88,85	924,6
7	Sycamore tree 3	974,9	3427	0,399	6,859	397	435,7	10,7	301,5
8	Sycamore tree 4	913,4	2986	0,391	4,927	401,8	317,1	12,67	307,4
9	Sycamore tree 5	1699	3769	0,428	6,302	598	561	17,25	693,2
	Avarage	**1471,6**	**3863,8**	**0,469**	**5,9**	**581,5**	**582**	**32,4**	**556,7**
10	**Lime tree** 1-1374	945	3449	0,31	3,548	290	396,4	7,571	305,5
11	Lime tree 2-137	3079	3196	0,429	6,914	960	628,4	15,87	675,5
12	Lime tree 3-153	2531	2369	0,596	8,159	1260	981	59,3	927,8
13	Lime tree 4-495	1031	2672	0,461	8,781	551,1	619,8	15,66	377,8
14	Lime tree 5-1650	934,3	1805	0,253	7,832	444,9	319,9	8,787	284,8
	Avarage	**1704,1**	**2698,2**	**0,41**	**7**	**701,2**	**589,1**	**21,4**	**514,3**
	Park Avarage	**1427,9**	**3126**	**0,409**	**6,3**	**602,3**	**545,2**	**23,2**	**555,3**

Table 2

The forest species from BotanicPark

	Forest species	K ppm	Ca ppm	Cd ppm	Cu ppm	Fe ppm	Mg ppm	Mn ppm	Na ppm
1	**Chestnut tree**1-213	2140	2233	0,475	4,687	815,4	680,6	80,16	623,5
2	Chestnut tree 2-215	891,1	1465,8	0,096	3,66	134,9	140,3	7,64	244,1
3	Chestnut tree 3-2437	1750	3298	0,39	5,642	872,2	688,8	25,79	743,2
4	Chestnut tree 4-2445	865,7	2343	0,284	3,532	510,3	456,6	8,287	291,7
5	Chestnut tree 5-1945	477,7	1218	0,175	2,839	189,7	156,2	16,19	246,2
	Avarage	**1224,9**	**2111,6**	**0,284**	**4,1**	**504,5**	**424,5**	**27,6**	**429,7**
6	**Sycamore tree**1-2	2236	2843	0,315	49,22	774,7	993,8	154,7	943,2
7	Sycamore tree 2-1068	2353	3133	0,41	8,287	1150	984,7	133,3	947,3
8	Sycamore tre 2-203	2451	3649	0,604	5,631	1360	672,7	60,4	568,9
9	Sycamore tre 3-1217	2111	3479	0,55	3,695	942,3	1057	78,92	911,7
10	Sycamore tre 4-1216	2274	5500	0,679	65,35	791	992,9	99,2	930,9
11	Sycamore tre 5-2134	2201	3472	0,562	9,165	920	915,5	85,75	933,6
	Avarage	**2271**	**3679,3**	**0,52**	**23,6**	**989,7**	**936,1**	**102**	**872,6**
12	**Lime tree** 1-169	2421	1460	0,441	6,242	960,9	578,5	65,63	592,3
13	Lime tree 2-398	2454	2983	0,605	6,833	1069	1101	70,97	950,8
14	Lime tree 3-223	2468	6013	0,765	12,69	1094	1327	104,6	939,8
15	Lime tree 4-523	2484	2981	0,471	7,088	868	618,5	117,2	675,4
16	Lime tree 5-1777	2402	2575	0,569	7,569	1167	1089	82,45	941,9
	Avarage	**2445,8**	**3202,4**	**0,57**	**8,1**	**1031,8**	**942,8**	**88,2**	**820**
	Park avarage	1980,6	2997,8	0,458	11,9	842	767,8	72,6	707,4

CONCLUSIONS

The advantages of the studied green parking lots include reduced motor vehicle-induced environment pollution and urban heat islands, less UV radiation exposure thanks to tree crowns, reduced stormwater runoff and the potentially prolonged life of the pavement.

In Timisoara's existing environment, lime tree *(Tilia sp.)* and sycamore tree *(Acer platanoides)* have a higher motor vehicle emission metabolization and air purification capacity than chestnut tree (*Aesculus hippocastanum)*. Therefore they should be planted more extensively.

REFERENCES

1. E. GREGORY MCPHERSON, JAMES R. SIMPSON, AND KLAUS I. SCOTT, Actualizing Microclimate And Air Quality Benefits With Parking Lot Shade Ordinances, www.wcufre.ucdavis.edu, 2002
2. KLAUS I. SCOTT, JAMES R. SIMPSON, AND E. GREGORY MCPHERSON, Effects of tree cover on parking lot microclimate and vehicle emissions, Journal of Arboriculture, 1999
3. ONCIA SILVICA, ŞMULEAC LAURA, Studiu privind parcările ecologice, Contract de cercetare, 2007
4. SOUTHERN CENTER FOR URBAN FORESTRY RESEARCH & INFORMATION – 2004 - Urban and Community Forestry: Improving Our Quality Of Life, USDA Forest Service