# THE EVALUATION OF PINE FOREST VEGETATION IN RIGA CITY, LATVIA

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The research was carried out in the framework of the project 'Support system of decision making in sustainable forest resource management planning' (agreement No. 2010/0208/2DP/2.1.1.0/10/APIA /VIAA/146, ERAF/ Latvia University of Agriculture).

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# Urban forests

Urban greenspaces include substantial forest resources which can strongly influence the biological environment and mitigate many impacts of urban development by

- moderating climate,
- conserving energy, carbon dioxide, and water,
- improving air quality,
- controlling rainfall runoff and flooding,
- lowering noise levels,
- harboring wildlife,
- enhancing the attractiveness of cities

Urban forests can be viewed as a key component of the urban infrastructure

# Urban forests

- are prominent components of the landscape in urban areas
- they provide a wide range of recreational and outdoor leisure opportunities
- have high educational values by representing nature and natural processes in cities and towns
- used as testing and education areas for forestry

The recreational and aesthetic benefit is traditionally **important** especially **in the Nordic and Baltic countries,** because the **forest is a major element** of the **landscape** and **national economy**

# Urban forests

- Unorganized recreation and excessive recreation causes significant disturbances to forest ecological functions.
  As result, mosaic type forest structure is formed – disturbed and undisturbed forest compartments.

The urban environment provides a unique opportunity to combine landscape design with ecological management

# Latvia

- country in the Baltic region of Northern Europe

Territory - 64,589 $km^2$
Inhabitants: 2,067,887

- it is one of the least densely populated countries of the European Union

- has a temperate seasonal climate

# Riga, the capital of Latvia

- **Riga** is located along the Baltic Sea at the southern coast of the Gulf of Riga

Riga is situated on the banks of the Daugava River, about 10 kilometers from where the Daugava flows into the Gulf of Riga


The natural terrain of this area is a flat and sandy plain, about 1 to 10 meters above the sea level

# Riga, the capital of Latvia

- Climate is influenced by its proximity to the sea (moderately warm and humid)

<u>Summers</u> - cool and cloudy

<u>Winters</u> - warm with frequent thaws


Snow cover:
the middle of December - the middle of March

~40% of the days in a year are cloudy;
average precipitation – 700-720 mm a year

# Riga, the capital of Latvia


The territory of Riga - 304.05 km$^2$:

- 29.9% Dwelling space - 91.03 km$^2$
- 2.3% Industrial space - 6.9 km$^2$
- 2.9% Land for technological structures - 8.65 km$^2$
- 14.9% Roads (streets) - 45.19km$^2$
- 28.0% Green area - 85.09 km$^2$
- 15.7% Water – 47.67km$^2$
- 5.5% Port area – 16.66 km$^2$
- 0.9% Airfield land – 2.86 km$^2$

# Forests in Riga

*0.8% of all Latvia's forests are considered urban forests and 20% of urban areas covered by forests

- Riga has been the owner of forests since the thirteenth century

- Today municipality owns more than 55.600 ha of forests and in inner city there are 4243.7 ha of forests

# Forests in Riga

The dynamics of land use and management of green space in Riga city are based on

- the main laws in Latvia
- the numerous documents regulations of municipality

➢ differences between maintenance and management of rural and urban forest is not specified by the legislation

# Forests in Riga

- Riga city forests consist of **15 forest tracts** which are connected with rural forests and some small, isolated forests – the remnants of ancient forest or planted forests

# Forests in Riga

The aim of the research was to analyse and evaluate the current situation of pine forests' vegetation in Riga city

The main tree species is Scots pine *Pinus sylvestris* L.
(46.9 km$^2$ or 88% of total forest area)

# Methods of vegetation research (I)

- The research was carried out in *Myrtillosa* type pine forests, which constitutes the highest proportion (33%) of the prevailing forests on dry sites in Riga city

- In each forest tract during the vegetation season of 2011, 45 vegetation sample plots were arranged and surveyed (the area of each sample plot - 400 m2)

- The age of pine is 80-94 years

- The Braun-Blanquet method was used to describe the plant communities: the total projective coverage of tree (E3), shrub (E2), herb (E1) and moss (E0) layer as well as the coverage of each separate species was evaluated in the sample plots in percentage

# Methods of vegetation research (2)

- The descriptions of vegetation were summarised in the data base of the Excel software programme

- The occurrence of plant species is characterised by the constancy class which is calculated by referring the number of those sample plots where the species has been identified to the number of the whole group of sample plots:

I - < 21, II - 21-40, III - 41-60, IV - 61-80, V - 81-100 %

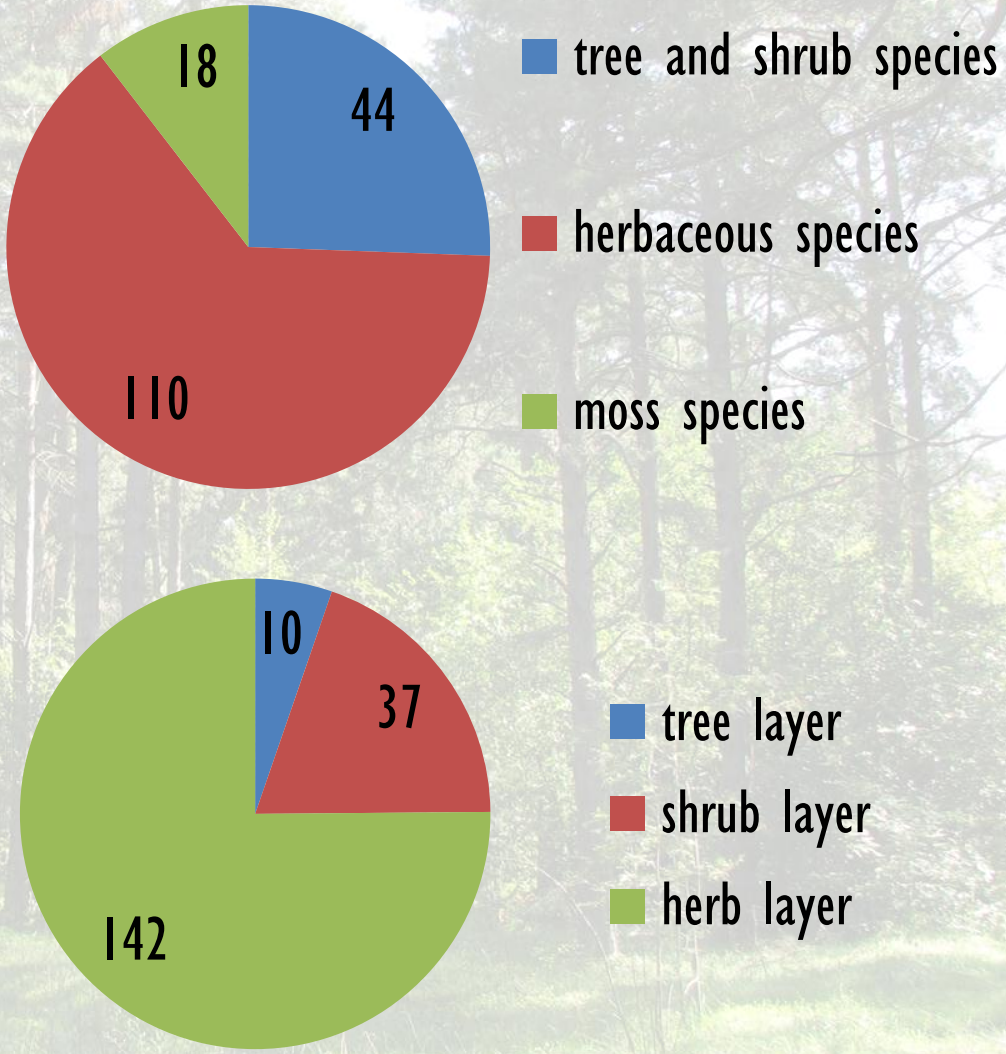
- Data processing was carried out with the software programme Community analysis package (Pisces Conservation Ltd.) TWINSPAN and PCA (Principal component analysis)

- For the credibility evaluation statistical methods were used

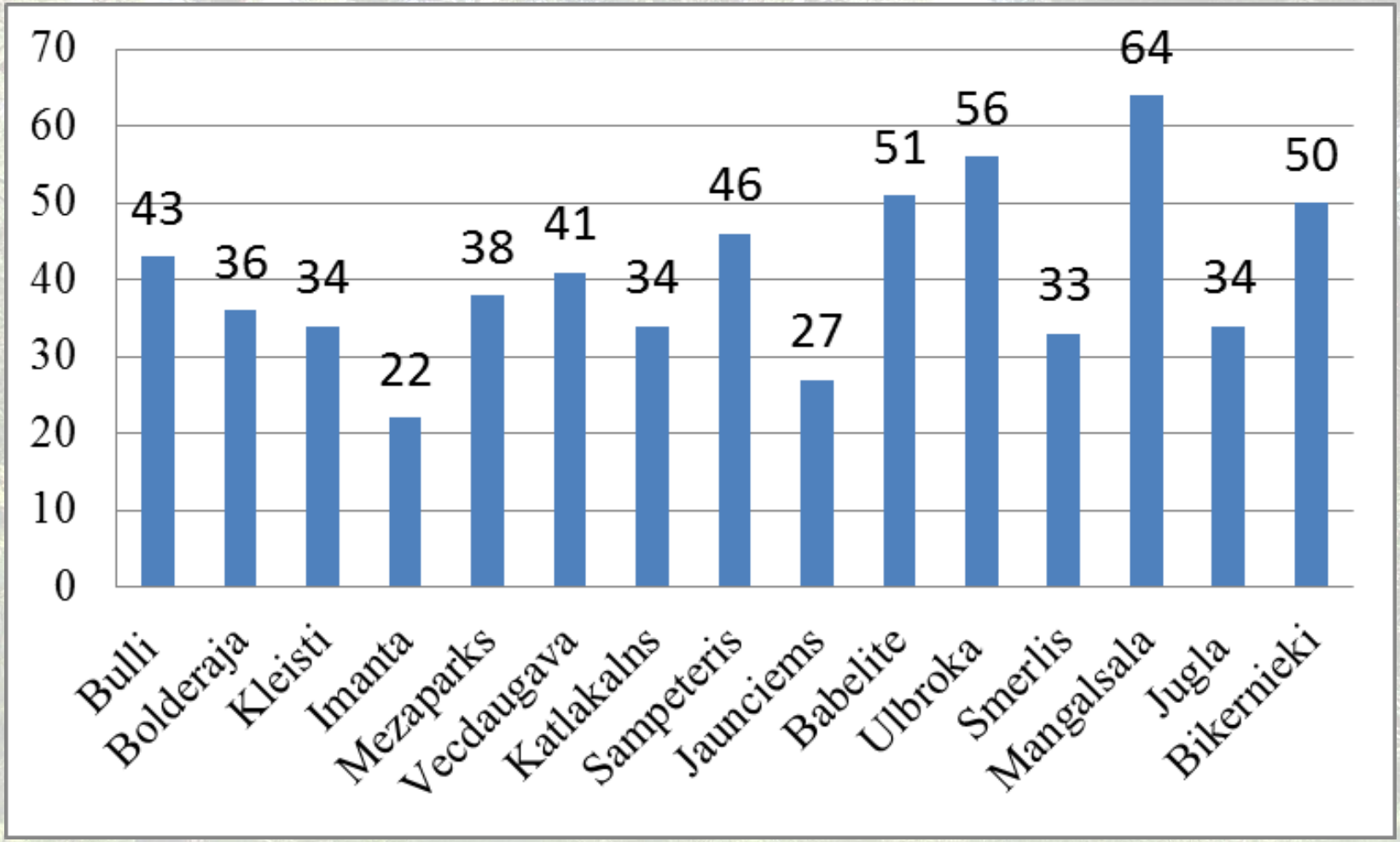
# The number of species

In Riga urban pine forests in total:

- 154 vascular plant species
- 18 moss species



# The number of species



# The coefficient of occurrence and constancy class

The coefficient of occurrence and constancy class show how stable a species is in a particular habitat: the higher constancy class, the more stable position the species occupies in the plant community

- The researched plots are located in anthropogenically impacted forests, therefore the tendency of species inconstancy has been observed

# The occurrence of species (constancy)

The most often (constancy class V) found tree species is *Pinus sylvestris* and shrub species are *Sorbus aucuparia and Amelanchier spicata*

There are neither herbaceous plant nor moss species in this class

Photo-N.Prieditis

# The occurrence of species (constancy)

In the constancy class IV *Quercus robur*, *Acer platanoides* and *Frangula alnus* in the shrub layer...

Photo-N.Prieditis

# The occurrence of species (constancy)

...and herbaceous species *Luzula pilosa*, *Lerchenfeldia flexuosa*, *Fragaria vesca*, *Rubus idaeus* are observed.

Photo-N.Prieditis

# The occurrence of species (constancy)

The results obtained show that in forest ecosystem the layers of herbs and mosses respond most sensitively to different unfavourable disturbances

Low level of constancy may be indicative of two reasons:

- the species has just been established and will be developed in the future
- it will be suppressed by other species and cast out of the plant community

# The occurrence of species (constancy)

In the pine forests the species with low constancy are typical meadow species

It should be taken into account that after the disturbance succession starts in the forest.
As a result of that the plant communities which are similar to the previous vegetation are restored.
Therefore long-term monitoring is required to precisely characterise the conditions of forest vegetation.

# The occurrence of species (constancy)

The pine and spruce forest species are the most commonly found

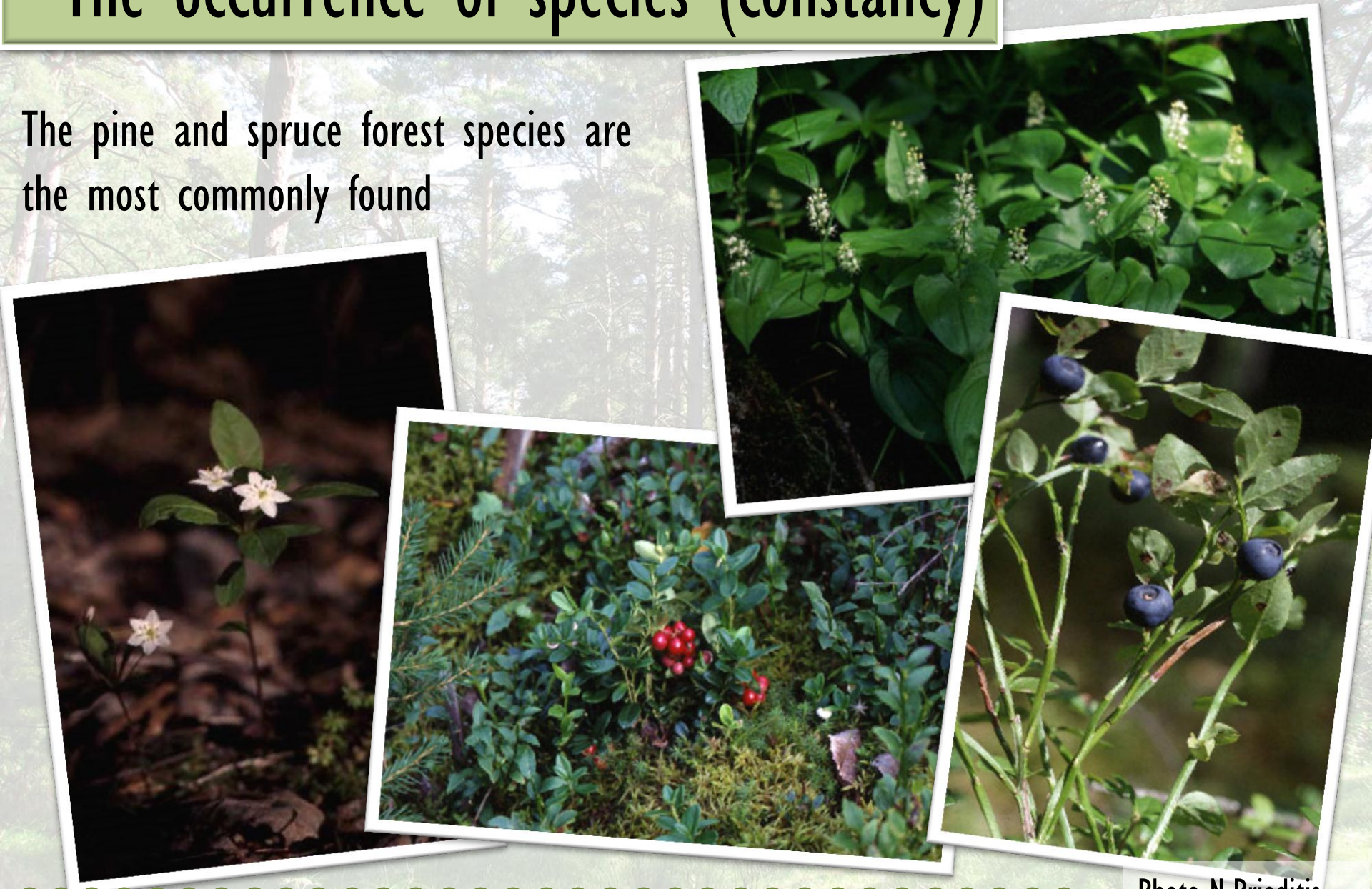


Photo-N.Prieditis

# The occurrence of species (constancy)

- The species introduced in Latvia such as *Amelanchier spicata*, as well as adventive species *Impatiens parviflora* have been naturalized in urban forests

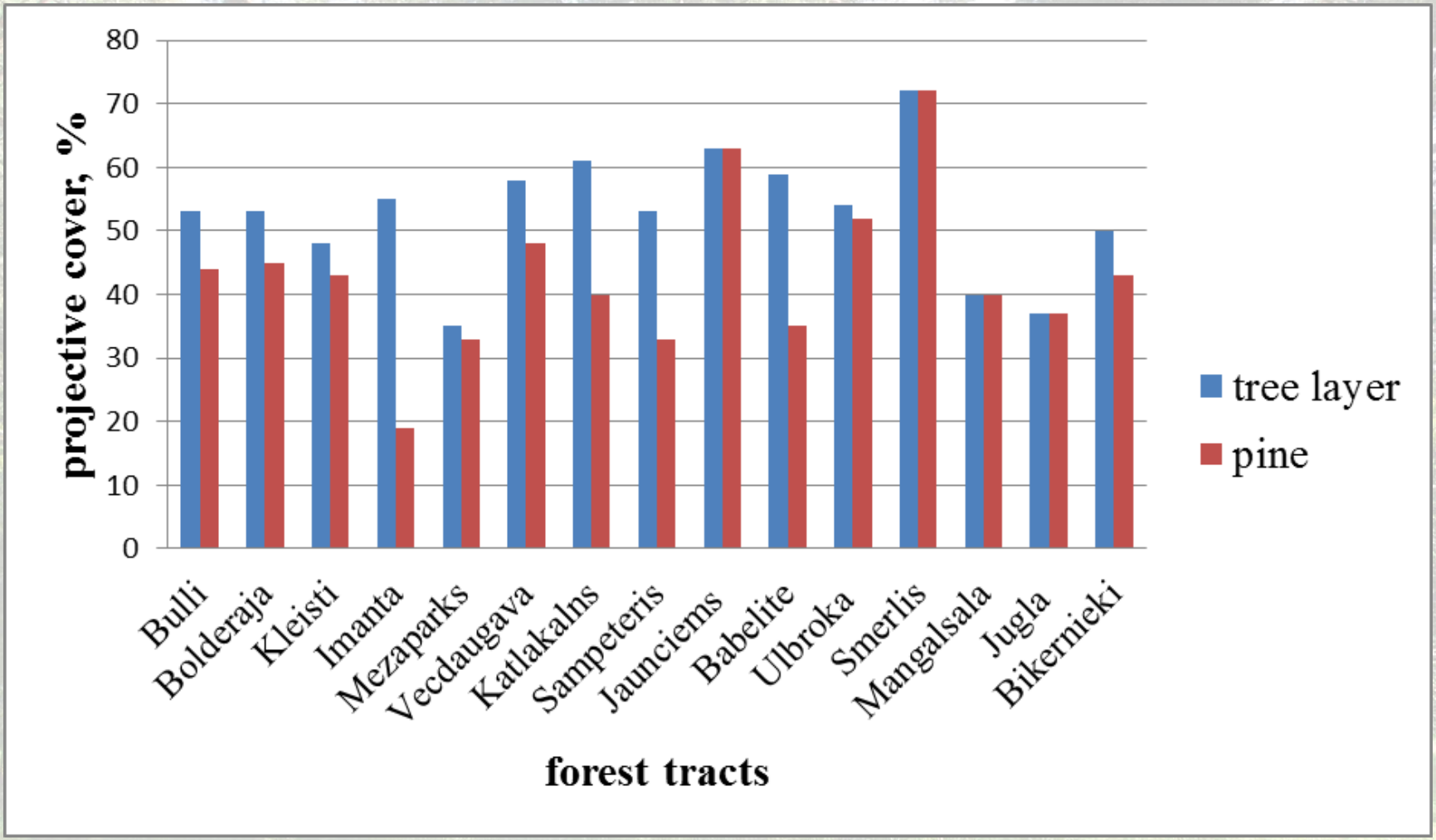
Photo-N.Prieditis

# The occurrence of species (constancy)

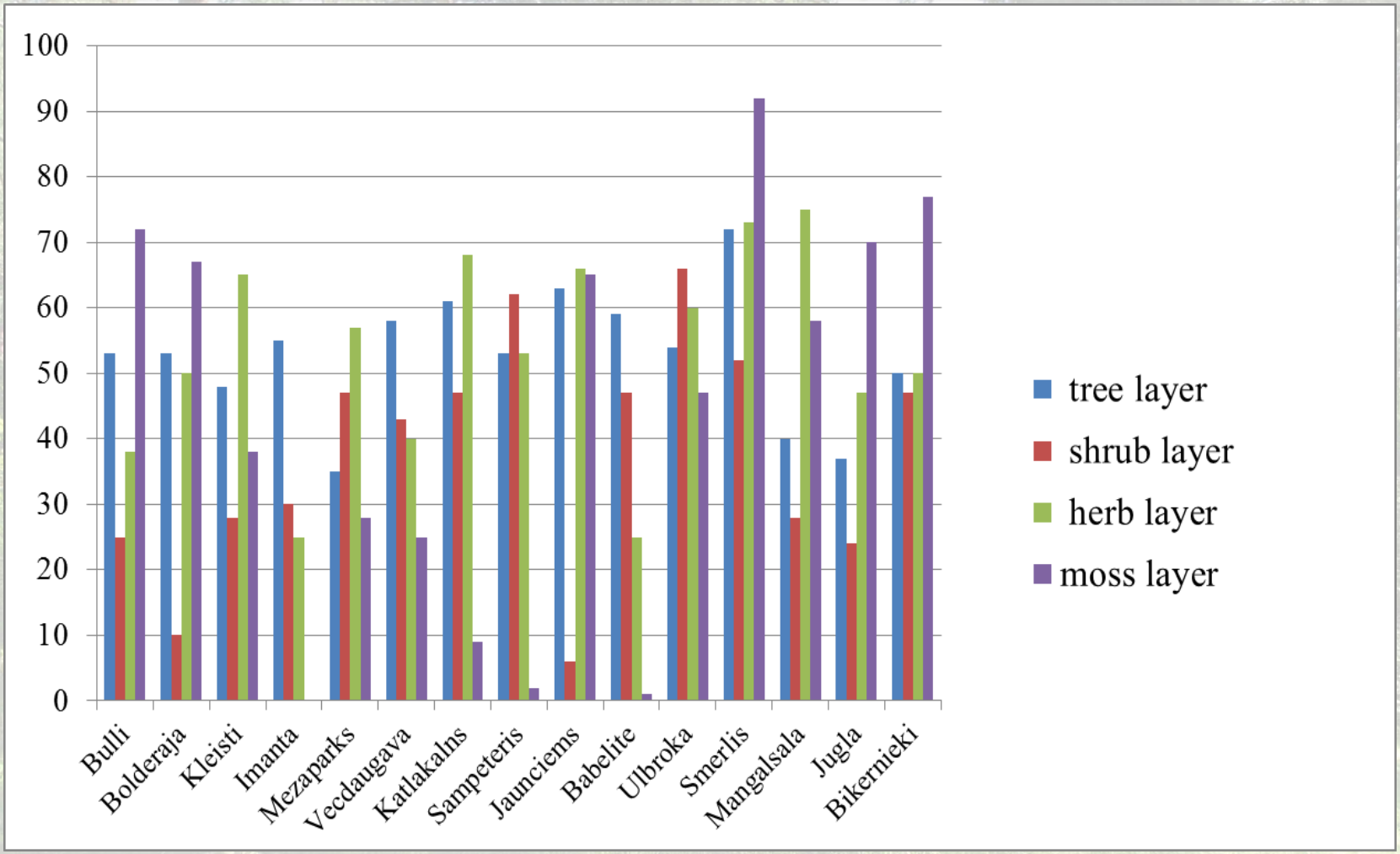
- The species *Chamaenerion angustifolium, Fragaria vesca* and *Rubus idaeus* are rapidly developing after anthropogenic disturbances, which are connected with the improvement of light conditions and more rapid decomposition of nutrients in such places

Photo-N.Prieditis

# The comparision of projective coverage (%) of tree layer and *Pinus sylvestris*



# The projective coverage of layers *Myrtillosa* type pine forests in Riga



# The projective coverage of layers

- In several forest tracts the shrub layer is very dense: it can been seen that fruitification has taken place.

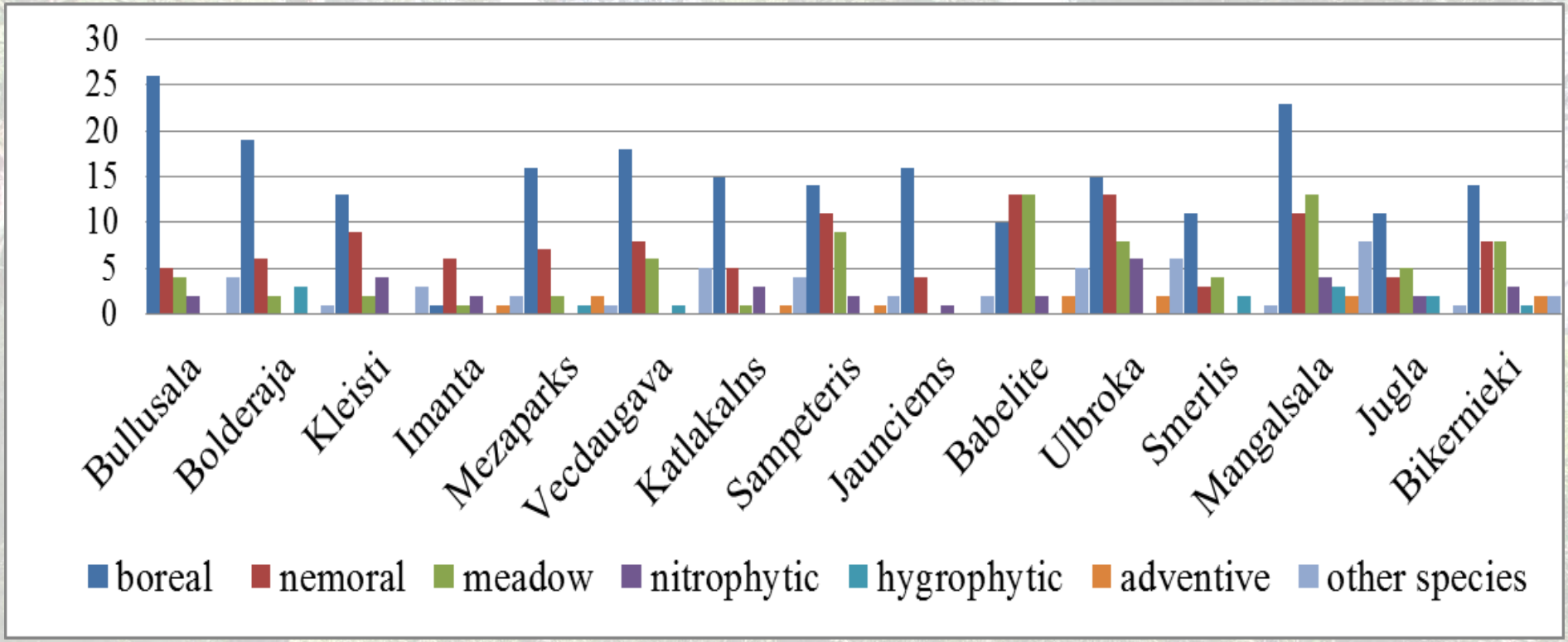
- It shows gradual expansion of shrub communities and deciduous forests in the territory of Latvia, which is connected with climate changes and enrichment of the environment with nutrients, especially with nitrogen.

# The projective coverage of layers

- A dense undergrowth hinders not only forest regeneration, but it also makes the forest stands uniform, out of full vision, impenetrable and unsuitable for recreation.

- In these places it is advisable to carry out such activities as thinnings and partial cutting of undergrowth to improve the landscape.

# The functional groups of plants



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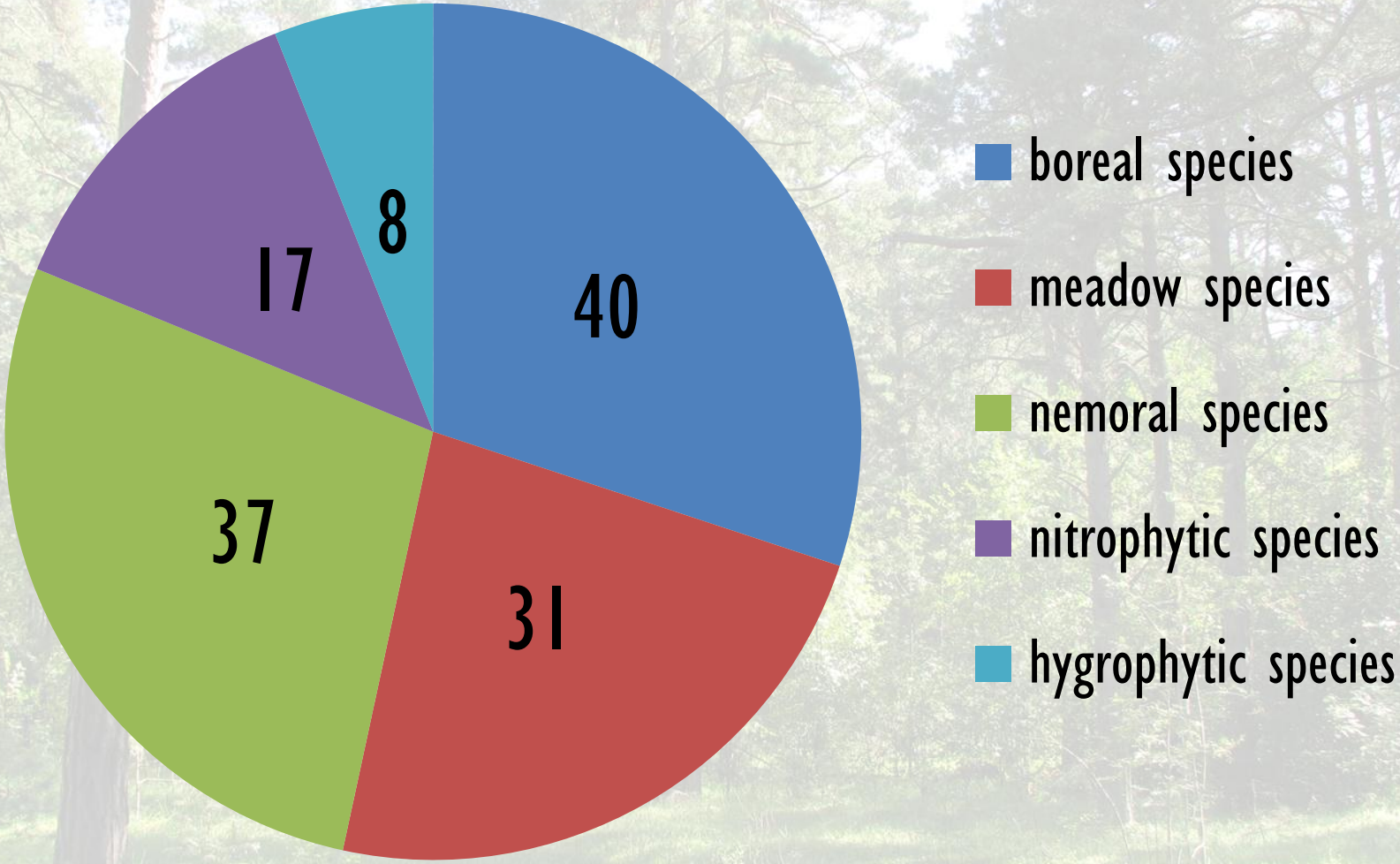


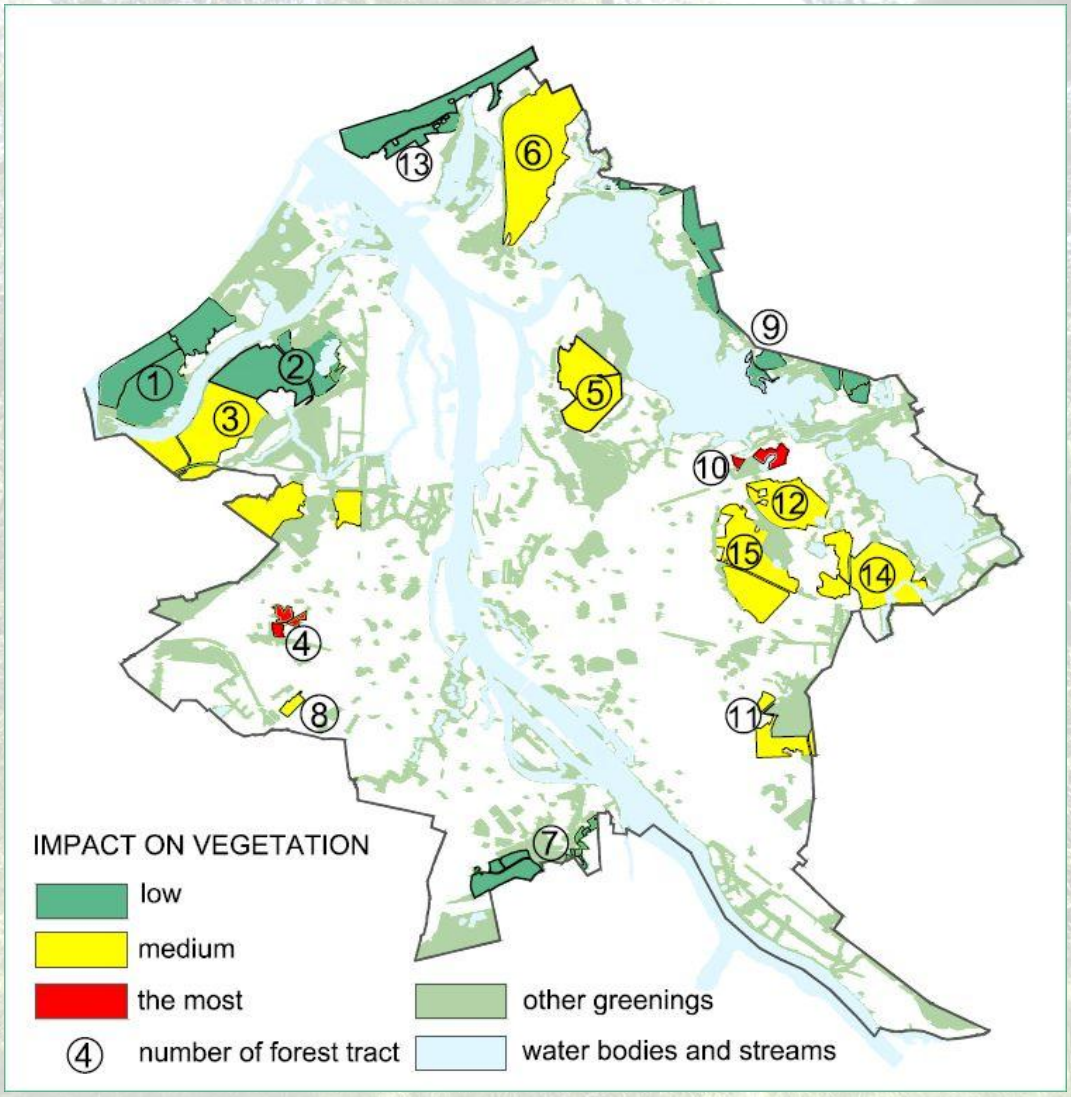
# The moss layer

- In the moss layer 18 species are found
- most species-

*Dicranum polysetum,*
*Dicranum scoparium,*
*Hylocomium splendens,*
*Plagiomnium affine,*
*Plagiomnium undulatum,*
*Pleurozium schreberi,*
*Polytrichum juniperinum,*
*Ptilium crista-castrensis,*
*Rhytidiadelphus squarrosus*
*Rhytidiadelphus triquetrus*

are characterized by poor sand soils in coniferous and coniferous-deciduous forests

# Antropogenic impact on vegetation



# The further research

- The further research of forest vegetation needs to be done, modelling the distribution of visitors in forest tracts for different distances by using of GIS technique.

- It would be potential to interpret results of forests' ecological and social functions as well as to develop more advanced management of urban forests.

# Thank you for attention!

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