PINE FORESTS IN LABIN'S YESTERDAY - TODAY - TOMORROW

GLOBE GROUP
SECONDARY SCHOOL MATE BLAZINA LABIN,CROATIA

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Abstract

We decided to reinvestigate pine forests. We assumed that twenty years is a enough period in life of the forest and changes will be visible.
QUESTIONS: How old are the pine forests? What is the state of pine forests today and what is their future?
Work is divided into two parts: fieldwork at six locations, we determined coordinates, cover, age, degree of damage, and took samples of soil and needles, which we analyzed in the second part. In work, we used GLOBE protocols and instructions of the FORESTRY INSTITUTE, Zagreb.
Through research, we confirmed our assumptions and got answers to questions:
The pine forests of Labin are in a worse condition, because the level 3 and 4 damage has increased significantly.
The oldest forest is at the Pineta, it was planted 120 years ago, age in the other locations corresponds to the development of Podlabin and Rabac.
Sources of soil and air pollution are not significant for damage of forests.
In the past period, a series of human activities reduced the area of forests.
It has been noted that human care for forests is not enough considering the values that are obtained from them, so we believe that this is the biggest reason for the decline of pine forests in our area.
We will monitor activities related to the preservation of our forests.

Research Question

OUR RESEARCH QUESTIONS:
How old are the Labina pine forests?
What is the state of the Labina pine forests today and what is their future?

OUR HYPOTHESIS
We assumed that twenty years is a long enough period in the life of the forest and that changes will be visible.
We think that the condition of the forests will be worse because of many human activities in the past period.

Introduction

Forests occupy 40% of the vegetation surface of the Earth, and their role in the life of the entire biosphere is invaluable.

State of the forest fund of Labinština:
Total forest area: 19076 ha
According to forest type:
85% are deciduous,
15% coniferous forest.

Research Methods

We used Globe GPS protocols to determine geographic coordinates and Globe MUC protocols for land cover classification. For soil analysis we used Globe soil protocols.
To determine the age of the trees, we used the "TREE RING" PROJECT PROTOCOL.
For analysis of pine needles and to determine the degree of damage we used proposal of the team of the FORESTRY INSTITUTE

Figure 1. Tree ring protocol

Figure 2. Needle analysis

DEGREE OF DAMAGE	PERCTENTAGE OF DAMAGE	THE APPEARANCE OF THE TREE
0	0-10%	Normally thick crown, with slightly noticable less of leaves in the lower part. If you look at the tree from the bottom, the crown appers almost intransparent.
1	11-25%	The fall of the needles starts inside out in the lawer and middle part of the crown. Dry twigs appear in the lower part looking along the trunk the crown looks partly transparent.
2	26-60%	The needles appear to be more numerous in the lower and middle part of the crown. At the bottom of the crown same thicker dry branches appear. There are dry twigs over the whole cramn. Looking aside the structure can be seen. Looking along the trunk, the crown appears transparent to its top.
3	61-99%	There are numerous needles and a certain number of dry twigs over the whole crown. There are some thicker dry branches at the bottom and in the middle of the crown. The structure can be seen clearly. There are green sprouts only on top.
4	100%	Completely dry tree.

Figure 3. Crown damage

Results

Table 1. Data of measurement locations

LOCATION	LATITUDE-N	LONGITUDE-E	ALTITUDE- m	AREA -m^2
1. PINETA	45.0875°	14.1254°	234	29912
2. STARCI	45.0940°	14.1126°	157	1000
3. MUP	45.0953°	14.1212°	225	3132
4. VODOVOD	45.0888°	14.1134°	204	2000
5. LANTERNA	45.0752°	14.1660°	32	7353
6.GIRANDELLA	45.0786°	14.1702°	37	7846

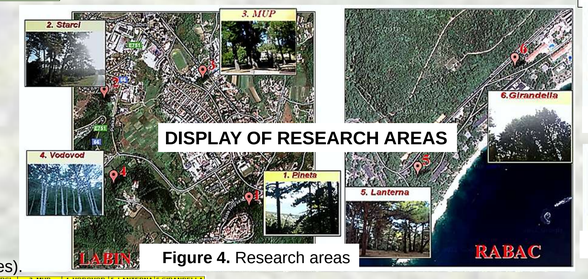


Figure 4. Research areas

Table 2. MUC code

LOCATION	TYPE OF PINE	MUC
1. PINETA	*Pinus nigra*	1121
2. STARCI	*Pinus nigra*	1121
3. MUP	*Pinus nigra*	1121
4. VODOVOD	*Pinus nigra*	1121
5. LANTERNA	*Pinus halepensis*	1121
6.GIRANDELLA	*Pinus halepensis*	1121

Table 3. Analysis of plant material (needles).

LOCATION	1. PINETA		2. STARCI		3. MUP		4. VODOVOD		5. LANTERNA		6.GIRANDELLA	
INDICATOR	2003.	2023.	2003.	2023.	2003.	2023.	2003.	2023.	2003.	2023.	2003.	2023.
pH-value	5,5	7,2	5,5	6,0	6,5	6,0	6,5	6,5	6,0	6,0	6,5	6,0
Nitrates Nitrites mgL^{-1}	0	0	0	0	0	0	0	0	0	0	0	0
Sulfates mgL^{-1}	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200	<200
Iron mgL^{-1}	0	0	2	3	3	0	1	1,5	2	1,5	2	
Lead mgL^{-1}	0	0	0	0	0	0	0	0	0	0	0	0
Mercury mgL^{-1}	0	0	0	0	0	0	0	0	0	0	0	0

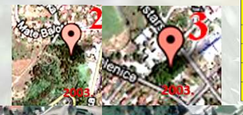
Table 4. The age of the forest

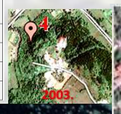
LOCATION	1. PINETA	2. STARCI	3. MUP	4. VODOVOD	5. LANTERNA	6. GIRANDELLA
AGE (year)	124,3	63,3	93,0	54,3	53,0	52,0

Table 5. Physical and chemical soil properties

LOCATION	1. PINETA		2. STARCI		3. MUP		4. VODOVOD		5. LANTERNA		6.GIRANDELLA	
INDICATOR	2003.	2023.	2003.	2023.	2003.	2025.	2003.	2025.	2003.	2025.	2003.	2025.
Distribution % Clay Sand Silt	67,8 27,8 4,4	72,9 26,9 1,1	82,3 16,6 2,2	82,0 16,7 2,3	87,9 27,7 4,4	87,3 27,6 4,6	86,5 25,0 6,6	86,0 25,6 6,6	81,8 16,2 2,2	81,6 16,2 2,2	60,0 34,4 4,6	60,3 34,1 4,6
Type of soil	clay	clay	clay	clay	clay	clay	clay	clay	clay	clay	clay	clay
Porosity %	48	46	45	44	60	60	62	66	44	46	44	46
Contents of carbonate %	< 1	< 1	1-5	1-5	< 1	< 1	1-5	1-5	1-2	1-2	1-5	1-5
Contents of humus %	< 1	1-2	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1	< 1
pH-value	6,5	7,1	7,0	7,4	6,5	6,8	6,0	6,5	6,0	6,5	6,0	6,5
Ammonium as NH_4^+ mgL^{-1}	5	1,0	10	5	10	5	0	5	5	5	7	5
Nitrates / Nitrites as N mgL^{-1}	11,4	10,9	6,65	6,62	11,4	11,4	2,27	2,27	1,14	2,27	2,27	2,27
Phosphates as P mgL^{-1}	3,26	3,06	1,63	1,63	1,63	1,63	3,26	3,26	3,26	3,26	3,26	3,26
Potassium mgL^{-1}	0	10,0	0	60	100	100	100	100	150	150	60	60
Chlorides mgL^{-1}	0	0	0	0	0	0	0	0	0	100	0	100
Sulfates mgL^{-1}	>400	<200	>400	<200	>400	<200	>400	<200	300	<200	>400	<200
Copper mgL^{-1}	0	0	1	1	5	1	0	0	5	5	2	2
Iron mgL^{-1}	0	0	1,5	2	0	1,5	3	3	1,5	1,5	1,5	1
Lead/ Mercury mgL^{-1}	0	0	0	0	0	0	0	0	0	0	0	0

The following photos (Figure 5 to 10) show the changes on the surfaces of pine forests and the reasons for their occurrence.





The area remained the same, the damage to the trees increased.

The area was reduced due to the construction of the shopping center, the damage to the trees increased.

The forest was visited for the purpose of decorating the monument to the Miner.

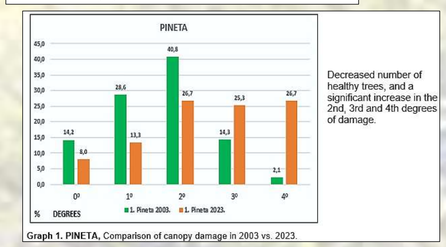
The area has decreased due to the construction of roads, the damage to trees has increased.

The area has been reduced due to the construction of the tourist complex, the damage to the trees has increased.

The area has been reduced due to the construction of the tourist complex, the damage to the trees has increased.

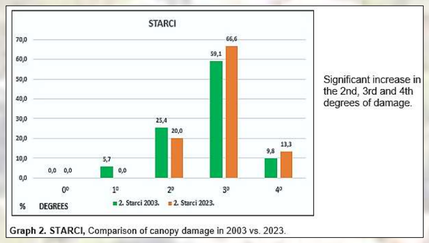
DETERMINING THE DEGREE OF TREE DAMAGE

A **total of 833 trees** were inspected.
In 2003, 448 trees were inspected,
in 2023. 388 trees were inspected in the same locations and the results were compared. The graphs show the degrees of damage at locations and the condition after twenty years.



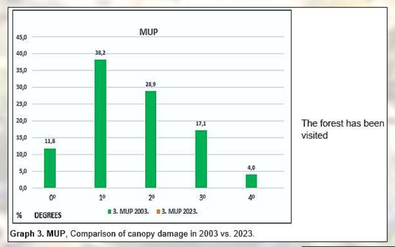
Graph 1. PINETA, Comparison of canopy damage in 2003 vs. 2023.

Decreased number of healthy trees, and a significant increase in the 2nd, 3rd and 4th degrees of damage.



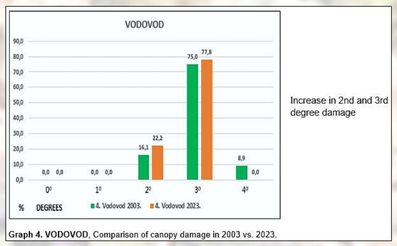
Graph 2. STARCI, Comparison of canopy damage in 2003 vs. 2023.

Significant increase in the 2nd, 3rd and 4th degrees of damage.



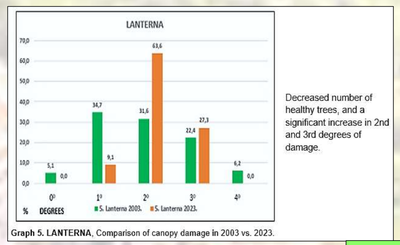
Graph 3. MUP, Comparison of canopy damage in 2003 vs. 2023.

The forest has been visited



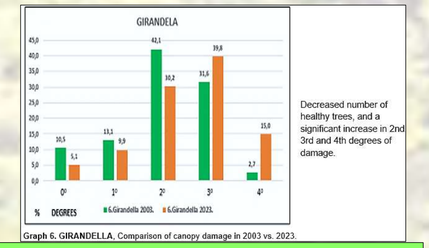
Graph 4. VODOVOD, Comparison of canopy damage in 2003 vs. 2023.

Increase in 2nd and 3rd degree damage



Graph 5. LANTERNA, Comparison of canopy damage in 2003 vs. 2023.

Decreased number of healthy trees, and a significant increase in 2nd and 3rd degrees of damage.



Graph 6. GIRANDELLA, Comparison of canopy damage in 2003 vs. 2023.

Decreased number of healthy trees, and a significant increase in 2nd and 3rd and 4th degrees of damage.

Conclusions

Through research, we confirmed our assumptions and got answers:

- The pine forests of the city of Labin are in a worse condition than twenty years ago, because the level 3 and 4 crown damage has increased significantly.
- The oldest forest is at the Pineta location in old Labin, it was planted more than 120 years ago, while the age of the forests in the other locations corresponds to the development of the mining Podlabin and tourist Rabac.
- Sources of soil and air pollution are not significant.
- In the past period, a series of human activities reduced the area of forests and the number of trees.
- It has been noted that human care for forests is not enough considering the values that are obtained from them, so we believe that this is the biggest reason for the decline of pine forests in our area.

Discussion

For a karst area like ours, the protective role of the forest is very important.
The vision of the City of Labin is defined as follows:
"Labin is a city of preserved traditional values, historical and natural heritage, prosperous and social development that continuously raises the quality of life - a city tailored to man"

Figure 11. Announcement of the renovation of Pineta forest

ASSOCIATES ON THE PROJECT:
- FORESTRY INSTITUTE, ZAGREB
- CROATIAN FORESTS, LABIN
- CITY OF LABIN

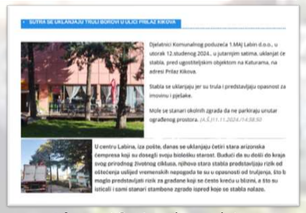


Figure 12. Regular maintenance

Bibliography

1. GLOBE GPS PROTOCOL, https://www.globe.gov/documents/356823/11572602/GPS+Protocols.pdf/6723169a-8b4c-449b-8755-e057be7693a3.
2. GLOBE MUC PROTOCOL, https://www.globe.gov/documents/3550050/5a2ab7cc-2fdc-41dc-b7a3-59e3b110e25f.
3. GLOBE SOIL PROTOCOL, https://www.globe.gov/web/soil,
4. GLOBE PROTOCOL- TREE RING, https://www.naturfagsenteret.no/c1761334/artikkel/vis.html?tid=1823025&within_tid=1783505
5. KUŠAN, V., I dr. 1991: IZGLED OŠTEĆENIH STABALA JELE, SMREKE I BUKVE, HRVATSKO EKOLOŠKO DRUŠTVO I UPRAVA SUMA DELNICE, *KUŠAN, V., et al. 1991: Appearance of damaged fir, spruce and beech trees.* https://www.sumari.hr/biblio/pdf/14002.pdf
6. PRAVILNIK O NAČINU MOTRENJA OŠTEĆENOSTI ŠUMSKIH EKOSUSTAVA, NN 67/2010.,*Rulebook on the method of monitoring damage to forest ecosystems* https://narodne-novine.nn.hr/clanci/sluzbeni/2010_05_67_2069.html.
7. PROJEKT UKUPNOG RAZVOJA GRADA LABINA 2008.-2018., *Project of overall development of the city of Labina 2008-2018.,* https://www.labin.com/vijesti/projekt-ukupnog-razvoja-grada-labina-dokumenti-za-preuzimanje-2603
8. ŠUMARSKI INSTITUT, *Forestry Institute,* https://www.google.com/search?q=jaska.sumins.hr
9. ZAKON O ŠUMAMA, https://www.zakon.hr/z/294/Zakon-o-%C5%A1umama

Finally, pictures and a song by our member in the local dialect.