GLOBE Estonia Learning Expedition

Land cover around Varemurru

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Estonia
2022

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Abstract

The aim of our study was to gain insight into how post-glacial land uplift and soil age affect vegetation diversity. In total, we did an outdoor investigation for a day on August 10th 2021 near the Varemurru Holiday Center.

We made different observations and identified the plants in two different measurement sites, where the area of both research sites was 1250 m^2. It should be mentioned that the results were quite different and that surprised us all.

As a result, the vegetation in both places was quite similar. In addition, we found quite a few edible plants in the selected areas.

Introduction

Varemurru Holiday Center is located in Pärnu County, Western Estonia, on a coast of the Gulf of Livonia. Land cover and landscape is affected by the sea. We collected data about trees, plants to describe the land cover type in the area near Varemurru Holiday Center (Figure 1).

Figure 1. Location of the research area in Estonia.

Research questions

To investigate the land cover of the area and compare the results of different sites, we asked 3 research questions:

1. How much is the tree height affected by the growth position on the dune?
2. How much does the ground age affect plant biological diversity?
3. How does the trees' positioning on the dunes and the closeness to the sea affect tree crowns?

Research Methods and Materials

In order for us to be able to measure tree height and collect the data, we needed tools. The tools we used were:

- Compass,
- GPS receiver,
- Camera/smartphone,
- MUC Field Guide,
- Measuring tape (1,5m and 50m),
- Flags for marking (5pcs),
- Altimeter(clinometer),
- Tubular densiometer.

Plant species were identified by one of our team members based on her knowledge only. She didn't use any additional materials.

We collected data from two research areas, both of which had an area of 50 m and calculated the total area of the area, each with an area of approximately 1250 m2. "Area 1" was the place where the ice age had shaped/raised the ground more and the ground was above and beyond sea level. "Area 2" however, had less glacial influence and was closer to the sea. This is how the altitude of "Area 1" is 5 m above sea level and "Area 2" is 2 m above sea level.

Our main task was to observe and describe the surroundings and measure the trees. We measured the circumference of each tree as well as its approximate height.

In order to measure the heights of the trees, we used a clinometer (Figure 4) designed to measure the angles. We selected certain trees that were within our measurement area and looked for their tops. Then we took the clinometer, placed it at eye level, and retreated from the tree to be measured until we saw the top of the tree at a 45-degree angle. The height of the tree was the distance between the tree and the person who measured it with the clinometer.

We also measured the circumference of the same trees whose heights were measured. We measured the circumference with a 1.5m measuring tape about the height of the chest.
After we measurements we calculated the circumference and length average value.

1. We measured the size of the square by walking on a diagonal. We evaluated the ground and the canopy along the diagonals and we used a densiometer (Figure 2) to evaluate the canopy cover. After every 2 steps, we described both the canopy and the ground cover (if we can see the branches or if anything green is touching our feet).

We identified the MUC code by using the GLOBE MUC code guide. Mapping out the central point (Figure 3) is used to help define an area of research. We identified our Land Cover Sample Site. Measurements taken using the Canopy Cover and Ground Cover Field Guide. We identified the scientific classification of the plant community observed using the MUC Guide.

Figure 2. Measuring tree height with densiometer

Figure 3. Mapping a central point

Figure 4. Measuring a tree height with a clinometer

Figure 5. Measuring a tree circumference

Results

Area 1

"Area 1" was the first area where we did measurements and research. The area was sloping, with the lowest point at 5m and the highest at 9m. The ground was formed after the end of the ice age.

Not even the biggest plant experts could see that there were many species in it. There were a lot of trees and they were high and the tops barely noticeable. (Tree heights can be found in "Table 2")

We found a total of 37 species of plants (Appendix 1). There were a lot of different cover plants.

The three most common species in the "Area 1" were *Pleurozium schreberi*, pine and *Convallaria majalis*.

We also learned that the overlap of tree canopies in the first area was very high, but the overlap of the ground was also impressive. The overlap of the crowns and the ground was measured with a densiometer. (Table 1)

Area 2

"Area 2" was the second area where we did research and measurements. The ground was two meters above sea level and the ice age did not affect the area as much as "Area 1".

We identified a total of 43 plant species from the "Area 2" (Appendix 2), but we are sure that there were more of them. As most of the plants were grassy then it became difficult to identify all of them. There were significantly fewer trees than one area.There were only a few single trees and they were shriveled and small. (Hights can be found in Table 2).The three most common types of area 2 were Pine, *Galium verum* and *Crambe maritima*.

The overlap of crowns and ground was smaller compared to the first area. (Details in Table 1.)

The most dominant species of tall vegetation from both areas was pine. From “Area1” we found False Lily. Area 1 had rich ground vegetation and a lot of different spices. “Area 2” had a lot of species of graminoids. In “Area 2” we found some domestic plants such as sea buckthorn and asparagus.

The overlap of the canopy of “Area 1” was significantly greater than the overlap of “Area 2”.

If we draw an eye-catching conclusion, “Area 1” was greener and more forested than “Area 2”, which was yellower and more agricultural. On the other site however, there seemed to be more plant species and discoveries.

Table 1. Ground cover and canopy cover from both area

		canopy %	coniferous trees %	ground canopy %	graminoids %
Research Area 1	N/S diagonal	80,3	86,0	72,3	25,0
Research Area 1	E/W diagonal	71,7	98,3	78,3	22,3
Research Area 2	N/S diagonal	60,5	61,0	91,5	62,5
Research Area 2	E/W diagonal	37,0	100,0	87,0	57,5

Table 2. Heights and widths of trees from both areas

	pine tree height		circumference	
	On top of the dune 9m	Ground level 5	On the shore 2m	
"Area 1" N 58°22`19", E 23°44`16"	17,9	22,2		1,6
	17,3	23,1		1,7
	18,5	22,2		1
"Area 2" N 58°22`28", E 23°44`03"			9,2	1,13
			9,2	0,87
			14	1,17

Conclusion

We asked three research questions and based on the fieldwork we found answers to these.

1. -“How much the tree height is affected by the growth position on the dune?”-.The tallest trees were located on the ground level (5m/”area 1”) because of stable ground. Shortest trees were on the shore (2m/”area 2”), because of the unstable ground.

2. “How much does the ground age affect plant biological diversity?”-.The difference between the number of species in two areas is still quite large. In “area 2” we found 6 more species that we could not identify. There were more species in the lower area (“area 2”), which is 2m above sea level because there were more grasses.

3. “How does the trees positioning on the dunes and the closeness to the sea affect tree crowns?”

The tree crowns on the shore were wider than in the forest, because they had more room to space out.

References

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2. Maapinna tõus on tuhanded kinnistud jätnud veepiirita | Majandus | ERR
3. The GLOBE Program MUC Field Guide: https://www.globe.gov/documents/355050/355097/MUC+Field+Guide/5a2ab7cc-2fdc-41dc-b7a3-59e3b110e25f

PS:We used point 1 on the map to determine our location. We used point 2 to make clear the impact of the ice age on ourselves. Point 3 was used to determine Muc

Appendix 1. Plants in Area 1

1. Leseleht / *Maianthemum bifolium* / ***False lily of the valley***
2. Magesõstar / *Ribes alpinum* / ***Mountain currant***
3. Metshärghein /*Melampyrum* /***Cow wheat***
4. Harilik Pihlakas / *Sorbus aucuparia* / ***Rowan***
5. Harilik Tamm / *Quercus robur* / ***Common oak***
6. Piibeleht / *Convallaria majalis* / ***Lily of the valley***
7. Harilik Sarapuu / *Corylus avellana* / ***Common hazel***
8. Harilik Vaher / *Acer platanoides* / ***Norway maple***
9. Harilik Toomingas / *Prunus padus* / ***Bird cherry***
10. Laanelill / *Lysimachia europaea* / ***Arctic starflower***
11. Paakspuu / *Frangula alnus* / ***Alder buckthorn***
12. Kadakas / *Juniperus communis* / ***Common juniper***
13. Mustikas / *Vaccinium myrtillus* / ***European blueberry***
14. Piiphein / *Luzula* / ***Wood-rush***
15. Äiatar / *Knautia* / **Widow flower**
16. Põldmari / *Rubus* / ***Dewberry***
17. Raudrohi / *Achillea millefolium* /***Common yarrow***
18. Soo Kurereha / *Geranium palustre* /***Marsh cranesbill***
19. Angerpist / *Filipendula vulgaris* / ***Dropwort***
20. Lillakas / *Rubus saxatilis* / ***Stone bramble***
21. Pappel / *Populus* / ***Poplar***
22. Puju / *Artemisia vulgaris* / ***Mugwort***
23. Mesikas /*Melilotus* / ***Sweet clover***
24. Kõrvenõges / *Urtica dioica* / ***Stinging nettle***
25. Metsvaarikas / *Rubus idaeus* / ***Raspberry***
26. Kuslapuu / *Lonicera* / ***Honeysuckles***
27. Suureõieline Kellukas / *Campanula* / ***Big Bellflower***
28. Metsmaasikas / *Fragaria vesca* / ***Wild strawberry***
29. Palusammal /*Pleurozium schreberi* / ***Ed-stemmed feathermoss***
30. Mägiristik / *Trifolium montanum* / ***Mountain clover***
31. Sõnajalg / *Dryopteris* / ***Wood ferns***
32. Harilik Koldrohi / *Anthyllis vulneraria* / ***Woundwort***
33. Harilik Laanik / *Hylocomium splendens* / ***Stairstep moss***
34. Lainjas- Kaksikhammas / *Dicranum polysetum* / ***Dicranum polysetum***
35. Naat / *Aegopodium podagraria* / ***Ground elder***

36. Kask / *Betula* **/ *Birch***
37. Mänd / *Pinus sylvestris* **/ *Baltic pine***

Appendix 2. Plants in “Area 2”

1. Harilik Mailane / *Veronica officinalis* **/ *Heath speedwell***
2. Hapu oblikas / *Rumex acetosa* / ***Sorrel***
3. Angerpist / *Filipendula vulgaris* **/ *Dropwort***
4. Hobumadar / *Galium verum* / **Yellow bedstraw**
5. Harilik Pihlakas / *Sorbus aucuparia* / ***Rowan***
6. Mägiristik / *Trifolium montanum* **/ *Mountain clover***
7. Punane Ristik / *Trifolium pratense* **/ *Red clover***
8. Kadakas / *Juniperus communis* **/ *Common juniper,***
9. Harilik Saar / *Fraxinus excelsior* **/ *European ash***
10. Metsmaasikas / *Fragaria vesca* **/ *Wild strawberry***
11. Puju / *Artemisia vulgaris* **/ *Mugwort***
12. Jumikas / *Centaurea* / **American *Basket flower***
13. Põldmari / *Rubus* / ***Dewberry***
14. Kassiristik / *Trifolium arvense* / ***Rabbitfoot clover***
15. Merikapsas / *Crambe maritima* **/ *Seakale***
16. Äiatar / *Knautia* / **Widow flower**
17. Astelpaju / *Hippophae rhamnoides* / ***Sea-buckthorn***
18. Harilik Koldrohi / *Anthyllis vulneraria* **/ *Woundwort***
19. Raudosi / *Equisetum hyemale* **/ *Rough horsetail***
20. Piibeleht / *Convallaria majalis* / ***Lily of the valley***
21. Võilill / *Taraxacum* **/ *Dandelion***
22. Türnpuu / *Rhamnus cathartica* **/ *European buckthorn***
23. Soolikarohi / *Tanacetum vulgare* / ***Tansy***
24. Suureõieline Kellukas / *Campanula* **/ *Big Bellflower***
25. Raudrohi / *Achillea millefolium* **/*Common yarrow***
26. Harilik Mänd / *Pinus sylvestris* **/ *Baltic pine***
27. Harilik Vaher / *Acer platanoides* **/ *Norway maple***
28. Kibuvits / Rosa rubiginosa / **Rose**
29. Metsporgand / *Daucus carota* / ***Wild carrot***
30. Harilik Tamm / *Quercus robur* **/ *Common oak***
31. Harilik Toomingas / *Prunus padus* **/ *Bird cherry***
32. Harilik Kuslapuu / *Lonicera* **/ *Honeysuckles***
33. Valge Ristikhein / *Trifolium repens* **/ *White clover***

34. Hõbemaran / *Potentilla argentea* / ***Silver-leaf cinquefoil***
35. Tedremaran / *Potentilla erecta* / ***Potentilla laeta***
36. Aas-Seahernes / *Lathyrus pratensis* / **Yellow pea**
37. Mets tikker / *Ribes uva-crispa* / ***Gooseberry***
38. Käokannus / *Linaria vulgaris* / ***Yellow toadflax***
39. Kukehari / *Sedum* / ***Biting stonecrop***
40. Liiv-Merisinep / *Cakile maritima* / ***European searocket***
41. Rand-Ogamalts / *Kali turgidum* / ***Prickly saltwort***
42. Merihumur / *Honckenya peploides* / ***Sea sandwort***
43. Asparaagus /*Asparagus officinalis* / ***Asparagus***