Soil impact on vegetation

Beetles

GLOBE camp in Varemurru

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Photos: Ilona Fjodorova (1); Nastja Polubinskaja (2); Vaike Rootsmaa; Triine-Mirell Ämarik

Abstract

We made 3 excavations and collected samples from each of them.

We analyzed the samples and made the conclusion that soil does affect vegetation. Over a long time vegetation affects soil.

Figure 1. Us digging the first hole

Research questions and hypothesis

Soil is an important natural resource.

The disappearance of soil is a big problem in the world.

Is it possible to predict from places with different vegetation that soils will be different?

Places with different vegetation have different soil.

Research questions and hypothesis

Does flora affect the soil?

Flora affects the amount of humus in the soil.

Does the soil affect vegetation?

The thickness of the humus layer affects the amount of plants.

Research methods

3 soil excavations

measuring and describing soil horizons

soil temperature at 5 and 10 cm, plus air temperature, humidity and atmospheric pressure

soil humidity, structure

Fifure 2. Us measuring the structure of the soil

Research methods

soil warp

the amount of roots

free carbonates

MUC code

photos of surroundings

color

consistency

soil horizons pH

the amount of stones soil warp

Figure 3. Soil warp in action

Tools

Figure 4. Globisens lab-disc

shovel, soil drill, scoops

cups

destilled water

measuring pole, measuring tape

horizon markers

marker

GLOBE pedosphere datasheets

Tools

pH-paper, pH-meter

Soil Color Book

MUC-code book

Vernier and Globisens lab-disc

soil thermometer

30% vinegar

Figure 5. Vernier´s sensor

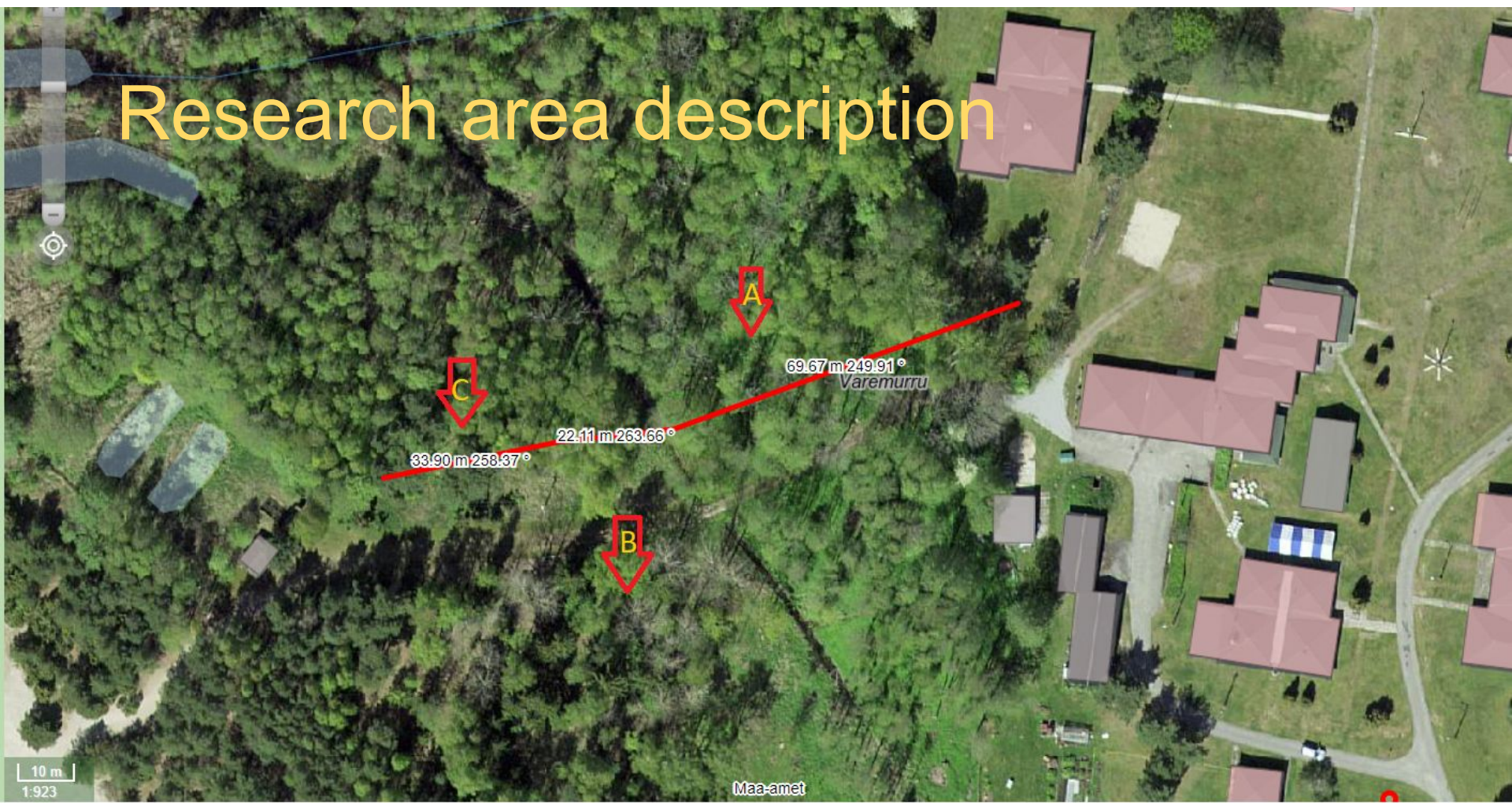


Figure 6. Location excavations

Location and weather description

Pärnumaa, Lääneranna vald, Matsi küla

The excavations were made 60-100m south-west from Varemurru recreation center’s yard.

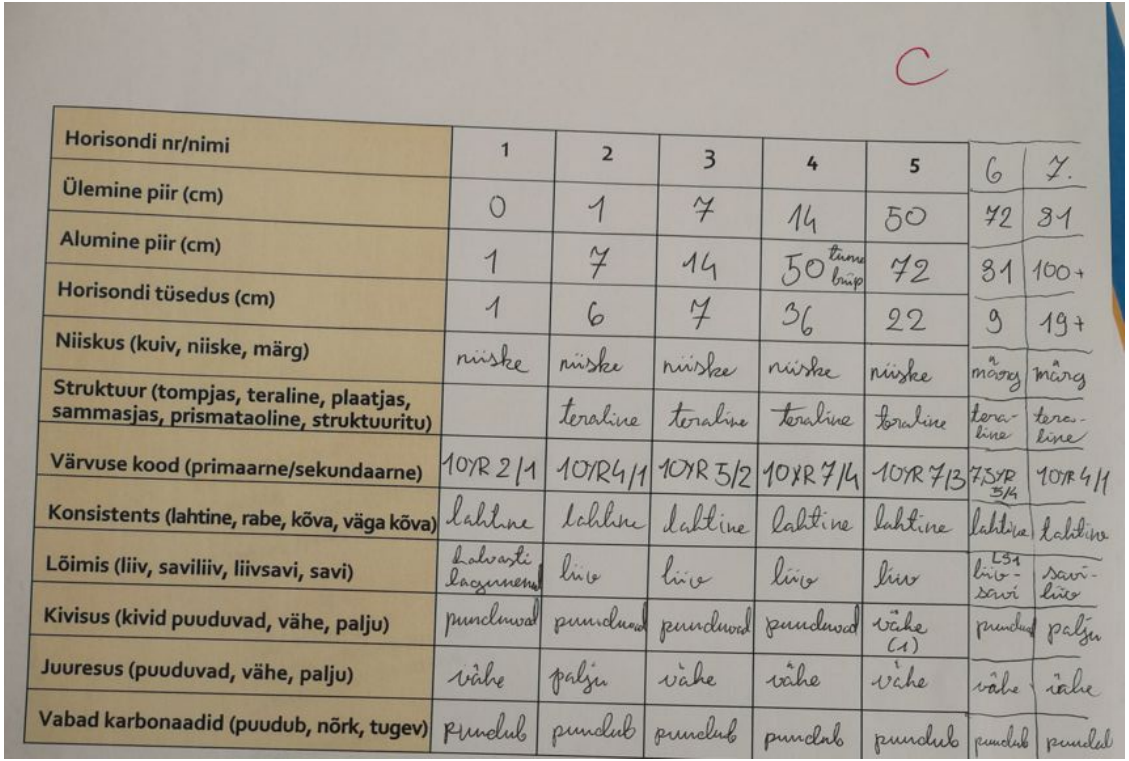
Flat; 1.5 meters above sea level

11:00 10.08.2021

Temperature 22 degrees, humidity 63%, atmospheric pressure 1018 hPa

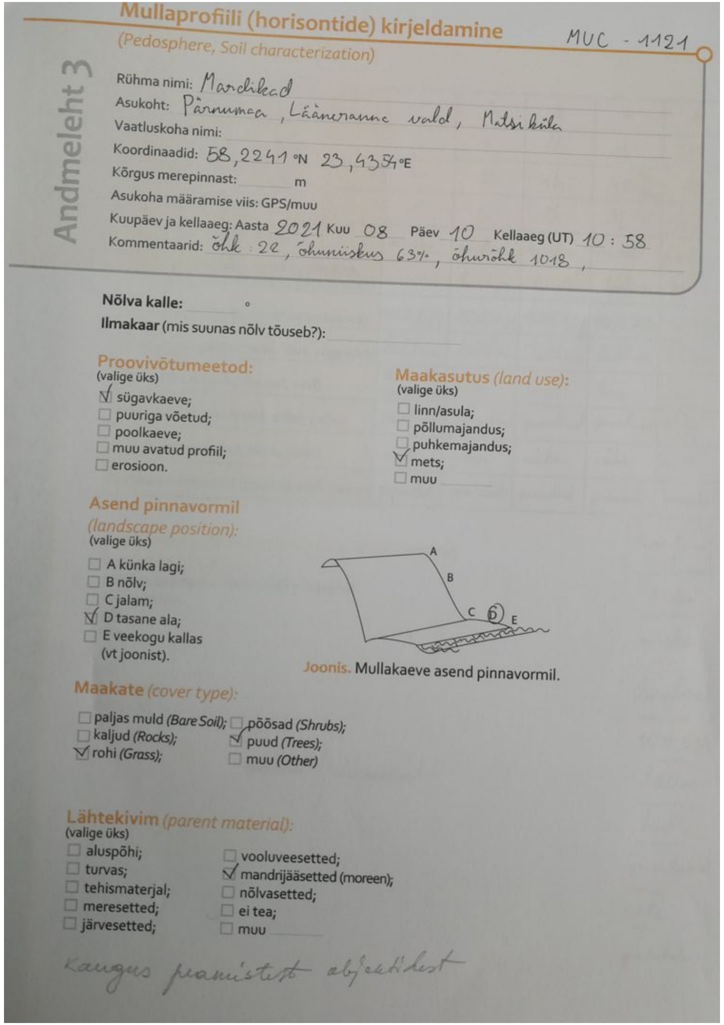
The day before was rainy.

Example of a worksheet



C

Horisondi nr/nimi	1	2	3	4	5	6	7.
Ülemine piir (cm)	0	1	7	14	50	72	81
Alumine piir (cm)	1	7	14	50 [illegible]	72	81	100+
Horisondi tüsedus (cm)	1	6	7	36	22	9	19+
Niiskus (kuiv, niiske, märg)	niiske	niiske	niiske	niiske	niiske	märg	märg
Struktuur (tompjas, teraline, plaatjas, sammasjas, prismataoline, struktuuritu)		teraline	teraline	teraline	teraline	tera-line	tera-line
Värvuse kood (primaarne/sekundaarne)	10YR 2/1	10YR 4/1	10YR 5/2	10YR 7/4	10YR 7/3	7,5YR 5/4	10YR 4/1
Konsistents (lahtine, rabe, kõva, väga kõva)	lahtine	lahtine	lahtine	lahtine	lahtine	lahtine	lahtine
Lõimis (liiv, saviliiv, liivsavi, savi)	halvasti lagunenud	liiv	liiv	liiv	liiv	LS1 liiv-savi	savi-liiv
Kivisus (kivid puuduvad, vähe, palju)	puuduvad	puuduvad	puuduvad	puuduvad	vähe (1)	puudu	palju
Juuresus (puuduvad, vähe, palju)	vähe	palju	vähe	vähe	vähe	vähe	vähe
Vabad karbonaadid (puudub, nõrk, tugev)	puudub	puudub	puudub	puudub	puudub	puudub	puudub



Mullaprofiili (horisontide) kirjeldamine MUC - 1121

(Pedosphere, Soil characterization)

Andmeleht 3

Rühma nimi: Mardikad
Asukoht: Pärnumaa, Lääneranna vald, Mätsi küla
Vaatluskoha nimi:
Koordinaadid: 58,2241 °N 23,4354 °E
Kõrgus merepinnast: m
Asukoha määramise viis: GPS/muu
Kuupäev ja kellaaeg: Aasta 2021 Kuu 08 Päev 10 Kellaaeg (UT) 10 : 58
Kommentaarid: õhk 22, õhuniiskus 63%, õhurõhk 1018,

Nõlva kalle: °
Ilmakaar (mis suunas nõlv tõuseb?):

Proovivõtumeetod: (valige üks)
- ☑ sügavkaeve;
- ☐ puuriga võetud;
- ☐ poolkaeve;
- ☐ muu avatud profiil;
- ☐ erosioon.

Maakasutus *(land use)*: (valige üks)
- ☐ linn/asula;
- ☐ põllumajandus;
- ☐ puhkemajandus;
- ☑ mets;
- ☐ muu

Asend pinnavormil *(landscape position)*: (valige üks)
- ☐ A künka lagi;
- ☐ B nõlv;
- ☐ C jalam;
- ☑ D tasane ala;
- ☐ E veekogu kallas (vt joonist).

Joonis. Mullakaeve asend pinnavormil.

Maakate *(cover type)*:
- ☐ paljas muld *(Bare Soil)*;
- ☐ kaljud *(Rocks)*;
- ☑ rohi *(Grass)*;
- ☐ põõsad *(Shrubs)*;
- ☑ puud *(Trees)*;
- ☐ muu *(Other)*

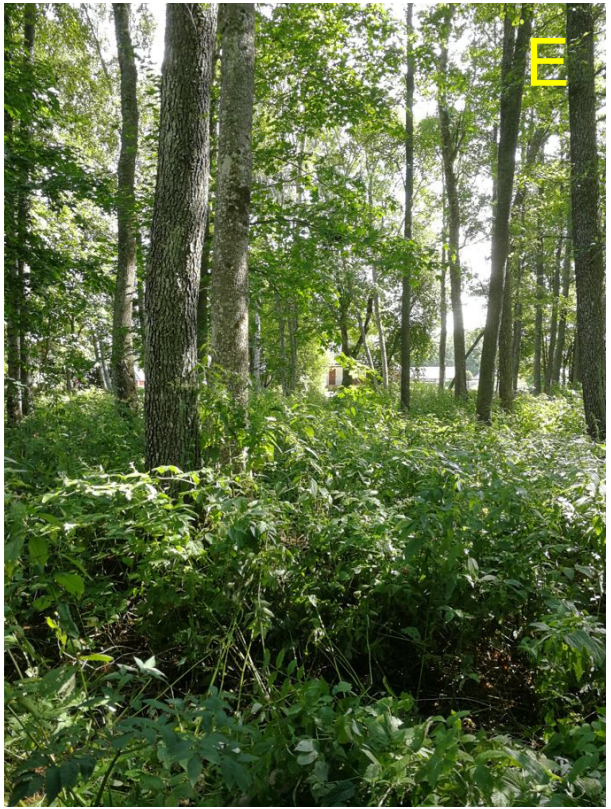
Lähtekivim *(parent material)*: (valige üks)
- ☐ aluspõhi;
- ☐ turvas;
- ☐ tehismaterjal;
- ☐ meresetted;
- ☐ järvesetted;
- ☐ vooluveesetted;
- ☑ mandrijääsetted (moreen);
- ☐ nõlvasetted;
- ☐ ei tea;
- ☐ muu

Kaugus prahistest objektidest

Figure 7. Worksheet of the C excavation

View around excavation site A

MUC 1233



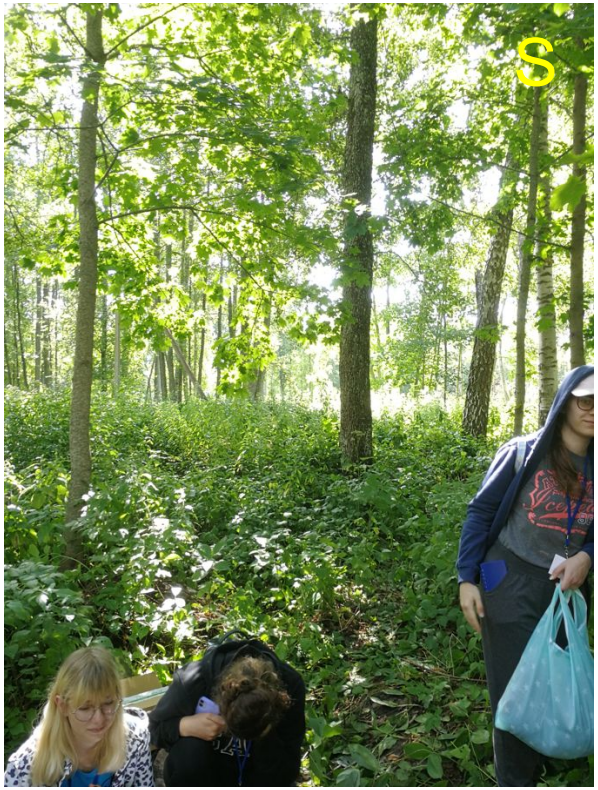


Figure 8, 9 and 10. Photos from excavation A to north, east and south

View around excavation site A

Figures 11, 12 and 13.

Excavation A - Go - leached glial soil

Figure 14. Excavation A profile

Table 1. Data of the excavation A

horizon no	1	2	3
upper limit (cm)	0	32	65
lower limit (cm)	32	65	75+
horizon thickness (cm)	32	33	10+
humidity (dry, humid, wet)	humid	humid	wet
structure		grainy	plastic clay
colour code	7.5YR 2.5/2	10YR 6/3	5B 4/1
consistence	loose	loose	friable
soil warp	t3	sand	sand clay
stoniness	little	a lot	a lot
roots	a lot	little	missing
free carbonates	missing	low	low

Figure 15. Soil drill of the bottom 70-100 cm from excavation A

Excavation A

Three differentiable horizons (crude humus (AT), sand, clay)

The humus and sand layers were humid and the clay layer was wet

The two lower horizons of the soil profile were rich in rocks and free carbonates

Lush vegetation grows on a thick layer of humus (*Betula, Populus tremula, Fraxinus excelsior, Acer platanoides, Alder, Urtica, Filipendula ulmaria, Aegopodium podagraria*)

Due to the stoniness, it was not possible to dig deeper than 75 cm with a shovel and a soil drill was used to analyze the deeper profile (continued clay horizon)

View around excavation site B

MUC 1222

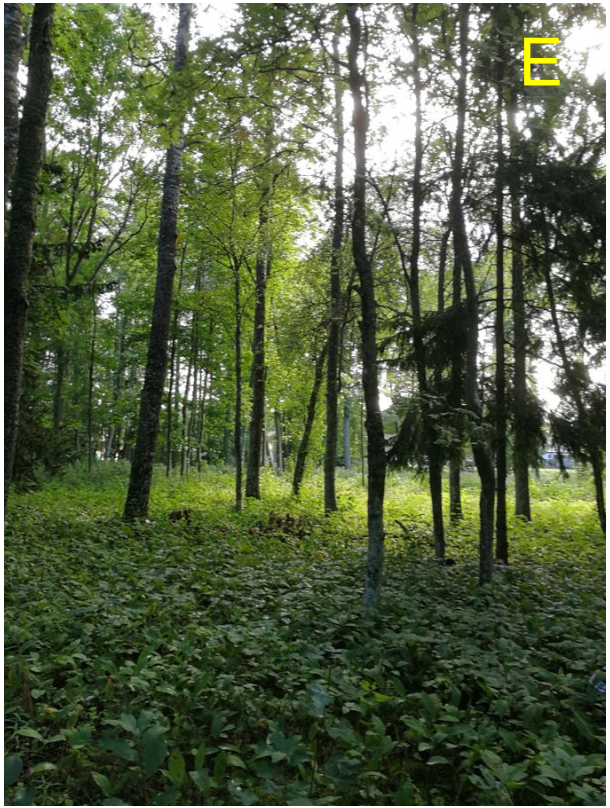


Figure 16, 17 and 18. ...

View around excavation site B

Figure 19, 20 and 21. ...

Excavation B - Kog - geysed leached soil

Table 2. Data of the excavation B

horizon no	1	2	3	4	5
upper limit (cm)	0	2	10	40	90
lower limit (cm)	2	10	40	90	100+
horizon thickness (cm)	2	8	30	50	10+
humidity (dry, humid, wet)	humid	dry	humid	humid	humid
structure		grainy	grainy	grainy	
colour code	25Y 3/2	10YR 5/3	10YR 6/4	10YR 6/4	N 2.5/
consistence	loose	loose	loose	loose	loose
soil warp	poorly decomposed	sand	sand	sand	t3
stones	missing	missing	a little (1)	missing	missing
roots	a lot	a lot	a few	missing	missing
free carbonates	missing	missing	missing	missing	missing

Excavation B

Five differentiable horizons (decay, humus, 3 different layers of sand, in the last peat stripes)

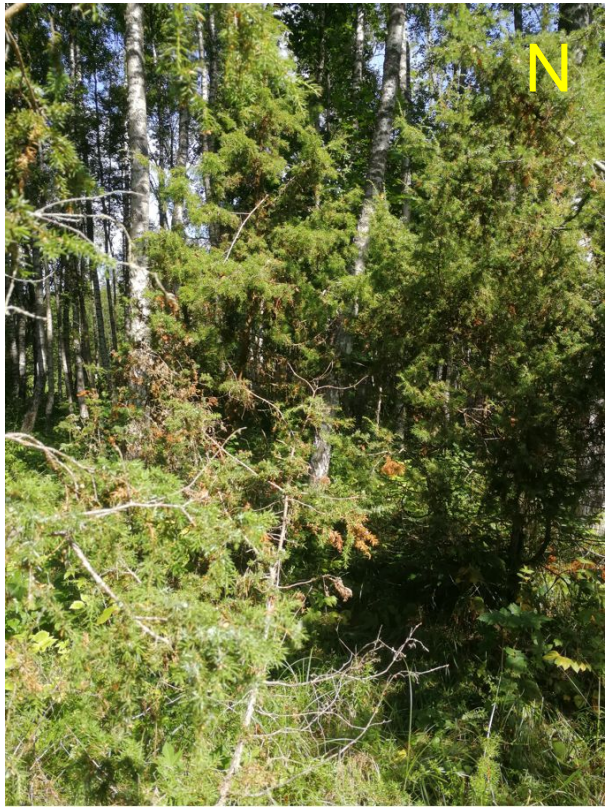
All layers except the second layer, which was dry, had wet horizons. In the metric well there was one sandstone in the third layer, which contained carbonates (there were no carbonates in the layers)

There was no shrub front and there were fewer plants than in well A (*Picea abies, Betula, Sorbus, Acer platanoides, Populus tremula, Convallaria majalis, Poaceae*)

Figure 22. Excavation B profile

View around excavation site C

MUC 1121



View around excavation site C

Excavation C - geysed leached soil

Table 3. Data of the excavation C

horizon no	1	2	3	4	4.1	5	6	7
upper limit (cm)	0	1	7	14	16	50	72	81
lower limit (cm)	1	7	14	50	48	72	81	100+
horizon thickness (cm)	1	6	7	36	2	22	9	19+
humidity (dry, humid, wet)	humid	humid	humid	humid	humid	humid	wet	wet
structure		grainy	grainy	grainy	grainy	grainy	grainy	grainy
colour code	10YR 2/1	10YR 4/1	10YR 5/2	10YR 7/4	10YR 5/4	10YR 7/3	7.5 YR 5/4	10YR 4/1
consistence	loose	loose	loose	loose	loose	loose	loose	loose
soil warp	poorly decomposed	sand	sand	sand	sand	sand	sand clay	sand clay
stones	missing	missing	missing	missing	missing	a little(1)	missing	a lot
roots	a little	a lot	a little	a little	a little	a little	a little	a little
free carbonates	missing	missing	missing	missing	missing	missing	missing	missing

Excavation C

Seven distinguishable horizons (decay, humus, 4 distinct layers of sand, moraine)

The top layers were moist and the last two wet

In the fourth layer, at 40 cm, there was a thin darker stripe

Excavation C

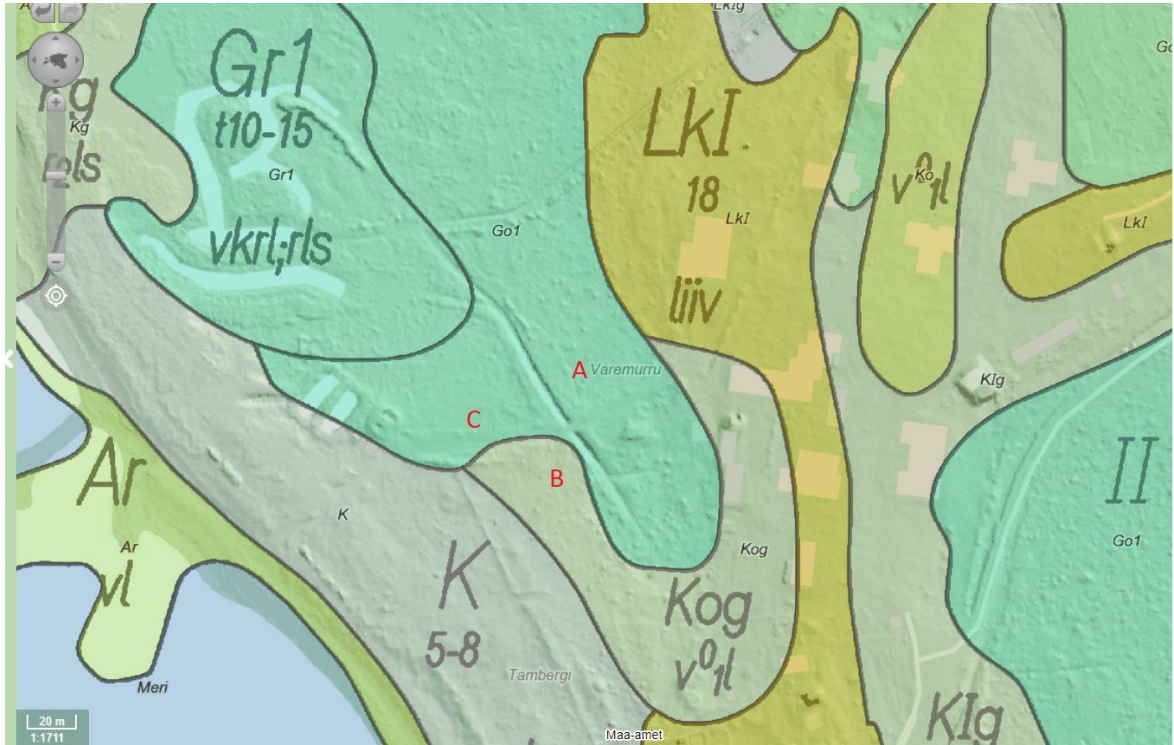
The last layer was rocky (moraine)

The vegetation was dominated by conifers (*Pinus, Juniperus communis*), the underlying vegetation is similar to well B (*Convallaria majalis, Fragaria vesca, Poaceae*)

Soils according to the soil map of Maa-amet

Excavations A and B corresponded to the soil types indicated on the soil map of the Maa-amet

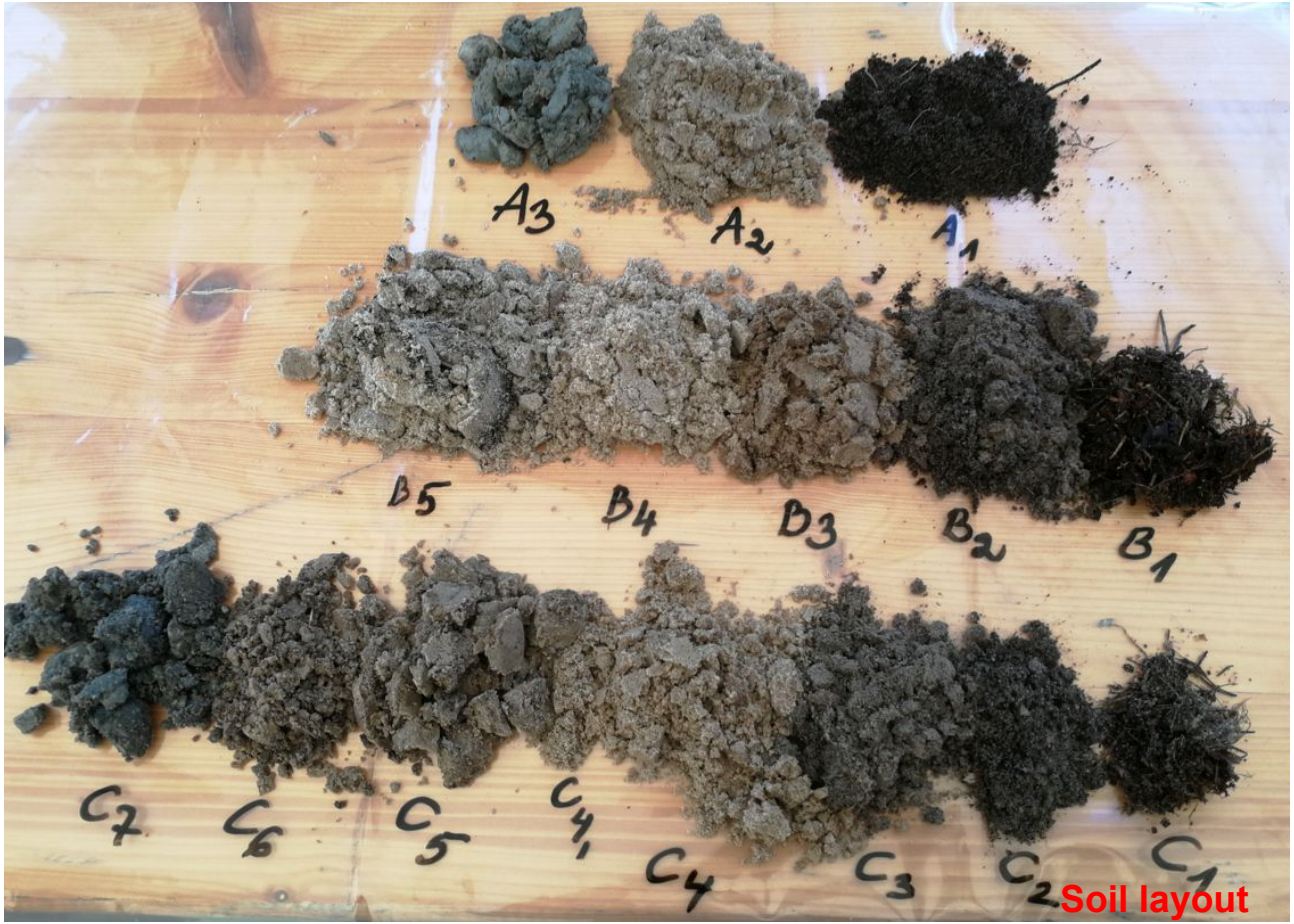
However, excavation C was more similar to the profile of excavation B, the bottom of the excavation was close to excavation A.



Comparison of excavations

Conclusion

Excavation A had a raw humus layer on top, excavations B and C had a thin layer of duff on top and a humus horizon below it.



Soil layout

Discussion

Is it possible to predict from places with different vegetation that soils will be different?

- Places with different vegetation have different soil. In our 3 excavations the plants growing on soil showed how the soils were different and how they were affected by the flora growing on ground.

Discussion

Does flora affect the soil?

- Flora affects the amount of humus in the soil. The decay contained leaves and other parts from trees and plants. The organic layer was thicker in deciduous forest.

Does the soil affect vegetation?

- The thickness of the humus layer affects the amount of plants. The type of soil defines what kind of vegetation has the ability to grow.

What could be better

New GLOBE soil colour books (old codes do not work with GLOBE data entry)

Different pH levels with different equipment (universal indicator)

Temperature measurement on different times

Sieves. the wet material was difficult to sieve, most of the particles remained on the 2.0 mm sieve

soil warp in action


GAP