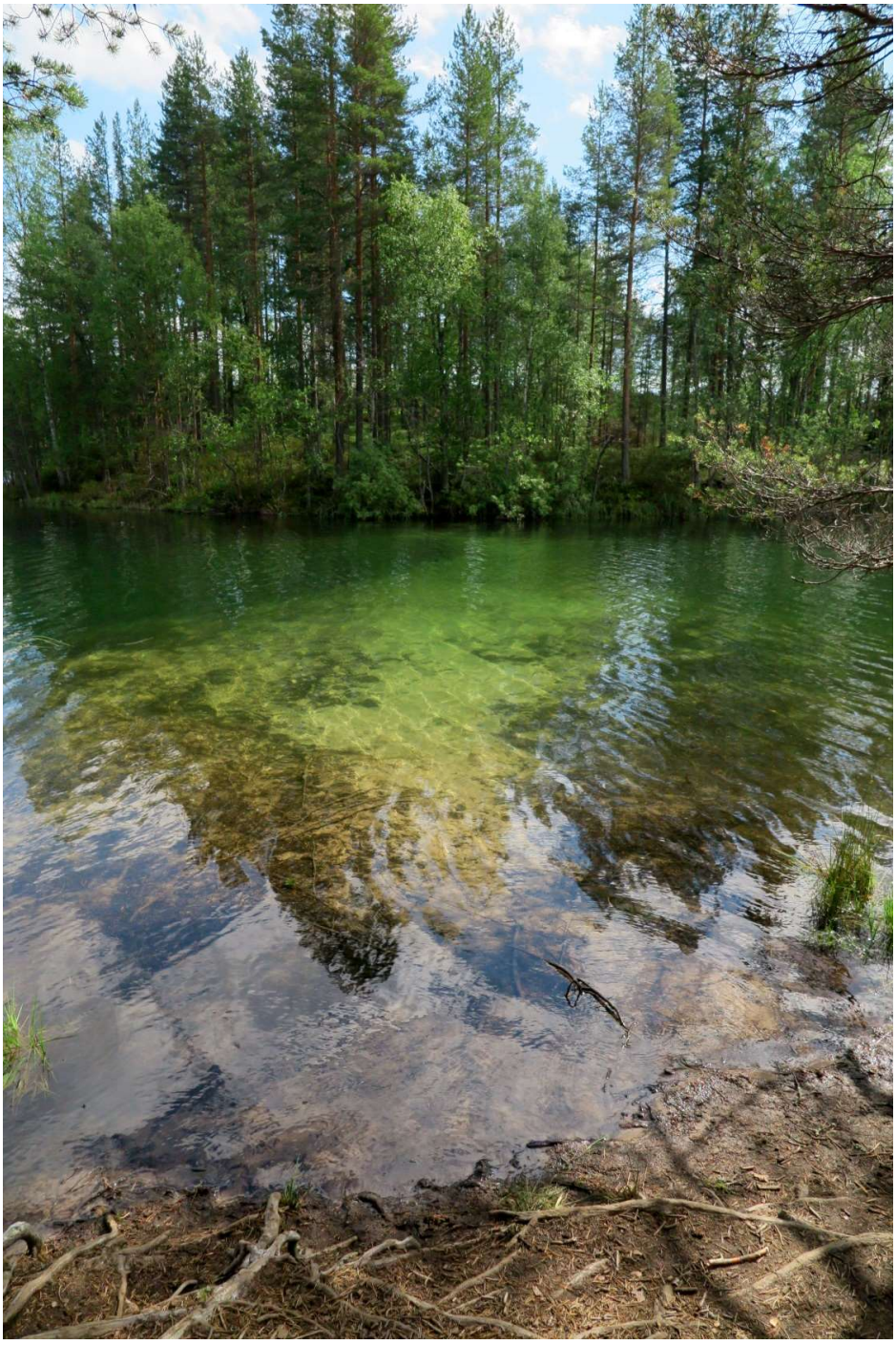
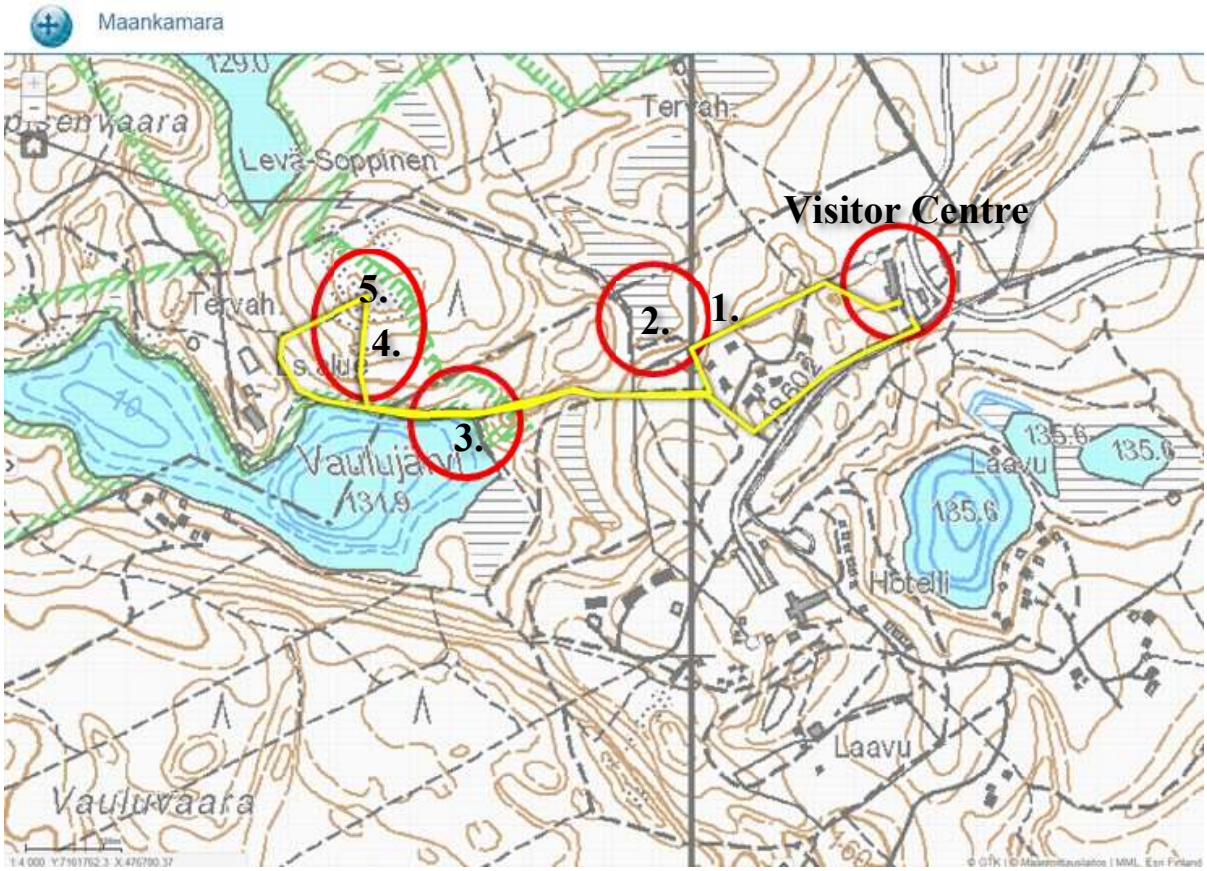
Geoheritage and water reserves

Nordplus project in Vaala 27.9.-1.10.2021



-Worksheet for Rokua-

Maps for the study sites (numbers indicating the sites)



1. THEORY

Water quality - the physico-chemical state of water

Distilled water contains only water molecules (H_2O). They are vital for life but can´t sustain it. In turn, there are several substances from atmosphere, soil and bedrock which have dissolved or mixed in natural waters and necessary for life. The dissolved and mixed substances determine the chemical quality of water appearing as color, transparency (turbidity), pH and conductivity, to mention few. Also, oxygen content, nutrient content and concentration of harmful substances ("pollutants, poisons") can be measured. Basic production in a water body is limited by temperature conditions, amount of light, pH and nutrients, of which phosphorus and nitrogen are the most important. In Finnish water bodies, there is usually a shortage of phosphorus especially in summer time. If there is enough light, heat and nutrients, the biomass of algae and cyanobacteria grows rapidly.

Acidity

The normal pH of water is close to neutral (pH = 7). Aquatic life has adapted to life in the pH range of 6.0 -8.0. Finnish water bodies are slightly acidic (6.5-6.8) due to the natural humus load of the waters and felsic (=rich in feldspar and silica) bedrock (and soil).

Conductivity

Electrical conductivity measures the concentration of dissolved salts (minerals) in water. A high value indicates a high salinity. In inland waters, electrical conductivity is mainly increased by sodium, potassium, calcium, magnesium, chlorides, or sulphates. Finnish waters are low in salinity because the bedrock is poorly weathered.

Temperature and its stratification

Water temperature is measured as a part of water quality analysis. Temperature affects to values of many water quality indicators. Temperature also determines the density of water: four-degrees-water is the densest, and the colder or warmer, the less dense the water is. That´s why there are two so called full cycles in Finnish lakes at the time when the whole water mass in the water body reaches the temperature of four degrees: the spring cycle and the autumn cycle. This is a very important phenomenon for water oxygenation.

Color and turbidity (transparency) of water

The vertical visibility in a water body is mainly affected by turbidity of the water. For example, in rivers, high erosion and sediment transport usually increase turbidity. High-nutrient water bodies turn cloudy because of strong algal growth, this might be a reason for low vertical visibility in ponds and lakes. This is indicated by greenish color of water. Yellow color usually comes from humus (acids), brownish color from iron and dark or even black color from manganese.

2. ANALYSING WATER QUALITY – SAMPLING AND MEASUREMENTS

Taking water sample:

1. Make sure, that the sample container is clean and dry.
2. Don´t touch inner surface of the container!
3. Set the container below water surface so that you don´t get water from surface layer but below it.
4. Take the sample as far away from shore as safely possible.
5. Avoid taking material from bottom in the sample.
6. When the container is full, rise it up and close it or make measurements as fast as possible, to avoid disturbing the sample.
7. Mark place, time and who took the sample if you need to pack the sample for later analysing.

Measuring temperature:

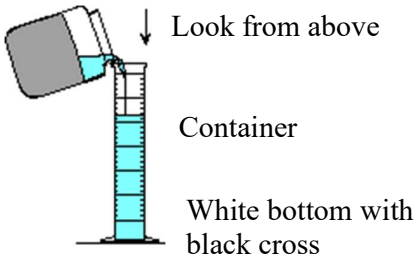
1. Measure temperature in the site with temperature indicator.
2. Keep the indicator in water few minutes.
3. Read result and write it on paper.

Measuring pH:

1. Measure pH in the site with pH paper.
2. Read value by comparing color of paper to reference colors (you´ll find them by asking the guide).
3. Remember, that temperature affects to pH value and that´s why result is different if you measure pH later from the sample.

Measuring color:

1. Fill the container with sample water.
2. Make sure that bottom of container is white.
3. Look from above and estimate color: bright, bluish green, green, yellowish green, brown, dark brown.



Good water is bright and non-coloured. In surface waters typical factors for color are natural organic acids from soil and algaes leading to brownish and greenish colors. If water is dark or even black and there seem to be coagulates, the reason is most probably manganese.

Estimating water opacty:

1. Make sure that you have white bottom in container and you can see a black cross in the bottom (length and wide 0,5 cm; line width 0,5 mm).
2. Shake your water sample.
3. Fall it in container as long as the cross stays visible. When it hides, measure depth of water pillar and mark result on paper.
4. Opacity will be determined by the following table:

Depth	Classifying
201> mm	clean
151 - 200 mm	suspicious
51 - 150 mm	poor
0 - 50 mm	polluted

3. WATER SAMPLES AND ANALYSIS IN ROKUA

A. What kind of lake is Lake Levä-Soppinen? _____

B. Water quality measurements (use instruction paper to carry out measurements):

i. Temperature: _____
ii. pH: _____
iii. Alkalinity: _____
iv. Color (circle your opinion): bright, bluish green, green, yellowish green, brown, dark brown
v. Opacity (circle your result): polluted, poor, suspicious, clean

Site 3: Groundwater

Instructions for surveying groundwater

1. Take water samples and analyze them as introduced at the surveying point.
2. Describe, how do you recognize the presence of groundwater in surroundings.

3. Ponder, where does groundwater come from and where it flows. Draw a sketch in the bow!

4. Observe and make notes, if you notice any signs of changes in groundwater level.

5. If you find a tree growing in water (part of the trunk is under the water level), take a drill sample and calculate the age of the tree. Measure also the depth of water if possible.

Tree species:	**Age:**	**Water depth:**
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

On the way and on the site 3: Landscape analyzing

Group members:

_____

_____

List the landforms that you recognize from the following points. You can use mobile apps to recognize the landforms better: - Point 1: - Point 2: - Point 3:	What kind of signs telling about the human being can you recognize around the points: - Point 1: - Point 2: - Point 3:
Imagine the landscape opening from the point 3 ca. 9000 years ago. Draw it!	

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