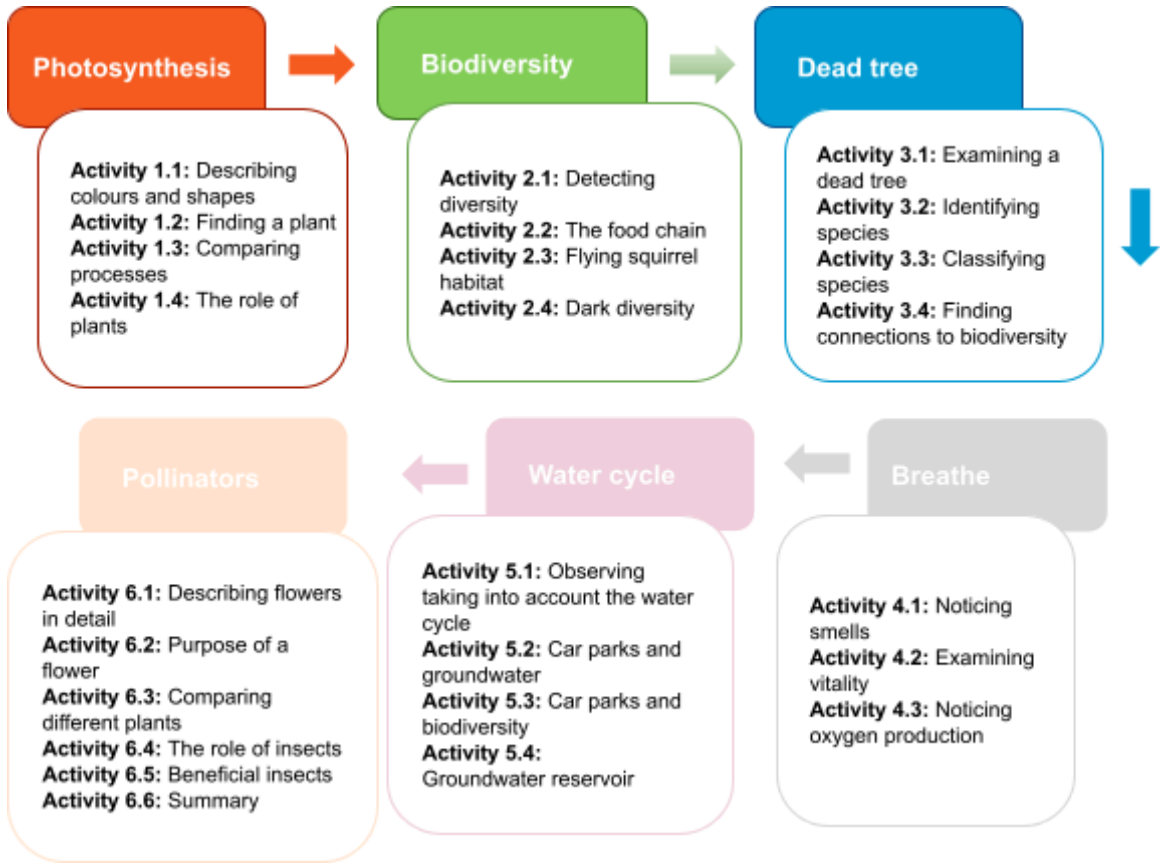
EXAMPLE TRAIL Estonia 1: Biodiversity persists through relationships and cooperation

Name of the trail:	Biodiversity persists through relationships and cooperation (Elurikkus püsib suhetel ja koostööl)
How to find it on Discovery Trail:	https://keskkonnaharidus.avastusrada.ee/admin/map/-elurikkus-psib-suhetel-ja-koostl
Screenshot:	
Developer:	Mari Kala (Environmental education specialist)
Addressed age group:	Grades 7–9
Relevant topics:	Dark diversity, pollinators, water cycle
General overview and aim:	**What is the general aim of the trail?** Getting to know the values of biodiversity from the point of view of both nature and human society **Learning goals** *The student knows:* - that biodiversity is the diversity of organisms - that the cycle of matter takes place in the nutritional relationships of biodiversity, where the living conditions of

	people are also created and the sustainability of life on Earth is ensured; - about the most important processes of wildlife and the relationships between organisms; *The student can:* - notice the diversity of life in nature and group it at the national level; - create a food chain; *The student will understand:* - that the natural cycle of matter is carried out in cooperation between producers, consumers, and decomposers and is based on the reuse of substances; - that they are also a part of nature and can contribute to nature conservation and sustainable development with well-thought-out activities every day (e.g. by reasonable consumption and avoiding waste generation). - about the most important processes of wildlife and the relationships between organisms; **Additional information:** ***Add opening and closing questions:*** **Before the trail:** What is biodiversity? How is your life connected to biodiversity? **After the trail:** You have now explored biodiversity in more depth. Please answer the question again: How is your life connected to biodiversity?

Framework conditions:	**Time:** This trail is suitable for an outdoor education day or something similar as it takes around 60–75 minutes to complete the whole trail. If discussions are held before and after the trail, it may take longer. The trail could also be divided into subsections based on the topics that are more relevant to students. **Equipment required:** Mobile phones or tablets with internet access for all participants. The trail could also be completed in groups. Then, only one device is needed per group. **Prior knowledge:** It would be good to discuss the most important processes of wildlife before going to the trail. **Grouping:** It is suitable to divide participants into groups of two to four people. **Motivating framework (narrative, context):** Biodiversity is important for the functioning of nature and for creating living conditions for humans. Biodiversity is present both around the school and in protected areas, and it is necessary to preserve biodiversity everywhere.
Flowchart	



Modules of the trail	
Content 1 – *Photosynthesis*	
Activity 1.1 – *Describing colours and shapes*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**2 minutes**
Description of the activity	**Question:** Look around you: describe the colours and shapes that you see. **Answer format:** free text
Content 1 – *Photosynthesis*	
Activity 1.2 – *Finding a plant*	

Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**5 minutes**
Description of the activity	**Question:** Find a plant and use it as an example to describe how photosynthesis occurs there. **Answer format:** free text **Additional information after answering the question:** It is often thought that plants produce oxygen during photosynthesis, but that is not quite accurate.
Content 1 – *Photosynthesis*	
Activity 1.3 – *Comparing processes*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**2 minutes**
Description of the activity	**Question:** When wood is taken to a sawmill, sawdust is created as a by-product. Similarly, what by-products are created during photosynthesis? **Answer format:** free text **Additional information after answering the question:** In photosynthesis, green plants produce primary organic matter, and oxygen is a by-product. You can read how the photosynthesis process happens from here: https://education.nationalgeographic.org/resource/photosynthesis/
Content 1 – *Photosynthesis*	
Activity 1.4 – *The role of plants*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**2 minutes**

Description of the activity	**Question:** Plants are important to other organisms because they create primary organic matter and oxygen. Name another reason why plants are necessary for other living beings. **Answer format:** free text **Additional information after answering the question:** Now, you have thought about photosynthesis. What do you think – how is photosynthesis related to biodiversity? For more specific information, you can read the following scientific paper: https://www.sciencedirect.com/science/article/abs/pii/S0176161714002363
Content 2 – *Biodiversity*	
Activity 2.1 – *Detecting diversity*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**2 minute**
Description of the activity	**Question:** The biodiversity of any place includes all the living organisms that reside there. Some of this biodiversity is invisible to the naked eye. Who might these unseen organisms be? **Answer format:** free text
Content 2 – *Biodiversity*	
Activity 2.2 – *Food chain*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**3 minutes**
Description of the activity	**Question:** Describe a food chain that definitely exists in this place. **Answer format:** free text
Content 2 – *Biodiversity*	
Activity 2.3 – *Flying squirrel habitat*	

Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**3 minutes**
Description of the activity	**Question:** Why does the flying squirrel not live here? Which conditions are missing? **Answer format:** free text
Content 2 – *Biodiversity*	
Activity 2.4 – *Dark diversity*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**3 minutes**
Description of the activity	**Question:** Think about what other species could live in this area. Dark diversity includes species suitable for the ecosystem, but currently absent. What conditions might indicate that a species could live here? **Answer format:** free text
Content 3 – *Dead tree*	
Activity 3.1 – *Examining a dead tree*	
Site conditions/information	Location: in the forest or a park where there is a lying/dead tree around.
Duration	**3 minutes**
Description of the activity	**Question:** Find a dead tree and examine it closely. What different types of living organisms do you find on the dead tree? **Answer format:** free text
Content 3 – *Dead tree*	

Activity 3.2 – *Identifying species*	
Site conditions/information	Location: in the forest or a park where there is a lying/dead tree around.
Duration	**5 minutes**
Description of the activity	**Question:** Which different kinds of living things can you find on a dead tree? Try to identify the species using Google Lens. Name these species. **Answer format:** free text
Content 3 – *Dead tree*	
Activity 3.3 – *Classifying species*	
Site conditions/information	Location: in the forest or a park where there is a lying/dead tree around.
Duration	**5 minutes**
Description of the activity	**Question:** Into how many groups can these species be classified? Name these groups. **Answer format:** free text
Content 3 – *Dead tree*	
Activity 3.4 – *Finding connections to biodiversity*	
Site conditions/information	Location: in the forest or a park where there is a lying/dead tree around.
Duration	**3 minutes**
Description of the activity	**Question:** How is the dead tree related to biodiversity? **Answer format:** free text Additional information: Many rare species need dead wood for their activities.
Content 4 – *Breathe*	
Activity 4.1 – *Noticing smells*	

Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**3 minutes**
Description of the activity	**Question:** Close your eyes if this is okay for you and take a couple of minutes to focus on your breathing. Which smells do you notice? **Answer format:** free text
Content 4 – *Breathe*	
Activity 4.2 – *Examining vitality*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**3 minutes**
Description of the activity	**Question:** Without which substance can you not survive for more than five minutes? **Answer format:** free text
Content 4 – *Breathe*	
Activity 4.3 – *Noticing oxygen production*	
Site conditions/information	Location: in the forest, but a park would also be suitable.
Duration	**3 minutes**
Description of the activity	**Question:** Look around you and list who helps to produce oxygen here. **Answer format:** free text
Content 5 – *Water cycle*	
Activity 5.1 – *Observing taking into account the water cycle*	
Site conditions/information	A place in a park/forest where the car park can also be seen.
Duration	**3 minutes**

Description of the activity	**Question:** The water cycle occurs everywhere, involving both living and non-living nature. Observe your surroundings and name the phenomena or processes that help the water cycle here. **Answer format:** free text **Additional Information:** Every living being participates in the water cycle through its metabolism (breathing, eating, excreting, sweating). Water continuously moves – flows, seeps into the groundwater through the soil, or moves from the soil to plants through their roots, rises up the plant stem to the leaves, and evaporates into the air. When the temperature changes, the state of water also changes. For example, when the air cools, water vapour condenses, forming clouds, fog, dew. When it warms, evaporation accelerates everywhere, and ice/snow melts.
Content 5 – *Water cycle*	
Activity 5.2 – *Car parks and groundwater*	
Site conditions/information	A place in a park/forest where the car park can also be seen.
Duration	**3 minutes**
Description of the activity	**Question:** Groundwater reserves are replenished when rainwater seeps through different soil layers, being purified along the way. How does this car park affect groundwater formation? **Answer format:** free text
Content 5 – *Water cycle*	
Activity 5.3 – *Car parks and biodiversity*	
Site conditions/information	A place in a park/forest where the car park can also be seen.
Duration	**3 minutes**
Description of the activity	**Question:** What impact do car parks and other man-made surfaces have on biodiversity? **Answer format:** free text
Content 5 – *Water cycle*	
Activity 5.4 – *Car parks and biodiversity*	

Site conditions/information	A place in a park/forest where the car park can also be seen.
Duration	**3 minutes**
Description of the activity	**Question:** When it rains in this car park, where does the water go? How is this different from infiltration in a forest? **Answer format:** free text
Content 5 – *Water cycle*	
Activity 5.5 – *Groundwater reservoir*	
Site conditions/information	A place in a park/forest where the car park can also be seen.
Duration	**3 minutes**
Description of the activity	**Question:** What does the water carry into the groundwater? Is this a problem, and why? What would be the solution? **Answer format:** free text
Content 6 – *Pollinators*	
Activity 6.1 – *Describing flowers in detail*	
Site conditions/information	A place in a park/forest where there are blooming plants (use this activity only at a time when there are blooming flowers).
Duration	**5 minutes**
Description of the activity	**Question:** Look around, do you see any plants in bloom? Describe the flowering plants you see and detail how their flowers look. **Answer format:** free text
Content 6 – *Pollinators*	
Activity 6.2 – *Purpose of a flower*	
Site conditions/information	A place in a park/forest where there are blooming plants (use this activity only at a time when there are blooming flowers).
Duration	**5 minutes**
Description of the activity	**Question:** What is the purpose of a flower for a flowering plant? **Answer format: multiple choice** 1. To provide visual pleasure to others.

	2. To ensure its own reproduction (correct). 3. To provide food for insects. 4. To provide food for all others. 5. Actually, the plant does not need the flower. **Additional information:** A seed is a means of renewal for a plant as a renewable natural resource; plants reproduce through seeds. The role of insects is crucial in the formation of the fruits and seeds of most flowering plants.
Content 6 – *Pollinators*	
Activity 6.3 – *Comparing different plants*	
Site conditions/information	A place in a park/forest where there are blooming plants (use this activity only at a time when there are blooming flowers).
Duration	**5 minutes**
Description of the activity	**Question:** How is a flowering plant different from other plants that do not flower? Why do some plants not flower? Are there any plants here that never flower? **Answer format:** free text
Content 6 – *Pollinators*	
Activity 6.4 – *The role of insects*	
Site conditions/information	A place in a park/forest where there are blooming plants (use this activity only at a time when there are blooming flowers).
Duration	**3 minutes**
Description of the activity	**Question:** Who do you see working around the flowers? What are they doing there? **Answer format:** free text
Content 6 – *Pollinators*	
Activity 6.5 – *Beneficial insects*	
Site conditions/information	A place in a park/forest where there are blooming plants (use this activity only at a time when there are blooming flowers).
Duration	**5 minutes**

Description of the activity	**Question:** In nature, a lot of organisms cooperate. Why is it beneficial for the plant to have insects working there? What about for the insect? **Answer format:** free text .
Content 6 – *Pollinators*	
Activity 6.6 – *Summary of the topics*	
Site conditions/information	A place in a park/forest
Duration	**5 minutes**
Description of the activity	**Question:** Now, you have learned about pollinators, the water cycle, photosynthesis, and the role of dead trees in the forest. How are these topics related to biodiversity? What did you learned about biodiversity through these topics? **Answer format:** free text

EXAMPLE TRAIL Estonia 2: Pine grove invites to explore biodiversity

Name of the trail:	Pine grove invites to explore biodiversity (Kapa männik kutsub)
How to find it on Avastusrada:	https://keskkonnaharidus.avastusrada.ee/admin/map/kapa-mannik/demo
Screenshot:	
Developer:	Kätri Kaik (Environmental education specialist)
Addressed age group:	Grades 1–6
Relevant topics:	
General overview and aim:	**What is the general aim of the trail?** Spotting and discovering biodiversity in the everyday environment. Getting to know the concept of biodiversity and making sense of its content with the help of different ways of thinking and aids. **Learning goals**

	A learner - gets acquainted with the content of the concept of biodiversity. - studies the expression of biodiversity in their immediate surroundings. - notices the richness of life around them.
Framework conditions:	**Time:** 45–60 minutes **Equipment required:** - Mobile phones or tablets with internet access for all participants. Could be also done in separate groups or one big group if the students are younger. Then, the device should be held by a teacher, who can read the assignments and mark down the answers. - Bag of different equipment (picture frame, mirror, and an envelope with a description of biodiversity). **Prior knowledge:** not required. **Grouping:** the participants could be divided into groups of two to four people or walk together as one big group. **Motivating framework (narrative, context):** Depending on the location, it could be related to the story of the surroundings. The teacher could explain why this forest, park, etc. is formed like that and what was there before.

Flowchart

Modules of the trail	
Content 1 – *Biodiversity*	
Activity 1.1 *– Examples of biodiversity*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group.
Duration	**3 minutes**
Description of the activity	**Question:** Think about the word 'biodiversity'. What could it mean? Can it be seen here in the park? Take time to discuss. Feel free to answer because there are no wrong answers! **Answer format:** free text
Content 1 – *Biodiversity*	
Activity 1.2 *– The green envelope*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group.

Duration	**2 minutes**
Description of the activity	Look for a green envelope which says 'BIODIVERSITY' in the backpack you brought. **Assignment in the envelope:** <u>Lennart Lennuk (biologist and populariser of science, Kohila High School graduate from Estonia):</u> BIODIVERSITY is everything alive around us, and the more diverse it is, the richer our life is. Not in a financial sense, but rather in terms of well-being, health, and our worldview. The first half of the word, BIO (life), comprises everything alive around us – from soil-dwelling roundworms and miniature fungi beneath our feet to Earth's largest living mammal, the blue whale. The other half of the word, 'DIVERSITY', means how much life there is and how diverse it is. For example, how many different species there are in a handful of seawater or agricultural soil. The more species live in a specific grove, the richer this forest is. If we have many species, then nature works well – for us, there is oxygen to breathe, food to eat, and a variety of nature to enjoy. At the same time, diseases unknown to us do not bother us, we are not threatened by floods or other catastrophic events, and the environment is RICH IN LIFE. Source: Saks, J. (2021). Kuidas elurikkusele kaasa aidata? (How to contribute to biodiversity?) *Postimees Juunior* 16/09, https://juunior.postimees.ee/7392548/intervjuu-kuidas-elurikkusele-kaasa-aidata **Read what Lennart Lennuk says about the word 'biodiversity' and try to explain it to your partners in your group in your own words. Find an example together (e.g. a landscape) for which this word could fit! You could also find an example of where this word cannot be used.** **Answer format:** free text **Additional information:** Please put the envelope back to your bag when you have finished.
Content 1 – *Biodiversity*	

Activity 1.3 *– Looking and seeing*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group. Possibly a place where there is nature when looking up (higher trees), but also something on the ground.
Duration	**2 minutes**
Description of the activity	Look for picture frames in the bag you brought. Divide the frames between group members. **Question:** Think and discuss what the difference is between looking and seeing. **Answer format:** free text **Additional information:** These same picture frames will help you understand this difference. Explore nature through the frames and you will start to notice much more.
Content 1 *– Biodiversity*	
Activity 1.4 *– Using the frame*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group. Possibly a place where there is nature when looking up (higher trees), but also something on the ground.
Duration	**2 minutes**
Description of the activity	**Question:** What did you notice or discover when you looked through the frame? Take a photo of some new discovery! **Answer format:** Photo **Additional information:** Once you have seen enough, collect the frames, put them in the bag, and head to the next point.

Content 2 – *Silence*	
Activity 2.1 – *A minute of silence*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group. It would also be good if there were different sounds in the place (human-made, but also natural).
Duration	**1 minute**
Description of the activity	It is well known that being in nature has a refreshing effect on everyone. At this point, it is a good opportunity to take time out for a moment. **Assignment:** Get in a circle with your group and close your eyes for one minute, if this is comfortable for you (someone has to start the timer). Listen and remember what you heard. **Answer format:** information
Content 2 – *Silence*	
Activity 2.2 – *Sharing*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group. It would also be good if there were different sounds in the place (human-made, but also natural).
Duration	**1 minute**
Description of the activity	**Question:** After a minute of silence, share one by one what you heard with others in line. Add some aspects to the answer of this question. **Answer format:** free text
Content 3 – *Mirrors*	
Activity 3.1 *– Examining nature through a mirror*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group. Possibly a place where there is nature when looking up (higher trees).
Duration	**5 minutes**

Description of the activity	You have reached the point where the mirrors should be taken out of the bag. Share the mirrors. Now, it is time to explore the treetops and the surroundings without looking at the sky. **Assignment:** Place the mirrors on the bridge of your nose, under the eyes. Walk slowly and observe your surroundings through the mirror. It is a new and exciting experience! **Answer format:** information
Content 3 – *Mirrors*	
Activity 3.2 *Noticing*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group. Possibly a place where there is nature when looking up (higher trees).
Duration	**3 minutes**
Description of the activity	**Question:** What did you notice when observing nature with the help of mirrors? **Answer format:** free text
Content 3 – *Mirrors*	
Activity 3.3 *Summary*	
Site conditions/information	Location: in a park or forest where it is possible to stand and discuss with a bigger group. Possibly a place where there is nature if looking up (higher trees).
Duration	**5 minutes**
Description of the activity	**Question:** Now observe the surroundings for 5 minutes and think what do you see after finishing the trail? Do you notice something that you have never seen before? **Answer format:** free text **Additional information:** All these topics that you discussed can help to better understand what biodiversity is.