Hydrological field research factsheet – Amalva Peatland – Lithuania

Technical report of the DESIRE project – action 3.2

Paweł Osuch
Marta Stachowicz
Paweł Trandziuk
Robert Michałowski
Leonas Jarašius
Jūratė Sendžikaitė
Nerijus Zableckis
Mateusz Grygoruk

This research was funded by the Interreg Baltic Sea Region project DESIRE (Development of sustainable (adaptive) peatland management by restoration and paludiculture for nutrient retention and other ecosystem services in the Neman River catchment) Index number R3071, project number #R091 implemented in the framework of the Interreg Baltic Sea Region Program, co-funded by the European Regional Development Fund.

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

WITH FINANCIAL SUPPORT OF THE RUSSIAN FEDERATION

Cover photo: Amalva Peatland (Photo: Krystian Kamiński)

Paweł Osuch, Marta Stachowicz, Paweł Trandziuk, Robert Michałowski, Leonas Jarašius, Jūratė Sendžikaitė, Nerijus Zableckis, Mateusz Grygoruk

Hydrological field research factsheet – Amalva Peatland – Lithuania. Technical report of the DESIRE project – action 3.2

Warsaw

June 2021

Contents

1. Introduction

The following report was prepared in the framework of the action 3.2 of the DESIRE project 'Development of sustainable (adaptive) peatland management by restoration and paludiculture for nutrient retention and other ecosystem services in the Neman River catchment' (2019–2021). Main goal of this report is to document hydrological features of the Amalva Peatland located in the south-western part of Lithuania (Fig. 1).

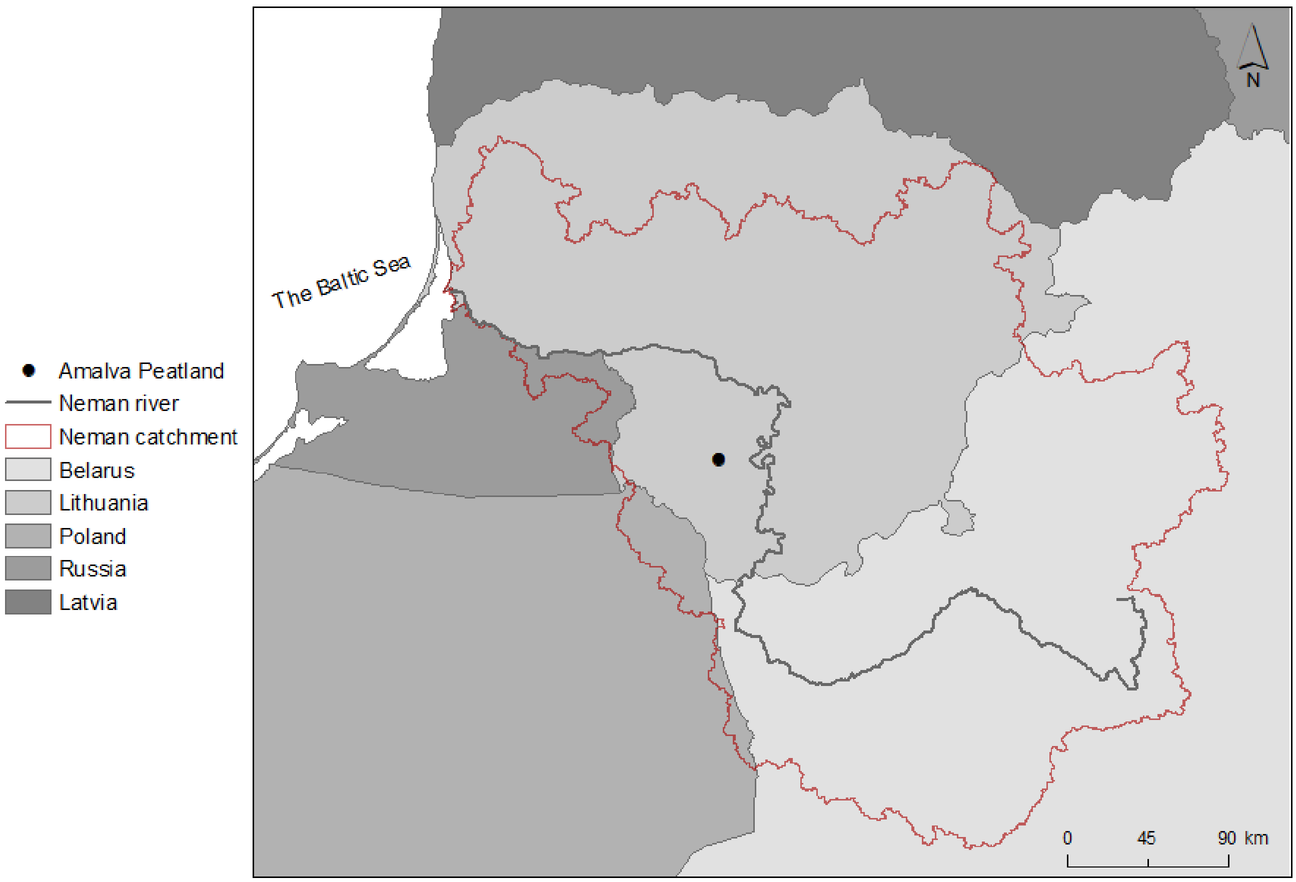

Figure 1. Location of the study site – Amalva Peatland, Lithuania

Amalvas study site is an agricultural land located in Amalvas polder in the north-eastern corner of Amalva mire complex (3414 ha), belongs to Žuvintas Biosphere Reserve (Žuvintas BR) and can be characterized as a floodplain meadow on drained fen. Part of the investigated territory was abandoned for some years and overgrown by woody vegetation (*Salix* spp.), which was removed in winter 2019/2020. The site is a part of Ecosystems restoration zone of the Biosphere Reserve. More than 2000 ha of the mire has been drained in the second part of the 20th century. In the north-eastern part of the peatland was installed an Amalvas winter polder (converted to summer polder some years ago) for perennial grasslands and arable land. Before the large-scale reclamation, the entire mire complex was mainly characterized by raised bog, surrounded by transitional mire and fen vegetation. The part of the Amalva peatland (with the Amalvas Lake) that has retained its natural features has a status of Botanical-Zoological Reserve (1280 ha). Unfortunately, the lowered groundwater level in the surrounding territories also affects this protected area.

First efforts to restore hydrological regime in the area of former Amalva peatland were implemented in western and southern parts of the mire complex in 2011, 2018 and 2021 by the projects WETLIFE, WETLIFE2 and LIFE PEAT RESTORE.

Figure 2. Location of the piezometric transect in Amalva Peatland, Lithuania

The location of the research site, installed piezometers and drainage ditches is shown in Figure 2. Table 1 summarizes locations of the piezometers and technical parameters.

Table 1. Detailed information about measurement points

Piezometer's name	Coordinate X [oN]	Coordinate Y [oE]	Elev. of the ground	Model of the diver	Outer diameter of the pipe	Pipe length	Diver's ID
			[m]	[-]	[mm]	[m]	[-]
PIEZ-AMAL01	23.609696	54.537600	82,76	Solinst Levelogger Model 3001	60	2.00	2111182
PIEZ-AMAL02	23.609343	54.53762	83,60				2111201
PIEZ-AMAL03	23.606685	54.537664	83,38				2111203
PIEZ-AMAL04	23.603757	54.537812	83,42				2111185
PIEZ-AMAL05	23.603412	54.537811	82,93				2111205

The main objective of this report is to present and analyse the hydrological features of the Amalva Peatland. In this report we perform the meteorological analysis of the site, explain the methodology behind the research and present the results of field research and hydrological monitoring.

2. Analysis of meteorological situation of the mire

The meteorological analysis was performed based on the data from the nearest meteorological station in Žuvintas BR administration. This means that the data represents local meteorological conditions. The station provides the average monthly air temperatures from 2008 to 2020 and precipitation data from 1992 to 2020. There is a gap in precipitation data for 2003.

Based on the 12-years temperature data, the coldest month is January, with an average monthly air temperature of –3.5 °C, and the warmest month is July with an average monthly air temperature of +18.8 °C. The lowest monthly average temperature during the measurement period in question occurred in January 2010 and was –10.5 °C, and the highest occurred in July of the same year and was +22.3 °C. In terms of precipitation, on average the driest month is February (35.2 mm) and the wettest month is July (78.0 mm). Comparing the annual precipitation, the wettest years were 2013 with an annual rainfall of 792.1 mm and 2017 with an annual rainfall of 779.7 mm. The driest years were 2018 and 2019 with annual precipitation values of 417.8 mm and 398.4 mm. The 27-year average annual precipitation is 606.9 mm, and the average annual air temperature is +8 °C. The summary of average monthly air temperature and monthly precipitation in Žuvintas meteorological station is shown in Figure 3 and Figure 4.

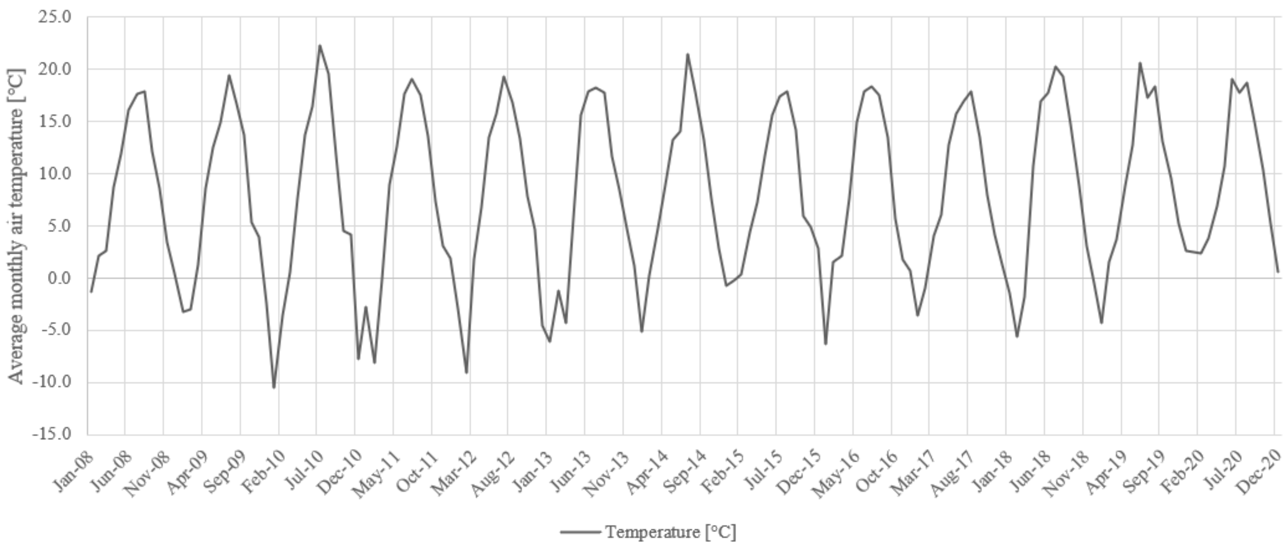

Figure 3. Summary of average monthly air temperature in °C in Žuvintas BR, Lithuania, in 2008– 2020.

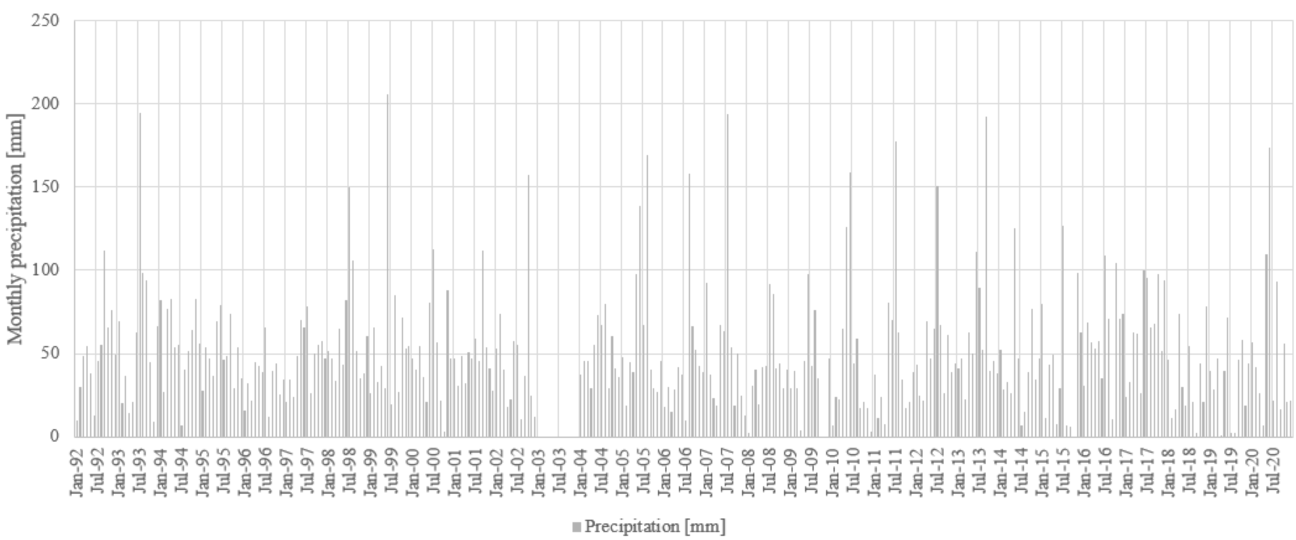

Figure 4. Summary of monthly precipitation in millimeters in Žuvintas BR, Lithuania, in 1992–2020.

The analysis of meteorological data indicates that there is a visible growth trend in temperature values. The summers are warmer, with less rainfall and the winters have higher average air temperature values. As a result, there is an increased risk of extreme weather events, such as droughts.

3. Methodology of field investigation

Measurements of the groundwater table are carried out at 5 piezomertric points which were installed at the depth of 2 m below ground level. Transect consisting of 5 points runs perpendicularly to drainage ditches (AMAL01 - AMAL05). In each piezometer there was installed - Solinst Levelogger - an automatic recorder of water level and water temperature changes, which is used for long-term monitoring. The measuring range of this equipment is 0 - 10 m (accuracy ± 0.05%) and -20°C to +80°C (accuracy ± 0.1 °C). Besides, Solinst Barologger device was installed in the field, which is used to record changes in atmospheric pressure with a measuring range of 0 - 1.5 m (accuracy ± 0.05%). The measurements of the water level are performed in five piezometers from 25.09.2019 in 6-hour intervals. Accurate point location measurements using GPS RTK technology (with a base station) and levelling measurements were taken during installation.

Figure 5. Installed piezometer (1), Solinst Levelogger (2), landscape of the research area (3), piezometer construction (4), GPS base station (5), reading the data from the Solinst Levelogger (6).

4. Groundwater levels – monitoring

Water table in the Amalva peatland remained below ground level for most of the measurement period. Fig. 6 shows the variation of water table in time for individual piezometers and the statistics are contained in Table 2. In the piezometer AMAL02, the groundwater level remained below ground level almost throughout the measurement period. The percentage of all measurement days with water table above ground for piezometers AMAL03 and AMAL04 is similar. Piezometers AMAL01 and AMAL05 measure the variation of water level in the ditches.

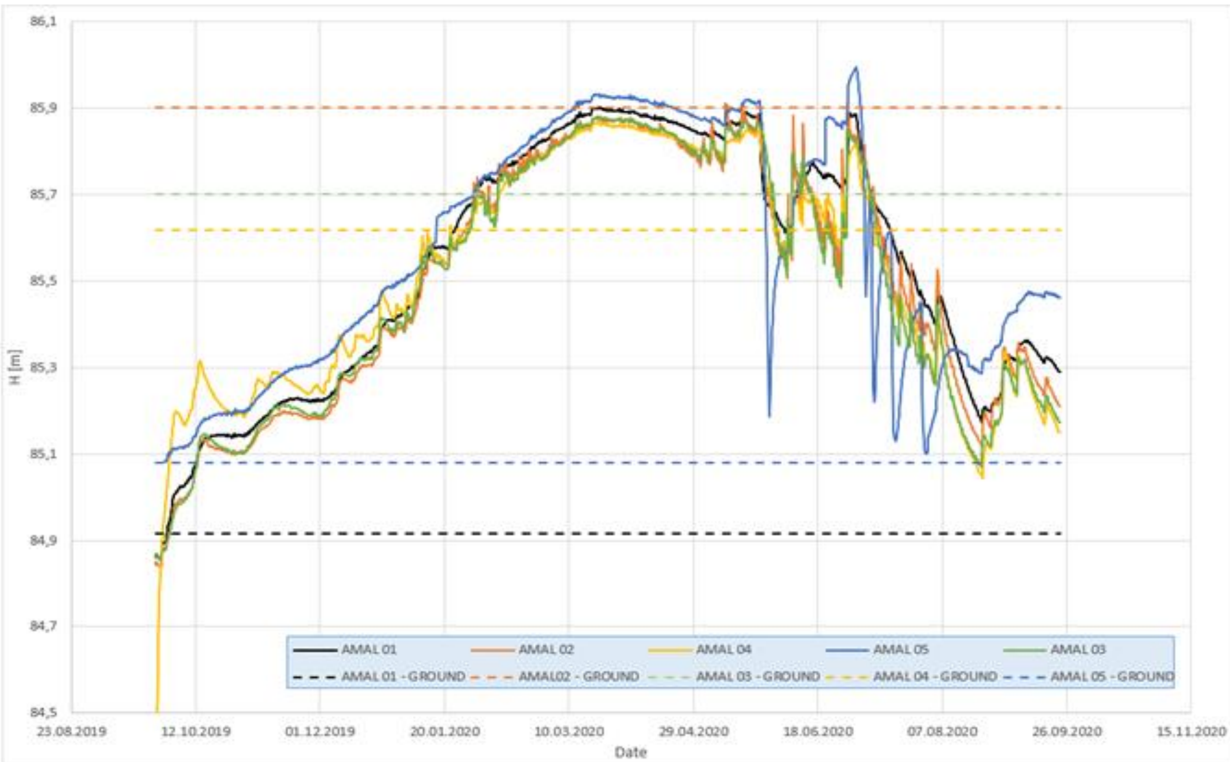

Figure 6. Variability of the groundwater table in the piezometers on the Amalva Peatland (Žuvintas BR., LT). Measurement period: 2019-09-25 - 2020-09-23.

Table 2. Depth to Water Table [m] – minimum/average/maximum and % of all measurement days with the water table above the ground. Measurement period: 2019-09-25 - 2020-09-23.
(“+“ – above the ground / “-” – below the ground level).

Piezometer	Depth to Water Table [m]			% of all measurement days with the water table above the ground
	MAX	AVERAGE	MIN	
PIEZ-AMAL01	0.99	0.62	-0.06	99
PIEZ-AMAL02	0.02	-0.40	-1.07	0.2
PIEZ-AMAL03	0.18	-0.19	-0.85	35
PIEZ-AMAL04	0.25	-0.11	-0.58	42
PIEZ-AMAL05	0.91	0.49	-0.29	99

Figure 7 shows water-level-duration curves for 5 piezometers located in the Amalva Peatland. Axis X represents measured frequency of exceedance where depth to the water table is higher or equal to value from axis Y.

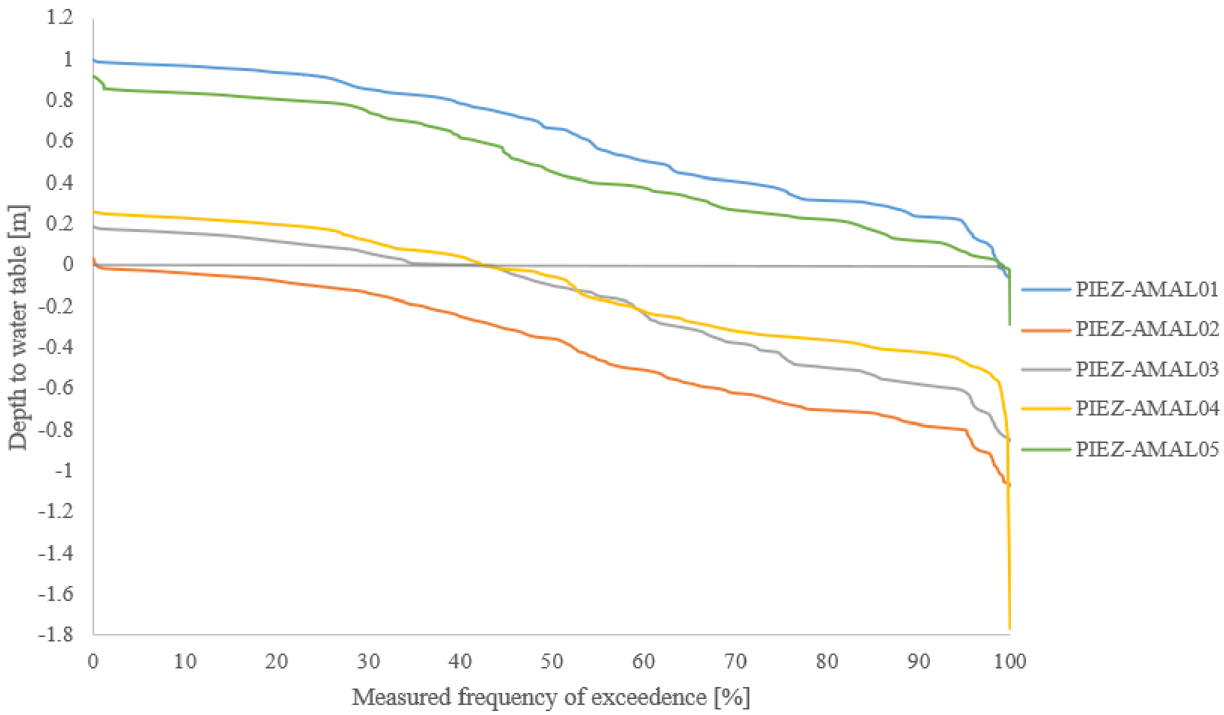

Figure 7. Water-level-duration curves for 5 piezometers located in the Amalva Peatland.

5. Conclusions

- Water table in the Amalva peatland was below the ground level for most of the measurement period, therefore hydrological conditions in the Amalva peatland are rather unfavorable for peat accumulation.
- Although the measurements were taken during one the driest periods in a recent decade, which may have affected the results of hydrological monitoring, the impact of climate change with higher temperatures and less precipitation can cause water scarcity in the landscape, and therefore the hydrological conditions measured during the study period may be valid in the future.
- The Amalva peatland shows good conditions for eutrophication.
- In order to restore hydrological conditions favorable for peat accumulation in the Amalva peatland, implementation of rewetting measures is recommended.

6. References

Krajowy Zarząd Gospodarki Wodnej (KZGW), 2020. Program Przeciwdziałania Skutkom Suszy.

Pawlaczyk P. Biedroń I., Brzóska P. Dondajewska-Pielka R., Furdyna A., Gołdyn R., Grygoruk M., Grześkowiak A., Horska-Schwarz S., Jusik Sz., Kłósek K., Krzymiński W., Ligięza J., Łapuszek M., Okrasiński K., Przesmycki M., Popek Z., Szałkiewicz E., Suska K., Żak J. 2020. Podręcznik dobrych praktyk renaturyzacji wód powierzchniowych. Oprac. w ramach przedsięwzięcia „Opracowanie krajowego programu renaturyzacji wód powierzchniowych". Państwowe Gospodarstwo Wodne Wody Polskie, Krajowy Zarząd Gospodarki Wodnej, Warszawa.

Stoškus A., Šlepetys J., Katutis K., Stukonis V. 2011. Tausojančio ūkininkavimo durpiniuose dirvožemiuose rekomendacijos. Gamtos paveldo fondas, Vilnius. ISBN 978-9955-9860-2-7. *http://www.wetlife.gpf.lt/images/File/UKININ_internetui.pdf*