

# THE IMPORTANCE AND FUNCTIONS OF RIPARIAN STANDS OF THE RECREATIONAL WATER RESERVOIR POČÚVADLO IN ŠTIAVNICKÉ VRCHY

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## Abstract

The recreational water reservoir Počúvadlo, which was built in the years 1775-1779, is located in the Štiavnické vrchy Protected Landscape Area near the town of Banská Štiavnica. This water reservoir, as a part of the historical mining water management system, is the most visited and used for recreation out of the 26 preserved reservoirs in the vicinity of Banská Štiavnica. Počúvadlo water reservoir covers an area of 12.13 hectares and is a popular summer and winter recreation center and the venue for various cultural and sports events in this region. An important part of the Počúvadlo water reservoir are the riparian stands, which have several functions. These functions are mainly related to the protection of banks from erosion (abrasion), create suitable space and conditions for recreation and relaxation, affect the water quality in the reservoir, etc. In 1993, town Banská Štiavnica, together with the technical monuments in the vicinity (including the unique water management system of water reservoirs), was entered into the UNESCO World Cultural and Natural Heritage List.

**Key words:** lacustrine vegetation, erosion control, water quality, tourism

## Introduction and issues

Riparian stands can be defined as a continuous forest stands or their parts, as well as groups, strips, rows of trees, shrubs and herbaceous vegetation that grow on the banks of watercourses and reservoirs and in their immediate surroundings (Valtýni 1981). Riparian vegetation have a whole range of functions in the country, especially in relation to adjacent water bodies. The functions of riparian vegetation can be generally divided into three basic functions: ecological, environmental and production. Among the ecological functions, we include the soil protection function, which includes the anti-erosion (anti-abrasion) and anti-slide function, and the water protection function, which includes the filtration, infiltration, shading and anti-deflation functions. Among the environmental functions (landscape use and protection), we include the health-recreational, landscape-creating (aesthetic) and protective (preservation of original natural ecosystems and biodiversity) functions.

When evaluating the functions of riparian vegetation, it is necessary to focus on solving two basic tasks:

- determination of the primary function of the riparian stands,
- proposal for optimal tending of riparian stands according to their primary function.

During the design and targeted support of the priority function of the riparian vegetation, it is necessary to take into account the location and habitat of the particular riparian stands. In places that are used as beaches for reasons of good access to the water (with low or moderate bank slopes), it is necessary to focus on supporting the recreational function of the riparian stands. Several authors dealt with the issue of the recreational function of riparian vegetation in various contexts (Valtýni 1981, Rasmussen, Padgett 1994, Collective of authors 2002, Majorošová, Reháčková 2022, Saklaurs et al. 2022, Zingraff-Hamed et al. 2022, etc.). In places with a steep bank slopes with significant abrasion and poor access to water, the anti-erosion (anti-abrasion) function of the riparian stands should be a priority. The issue of the anti-erosion function of riparian vegetation has been addressed by several authors (Simon, Collison 2002, Šlezinger 2011, Jakubisová 2011, etc.).

From the point of view of water quality protection in Lake Počúvadlo, other functions of riparian vegetation are also important. The filtration function significantly affects the water quality in the lake. Riparian vegetation filters - mechanically captures products of erosion which are transported by surface runoff from adjacent slopes. The infiltration function allows surface runoff to soak into the soil and thereby reduces the risk of soil erosion caused by surface runoff. The shading function affects the microclimate primarily by reducing evaporation and increasing humidity in the immediate surroundings of the lake.

An integrated and comprehensive view of the ecosystem services of riparian vegetation was elaborated in detail by Riis et al. (2020) and Collective of authors (2002).

### Material and methods

Lake Počúvadlo is located in Štiavnické vrchy Protected Landscape Area, about 10 km southwest of the town of Banská Štiavnica (Fig. 1).



Fig. 1: Map of the Slovak Republic with the location of Počúvadlo Lake

Počúvadlo Lake was built between 1775 and 1779 as part of the mining water management system. The lake has an area of 12.13 hectares and is located at an altitude of 677.64 meters a. s. l. Lake is formed by 5 separate dams, the main dam is 195.3 m long, 29.6 m high and 19 m wide at the base; the maximum depth of the lake is 10.8 m. The total volume of the reservoir is 745,000 m<sup>3</sup>. Other characteristics of the area and the water management system around Banská Štiavnica are elaborated in articles published by Jakubis (2016, 2019). Lake Počúvadlo is the most visited of all 26 lakes of the historic water management system. It is predisposed to this by the wide possibilities of summer and winter recreation, tourism, sports activities, good accommodation options, and the organization of various sports and cultural events. In recent years, the number of domestic and foreign visitors to this area has been increasing. In 2021, we investigated in detail the species representation of individual trees in the riparian stands of Lake Počúvadlo.

### Results

The individual functions of the riparian vegetation of the Počúvadlo recreational reservoir, to which we assigned a degree of significance (1 - highest degree, 2 - medium degree, 3 - lowest degree), are processed in Tab. 1. The species of trees in the riparian stands of the Počúvadlo Lake are shown in Tab. 2. We found that it is necessary to pay significantly more attention to the riparian stands and the overall condition of the coastal lands in the immediate vicinity of the reservoir in connection with their specific functions. According to the location of the riparian vegetation, it is necessary to determine its priority function. Through a field survey, we discovered a great diversity of species and quality of the shore vegetation of Lake Počúvadlo. We found that the deciduous woody plants significantly predominate over conifers. In recent years, a protected animal - the beaver (*Castor fiber*) - has been causing damage to the riparian stands of Lake Počúvadlo. This question will need to be solved in cooperation with conservation organizations.

### Some proposals for riparian stands of Počúvadlo Lake tending

As part of the tending of riparian vegetation and the support of their recreational function, it is necessary to focus on the creation of a suitable recreational environment and conditions for the recreational use of the lake and the surrounding area. Autochthonous species of wood (*Quercus petraea*, *Alnus glutinosa*, *Carpinus betulus*, *Tilia cordata*, *Fagus sylvatica*, *Acer pseudoplatanus*, *Corylus avellana* etc.) should be used. It is important to carry out regular inspections of riparian vegetation and check their health status. From the point of view of the safety of vacationers, it is necessary to remove diseased, damaged and endangered trees, or their parts (Fig. 2).

Tab. 1: Functions of riparian stands of Počúvadlo Lake

Basic function	Particular function	Specific function	Content of a specific function <b>Degree of importance</b>
Ecological	Soil protection	anti – erosion (anti – abrasion)	They strengthen the soil on the banks with their root system and limit the occurrence of erosion (abrasion) <b>1 - steep eroded banks</b> <b>2 - beaches</b>
	Water protection	filtration	They mechanically filter, slow down or limit surface runoff from adjacent slopes, capture erosion products from around the reservoir <b>2</b>
		infiltration	They help soak surface runoff into the soil and limit the occurrence of erosion <b>2</b>
		shading	They shade the water level, reduce evaporation, increase humidity and positively affect the microclimate <b>2</b>
Environmental	Landscape creating, protection and use	health - recreational	They create a suitable environment for recreation and relaxation <b>1 – beaches</b> <b>2 – other areas</b>
		aesthetic and landscape creating	They create an interaction between the reservoir and the surroundings, improve the appearance of the landscape and its aesthetic value <b>1 - 2</b>
		protective (biodiversity and natural ecosystems protection)	They contribute to the stability of natural ecosystems and improve the conditions for biodiversity <b>1 - 2</b>
Production	Production of wood	Production of wood assortments and biomass	They provide a resource of wood and biomass <b>3</b>

Note on Tab. 1: 1 - highest degree of significance, 2 - medium degree of significance, 3 lowest degree of significance



Fig. 2: Some trees in riparian stands require adequate tending

Tab. 2: Woody plants species in riparian stands of Počúvadlo Lake

Woody plant	Number of pcs	Woody plant	Number of pcs
Quercus petraea	391	Salix caprea	10
Carpinus betulus	183	Malus sp.	8
Alnus glutinosa	111	Salix alba	8
Abies alba	79	Sambucus nigra	8
Fagus sylvatica	75	Acer campestre	7
Populus tremula	53	Fraxinus angustifolia	6
Rosa canina	35	Juniperus communis	6
Betula pendula	25	Picea abies	6
Corylus avellana	21	Crataegus monogyna	5
Syringa vulgaris	19	Hedera helix	3
Fraxinus excelsior	16	Acer platanoides	2
Acer pseudoplatanus	16	Rubus idaeus	2
Cerasus avium	15	Salix cinerea	670 m <sup>2</sup>

## Conclusion

The riparian vegetation on the banks of the Počúvadlo water reservoir is important from several aspects. The tending about riparian vegetation needs to be determined according to the specific location of the riparian vegetation. In places with low or moderate bank slopes and good access to water (beaches) without significant erosion, the recreational function of the riparian vegetation should have priority and support. In places with steeper slopes with signs of significant erosion (abrasion), the anti-erosion function of the riparian vegetation should have priority and support.

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## Souhrn

Rekreační vodní nádrž Počúvadlo, ktorá bola vybudovaná v letech 1775-1779, sa nachádza v Chránenej krajinnnej oblasti Štiavnické vrchy neďaleko mesta Banská Štiavnica. Táto vodná nádrž ako súčasť historického ťažného vodohospodárskeho systému je najnavštevovanejšia a najvyužívanejšia z 26 zachovalých nádrží v okolí Banskej Štiavnice. Vodná nádrž Počúvadlo sa rozkladá na ploše 12,13 ha a je obľúbeným strediskom letnej i zimnej rekreácie a dejiskom rôznych kultúrnych akcií v tomto regióne. Významnou súčasťou vodnej nádrže Počúvadlo sú brehové porasty, ktoré plnia niekoľko dôležitých funkcií. Tieto funkcie súvisia s ochranou brehov pred eroziou (abrazíou), ovplyvňujú kvalitu vody v nádrži a vytvárajú vhodný priestor a podmienky pre rekreáciu a relaxáciu atď. Pôsta o brehových porastoch je potrebné určiť podľa konkrétneho umiestnenia brehových porastov. V miestach s nízkymi alebo miernymi brehovými svahmi a dobrým prístupom k vode (pláž) bez výraznejšej erozie by mala mať prioritu a podporu rekreačnej funkcie brehových porastov. V miestach so strmšími svahmi sa známami výraznej erozie (abraze) by mala mať prioritu a podporu protieroznej funkcie brehových porastov. V roku 1993 bolo mesto Banská Štiavnica spolu s technickými pamiatkami v okolí (včetně unikátneho vodohospodárskeho systému vodných nádrží), zapísaná na Seznam svetového kultúrneho a prírodného dedičstva UNESCO.

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