BANK STABILIZATION – NON-TRADITIONAL WAYS OF USING VEGETATION - INCREASING RECREATIONAL ATTRACTIVENESS

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Abstract

Bank damage caused by deflation has appeared in nearly all world reservoirs. However, bank stabilization is mostly seen as a solution and implemented only when bank damage occurs.

In this case, there is a unified scheme used - a stone bank toe is constructed and the (eroded) bank sloping is restored in place of the erosion wall.

However, this paper presents another solution - a solution using breakwaters. One of their basic types is presented together with the diagram and the 3D model. The article also includes a proposal for an unconventional way of stabilizing the shore.

Key words: Stabilization, river, dam, vegetation. recreation

Introduction

Bankside trees and shrubs are one of the building blocks of territorial systems of ecological stability (TSES). It is part of an ecologically balanced landscape, a form of spread green vegetation growing outside integrated forest complexes. It is created by tree species and herbs growing along streams. In relation to stream regulation, linear building along water streams etc., a lack of riparian and accompanying stands started to manifest negatively. We can say that only once it decreases, will we start to realise its indispensability in our landscape. The following paragraphs deal with the basic functions of bankside trees and shrubs.

Asic functions bankside trees and shrubs – effect on recreational use

Aesthetic Fuction - Recreational Function

Bankside trees and shrubs are a precondition for creating rest areas near streams in the vicinity of towns and cities; in the case of reservoirs used for recreation they are a pre-condition for its development; by supporting the good condition of fish in streams and reservoirs, it helps in the development of sports fishing, etc.

Bankside trees and shrubs are an important element in landscape enhancement. Within stream regulation, we should try to propose necessary interventions to the river profile and its closest surroundings with maximum respect for existing vegetation. Having carried out technical adjustments, it is necessary to propose, in liaison with competent specialists, and to provide for the implementation of new planting, or reconstruction of riparian and accompanying stands.

The planting of and the consequential care for bankside trees and shrubs should not be underestimated as unplanted areas within natural succession become overgrown with self-seeding species whose unsuitable location and species structure may impair the stability of slopes, flow ratios in the riverbed and, even in aesthetical terms, they do not have to necessarily make a good impression.

Fully-grown, maintained bankside trees and shrubs are a dominant element in flatlands and their impact on the overall character of the area is appreciable.

Anti-deflationary Function

Protection against silting up of a riverbed or a reservoir with material transported by wind from adjacent land is significant especially in intensively cultivated agricultural plains. Along with fine dust particles, organic residuals, plant seeds, excessive fertilisers, preservative agents etc. are also transported here.

A fully-grown, sufficiently involved accompanying stand (mostly trees) and riparian stand (mostly shrubs) acts as a "protective wall" and is able to intercept much of the transported material. According to the width and quality of bankside trees and shrubs, we can speak about a similar function as a semi-permeable windbreak. Its importance in the protection against the effects of side wind is also demonstrated in inland navigation, especially in the navigation of empty ships.

Protective Function

Protection against riverbed overgrowth and silting

A direct incidence of sunrays on the water surface causes intensive warming of water in riverbeds. Since the intensity of sunshine is highest in summer months when the water level is also very low, water flora grows more. Irrigation channels and shallow reservoirs are most endangered. The final effect of a fast growth of hydrophytes in warm water, well provided with nutrients from adjacent agricultural land, may be an increasing oxygen deficit with all its unfavourable consequences for fish in the reservoir (pond). In addition, it should be emphasised that an overgrown riverbed does not have to be capable of higher flow in case of rainstorms, thus causing a flood, albeit only a local one.

An increased occurrence of hydrophytes in the riverbed results in increased bottom roughness and a lower flow profile. The speed of running water reduces and, consequently, more particles are deposited. Especially smaller streams with a minor bottom slope are endangered. By means of hydrophytes, such deposits are stabilised and the flow profile gradually reduces, increasing the risk of overflows.

Appropriate bankside trees and shrubs, especially with smaller streams, prevent excessive access of direct light, partially shading the

surface and very effectively preventing conditions suitable for the rapid growth of weed hydrophytes.

Water Quality Function

Impact on self-cleanability of water streams

The pre-condition for self-cleanability to develop is a sufficiently aerated water stream and the presence of organisms in the water. Organisms colonising uneven places on the bottom, roots penetrating into the stream, parts of plants etc. participate, to the maximum extent, in the removal of organic pollution in the stream (its natural transformation into inorganic substances). It is riparian vegetation, its surface and underground parts that have a considerable share in the enhancement of self-cleanability of water streams. However, it should be pointed out that full shading of the surface is undesirable. The more the surface is shaded, the more its self-cleanability is reduced.

Conclusion

Within stream regulation, great attention is also paid to programs in the area of landscape ecology and environmental engineering, aroused by efforts not to irreversibly disturb (through proposed construction complexes) the ecological balance of the system. (Ecological balance is a dynamic condition of the ecosystem and is the main feature of ecological stability of the system. Ecological stability is then the ability of the ecosystem to endure the effect of stressors and, after they subside, to return to the initial condition.)

Within hydraulic engineering, revitalisation and eco-biological constructions (but only here), it is vital to initially become acquainted with the current situation of the locality which will be more or less affected by proposed modifications or building interventions.

Possible recreational use is also an important part. Quality, vital trees and shrubs are the foundation.

References

Gałaś, S.; Zeleňáková, M.(2011). The complex evaluation of the development potential of the area - case study in the village Dedinky in the Spis county Public recreation and landscape protection - hand in hand?: Conference proceeding pages: 142-147, 2011

Junáková, N., Junák, J.,Bálintová, M., (2015). Reservoir sediment as a secondary raw material in concrete production. Clean Techn Environ Policy, 2015. DOI: 10.1007/s10098-015-0943-8

Korytárová, J., Šlezingr, M., Uhmannová, H. (2007). Determination of potential damage to representatives of real estate property in areas afflicted by flooding (2007) Journal of Hydrology and Hydromechanics, 55 (4), pp. 282-285.

Marková, J., Pelikán, P., (2013). Assessment of stability of a revitalized stream T12 in Orlické Záhoří. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis.* 2013. sv. 61, č. 5, s. 1321--1328. ISSN 1211-8516.

Soldo, B., Oreskovič, M., Anioskin, A. (2010). An example of examination of the bank slope and water wavering contact, Journal of Landscape Management, No 2 , 1, 41 – 44 p 2010

Šlezingr M.; Jedlicka L., (2010). Accompanying vegetation – grassland In: Colloquium on Landscape Management, No 1, pages: 28-30

Šlezingr, M. (2007). Stabilisation of reservoir banks using an "armoured earth structure" (2007) Journal of Hydrology and Hydromechanics, 55 (1), pp. 64-69.

Zelenakova, M.; Carnogurska, M.; Slezingr, M..; et al. (2013). A model based on dimensional analysis for prediction of nitrogen and phosphorus concentrations at the river station Izkovce, Slovakia HYDROLOGY AND EARTH SYSTEM SCIENCES Volume: 17 Issue: 1 Pages: 201-209 Published: 2013

Souhrn
Vegetační doprovod vodního toku či nádrže je nedílnou součástí úpravy toku a jeho začlenění do krajiny. Řeka včetně kvalitního vegetačního doprovodu se stává především v nížinné krajině dominantním prvkem. Určuje krajinný ráz, je vodícím prvkem při budování sítě pěšin pro turistiku cest pro cyklistiku míst pro nerušený rybolov apod.
V příspěvku si všímáme funkcí vegetačního doprovodu zajišťujících právě možnost nerušeného a kvalitního rekreačního využití okolí vodního toku. Jsou to především funkce krajinotvorná, funkce hygienická, rekreační, estetická, důležitá je také podpora procesů samočištění aj.

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