Ecological and Socio-Economic Value of Waterlogged Areas

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Abstract. The article summarizes the main indicators of the value of waterlogged areas, which must be taken into account for the sustainable management of wetlands. The ecosystem functions of wetlands included in the natural capital of a region relate to hydrology, water quality, supporting food chains, and providing habitats for living organisms, including rare and protected ones. The socio-economic significance of wetlands is formed both from their consumer value and from non-productive, socio-cultural values. There is a need to develop an approach and methodology for the study of waterlogged areas, within which the assessment of the natural capital of a region will necessarily include the assessment of the non-productive values of wetlands.

1. Introduction

Waterlogged areas (wetlands, swamps) are traditionally defined as ecosystems with constant or non-periodic moisture, with slowed down biogeochemical processes, oxygen deficiency, and the ability to accumulate peat. The phytocenosis of such areas is, as a rule, a community of plants specialized for waterlogged soils.

In the history of human society, wetlands have largely been regarded as non-productive and even dangerous lands. Great efforts were spent on their reclamation for intensive agricultural production, fishing, in order to create land for industrial development or urban growth. Recently, however, the more wetlands are lost, the more society begins to understand their actual significance. There is a growing awareness that wetlands can be more valuable in their natural, or only mildly modified state than when dewatered, drained, or built-up. So far, this understanding is not enough to guarantee their conservation. As wetlands were neglected in the past, research and planning methods, policy, and management methodology for their conservation and sustainable use in various regions are underdeveloped today.

For sustainable management of wetlands, it is necessary to understand the value of wetlands as the natural capital of a region, including their functional significance in the ecosystems of a region. A significant number of modern studies are aimed precisely at determining the value and developing methods for studying wetlands.

2. Discussion

2.1 Hydrology

The natural functions of wetlands are closely related to hydrology. Primary productivity, nutrient cycling, habitat of living organisms, economic and social significance are undoubtedly related to the quality and quantity of water in the ecosystems of swamps [1].

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Among all hydrological environments, wetlands are the most problematic for assessment [2]. The difficulty in assessing largely explains the fact that the hydrological characteristics of wetlands are poorly explored. The primary importance of wetlands in systems hydrology is: 1) flood control; 2) groundwater supply; 3) coastline protection and erosion reduction.

2.2 Water Quality
Wetlands perform the functions of filtering the waters passing through them, removing dissolved substances and suspended particles contained in these waters due to the following processes: 1) sedimentation as a result of a decrease in the speed of water flow when it passes through swamps; 2) fixation of the sedimented particles; 3) microbiological decomposition of organic substances; 4) photosynthesis, biodegradation, bioaccumulation, and other processes related to the metabolism of plants and animals [3].

2.3 Elemental Transformation and Cycling
The function of supporting food chains is related to the direct or indirect use of nutrients obtained from wetlands by heterotrophic organisms permanently or temporarily living in wetlands and adjacent areas.

First of all, the volume of the biological cycle of carbon, phosphorus, and nitrogen is of interest. Lack of oxygen, in addition, contributes to the predominance of production over decomposition, causing, in particular, such of the main characteristics of wetlands as the accumulation of peat. To support food chains, the ability of wetlands to export nutrients is potentially more important than the gross primary production level [4].

2.4 Aquatic and Wildlife Habitat
Wetlands are a habitat for a wide variety of living creatures. Some of them are completely dependent on wetlands as an area where they feed, breed, escape predators and/or bad weather. These species, for the most part, spend their entire life within wetlands. A significant number of species use waterlogged areas only to ensure their certain vital functions, for example, only during a specific period of the life cycle, or of a year, or moving from one wetland to another. Some species can live in wetlands, but their main habitat is considered to be more elevated parts of the land or deep-water ecosystems.

Wetlands provide essential habitats for many rare and endangered plant and animal species. However, with all its importance for biodiversity maintenance, waterlogged areas, according to the terms of the Endangered Species Act, account for more than half of the areas identified as critical habitats [5].

The value of waterlogged areas as habitat is influenced by many factors — occupied areas; spatial structure within and between wetlands; vertical and horizontal zoning; genetic, species, and ecosystem diversity of the area; water chemistry; anthropogenic impact directly on the ecosystem in question and adjacent areas, etc. [6].

The value of waterlogged areas as habitats for various animal species, especially exploitable species, largely determines the socio-economic importance of such areas. For example, in the United States, a large share (from 66 to 90 percent) of commercial and sport fishing depends on coastal river mouths and their wetlands as a source of food and a developmental area for young animals [7].

2.5 Social and Economic Values
Along with the humanization of society, those elusive elements, that affect the higher aspirations of mankind and constitute, in the end, the same elusive thing — the “quality of life”, are getting detached (and getting farther) from society's material economic values. These elements are, in fact, humanity, spirituality, beauty. A precise definition of productive and non-productive values separately is impossible due to their deep, genetic interpenetration. In this regard, the values of such different “classes” are often described jointly.

The intangible nature conservation values of wetlands can receive quite definite material expression. Thus, for example, to prevent a repetition of the horrific fires of 2010, in the Moscow region, about 8
thousand hectares of wetlands were restored during the implementation of a peatland rewetting project. However, in general, non-productive values have so far been ranked lower than functions related directly to ecological services or economic benefits. There is a variation within the group: for example, flood control functions are generally considered to be of greater importance than aesthetic ones. There are significant exceptions to this rule, but they are rare [8].

This “secondary” status of non-productive values has several reasons: 1) “the values of being” are intangible, often directly related to the socio-cultural or even personal interaction of a specific subject with specific natural objects; 2) insufficiency of methods and practical experience in assessing human perception of environmental value per se; 3) the lack of a single measure, a certain standard for intangible functions does not allow them to be compared with material, economic value.

The consumer value is represented, for example, by a variety of resources extracted from swamps. They are clearly tied to the area and have, in contrast to the “values of being”, specific material and economic expression. The consumer value of wetlands is most extensively recorded for the ability to produce peat, wood, agricultural crops, energy, species reproduction, and water supply. However, the assessment based on the dollar value of the collected resource does not fulfill three mandatory requirements for any assessment scheme: environmental reasonableness; objectivity; analysis completeness. In addition, the exploitation of natural areas in order to obtain material benefits in some cases can significantly change the state of ecosystems and even destroy them. Thus, at present, there is no ready-made methodology that can fully take into account all the components of the value of natural areas in general and waterlogged areas in particular.

The development of a methodology for assessing the non-productive values of wetlands is being pursued, in particular, by the IUCN Wetlands Specialist Group. They proposed to use the method of expert assessments from professionals related to environmental values, in terms of the basic principles of anthropology, history, psychology, aesthetics, landscape architecture, recreation, and related fields. After data integration, the methodology and tools are developed to assess the non-productive value of wetlands [9].

3. Conclusion
In connection with the increase in anthropogenic load on waterlogged areas in Russia, the question of their study and protection arises. The practical significance of the research carried out earlier was limited, basically, only to the justification of various projects for their reclamation and subsequent development for any type of activity (agricultural production, afforestation, peat extraction). In recent decades, however, research aimed at studying the uniqueness and significance of wetland systems are being turned to.

On the territory of the Novgorod region, there are more than 500 rivers with a total length of 15.0 thousand km, more than a thousand lakes, and 90 swamps. The region is one of the most waterlogged in the North-West of Russia. The total area of land under water, including swamps, is 721.9 thousand hectares or 13.3% of the total land fund of the region, of which 174.1 thousand hectares are occupied by rivers, streams, lakes, ponds, and drainage canals, and 547.8 thousand hectares are occupied by swamps [10]. Today, the traditional methods of their research are already insufficient, there are relatively few generalizations on the accumulated data on swamps, such modern research technologies as, for example, technologies of geographic information systems are poorly applied, therefore the problem requires careful study.

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