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ECOSYSTEM SERVICES OF BOREAL MIRES AND PEATLANDS

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SUMMARY

Ecosystem services are defined as direct or indirect benefits of ecosystems to humans. They include goods provided by ecosystems (e.g. timber, berries and game) and different functions (e.g. climate change mitigation, regulation of the circulation and quality of water) they perform. The aim of our project is to identify and valuate ecosystem services provided by pristine mires and managed peatlands. The work will be based on a case study carried out in the North Karelia Biosphere Reserve in Eastern Finland. Regional expert and stakeholder workshop and local stakeholder interviews will be used to identify ecosystem services and possible conflicts and synergies between them as well as to evaluate the socio-economic importance of the benefits.

KEYWORDS: boreal, ecosystem services, mire, peatland

INTRODUCTION

Ecosystem services are defined as benefits of ecosystems to humans (Millennium Ecosystem Assessment 2005). These services include goods provided by ecosystems and different functions they perform, both of which benefit directly or indirectly human well-being.

Mire ecosystems are well-known for their unique species and habitats of high conservation value. Mires and peatlands also provide a range of benefits to our societies and economies. For example, peatlands are a source of important natural resources such as timber, berries, game and peat for fuel. In addition, mire and peatland ecosystems form important carbon storage and they also play an important role in regulating climate and the circulation and quality of water. Pristine mires provide also opportunities for recreation and tourism. Given the range of different values and services, it is not surprising that mire and peatland ecosystems face conflicting demands for their use.

Ecological processes, ecosystem functions and related ecosystem services in mires and peatlands take place at different temporal and spatial scales. Furthermore, stakeholders benefit from, and therefore also value, these services at different scales. This "flow" of services from

ecosystems to beneficiaries is an integral part of the ecosystem service concept (TEEB 2010). Insights on the flow of services, e.g. different scales and stakeholders involved, helps to identify values and benefits provided by mires and peatlands, including possible conflicting interests related to their use. Increased understanding of the benefits and beneficiaries can help to conserve, manage and utilise mires and peatlands so that they maintain a wide range of ecosystem services, benefiting a variety of stakeholders.

When considering the maintenance and use of mire and peatland ecosystem services it is also important to understand that there are trade-offs between different services. Trade-offs occur when the provision of one ecosystem service is reduced as a consequence of increased use of another service (e.g. Rodrigues *et al*., 2006; Bonn *et al*., 2009). These trade-offs arise from management choices related to the use of mires and peatlands. For example, drainage of mires and peatlands to enhance wood production may reduce water quality downstream. Trade-offs are also common between maintaining the natural values of mires and using them as a natural resource. In the most extreme case, such as peat extracting, the trade-offs between different ecosystem services can be irreversible, even leading to the complete change of ecosystem and loss of all other services and values provided by the site. On the other hand, in several occasions different services can co-exist and multiple values of mires and peatlands can be maintained by appropriate land use and adaptive management practises.

So far the decisions on land use on mires and peatlands have not taken into consideration the full range of ecosystem services, including the trade-offs and synergies between different services. Increased appreciation and understanding of these aspects can help to maintain a wider range of values and services, benefitting both conservation and a variety of stakeholders.

The aim of our project is to identify and valuate ecosystem services provided by pristine mires and managed peatlands. In this paper we will focus on identifying ecosystem services at regional and local scale and the possible synergies and conflicts between the services. The economical and social importance of the ecosystem services will also be discussed.

MATERIALS AND METHODS

The work will be based on a case study carried out in the North Karelia Biosphere Reserve in Eastern Finland (Fig. 1). The North Karelia Biosphere Reserve was established in 1992 and it is part of the UNESCO's World Network of Biosphere Reserves. As biosphere reserves strive to promote sustainable development based on local community efforts and sound science, it suits well as a case study area for ecosystem services.

Identification of regional mire and peatland ecosystem services

Expert workshop was used to identify mire and peatland ecosystem services at the regional scale, i.e. in the whole North Karelia Biosphere Reserve. The workshop was held in January 2012 in Joensuu, North Karelia. The participants represented a wide range of expertise and perspectives on North Karelian mires and peatlands: economy, environmental policy, recreation, game management, conservation, forestry, research, landscape planning and nature tourism. Presentations on ecosystem services, their valuation and North-Karelian mires and

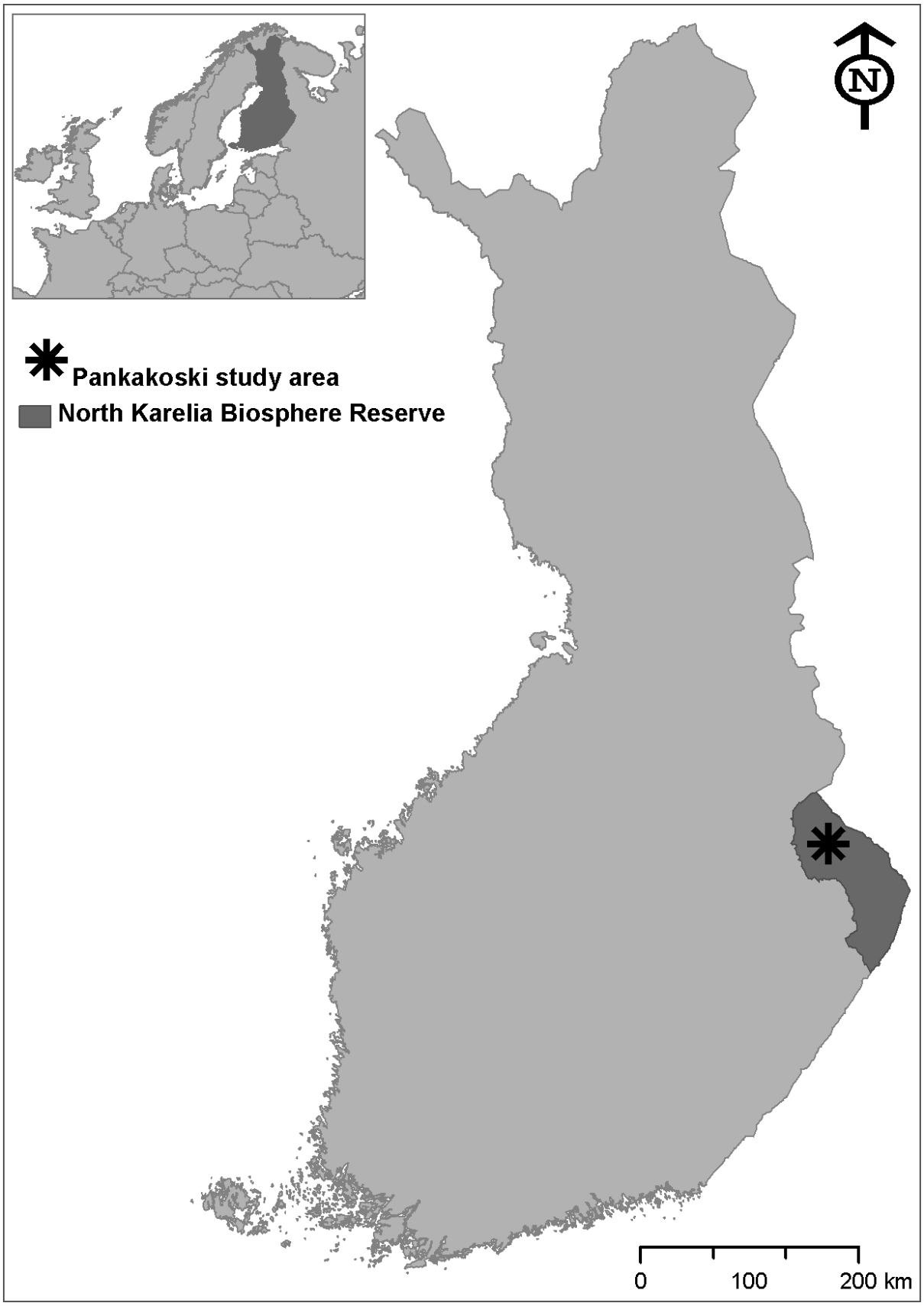

Fig.1. Location of the study area, the North Karelia Biosphere Reserve, and the village Pankakoski, in Eastern Finland. © Maanmittauslaitos lupa nro 7/MML/12.

peatlands provided the participants with the necessary background information on the workshops' theme. Participants were divided into four working groups.

Information on identification and importance of mire and peatland ecosystem services in North-Karelia was collected by using a matrix with ecosystem services as rows and the current and future importance of them as columns and by listing 3-5 most important services now and in the future as well as 3-5 least important current services. The importance referred to the importance of the service at the study area. The future was defined as the next 10 to 20 years. The economic and social importance of ecosystem services were valuated by using matrices with ecosystem services and their products as rows and non-market / indirect economic benefits (for private households), direct economic benefits (for private households) and market benefits (for business and companies) as columns. Also three most important ecosystem services and the goods they provide were listed in each category. The valuation was made separately for pristine mires, for peatlands drained for forestry and for peat extraction areas. In this paper we will focus on the initial results from the listings. Information on synergies and conflicts between services were gathered at group discussions.

Identification of local mire and peatland ecosystem services

Appreciation and understanding of ecosystem services at a local scale were studied by conducting a stakeholder survey (23 semi-structured interviews) in Pankakoski (Lieksa, North Karelia) (Silvennoinen 2012). Pankakoski is a small village with approximately 880 inhabitants (Fig. 1). The local perception of different values and benefits related to mires and peatlands was assessed by comparing ecosystem services provided by two different areas: Reposuo mire and Näräsensuo peatland, both located near village Pankakoski. The former is a protected mire in its natural state with some facilities and infrastructure for recreation. The latter is a peatland drained for forestry. The aim of the survey was to assess which ecosystem services are recognised and appreciated by the local people and how they perceive the difference between services provided by the two, very different mire and peatland areas.

RESULTS

Ecosystem services at regional level

Biodiversity maintenance and protection, recreation, berries, timber and carbon sequestration were most often listed as being amongst the 3-5 most important ecosystem services provided by the mires and peatlands in the North Karelia Biosphere Reserve. Except for the berries, the same services were most often mentioned as being important also in the future, although services related to climate change regulation were mentioned more often than timber. As for the least important services in the region were most often listed arable crop, energy peat, cosmetics, prevention of forest fires and natural medicines.

Recreation, aesthetic and landscape values and berries were most often listed as being amongst the three most important non-market / indirect economic benefits for private households provided by the mires and peatlands in the study area. As direct economic benefits for private households game, timber and berries were most often listed. For business and

companies nature tourism, energy wood, timber and energy peat were most often listed as being the most important benefits from the mires and peatlands of the region.

The synergy between berries and game with cultural services (recreation, tourism, cultural and spirituality values, mental wellbeing and health, communality, landscape values) was highlighted in all group discussions. Biodiversity maintenance and protection was found to have synergies with for example regulation of water flow and quality, nature tourism and recreation, berries, pollination, natural medicinal products, education and research and aesthetic and landscape values. In general it was also stated that all ecosystem services in pristine mires are in synergy with each other.

Key conflicts were associated with timber and energy wood production with most of the ecosystem services provided by pristine mires, and energy peat use with most of the mire and peatland ecosystem services.

Ecosystem services at local level

Initial results from Pankakoski case study show that local people value ecosystem services provided by the pristine Reposuo area more than those provided by the drained Näräsensuo peatland. Most of the interviewees had visited Reposuo and most of them also used its ecosystem services actively. Only few of the interviewees had visited Näräsensuo.

Cultural (e.g. recreation) and provisioning services (e.g. berries) were identified as important local benefits of Reposuo. Maintenance and protection of biodiversity and providing nesting and refuge sites for wildlife (habitat services) were mentioned as important larger scale ecosystem services. It was also recognized that Reposuo, as pristine mire, has an important role in climate change mitigation. The infrastructure (duckboards, camp-fire places) provided in Reposuo seems to be an important factor in utilization of its cultural ecosystem services.

As benefits derived locally from Näräsensuo mainly provisioning services were mentioned (berries, mushrooms, game and firewood). The benefits of the drained Näräsensuo locally or at a broader social level as an area producing timber and economic benefits, was seen as marginal or even questionable.

DISCUSSION

Both at the regional and local scale a wider range of ecosystem services were associated with pristine mires than drained peatlands. Especially for the regulating services, the state of the peatland ecosystem is crucial. As 75 % of the peatlands in the region have been drained, it was pointed out that their role in providing e.g. regulation of climate or water quality has clearly declined. At the regional scale the main services of drained peatlands were associated with timber and energy wood production, with direct economic benefits for the households and forest industry. At the local level benefits of drained peatlands were identified, but not valued as important.

Both the regional and local studies revealed that certain provisioning and cultural services are tightly linked in mire ecosystem services. Berries and game are always linked with recreation, social activities, aesthetic values or mental wellbeing. In the workshop discussions it was

even claimed that for berry picking and hunting the cultural services are far more important than provisioning services (food).

We will continue our work with a more detailed analysis of the workshop results, mapping the mire and peatland ecosystem service potential in the case study area and conducting a more in-depth study on the values of the services.

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