Trade-offs between the forest ecosystem services biodiversity and recreation: Perception and assessment of deadwood by outdoor recreationists and the general public in Bavaria (SE Germany)

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Project background and research goals

Forests are of major importance to human societyworldwide, contributing to ecosystem servicesfundamental. In this context,biodiversity is regarded as a key factor. In recent years, numerous studiesidentified deadwood as a crucial precondition for forest biodiversity(e.g. Müller et al. 2008; Müller & Job 2009).Deadwood encompasses non-living tree biomass including standing or lying woody debris or pile wood volumes and is created by tree mortality, which can be caused by several (natural) factors such asfire, storms, droughts, insects or pathogens.

Previous studies have improved the understanding of habitat relations for many species associated with deadwood, emphasizing the remarkable importance of deadwood for different supporting, provisioning and regulating ecosystems services(e.g. Gamfeldt et al. 2013). However, existing studies also indicate that neither forest visitors nor the public welcome higher shares of deadwood due to several reasons. This shows that considerable trade-offs exist between different ecosystem services (for instance between profit maximizing harvest and high deadwood amounts). These trade-offs are subject of a large research project called BioHolz (supported by the German Federal Ministry of Education and Research BMBF and the Federal Agency for Nature Conservation BfN, funded by the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety BMUB)which evaluates ecosystem services and biodiversity in a multidisciplinary perspective focusing on deadwood.

The present study is part ofthisproject and analyzes theinfluence of deadwood oncultural ecosystem services and their trade-offs like tourismand outdoor-recreation, but also on spiritual and emotional relations of respondents to forests as part of their place attachment and personal identity. Despite some progress in recent years this nexus has not been explored in detail and not with a multiple method research design combining quantitative and qualitative approaches. Thus, this study analyzes the impact of different amounts and arrangements of deadwood in specific forest sites on the visual preference of forest recreationists and tourists according to previous studies in that field (Edwards et al. 2012).Main goal of the research project is

the assessment of the perception and valuation of forest ecosystem services by visitors, the public and other stakeholders that are related to forest management. Based on the results we seek to recommend location specific forest development options.

Methodological approaches

The methodological approaches can be differentiated in several ways:

1. Stakeholder groups
2. Geographical scope
3. Quantitative vs. qualitative methods

Ad (1): Our project focusses on three major stakeholder groups: Forest visitors, non-forest visitors (general public) and decision makers related to forests like forest owners, foresters, hunters, administration and politics. The leading hypothesis here is the question if all groups are expected to have different attitudes towards ecosystem services

Ad (2): The geographical scope of our study is twofold: on one hand, we conduct in situ surveys with forest visitors in the Bavarian Forest, a densely wooded mountain region and national park in southeast Germany situated along the Czech border. In this survey area, we also show experimental plots of man-made deadwood accumulation to selected respondents in order to assess their perceptions and valuations of these differing experiment areas. The idea behind these experiments is the following: In order to maximize ecosystem services forest owners and managers have to be convinced to allow higher deadwood levels in their forests compared to the present situation. To achieve short to mid-term improvements of biodiversity levels, the project seeks possibilities to include more deadwood in regularly managed forests, for instance by leaving parts of the timber harvest at place. The experiments simulate this situation.

On the other hand, a representative online survey among the population of the German federal state of Bavaria allows the analysis of non-forest visitors' perceptions towards differing deadwood amounts and arrangements as well as their willingness to pay for hypothetical changes in forest management leading to higher deadwood amounts and thus most likely higher biodiversity. In addition, pictures of the deadwood experiment plots could be included in this online survey in order to compare the public opinion with the onsite experiences.

Ad (3): Adapted to the stakeholder groups, the geographical scope and the specific research question we use a broad mix of methods. The most suitable approach to include both forest preferences and trade-offs with other ecosystem services is by far a discrete choice model (Ben-Akiva&Lerman 1985; Hensher et al. 2005). This allows in a direct comparison an estimation of the utility preferences and marginal willingness to pay for distinct forest situations. Based on random utility theory (Hensher et al. 2005) the choice experiment (CE) is a common approach to assess respondents' preferences for several options. The most important challenge is to provide the best-fitting set of alternatives and corresponding attributes that will allow assessments of people's preferences for several forest scenarios. This holds especially true for the complex task of taking pictures representing ideally several forest and deadwood scenarios and amounts.

The CE will be both applied in the onsite survey in the Bavarian Forest and the representative online survey. Using the same survey instrument for both samples allows to test for the role of onsite experience and the geographical location of the respondents (urban vs. rural context). However, we will use two different versions of the CE: First, we will evaluate general forest scenarios ranging from near natural to intensively used. Second, we will specifically assess the effects of the deadwood accumulation experiments on scenic beauty and its perception and valuation by visitors and non-visitors.

In contrast, the study on the decision makers' perceptions and attitudes concerningecosystem services, their relationships and trade-offs follows a qualitative research approach using semi-structured personal interviews as well as discourse analysis methods based on press and media outlets. However, in order to assure comparability, the CE will also be undertaken with the decision makers but requires most likely a different statistical design as the number of respondents is limited. This means that every respondent has to answer a higher number of choice tasks then the respondents in the visitor and public surveys.

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